CASE NUMBER:

99-430

LOUISVILLE GAS AND ELECTRIC COMPANY/
KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to First Data Request of AG Dated January 25, 2000

Responding Witness: Lonnie E. Bellar

Q23. In Volume III, Section V, Exhibits 9 and 10 show the capacity options with lowest costs at different capacity factors, and without the CO2 adders. Please provide the results of these same two exhibits with the scenario of including the CO2 adders.

A23. The requested information is attached.

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base *1999 Dollars ($/kW yr)*
Heat Rate- Base
Fuel Forecast- Base

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	100	131	161	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	91	122	153	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	198	220	242	264	286	309	331	353	375	397
Pulverized Coal (LSFO)-400MW	196	218	240	262	285	307	329	351	373	395	417
Pulverized Coal (LSFO)-300MW	201	226	251	276	301	327	352	377	402	427	452
Pulverized Coal (LSFO)-200MW	245	268	291	314	336	359	382	405	428	451	474
Pulverized Coal (LSFO)-300MW X 2	180	202	225	247	269	291	314	336	358	381	403
Pulverized Coal Compliance (LSD)- 300MW	190	215	241	266	291	316	341	367	392	417	442
Pulverized Coal Supercritical (LSD)- 300MW	228	254	280	306	332	357	383	409	435	461	487
Pulverized Coal (Advanced LSFO)- 400MW	203	224	245	266	286	307	328	349	369	390	411
Atmosph Fluidized Bed (Circulating)-200MW	251	279	307	335	362	390	418	446	474	502	530
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	299	323	346	369	393	416	440	463	486	510
Press Fluidized Bed (Bubbling)-350MW	192	214	237	259	281	303	325	347	369	392	414
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	211	233	254	276	297	319	341	362	384	405
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	257	280	302	325	347	369	392	414	437	459
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	199	222	244	266	288	311	333	355	378	400
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	196	218	239	261	282	304	325	347	368	390
Foster Wheeler Advanced PFB (Circulating)-688MW	163	185	208	231	254	276	299	322	345	367	390
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	265	285	304	324	344	363	383	403	423	442
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	246	266	287	307	328	349	369	390	411	431
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	275	299	322	346	370	393	417	441	464	488
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	359	381	403	424	446	468	490	511	533	555
Advanced Int. Coal Gas-460MW	177	198	219	239	260	281	302	322	343	364	385
Combustion Turbine Heavy Duty-80MW	70	114	158	202	246	290	334	378	422	466	510
Combustion Turbine Heavy Duty-110MW	61	108	155	202	249	296	343	390	437	484	531
Combustion Turbine Heavy Duty-160MW	56	96	136	176	216	256	296	336	376	416	456
Combustion Turbine Aero- 45MW	114	150	186	222	258	294	330	366	402	438	474
CT Combined Cycle 2on1 - 330MW	87	113	140	167	194	221	247	274	301	328	354
CT Combined Cycle 2on1 - 470MW	76	100	125	150	175	199	224	249	274	299	323
CT Combined Cycle - 345MW	79	104	128	152	177	201	225	250	274	298	322
CT with Cascaded Humidified Advanced Turbine-300MW	72	99	126	153	180	207	234	261	287	314	341
Phosphoric Acid Fuel Cell-2.5MW	1203	1238	1272	1307	1342	1376	1411	1446	1480	1515	1550
Molten Carbonate Fuel Cell-100MW	373	395	416	438	460	481	503	525	546	568	590
Solid Oxide Fuel Cell-100MW	187	208	229	249	270	291	311	332	353	373	394
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	318	415	513	611	709	806	904	1002	1100	1198
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	188	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	194	218	242	266	290	315	339	363	387	411
Cane Run 3 Rehab w/ Natural Gas	127	164	201	239	276	314	351	388	426	463	501
Brown 5 CT 110MW	54	96	138	180	222	264	306	348	390	432	474
Brown 5 CT 164MW	55	91	127	163	199	235	271	307	343	379	415
Brown 5 CT 102MW	57	100	143	186	229	272	315	358	401	444	487
Brown 5 CT 159MW	51	88	125	162	199	236	273	310	347	384	421
Brown 5 CT 149MW	52	90	128	166	204	242	280	318	356	394	432
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	92	132	172	212	252	292	332	372	412	452
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	175	198	220	242	264	286	308	331	353	375
IAC at Brown 8-11	21	70	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	70	122	134	134	134	134	249	274	298	322

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate-Low
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	96	124	153	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	78	107	135	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	185	205	226	246	266	287	307	327	347	368
Pulverized Coal (LSFO)-400MW	184	204	225	245	265	285	306	326	346	367	387
Pulverized Coal (LSFO)-300MW	189	212	235	257	280	303	326	349	371	394	417
Pulverized Coal (LSFO)-200MW	231	252	273	294	314	335	356	377	398	419	440
Pulverized Coal (LSFO)-300MW X 2	169	189	210	230	251	271	292	312	333	353	374
Pulverized Coal Compliance (LSD)- 300MW	178	201	224	246	269	292	315	337	360	383	406
Pulverized Coal Supercritical (LSD)- 300MW	214	238	261	284	308	331	354	378	401	425	448
Pulverized Coal (Advanced LSFO)- 400MW	191	210	229	249	268	287	306	325	344	363	382
Atmosph Fluidized Bed (Circulating)-200MW	228	253	279	304	330	355	380	406	431	457	482
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	266	287	309	331	352	374	396	417	439	461
Press Fluidized Bed (Bubbling)-350MW	163	184	204	225	245	266	286	306	327	347	368
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	181	200	220	240	260	280	300	320	339	359
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	229	250	271	291	312	332	353	374	394	415
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	172	193	213	234	254	275	295	316	336	357
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	169	189	209	229	249	269	289	308	328	348
Foster Wheeler Advanced PFB (Circulating)-688MW	139	160	181	202	223	245	266	287	308	330	351
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	226	244	262	280	298	316	334	352	370	388
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	211	230	249	268	287	306	324	343	362	381
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	243	265	286	308	330	351	373	395	416	438
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	307	327	348	368	388	409	429	449	469	490
Advanced Int. Coal Gas-460MW	151	171	190	209	229	248	267	287	306	326	345
Combustion Turbine Heavy Duty-80MW	65	103	141	179	217	255	293	331	369	407	445
Combustion Turbine Heavy Duty-110MW	56	97	138	179	220	261	302	343	384	425	466
Combustion Turbine Heavy Duty-160MW	52	86	120	154	188	222	256	290	324	358	392
Combustion Turbine Aero- 45MW	105	137	169	201	233	265	297	329	361	393	425
CT Combined Cycle 2on1 - 330MW	81	104	127	150	173	196	219	242	265	288	311
CT Combined Cycle 2on1 - 470MW	71	92	113	135	156	178	199	220	242	263	284
CT Combined Cycle - 345MW	69	90	112	133	154	175	196	217	238	259	280
CT with Cascaded Humidified Advanced Turbine-300MW	64	88	111	135	159	183	206	230	254	277	301
Phosphoric Acid Fuel Cell-2.5MW	1115	1145	1176	1206	1236	1267	1297	1327	1358	1388	1418
Molten Carbonate Fuel Cell-100MW	332	351	370	389	408	427	446	465	484	503	522
Solid Oxide Fuel Cell-100MW	169	187	205	223	241	259	277	295	313	331	349
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	275	359	444	528	612	697	781	865	950	1034
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	181	203	225	247	269	292	314	336	358	380
Cane Run 3 Rehab w/ Natural Gas	120	152	184	216	248	280	313	345	377	409	441
Brown 5 CT 110MW	52	89	126	163	200	237	274	311	348	385	422
Brown 5 CT 164MW	52	83	114	145	176	207	238	269	300	331	362
Brown 5 CT 102MW	55	92	129	166	203	240	277	314	351	388	425
Brown 5 CT 159MW	49	81	113	145	177	209	241	273	305	337	369
Brown 5 CT 149MW	50	83	116	149	182	215	248	281	314	347	380
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	85	120	155	190	225	260	295	330	365	400
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	168	189	209	229	249	269	289	310	330	350
IAC at Brown 8-11	20	64	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	64	107	119	134	134	134	217	238	259	280

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	97	126	156	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	80	110	140	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	186	207	228	249	270	291	312	333	354	375
Pulverized Coal (LSFO)-400MW	184	205	226	247	268	289	310	331	353	374	395
Pulverized Coal (LSFO)-300MW	189	213	237	261	285	308	332	356	380	404	428
Pulverized Coal (LSFO)-200MW	231	253	274	296	318	340	362	384	406	427	449
Pulverized Coal (LSFO)-300MW X 2	169	190	211	233	254	275	296	318	339	360	381
Pulverized Coal Compliance (LSD)- 300MW	178	202	226	250	274	298	322	346	370	394	418
Pulverized Coal Supercritical (LSD)- 300MW	214	239	263	288	313	337	362	386	411	436	460
Pulverized Coal (Advanced LSFO)- 400MW	191	211	231	251	271	291	310	330	350	370	390
Atmosph Fluidized Bed (Circulating)-200MW	228	255	281	308	335	361	388	414	441	468	494
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	266	289	311	334	356	379	401	424	446	468
Press Fluidized Bed (Bubbling)-350MW	163	184	206	227	248	269	291	312	333	354	376
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	181	202	223	243	264	284	305	326	346	367
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	230	251	273	294	316	337	358	380	401	423
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	173	195	216	237	259	280	302	323	344	366
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	170	191	211	232	253	273	294	315	335	356
Foster Wheeler Advanced PFB (Circulating)-688MW	139	160	182	204	226	248	270	291	313	335	357
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	227	246	265	283	302	321	340	358	377	396
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	212	231	251	271	290	310	330	350	369	389
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	244	266	288	311	333	355	378	400	422	445
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	308	329	349	370	391	412	433	454	475	496
Advanced Int. Coal Gas-460MW	151	171	191	211	231	251	271	291	311	331	351
Combustion Turbine Heavy Duty-80MW	65	107	149	191	233	275	317	359	401	443	485
Combustion Turbine Heavy Duty-110MW	56	101	146	191	236	281	326	371	416	461	506
Combustion Turbine Heavy Duty-160MW	52	90	128	166	204	242	280	318	356	394	432
Combustion Turbine Aero- 45MW	105	140	175	210	245	280	315	350	385	420	455
CT Combined Cycle 2on1 - 330MW	81	106	131	157	182	208	233	258	284	309	335
CT Combined Cycle 2on1 - 470MW	71	94	118	141	165	188	212	235	259	282	306
CT Combined Cycle - 345MW	69	93	116	139	162	186	209	232	255	278	302
CT with Cascaded Humidified Advanced Turbine-300MW	64	90	115	141	167	193	218	244	270	295	321
Phosphoric Acid Fuel Cell-2.5MW	1115	1148	1182	1215	1248	1282	1315	1348	1382	1415	1448
Molten Carbonate Fuel Cell-100MW	332	353	373	394	415	435	456	477	497	518	539
Solid Oxide Fuel Cell-100MW	169	189	209	228	248	268	287	307	327	346	366
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	284	377	470	563	655	748	841	934	1027	1120
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	182	205	228	251	274	297	320	343	366	389
Cane Run 3 Rehab w/ Natural Gas	120	155	191	226	262	297	333	368	404	440	475
Brown 5 CT 110MW	52	92	132	172	212	252	292	332	372	412	452
Brown 5 CT 164MW	52	87	122	157	192	227	262	297	332	367	402
Brown 5 CT 102MW	55	96	137	178	219	260	301	342	383	424	465
Brown 5 CT 159MW	49	85	121	157	193	229	265	301	337	373	409
Brown 5 CT 149MW	50	87	124	161	198	235	272	309	346	383	420
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	88	126	164	202	240	278	316	354	392	430
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	169	190	212	233	254	275	296	317	338	359
IAC at Brown 8-11	20	67	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	67	110	119	134	134	134	232	255	278	302

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	98	129	160	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	82	114	145	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	187	209	232	254	276	299	321	343	365	388
Pulverized Coal (LSFO)-400MW	184	206	229	251	273	295	318	340	362	385	407
Pulverized Coal (LSFO)-300MW	189	215	240	266	291	317	342	368	393	419	445
Pulverized Coal (LSFO)-200MW	231	254	277	300	323	346	369	392	415	438	462
Pulverized Coal (LSFO)-300MW X 2	169	192	214	237	259	282	305	327	350	372	395
Pulverized Coal Compliance (LSD)- 300MW	178	204	230	256	281	307	333	359	385	411	437
Pulverized Coal Supercritical (LSD)- 300MW	214	241	267	294	320	346	373	399	426	452	479
Pulverized Coal (Advanced LSFO)- 400MW	191	212	233	254	275	296	317	338	359	380	401
Atmosph Fluidized Bed (Circulating)-200MW	228	257	285	313	342	370	399	427	456	484	513
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	268	291	315	339	362	386	410	433	457	481
Press Fluidized Bed (Bubbling)-350MW	163	186	208	231	253	276	298	320	343	365	388
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	182	204	226	248	269	291	313	334	356	378
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	231	254	277	299	322	344	367	390	412	435
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	174	197	219	242	264	287	309	332	354	377
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	171	193	215	236	258	280	301	323	345	367
Foster Wheeler Advanced PFB (Circulating)-688MW	139	161	184	207	230	253	276	299	322	345	368
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	228	248	268	288	308	327	347	367	387	407
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	213	234	254	275	296	317	337	358	379	400
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	245	269	292	316	340	363	387	411	434	458
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	308	330	352	373	395	417	439	460	482	504
Advanced Int. Coal Gas-460MW	151	172	193	214	235	256	277	298	319	340	361
Combustion Turbine Heavy Duty-80MW	65	111	157	203	249	295	341	387	433	479	525
Combustion Turbine Heavy Duty-110MW	56	105	154	203	252	301	350	399	448	497	546
Combustion Turbine Heavy Duty-160MW	52	93	134	175	216	257	298	339	380	421	462
Combustion Turbine Aero- 45MW	105	143	181	219	257	295	333	371	409	447	485
CT Combined Cycle 2on1 - 330MW	81	108	136	163	191	218	246	273	301	329	356
CT Combined Cycle 2on1 - 470MW	71	96	122	147	173	198	224	249	275	300	326
CT Combined Cycle - 345MW	69	94	120	145	170	195	220	245	270	295	320
CT with Cascaded Humidified Advanced Turbine-300MW	64	92	119	147	175	203	230	258	286	313	341
Phosphoric Acid Fuel Cell-2.5MW	1115	1151	1187	1223	1259	1295	1331	1367	1403	1439	1475
Molten Carbonate Fuel Cell-100MW	332	354	376	398	420	442	464	486	508	530	552
Solid Oxide Fuel Cell-100MW	169	191	212	233	255	276	297	319	340	361	383
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	292	393	494	595	696	797	898	999	1100	1201
Solar Photovoltaic:Flat Plate-10x5MW	416	416	418	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	183	208	232	257	281	305	330	354	379	403
Cane Run 3 Rehab w/ Natural Gas	120	158	197	236	274	313	351	390	429	467	506
Brown 5 CT 110MW	52	96	140	184	228	272	316	360	404	448	492
Brown 5 CT 164MW	52	90	128	166	204	242	280	318	356	394	432
Brown 5 CT 102MW	55	99	143	187	231	275	319	363	407	451	495
Brown 5 CT 159MW	49	88	127	166	205	244	283	322	361	400	439
Brown 5 CT 149MW	50	90	130	170	210	250	290	330	370	410	450
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	91	132	173	214	255	296	337	378	419	460
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	171	193	215	238	260	282	304	327	349	371
IAC at Brown 8-11	20	71	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	71	114	119	134	134	134	245	270	295	320

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	96	126	155	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	79	108	137	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	186	207	229	250	272	293	314	336	357	379
Pulverized Coal (LSFO)-400MW	184	205	227	248	269	291	312	334	355	376	398
Pulverized Coal (LSFO)-300MW	189	213	237	261	285	308	332	356	380	404	428
Pulverized Coal (LSFO)-200MW	231	253	275	297	319	341	363	385	407	429	451
Pulverized Coal (LSFO)-300MW X 2	169	190	212	234	255	277	298	320	341	363	384
Pulverized Coal Compliance (LSD)- 300MW	178	202	226	250	273	297	321	345	369	393	417
Pulverized Coal Supercritical (LSD)- 300MW	214	239	263	288	313	337	362	386	411	436	460
Pulverized Coal (Advanced LSFO)- 400MW	191	211	231	251	271	291	311	331	351	371	391
Atmosph Fluidized Bed (Circulating)-200MW	228	255	281	308	335	361	388	414	441	468	494
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	266	289	312	334	357	380	402	425	447	470
Press Fluidized Bed (Bubbling)-350MW	163	185	206	227	249	270	292	313	334	356	377
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	182	202	223	244	265	285	306	327	348	368
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	230	252	273	295	316	338	359	381	403	424
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	173	195	217	238	260	281	303	324	346	367
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	170	191	212	233	253	274	295	316	337	357
Foster Wheeler Advanced PFB (Circulating)-688MW	139	161	183	205	227	249	271	293	315	337	359
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	227	246	265	284	303	322	341	360	379	398
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	212	232	252	271	291	311	331	351	371	390
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	244	267	289	312	335	357	380	403	425	448
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	308	329	349	370	391	412	433	454	475	496
Advanced Int. Coal Gas-460MW	151	171	191	212	232	252	272	292	312	332	352
Combustion Turbine Heavy Duty-80MW	65	105	145	185	225	265	305	345	385	425	465
Combustion Turbine Heavy Duty-110MW	56	99	142	185	228	271	314	357	400	443	486
Combustion Turbine Heavy Duty-160MW	52	88	124	160	196	232	268	304	340	376	412
Combustion Turbine Aero- 45MW	105	138	171	204	237	270	303	336	369	402	435
CT Combined Cycle 2on1 - 330MW	81	105	129	154	178	202	227	251	275	299	324
CT Combined Cycle 2on1 - 470MW	71	93	116	138	160	183	205	228	250	273	295
CT Combined Cycle - 345MW	69	92	114	136	158	180	202	224	247	269	291
CT with Cascaded Humidified Advanced Turbine-300MW	64	89	114	138	163	188	213	237	262	287	312
Phosphoric Acid Fuel Cell-2.5MW	1115	1147	1179	1211	1243	1275	1307	1339	1371	1403	1435
Molten Carbonate Fuel Cell-100MW	332	352	371	391	411	430	450	470	489	509	529
Solid Oxide Fuel Cell-100MW	169	188	207	226	245	264	283	302	321	340	359
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	279	368	457	546	634	723	812	901	989	1078
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	182	205	228	252	275	298	321	345	368	391
Cane Run 3 Rehab w/ Natural Gas	120	154	187	221	255	289	323	357	390	424	458
Brown 5 CT 110MW	52	91	130	169	208	247	286	325	364	403	442
Brown 5 CT 164MW	52	85	118	151	184	217	250	283	316	349	382
Brown 5 CT 102MW	55	94	133	172	211	250	289	328	367	406	445
Brown 5 CT 159MW	49	83	117	151	185	219	253	287	321	355	389
Brown 5 CT 149MW	50	85	120	155	190	225	260	295	330	365	400
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	87	124	161	198	235	272	309	346	383	420
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	170	191	212	233	254	276	297	318	339	361
IAC at Brown 8-11	20	66	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	66	108	119	134	134	134	224	247	269	291

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate- Base
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	97	128	158	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	81	112	143	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	187	209	231	253	275	298	320	342	364	386
Pulverized Coal (LSFO)-400MW	184	206	228	250	273	295	317	339	361	383	405
Pulverized Coal (LSFO)-300MW	189	214	239	264	289	315	340	365	390	415	440
Pulverized Coal (LSFO)-200MW	231	254	277	300	322	345	368	391	414	437	460
Pulverized Coal (LSFO)-300MW X 2	169	191	214	236	258	280	303	325	347	370	392
Pulverized Coal Compliance (LSD)- 300MW	178	203	229	254	279	304	329	355	380	405	430
Pulverized Coal Supercritical (LSD)- 300MW	214	240	266	292	318	343	369	395	421	447	473
Pulverized Coal (Advanced LSFO)- 400MW	191	212	233	254	274	295	316	337	357	378	399
Atmosph Fluidized Bed (Circulating)-200MW	228	256	284	312	339	367	395	423	451	479	507
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	267	291	314	337	361	384	408	431	454	478
Press Fluidized Bed (Bubbling)-350MW	163	185	208	230	252	274	296	318	340	363	385
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	182	204	225	247	268	290	312	333	355	376
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	231	254	276	299	321	343	366	388	411	433
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	174	197	219	241	263	286	308	330	353	375
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	171	193	214	236	257	279	300	322	343	365
Foster Wheeler Advanced PFB (Circulating)-688MW	139	161	184	207	230	252	275	298	321	343	366
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	228	248	267	287	307	326	346	366	386	405
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	213	233	254	274	295	316	336	357	378	398
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	245	269	292	316	340	363	387	411	434	458
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	308	330	352	373	395	417	439	460	482	504
Advanced Int. Coal Gas-460MW	151	172	193	213	234	255	276	296	317	338	359
Combustion Turbine Heavy Duty-80MW	65	109	153	197	241	285	329	373	417	461	505
Combustion Turbine Heavy Duty-110MW	56	103	150	197	244	291	338	385	432	479	526
Combustion Turbine Heavy Duty-160MW	52	92	132	172	212	252	292	332	372	412	452
Combustion Turbine Aero- 45MW	105	141	177	213	249	285	321	357	393	429	465
CT Combined Cycle 2on1 - 330MW	81	107	134	161	188	215	241	268	295	322	348
CT Combined Cycle 2on1 - 470MW	71	95	120	145	170	194	219	244	269	294	318
CT Combined Cycle - 345MW	69	94	118	142	167	191	215	240	264	288	312
CT with Cascaded Humidified Advanced Turbine-300MW	64	91	118	145	172	199	226	253	279	306	333
Phosphoric Acid Fuel Cell-2.5MW	1115	1150	1184	1219	1254	1288	1323	1358	1392	1427	1462
Molten Carbonate Fuel Cell-100MW	332	354	375	397	419	440	462	484	505	527	549
Solid Oxide Fuel Cell-100MW	169	190	211	231	252	273	293	314	335	355	376
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	289	386	484	582	680	777	875	973	1071	1169
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	183	207	231	255	279	304	328	352	376	400
Cane Run 3 Rehab w/ Natural Gas	120	157	194	232	269	307	344	381	419	456	494
Brown 5 CT 110MW	52	94	136	178	220	262	304	346	388	430	472
Brown 5 CT 164MW	52	88	124	160	196	232	268	304	340	376	412
Brown 5 CT 102MW	55	98	141	184	227	270	313	356	399	442	485
Brown 5 CT 159MW	49	86	123	160	197	234	271	308	345	382	419
Brown 5 CT 149MW	50	88	126	164	202	240	278	316	354	392	430
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	90	130	170	210	250	290	330	370	410	450
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	170	193	215	237	259	281	303	326	348	370
IAC at Brown 8-11	20	89	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	69	112	119	134	134	134	240	264	288	312

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low *1999 Dollars ($/kW yr)*
Heat Rate- Base
Fuel Forecast- High

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	99	130	162	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	83	116	149	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	188	212	235	259	282	306	329	353	377	400
Pulverized Coal (LSFO)-400MW	184	207	231	255	278	302	325	349	372	396	419
Pulverized Coal (LSFO)-300MW	189	216	243	270	297	324	351	378	405	431	458
Pulverized Coal (LSFO)-200MW	231	255	279	303	327	352	376	400	424	448	472
Pulverized Coal (LSFO)-300MW X 2	169	193	216	240	264	287	311	335	358	382	406
Pulverized Coal Compliance (LSD)- 300MW	178	205	232	259	286	313	341	368	395	422	449
Pulverized Coal Supercritical (LSD)- 300MW	214	242	270	297	325	353	380	408	436	463	491
Pulverized Coal (Advanced LSFO)- 400MW	191	213	235	257	279	301	322	344	366	388	410
Atmosph Fluidized Bed (Circulating)-200MW	228	258	288	318	347	377	407	437	467	497	527
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	269	293	318	343	368	392	417	442	467	492
Press Fluidized Bed (Bubbling)-350MW	163	187	210	233	257	280	304	327	350	374	397
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	184	206	229	252	275	297	320	343	366	388
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	232	256	280	303	327	351	375	398	422	446
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	175	199	223	246	270	293	317	340	364	387
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	172	195	217	240	263	285	308	331	353	376
Foster Wheeler Advanced PFB (Circulating)-688MW	139	162	186	210	234	258	282	305	329	353	377
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	229	250	271	291	312	333	354	374	395	416
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	214	236	258	279	301	323	345	367	389	410
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	246	271	296	321	346	371	396	421	446	471
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	309	332	355	377	400	422	445	468	490	513
Advanced Int. Coal Gas-460MW	151	173	195	216	238	260	282	303	325	347	369
Combustion Turbine Heavy Duty-80MW	65	113	161	209	257	305	353	401	449	497	545
Combustion Turbine Heavy Duty-110MW	56	107	158	209	260	311	362	413	464	515	566
Combustion Turbine Heavy Duty-160MW	52	95	138	181	224	267	310	353	396	439	482
Combustion Turbine Aero- 45MW	105	145	185	225	265	305	345	385	425	465	505
CT Combined Cycle 2on1 - 330MW	81	110	139	167	196	225	254	283	312	341	370
CT Combined Cycle 2on1 - 470MW	71	97	124	151	178	204	231	258	285	312	338
CT Combined Cycle - 345MW	69	96	122	148	175	201	227	254	280	306	332
CT with Cascaded Humidified Advanced Turbine-300MW	64	93	122	151	180	209	239	268	297	326	355
Phosphoric Acid Fuel Cell-2.5MW	1115	1153	1190	1228	1266	1303	1341	1379	1416	1454	1492
Molten Carbonate Fuel Cell-100MW	332	355	378	401	424	447	470	493	516	539	562
Solid Oxide Fuel Cell-100MW	169	192	215	237	260	283	305	328	351	373	396
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	297	403	510	616	722	829	935	1041	1148	1254
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	184	210	236	261	287	313	339	364	390	416
Cane Run 3 Rehab w/ Natural Gas	120	160	201	242	282	323	363	404	445	485	526
Brown 5 CT 110MW	52	98	144	190	236	282	328	374	420	466	512
Brown 5 CT 164MW	52	91	130	169	208	247	286	325	364	403	442
Brown 5 CT 102MW	55	101	147	193	239	285	331	377	423	469	515
Brown 5 CT 159MW	49	90	131	172	213	254	295	336	377	418	459
Brown 5 CT 149MW	50	92	134	176	218	260	302	344	386	428	470
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	93	136	179	222	265	308	351	394	437	480
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	172	195	219	242	266	290	313	337	360	384
IAC at Brown 8-11	20	73	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	73	116	119	134	134	134	254	280	306	332

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate- High
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	97	126	156	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	80	110	140	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	108	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	187	209	232	254	276	299	321	343	365	388
Pulverized Coal (LSFO)-400MW	184	206	229	251	273	295	318	340	362	385	407
Pulverized Coal (LSFO)-300MW	189	214	239	264	289	314	339	364	389	413	438
Pulverized Coal (LSFO)-200MW	231	254	277	300	323	346	369	392	415	438	462
Pulverized Coal (LSFO)-300MW X 2	169	191	214	236	259	281	304	326	349	371	394
Pulverized Coal Compliance (LSD)- 300MW	178	203	228	253	278	303	329	354	379	404	429
Pulverized Coal Supercritical (LSD)- 300MW	214	240	266	291	317	343	368	394	420	445	471
Pulverized Coal (Advanced LSFO)- 400MW	191	212	233	254	275	296	317	338	359	380	401
Atmosph Fluidized Bed (Circulating)-200MW	228	256	284	312	339	367	395	423	451	479	507
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	267	291	314	338	362	385	409	432	456	479
Press Fluidized Bed (Bubbling)-350MW	163	186	208	230	252	275	297	319	342	364	386
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	182	204	226	248	269	291	313	334	356	378
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	231	254	276	299	321	343	366	388	411	433
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	174	197	219	242	264	287	309	332	354	377
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	171	193	215	236	258	280	301	323	345	367
Foster Wheeler Advanced PFB (Circulating)-688MW	139	161	184	207	230	252	275	298	321	343	366
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	228	248	268	288	308	327	347	367	387	407
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	213	234	254	275	296	317	337	358	379	400
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	245	269	292	316	340	363	387	411	434	458
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	308	330	352	373	395	417	439	460	482	504
Advanced Int. Coal Gas-460MW	151	172	193	214	235	256	276	297	318	339	360
Combustion Turbine Heavy Duty-80MW	65	107	149	191	233	275	317	359	401	443	485
Combustion Turbine Heavy Duty-110MW	56	101	146	191	236	281	326	371	416	461	506
Combustion Turbine Heavy Duty-160MW	52	90	128	166	204	242	280	318	356	394	432
Combustion Turbine Aero- 45MW	105	140	175	210	245	280	315	350	385	420	455
CT Combined Cycle 2on1 - 330MW	81	106	132	157	183	208	234	259	285	311	336
CT Combined Cycle 2on1 - 470MW	71	94	118	141	165	188	212	235	259	282	306
CT Combined Cycle - 345MW	69	93	116	139	162	186	209	232	255	278	302
CT with Cascaded Humidified Advanced Turbine-300MW	64	90	116	142	167	193	219	245	271	297	323
Phosphoric Acid Fuel Cell-2.5MW	1115	1148	1182	1215	1248	1282	1315	1348	1382	1415	1448
Molten Carbonate Fuel Cell-100MW	332	353	373	394	415	435	456	477	497	518	539
Solid Oxide Fuel Cell-100MW	169	189	209	228	248	268	287	307	327	346	366
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	284	377	470	563	657	750	843	936	1029	1122
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	183	207	232	256	280	305	329	353	377	402
Cane Run 3 Rehab w/ Natural Gas	120	155	191	226	262	297	333	368	404	440	475
Brown 5 CT 110MW	52	92	132	172	212	252	292	332	372	412	452
Brown 5 CT 164MW	52	87	122	157	192	227	262	297	332	367	402
Brown 5 CT 102MW	55	96	137	178	219	260	301	342	383	424	465
Brown 5 CT 159MW	49	85	121	157	193	229	265	301	337	373	409
Brown 5 CT 149MW	50	87	124	161	198	235	272	309	346	383	420
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	88	126	164	202	240	278	316	354	392	430
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	171	193	215	238	260	282	304	327	349	371
IAC at Brown 8-11	20	67	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	67	110	119	134	134	134	232	255	278	302

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	98	129	160	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	82	114	146	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	188	211	234	258	281	304	327	351	374	397
Pulverized Coal (LSFO)-400MW	184	207	230	254	277	300	323	347	370	393	416
Pulverized Coal (LSFO)-300MW	189	215	242	268	294	321	347	373	400	426	452
Pulverized Coal (LSFO)-200MW	231	255	279	303	327	351	375	399	423	447	471
Pulverized Coal (LSFO)-300MW X 2	169	192	216	239	262	286	309	333	356	379	403
Pulverized Coal Compliance (LSD)- 300MW	178	204	231	257	283	310	336	362	389	415	441
Pulverized Coal Supercritical (LSD)- 300MW	214	241	268	295	322	350	377	404	431	458	485
Pulverized Coal (Advanced LSFO)- 400MW	191	213	235	256	278	300	321	343	365	387	408
Atmosph Fluidized Bed (Circulating)-200MW	228	257	286	315	344	373	403	432	461	490	519
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	268	293	317	342	366	391	415	440	464	488
Press Fluidized Bed (Bubbling)-350MW	163	186	210	233	256	279	303	326	349	372	396
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	183	206	228	251	273	296	318	340	363	385
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	232	255	279	302	326	349	372	396	419	443
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	175	198	222	245	268	291	315	338	361	384
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	172	195	217	239	262	284	307	329	352	374
Foster Wheeler Advanced PFB (Circulating)-688MW	139	162	186	209	233	256	280	303	327	350	374
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	229	250	270	291	311	332	353	373	394	414
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	214	235	257	278	300	321	343	364	386	407
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	246	271	295	320	345	369	394	419	443	468
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	309	331	354	376	398	421	443	465	487	510
Advanced Int. Coal Gas-460MW	151	173	194	216	238	259	281	303	324	346	367
Combustion Turbine Heavy Duty-80MW	65	112	159	206	253	300	347	394	441	488	535
Combustion Turbine Heavy Duty-110MW	56	105	154	203	252	301	350	399	448	497	546
Combustion Turbine Heavy Duty-160MW	52	94	136	178	220	262	304	346	388	430	472
Combustion Turbine Aero- 45MW	105	143	181	219	257	295	333	371	409	447	485
CT Combined Cycle 2on1 - 330MW	81	109	137	165	193	221	249	277	305	333	361
CT Combined Cycle 2on1 - 470MW	71	96	122	148	174	200	226	252	277	303	329
CT Combined Cycle - 345MW	69	95	120	146	172	197	223	248	274	299	325
CT with Cascaded Humidified Advanced Turbine-300MW	64	92	120	149	177	205	233	261	289	317	346
Phosphoric Acid Fuel Cell-2.5MW	1115	1151	1188	1224	1260	1297	1333	1369	1406	1442	1478
Molten Carbonate Fuel Cell-100MW	332	354	377	399	421	444	466	488	511	533	555
Solid Oxide Fuel Cell-100MW	169	191	213	234	256	278	299	321	343	364	386
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	293	396	499	602	704	807	910	1013	1115	1218
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	184	209	235	260	286	311	336	362	387	413
Cane Run 3 Rehab w/ Natural Gas	120	159	198	237	277	316	355	394	434	473	512
Brown 5 CT 110MW	52	96	140	184	228	272	316	360	404	448	492
Brown 5 CT 164MW	52	90	128	166	204	242	280	318	356	394	432
Brown 5 CT 102MW	55	100	145	190	235	280	325	370	415	460	505
Brown 5 CT 159MW	49	88	127	166	205	244	283	322	361	400	439
Brown 5 CT 149MW	50	90	130	170	210	250	290	330	370	410	450
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	92	134	176	218	260	302	344	386	428	470
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	172	195	218	241	264	288	311	334	357	381
IAC at Brown 8-11	20	71	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	71	114	119	134	134	134	248	274	299	325

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost-Low
Heat Rate- High
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	55	87	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	77	106	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	67	99	132	164	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	50	84	118	152	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	165	189	214	239	263	288	312	337	362	386	411
Pulverized Coal (LSFO)-400MW	184	209	233	258	282	307	332	356	381	405	430
Pulverized Coal (LSFO)-300MW	189	217	245	274	302	330	358	386	414	443	471
Pulverized Coal (LSFO)-200MW	231	256	282	307	332	358	383	408	434	459	485
Pulverized Coal (LSFO)-300MW X 2	169	194	218	243	268	293	318	342	367	392	417
Pulverized Coal Compliance (LSD)- 300MW	178	206	235	263	291	320	348	376	405	433	461
Pulverized Coal Supercritical (LSD)- 300MW	214	243	272	301	330	360	389	418	447	476	505
Pulverized Coal (Advanced LSFO)- 400MW	191	214	237	260	283	306	329	352	375	398	421
Atmosph Fluidized Bed (Circulating)-200MW	228	259	290	321	352	383	415	446	477	508	539
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	270	296	321	347	373	399	425	451	476	502
Press Fluidized Bed (Bubbling)-350MW	163	188	212	237	261	286	310	334	359	383	408
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	184	208	232	256	279	303	327	350	374	398
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	233	258	283	308	333	357	382	407	432	456
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	177	201	226	250	275	300	324	349	373	398
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	173	197	221	244	268	292	315	339	363	387
Foster Wheeler Advanced PFB (Circulating)-688MW	139	163	188	212	237	262	286	311	335	360	385
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	230	252	274	296	318	339	361	383	405	427
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	215	238	260	283	306	329	351	374	397	420
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	248	274	300	327	353	379	406	432	458	485
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	310	333	357	380	404	427	450	474	497	521
Advanced Int. Coal Gas-460MW	151	174	196	219	242	264	287	310	332	355	377
Combustion Turbine Heavy Duty-80MW	65	116	167	218	269	320	371	422	473	524	575
Combustion Turbine Heavy Duty-110MW	56	110	164	218	272	326	380	434	488	542	596
Combustion Turbine Heavy Duty-160MW	52	97	142	187	232	277	322	367	412	457	502
Combustion Turbine Aero- 45MW	105	146	187	228	269	310	351	392	433	474	515
CT Combined Cycle 2on1 - 330MW	81	111	142	172	203	233	263	294	324	355	385
CT Combined Cycle 2on1 - 470MW	71	99	127	155	183	211	240	268	296	324	352
CT Combined Cycle - 345MW	69	97	125	152	180	208	236	263	291	319	346
CT with Cascaded Humidified Advanced Turbine-300MW	64	94	125	155	185	216	246	276	307	337	367
Phosphoric Acid Fuel Cell-2.5MW	1115	1154	1194	1233	1272	1312	1351	1390	1430	1469	1508
Molten Carbonate Fuel Cell-100MW	332	356	381	405	429	454	478	502	527	551	575
Solid Oxide Fuel Cell-100MW	169	193	217	240	264	288	311	335	359	382	406
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	302	414	526	637	749	861	973	1084	1196	1308
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	186	213	239	266	293	320	347	374	401	428
Cane Run 3 Rehab w/ Natural Gas	120	162	205	248	290	333	375	418	461	503	546
Brown 5 CT 110MW	52	100	148	196	244	292	340	388	436	484	532
Brown 5 CT 164MW	52	93	134	175	216	257	298	339	380	421	462
Brown 5 CT 102MW	55	104	153	202	251	300	349	398	447	496	545
Brown 5 CT 159MW	49	92	135	178	221	264	307	350	393	436	479
Brown 5 CT 149MW	50	94	138	182	226	270	314	358	402	446	490
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	50	95	140	185	230	275	320	365	410	455	500
Ohio Falls 9&10	142	142	142	142	—	—	—	—	—	—	—
Trimble County 2	148	173	198	222	247	271	296	321	345	370	394
IAC at Brown 8-11	20	75	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	20	75	118	119	134	134	134	263	291	319	346

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate-Low
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	99	127	156	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	88	117	145	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	196	216	237	257	277	298	318	338	358	379
Pulverized Coal (LSFO)-400MW	196	216	237	257	277	297	318	338	358	379	399
Pulverized Coal (LSFO)-300MW	201	224	247	269	292	315	338	361	383	406	429
Pulverized Coal (LSFO)-200MW	245	266	287	308	328	349	370	391	412	433	454
Pulverized Coal (LSFO)-300MW X 2	180	200	221	241	262	282	303	323	344	364	385
Pulverized Coal Compliance (LSD)- 300MW	190	213	236	258	281	304	327	349	372	395	418
Pulverized Coal Supercritical (LSD)- 300MW	228	252	275	298	322	345	368	392	415	439	462
Pulverized Coal (Advanced LSFO)- 400MW	203	222	241	261	280	299	318	337	356	375	394
Atmosph Fluidized Bed (Circulating)-200MW	251	276	302	327	353	378	403	429	454	480	505
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	298	319	341	363	384	406	428	449	471	493
Press Fluidized Bed (Bubbling)-350MW	192	213	233	254	274	295	315	335	356	376	397
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	210	229	249	269	289	309	329	349	368	388
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	255	276	297	317	338	358	379	400	420	441
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	197	218	238	259	279	300	320	341	361	382
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	194	214	234	254	274	294	314	333	353	373
Foster Wheeler Advanced PFB (Circulating)-688MW	163	184	205	226	247	269	290	311	332	354	375
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	263	281	299	317	335	353	371	389	407	425
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	244	263	282	301	320	339	357	376	395	414
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	273	295	316	338	360	381	403	425	446	468
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	358	378	399	419	439	460	480	500	520	541
Advanced Int. Coal Gas-460MW	177	197	216	235	255	274	293	313	332	352	371
Combustion Turbine Heavy Duty-80MW	70	108	146	184	222	260	298	336	374	412	450
Combustion Turbine Heavy Duty-110MW	61	102	143	184	225	266	307	348	389	430	471
Combustion Turbine Heavy Duty-160MW	56	90	124	158	192	226	260	294	328	362	396
Combustion Turbine Aero- 45MW	114	146	178	210	242	274	306	338	370	402	434
CT Combined Cycle 2on1 - 330MW	87	110	133	156	179	202	225	248	271	294	317
CT Combined Cycle 2on1 - 470MW	76	97	118	140	161	183	204	225	247	268	289
CT Combined Cycle - 345MW	79	100	122	143	164	185	206	227	248	269	290
CT with Cascaded Humidified Advanced Turbine-300MW	72	96	119	143	167	191	214	238	262	285	309
Phosphoric Acid Fuel Cell-2.5MW	1203	1233	1264	1294	1324	1355	1385	1415	1446	1476	1506
Molten Carbonate Fuel Cell-100MW	373	392	411	430	449	468	487	506	525	544	563
Solid Oxide Fuel Cell-100MW	187	205	223	241	259	277	295	313	331	349	367
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	304	388	473	557	641	726	810	894	979	1063
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	192	214	236	258	280	303	325	347	369	391
Cane Run 3 Rehab w/ Natural Gas	127	159	191	223	255	287	320	352	384	416	448
Brown 5 CT 110MW	54	91	128	165	202	239	276	313	350	387	424
Brown 5 CT 164MW	55	86	117	148	179	210	241	272	303	334	365
Brown 5 CT 102MW	57	94	131	168	205	242	279	316	353	390	427
Brown 5 CT 159MW	51	83	115	147	179	211	243	275	307	339	371
Brown 5 CT 149MW	52	85	118	151	184	217	250	283	316	349	382
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	87	122	157	192	227	262	297	332	367	402
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	173	194	214	234	254	274	294	315	335	355
IAC at Brown 8-11	21	65	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	65	115	134	134	134	134	225	247	268	289

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	100	129	159	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	90	120	150	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	197	218	239	260	281	302	323	344	365	386
Pulverized Coal (LSFO)-400MW	196	217	238	259	280	301	322	343	365	386	407
Pulverized Coal (LSFO)-300MW	201	225	249	273	297	320	344	368	392	416	440
Pulverized Coal (LSFO)-200MW	245	267	288	310	332	354	376	398	420	441	463
Pulverized Coal (LSFO)-300MW X 2	180	201	222	244	265	286	307	329	350	371	392
Pulverized Coal Compliance (LSD)- 300MW	190	214	238	262	286	310	334	358	382	406	430
Pulverized Coal Supercritical (LSD)- 300MW	228	253	277	302	327	351	376	400	425	450	474
Pulverized Coal (Advanced LSFO)- 400MW	203	223	243	263	283	303	322	342	362	382	402
Atmosph Fluidized Bed (Circulating)-200MW	251	278	304	331	358	384	411	437	464	491	517
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	298	321	343	366	388	411	433	456	478	500
Press Fluidized Bed (Bubbling)-350MW	192	213	235	256	277	298	320	341	362	383	405
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	210	231	252	272	293	313	334	355	375	396
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	256	277	299	320	342	363	384	406	427	449
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	198	220	241	262	284	305	327	348	369	391
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	195	216	236	257	278	298	319	340	360	381
Foster Wheeler Advanced PFB (Circulating)-688MW	163	184	206	228	250	272	294	315	337	359	381
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	264	283	302	320	339	358	377	395	414	433
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	245	264	284	304	323	343	363	383	402	422
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	274	296	318	341	363	385	408	430	452	475
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	359	380	400	421	442	463	484	505	526	547
Advanced Int. Coal Gas-460MW	177	197	217	237	257	277	297	317	337	357	377
Combustion Turbine Heavy Duty-80MW	70	112	154	196	238	280	322	364	406	448	490
Combustion Turbine Heavy Duty-110MW	61	106	151	196	241	286	331	376	421	466	511
Combustion Turbine Heavy Duty-160MW	56	94	132	170	208	246	284	322	360	398	436
Combustion Turbine Aero- 45MW	114	149	184	219	254	289	324	359	394	429	464
CT Combined Cycle 2on1 - 330MW	87	112	137	163	188	214	239	264	290	315	341
CT Combined Cycle 2on1 - 470MW	76	99	123	146	170	193	217	240	264	287	311
CT Combined Cycle - 345MW	79	103	126	149	172	196	219	242	265	288	312
CT with Cascaded Humidified Advanced Turbine-300MW	72	98	123	149	175	201	226	252	278	303	329
Phosphoric Acid Fuel Cell-2.5MW	1203	1236	1270	1303	1336	1370	1403	1436	1470	1503	1536
Molten Carbonate Fuel Cell-100MW	373	394	414	435	456	476	497	518	538	559	580
Solid Oxide Fuel Cell-100MW	187	207	227	246	266	286	305	325	345	364	384
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	313	406	499	592	684	777	870	963	1056	1149
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	193	216	239	262	285	308	331	354	377	400
Cane Run 3 Rehab w/ Natural Gas	127	162	198	233	269	304	340	375	411	447	482
Brown 5 CT 110MW	54	94	134	174	214	254	294	334	374	414	454
Brown 5 CT 164MW	55	90	125	160	195	230	265	300	335	370	405
Brown 5 CT 102MW	57	98	139	180	221	262	303	344	385	426	467
Brown 5 CT 159MW	51	87	123	159	195	231	267	303	339	375	411
Brown 5 CT 149MW	52	89	126	163	200	237	274	311	348	385	422
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	90	128	166	204	242	280	318	356	394	432
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	174	195	217	238	259	280	301	322	343	364
IAC at Brown 8-11	21	68	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	68	120	134	134	134	134	240	264	287	311

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	101	132	163	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	92	124	155	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	198	220	243	265	287	310	332	354	376	399
Pulverized Coal (LSFO)-400MW	196	218	241	263	285	307	330	352	374	397	419
Pulverized Coal (LSFO)-300MW	201	227	252	278	303	329	354	380	405	431	457
Pulverized Coal (LSFO)-200MW	245	268	291	314	337	360	383	406	429	452	476
Pulverized Coal (LSFO)-300MW X 2	180	203	225	248	270	293	316	338	361	383	406
Pulverized Coal Compliance (LSD)- 300MW	190	216	242	268	293	319	345	371	397	423	449
Pulverized Coal Supercritical (LSD)- 300MW	228	255	281	308	334	360	387	413	440	466	493
Pulverized Coal (Advanced LSFO)- 400MW	203	224	245	266	287	308	329	350	371	392	413
Atmosph Fluidized Bed (Circulating)-200MW	251	280	308	336	365	393	422	450	479	507	536
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	300	323	347	371	394	418	442	465	489	513
Press Fluidized Bed (Bubbling)-350MW	192	215	237	260	282	305	327	349	372	394	417
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	211	233	255	277	298	320	342	363	385	407
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	257	280	303	325	348	370	393	416	438	461
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	199	222	244	267	289	312	334	357	379	402
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	196	218	240	261	283	305	326	348	370	392
Foster Wheeler Advanced PFB (Circulating)-688MW	163	185	208	231	254	277	300	323	346	369	392
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	265	285	305	325	345	364	384	404	424	444
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	246	267	287	308	329	350	370	391	412	433
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	275	299	322	346	370	393	417	441	464	488
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	359	381	403	424	446	468	490	511	533	555
Advanced Int. Coal Gas-460MW	177	198	219	240	261	282	303	324	345	366	387
Combustion Turbine Heavy Duty-80MW	70	116	162	208	254	300	346	392	438	484	530
Combustion Turbine Heavy Duty-110MW	61	110	159	208	257	306	355	404	453	502	551
Combustion Turbine Heavy Duty-160MW	56	97	138	179	220	261	302	343	384	425	466
Combustion Turbine Aero- 45MW	114	152	190	228	266	304	342	380	418	456	494
CT Combined Cycle 2on1 - 330MW	87	114	142	169	197	224	252	279	307	335	362
CT Combined Cycle 2on1 - 470MW	76	101	127	152	178	203	229	254	280	305	331
CT Combined Cycle - 345MW	79	104	130	155	180	205	230	255	280	305	330
CT with Cascaded Humidified Advanced Turbine-300MW	72	100	127	155	183	211	238	266	294	321	349
Phosphoric Acid Fuel Cell-2.5MW	1203	1239	1275	1311	1347	1383	1419	1455	1491	1527	1563
Molten Carbonate Fuel Cell-100MW	373	395	417	439	461	483	505	527	549	571	593
Solid Oxide Fuel Cell-100MW	187	209	230	251	273	294	315	337	358	379	401
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	321	422	523	624	725	826	927	1028	1129	1230
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	194	219	243	268	292	316	341	365	390	414
Cane Run 3 Rehab w/ Natural Gas	127	165	204	243	281	320	358	397	436	474	513
Brown 5 CT 110MW	54	98	142	186	230	274	318	362	406	450	494
Brown 5 CT 164MW	55	93	131	169	207	245	283	321	359	397	435
Brown 5 CT 102MW	57	101	145	189	233	277	321	365	409	453	497
Brown 5 CT 159MW	51	90	129	168	207	246	285	324	363	402	441
Brown 5 CT 149MW	52	92	132	172	212	252	292	332	372	412	452
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	93	134	175	216	257	298	339	380	421	462
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	176	198	220	243	265	287	309	332	354	376
IAC at Brown 8-11	21	72	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	72	124	134	134	134	134	254	280	305	330

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	99	129	158	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	89	118	147	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	197	218	240	261	283	304	325	347	368	390
Pulverized Coal (LSFO)-400MW	196	217	239	260	281	303	324	346	367	388	410
Pulverized Coal (LSFO)-300MW	201	225	249	273	297	320	344	368	392	416	440
Pulverized Coal (LSFO)-200MW	245	267	289	311	333	355	377	399	421	443	465
Pulverized Coal (LSFO)-300MW X 2	180	201	223	245	266	288	309	331	352	374	395
Pulverized Coal Compliance (LSD)- 300MW	190	214	238	262	285	309	333	357	381	405	429
Pulverized Coal Supercritical (LSD)- 300MW	228	253	277	302	327	351	376	400	425	450	474
Pulverized Coal (Advanced LSFO)- 400MW	203	223	243	263	283	303	323	343	363	383	403
Atmosph Fluidized Bed (Circulating)-200MW	251	278	304	331	358	384	411	437	464	491	517
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	298	321	344	366	389	412	434	457	479	502
Press Fluidized Bed (Bubbling)-350MW	192	214	235	256	278	299	321	342	363	385	406
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	211	231	252	273	294	314	335	356	377	397
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	256	278	299	321	342	364	385	407	429	450
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	198	220	242	263	285	306	328	349	371	392
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	195	216	237	258	278	299	320	341	362	382
Foster Wheeler Advanced PFB (Circulating)-688MW	163	185	207	229	251	273	295	317	339	361	383
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	264	283	302	321	340	359	378	397	416	435
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	245	265	285	304	324	344	364	384	404	423
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	274	297	319	342	365	387	410	433	455	478
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	359	380	400	421	442	463	484	505	526	547
Advanced Int. Coal Gas-460MW	177	197	217	238	258	278	298	318	338	358	378
Combustion Turbine Heavy Duty-80MW	70	110	150	190	230	270	310	350	390	430	470
Combustion Turbine Heavy Duty-110MW	61	104	147	190	233	276	319	362	405	448	491
Combustion Turbine Heavy Duty-160MW	56	92	128	164	200	236	272	308	344	380	416
Combustion Turbine Aero- 45MW	114	147	180	213	246	279	312	345	378	411	444
CT Combined Cycle 2on1 - 330MW	87	111	135	160	184	208	233	257	281	305	330
CT Combined Cycle 2on1 - 470MW	76	98	121	143	165	188	210	233	255	278	300
CT Combined Cycle - 345MW	79	102	124	146	168	190	212	234	257	279	301
CT with Cascaded Humidified Advanced Turbine-300MW	72	97	122	146	171	196	221	245	270	295	320
Phosphoric Acid Fuel Cell-2.5MW	1203	1235	1267	1299	1331	1363	1395	1427	1459	1491	1523
Molten Carbonate Fuel Cell-100MW	373	393	412	432	452	471	491	511	530	550	570
Solid Oxide Fuel Cell-100MW	187	206	225	244	263	282	301	320	339	358	377
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	308	397	486	575	663	752	841	930	1018	1107
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen:-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	193	216	239	263	286	309	332	356	379	402
Cane Run 3 Rehab w/ Natural Gas	127	161	194	228	262	296	330	364	397	431	465
Brown 5 CT 110MW	54	93	132	171	210	249	288	327	366	405	444
Brown 5 CT 164MW	55	88	121	154	187	220	253	286	319	352	385
Brown 5 CT 102MW	57	96	135	174	213	252	291	330	369	408	447
Brown 5 CT 159MW	51	85	119	153	187	221	255	289	323	357	391
Brown 5 CT 149MW	52	87	122	157	192	227	262	297	332	367	402
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	89	126	163	200	237	274	311	348	385	422
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	175	196	217	238	259	281	302	323	344	366
IAC at Brown 8-11	21	67	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	67	118	134	134	134	134	233	255	278	300

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate- Base
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	102	133	165	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	93	126	159	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	199	223	246	270	293	317	340	364	388	411
Pulverized Coal (LSFO)-400MW	196	219	243	267	290	314	337	361	384	408	431
Pulverized Coal (LSFO)-300MW	201	228	255	282	309	336	363	390	417	443	470
Pulverized Coal (LSFO)-200MW	245	269	293	317	341	366	390	414	438	462	486
Pulverized Coal (LSFO)-300MW X 2	180	204	227	251	275	298	322	346	369	393	417
Pulverized Coal Compliance (LSD)- 300MW	190	217	244	271	298	325	353	380	407	434	461
Pulverized Coal Supercritical (LSD)- 300MW	228	256	284	311	339	367	394	422	450	477	505
Pulverized Coal (Advanced LSFO)- 400MW	203	225	247	269	291	313	334	356	378	400	422
Atmosph Fluidized Bed (Circulating)-200MW	251	281	311	341	370	400	430	460	490	520	550
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	301	325	350	375	400	424	449	474	499	524
Press Fluidized Bed (Bubbling)-350MW	192	216	239	262	286	309	333	356	379	403	426
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	213	235	258	281	304	326	349	372	395	417
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	258	282	306	329	353	377	401	424	448	472
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	200	224	248	271	295	318	342	365	389	412
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	197	220	242	265	288	310	333	356	378	401
Foster Wheeler Advanced PFB (Circulating)-688MW	163	186	210	234	258	282	306.	329	353	377	401
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	266	287	308	328	349	370	391	411	432	453
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	247	269	291	312	334	356	378	400	422	443
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	276	301	326	351	376	401	426	451	476	501
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	360	383	406	428	451	473	496	519	541	564
Advanced Int. Coal Gas-460MW	177	199	221	242	264	286	308	329	351	373	395
Combustion Turbine Heavy Duty-80MW	70	118	166	214	262	310	358	406	454	502	550
Combustion Turbine Heavy Duty-110MW	61	112	163	214	265	316	367	418	469	520	571
Combustion Turbine Heavy Duty-160MW	56	99	142	185	228	271	314	357	400	443	486
Combustion Turbine Aero- 45MW	114	154	194	234	274	314	354	394	434	474	514
CT Combined Cycle 2on1 - 330MW	87	116	145	173	202	231	260	289	318	347	376
CT Combined Cycle 2on1 - 470MW	76	102	129	156	183	209	236	263	290	317	343
CT Combined Cycle - 345MW	79	106	132	158	185	211	237	264	290	316	342
CT with Cascaded Humidified Advanced Turbine-300MW	72	101	130	159	188	217	247	276	305	334	363
Phosphoric Acid Fuel Cell-2.5MW	1203	1241	1278	1316	1354	1391	1429	1467	1504	1542	1580
Molten Carbonate Fuel Cell-100MW	373	396	419	442	465	488	511	534	557	580	603
Solid Oxide Fuel Cell-100MW	187	210	233	255	278	301	323	346	369	391	414
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	326	432	539	645	751	858	964	1070	1177	1283
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	195	221	247	272	298	324	350	375	401	427
Cane Run 3 Rehab w/ Natural Gas	127	167	208	249	289	330	370	411	452	492	533
Brown 5 CT 110MW	54	100	146	192	238	284	330	376	422	468	514
Brown 5 CT 164MW	55	94	133	172	211	250	289	328	367	406	445
Brown 5 CT 102MW	57.	103	149	195	241	287	333	379	425	471	517
Brown 5 CT 159MW	51	92	133	174	215	256	297	338	379	420	461
Brown 5 CT 149MW	52	94	136	178	220	262	304	346	388	430	472
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	95	138	181	224	267	310	353	396	439	482
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	177	200	224	247	271	295	318	342	365	389
IAC at Brown 8-11	21	74	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	74	126	134	134	134	134	263	290	316	342

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate- High
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	100	129	159	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	90	120	150	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	198	220	243	265	287	310	332	354	376	399
Pulverized Coal (LSFO)-400MW	196	218	241	263	285	307	330	352	374	397	419
Pulverized Coal (LSFO)-300MW	201	226	251	276	301	326	351	376	401	425	450
Pulverized Coal (LSFO)-200MW	245	268	291	314	337	360	383	406	429	452	476
Pulverized Coal (LSFO)-300MW X 2	180	202	225	247	270	292	315	337	360	382	405
Pulverized Coal Compliance (LSD)- 300MW	190	215	240	265	290	315	341	366	391	416	441
Pulverized Coal Supercritical (LSD)- 300MW	228	254	280	305	331	357	382	408	434	459	485
Pulverized Coal (Advanced LSFO)- 400MW	203	224	245	266	287	308	329	350	371	392	413
Atmosph Fluidized Bed (Circulating)-200MW	251	279	307	335	362	390	418	446	474	502	530
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	299	323	346	370	394	417	441	464	488	511
Press Fluidized Bed (Bubbling)-350MW	192	215	237	259	281	304	326	348	371	393	415
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	211	233	255	277	298	320	342	363	385	407
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	257	280	302	325	347	369	392	414	437	459
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	199	222	244	267	289	312	334	357	379	402
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	196	218	240	261	283	305	326	348	370	392
Foster Wheeler Advanced PFB (Circulating)-688MW	163	185	208	231	254	276	299	322	345	367	390
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	265	285	305	325	345	364	384	404	424	444
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	246	267	287	308	329	350	370	391	412	433
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	275	299	322	346	370	393	417	441	464	488
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	359	381	403	424	446	468	490	511	533	555
Advanced Int. Coal Gas-460MW	177	198	219	240	261	282	302	323	344	365	386
Combustion Turbine Heavy Duty-80MW	70	112	154	196	238	280	322	364	406	448	490
Combustion Turbine Heavy Duty-110MW	61	106	151	196	241	286	331	376	421	466	511
Combustion Turbine Heavy Duty-160MW	56	94	132	170	208	246	284	322	360	398	436
Combustion Turbine Aero- 45MW	114	149	184	219	254	289	324	359	394	429	464
CT Combined Cycle 2on1 - 330MW	87	112	138	163	189	214	240	265	291	317	342
CT Combined Cycle 2on1 - 470MW	76	99	123	146	170	193	217	240	264	287	311
CT Combined Cycle - 345MW	79	103	126	149	172	196	219	242	265	288	312
CT with Cascaded Humidified Advanced Turbine-300MW	72	98	124	150	175	201	227	253	279	305	331
Phosphoric Acid Fuel Cell-2.5MW	1203	1236	1270	1303	1336	1370	1403	1436	1470	1503	1536
Molten Carbonate Fuel Cell-100MW	373	394	414	435	456	476	497	518	538	559	580
Solid Oxide Fuel Cell-100MW	187	207	227	246	266	286	305	325	345	364	384
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	313	406	499	592	686	779	872	965	1058	1151
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	194	218	243	267	291	316	340	364	388	413
Cane Run 3 Rehab w/ Natural Gas	127	162	198	233	269	304	340	375	411	447	482
Brown 5 CT 110MW	54	94	134	174	214	254	294	334	374	414	454
Brown 5 CT 164MW	55	90	125	160	195	230	265	300	335	370	405
Brown 5 CT 102MW	57	98	139	180	221	262	303	344	385	426	467
Brown 5 CT 159MW	51	87	123	159	195	231	267	303	339	375	411
Brown 5 CT 149MW	52	89	126	163	200	237	274	311	348	385	422
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	90	128	166	204	242	280	318	356	394	432
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	176	198	220	243	265	287	309	332	354	376
IAC at Brown 8-11	21	68	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	68	120	134	134	134	134	240	264	287	311

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	101	132	163	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	92	124	156	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	199	222	245	269	292	315	338	362	385	408
Pulverized Coal (LSFO)-400MW	196	219	242	266	289	312	335	359	382	405	428
Pulverized Coal (LSFO)-300MW	201	227	254	280	306	333	359	385	412	438	464
Pulverized Coal (LSFO)-200MW	245	269	293	317	341	365	389	413	437	461	485
Pulverized Coal (LSFO)-300MW X 2	180	203	227	250	273	297	320	344	367	390	414
Pulverized Coal Compliance (LSD)- 300MW	190	216	243	269	295	322	348	374	401	427	453
Pulverized Coal Supercritical (LSD)- 300MW	228	255	282	309	336	364	391	418	445	472	499
Pulverized Coal (Advanced LSFO)- 400MW	203	225	247	268	290	312	333	355	377	399	420
Atmosph Fluidized Bed (Circulating)-200MW	251	280	309	338	367	396	426	455	484	513	542
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	300	325	349	374	398	423	447	472	496	520
Press Fluidized Bed (Bubbling)-350MW	192	215	239	262	285	308	332	355	378	401	425
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	212	235	257	280	302	325	347	369	392	414
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	258	281	305	328	352	375	398	422	445	469
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	200	223	247	270	293	316	340	363	386	409
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	197	220	242	264	287	309	332	354	377	399
Foster Wheeler Advanced PFB (Circulating)-688MW	163	186	210	233	257	280	304	327	351	374	398
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	266	287	307	328	348	369	390	410	431	451
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	247	268	290	311	333	354	376	397	419	440
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	276	301	325	350	375	399	424	449	473	498
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	360	382	405	427	449	472	494	516	538	561
Advanced Int. Coal Gas-460MW	177	199	220	242	264	285	307	329	350	372	393
Combustion Turbine Heavy Duty-80MW	70	117	164	211	258	305	352	399	446	493	540
Combustion Turbine Heavy Duty-110MW	61	110	159	208	257	306	355	404	453	502	551
Combustion Turbine Heavy Duty-160MW	56	98	140	182	224	266	308	350	392	434	476
Combustion Turbine Aero- 45MW	114	152	190	228	266	304	342	380	418	456	494
CT Combined Cycle 2on1 - 330MW	87	115	143	171	199	227	255	283	311	339	367
CT Combined Cycle 2on1 - 470MW	76	101	127	153	179	205	231	257	282	308	334
CT Combined Cycle - 345MW	79	105	130	156	182	207	233	258	284	309	335
CT with Cascaded Humidified Advanced Turbine-300MW	72	100	128	157	185	213	241	269	297	325	354
Phosphoric Acid Fuel Cell-2.5MW	1203	1239	1276	1312	1348	1385	1421	1457	1494	1530	1566
Molten Carbonate Fuel Cell-100MW	373	395	418	440	462	485	507	529	552	574	596
Solid Oxide Fuel Cell-100MW	187	209	231	252	274	296	317	339	361	382	404
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	322	425	528	631	733	836	939	1042	1144	1247
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	195	220	246	271	297	322	347	373	398	424
Cane Run 3 Rehab w/ Natural Gas	127	166	205	244	284	323	362	401	441	480	519
Brown 5 CT 110MW	54	98	142	186	230	274	318	362	406	450	494
Brown 5 CT 164MW	55	93	131	169	207	245	283	321	359	397	435
Brown 5 CT 102MW	57	102	147	192	237	282	327	372	417	462	507
Brown 5 CT 159MW	51	90	129	168	207	246	285	324	363	402	441
Brown 5 CT 149MW	52	92	132	172	212	252	292	332	372	412	452
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	94	136	178	220	262	304	346	388	430	472
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	177	200	223	246	269	293	316	339	362	386
IAC at Brown 8-11	21	72	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	72	124	134	134	134	134	257	282	308	334

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- Base
Heat Rate- High
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	102	135	167	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	94	128	162	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	200	225	250	274	299	323	348	373	397	422
Pulverized Coal (LSFO)-400MW	196	221	245	270	294	319	344	368	393	417	442
Pulverized Coal (LSFO)-300MW	201	229	257	286	314	342	370	398	426	455	483
Pulverized Coal (LSFO)-200MW	245	270	296	321	346	372	397	422	448	473	499
Pulverized Coal (LSFO)-300MW X 2	180	205	229	254	279	304	329	353	378	403	428
Pulverized Coal Compliance (LSD)- 300MW	190	218	247	275	303	332	360	388	417	445	473
Pulverized Coal Supercritical (LSD)- 300MW	228	257	286	315	344	374	403	432	461	490	519
Pulverized Coal (Advanced LSFO)- 400MW	203	226	249	272	295	318	341	364	387	410	433
Atmosph Fluidized Bed (Circulating)-200MW	251	282	313	344	375	406	438	469	500	531	562
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	302	328	353	379	405	431	457	483	508	534
Press Fluidized Bed (Bubbling)-350MW	192	217	241	266	290	315	339	363	388	412	437
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	213	237	261	285	308	332	356	379	403	427
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	259	284	309	334	359	383	408	433	458	482
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	202	226	251	275	300	325	349	374	398	423
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	198	222	246	269	293	317	340	364	388	412
Foster Wheeler Advanced PFB (Circulating)-688MW	163	187	212	236	261	286	310	335	359	384	409
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	267	289	311	333	355	376	398	420	442	464
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	248	271	293	316	339	362	384	407	430	453
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	278	304	330	357	383	409	436	462	488	515
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	361	384	408	431	455	478	501	525	548	572
Advanced Int. Coal Gas-460MW	177	200	222	245	268	290	313	336	358	381	403
Combustion Turbine Heavy Duty-80MW	70	121	172	223	274	325	376	427	478	529	580
Combustion Turbine Heavy Duty-110MW	61	115	169	223	277	331	385	439	493	547	601
Combustion Turbine Heavy Duty-160MW	56	101	146	191	236	281	326	371	416	461	506
Combustion Turbine Aero- 45MW	114	155	196	237	278	319	360	401	442	483	524
CT Combined Cycle 2on1 - 330MW	87	117	148	178	209	239	269	300	330	361	391
CT Combined Cycle 2on1 - 470MW	76	104	132	160	188	216	245	273	301	329	357
CT Combined Cycle - 345MW	79	107	135	162	190	218	246	273	301	329	356
CT with Cascaded Humidified Advanced Turbine-300MW	72	102	133	163	193	224	254	284	315	345	375
Phosphoric Acid Fuel Cell-2.5MW	1203	1242	1282	1321	1360	1400	1439	1478	1518	1557	1596
Molten Carbonate Fuel Cell-100MW	373	397	422	446	470	495	519	543	568	592	616
Solid Oxide Fuel Cell-100MW	187	211	235	258	282	306	329	353	377	400	424
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	331	443	555	666	778	890	1002	1113	1225	1337
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	197	224	250	277	304	331	358	385	412	439
Cane Run 3 Rehab w/ Natural Gas	127	169	212	255	297	340	382	425	468	510	553
Brown 5 CT 110MW	54	102	150	198	246	294	342	390	438	486	534
Brown 5 CT 164MW	55	96	137	178	219	260	301	342	383	424	465
Brown 5 CT 102MW	57	106	155	204	253	302	351	400	449	498	547
Brown 5 CT 159MW	51	94	137	180	223	266	309	352	395	438	481
Brown 5 CT 149MW	52	96	140	184	228	272	316	360	404	448	492
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	97	142	187	232	277	322	367	412	457	502
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	178	203	227	252	276	301	326	350	375	399
IAC at Brown 8-11	21	76	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	76	128	134	134	134	134	273	301	329	356

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate-Low
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	101	129	158	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	100	129	157	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	207	227	248	268	288	309	329	349	369	390
Pulverized Coal (LSFO)-400MW	207	227	248	268	288	308	329	349	369	390	410
Pulverized Coal (LSFO)-300MW	214	237	260	282	305	328	351	374	396	419	442
Pulverized Coal (LSFO)-200MW	260	281	302	323	343	364	385	406	427	448	469
Pulverized Coal (LSFO)-300MW X 2	191	211	232	252	273	293	314	334	355	375	396
Pulverized Coal Compliance (LSD)- 300MW	202	225	248	270	293	316	339	361	384	407	430
Pulverized Coal Supercritical (LSD)- 300MW	242	266	289	312	336	359	382	406	429	453	476
Pulverized Coal (Advanced LSFO)- 400MW	215	234	253	273	292	311	330	349	368	387	406
Atmosph Fluidized Bed (Circulating)-200MW	275	300	326	351	377	402	427	453	478	504	529
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	330	351	373	395	416	438	460	481	503	525
Press Fluidized Bed (Bubbling)-350MW	227	248	268	289	309	330	350	370	391	411	432
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	244	263	283	303	323	343	363	383	402	422
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	281	302	323	343	364	384	405	426	446	467
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	227	248	268	289	309	330	350	371	391	412
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	224	244	264	284	304	324	344	363	383	403
Foster Wheeler Advanced PFB (Circulating)-688MW	193	214	235	256	277	299	320	341	362	384	405
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	300	318	336	354	372	390	408	426	444	462
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	277	296	315	334	353	372	390	409	428	447
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	304	326	347	369	391	412	434	456	477	499
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	408	428	449	469	489	510	530	550	570	591
Advanced Int. Coal Gas-460MW	208	228	247	266	286	305	324	344	363	383	402
Combustion Turbine Heavy Duty-80MW	75	113	151	189	227	265	303	341	379	417	455
Combustion Turbine Heavy Duty-110MW	66	107	148	189	230	271	312	353	394	435	476
Combustion Turbine Heavy Duty-160MW	60	94	128	162	196	230	264	298	332	366	400
Combustion Turbine Aero- 45MW	122	154	186	218	250	282	314	346	378	410	442
CT Combined Cycle 2on1 - 330MW	92	115	138	161	184	207	230	253	276	299	322
CT Combined Cycle 2on1 - 470MW	81	102	123	145	166	188	209	230	252	273	294
CT Combined Cycle - 345MW	89	110	132	153	174	195	216	237	258	279	300
CT with Cascaded Humidified Advanced Turbine-300MW	80	104	127	151	175	199	222	246	270	293	317
Phosphoric Acid Fuel Cell-2.5MW	1291	1321	1352	1382	1412	1443	1473	1503	1534	1564	1594
Molten Carbonate Fuel Cell-100MW	415	434	453	472	491	510	529	548	567	586	605
Solid Oxide Fuel Cell-100MW	206	224	242	260	278	296	314	332	350	368	386
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	333	417	502	586	670	755	839	923	1008	1092
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	203	225	247	269	291	314	336	358	380	402
Cane Run 3 Rehab w/ Natural Gas	133	165	197	229	261	293	326	358	390	422	454
Brown 5 CT 110MW	56	93	130	167	204	241	278	315	352	389	426
Brown 5 CT 164MW	57	88	119	150	181	212	243	274	305	336	367
Brown 5 CT 102MW	59	96	133	170	207	244	281	318	355	392	429
Brown 5 CT 159MW	53	85	117	149	181	213	245	277	309	341	373
Brown 5 CT 149MW	54	87	120	153	186	219	252	285	318	351	384
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	90	125	160	195	230	265	300	335	370	405
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	179	200	220	240	260	280	300	321	341	361
IAC at Brown 8-11	22	66	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	66	117	134	134	134	134	230	252	273	294

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	102	131	161	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	102	132	162	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	208	229	250	271	292	313	334	355	376	397
Pulverized Coal (LSFO)-400MW	207	228	249	270	291	312	333	354	376	397	418
Pulverized Coal (LSFO)-300MW	214	238	262	286	310	333	357	381	405	429	453
Pulverized Coal (LSFO)-200MW	260	282	303	325	347	369	391	413	435	456	478
Pulverized Coal (LSFO)-300MW X 2	191	212	233	255	276	297	318	340	361	382	403
Pulverized Coal Compliance (LSD)- 300MW	202	226	250	274	298	322	346	370	394	418	442
Pulverized Coal Supercritical (LSD)- 300MW	242	267	291	316	341	365	390	414	439	464	488
Pulverized Coal (Advanced LSFO)- 400MW	215	235	255	275	295	315	334	354	374	394	414
Atmosph Fluidized Bed (Circulating)-200MW	275	302	328	355	382	408	435	461	488	515	541
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	330	353	375	398	420	443	465	488	510	532
Press Fluidized Bed (Bubbling)-350MW	227	248	270	291	312	333	355	376	397	418	440
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	244	265	286	306	327	347	368	389	409	430
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	282	303	325	346	368	389	410	432	453	475
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	228	250	271	292	314	335	357	378	399	421
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	225	246	266	287	308	328	349	370	390	411
Foster Wheeler Advanced PFB (Circulating)-688MW	193	214	236	258	280	302	324	345	367	389	411
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	301	320	339	357	376	395	414	432	451	470
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	278	297	317	337	356	376	396	416	435	455
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	305	327	349	372	394	416	439	461	483	506
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	409	430	450	471	492	513	534	555	576	597
Advanced Int. Coal Gas-460MW	208	228	248	268	288	308	328	348	368	388	408
Combustion Turbine Heavy Duty-80MW	75	117	159	201	243	285	327	369	411	453	495
Combustion Turbine Heavy Duty-110MW	66	111	156	201	246	291	336	381	426	471	516
Combustion Turbine Heavy Duty-160MW	60	98	136	174	212	250	288	326	364	402	440
Combustion Turbine Aero- 45MW	122	157	192	227	262	297	332	367	402	437	472
CT Combined Cycle 2on1 - 330MW	92	117	142	168	193	219	244	269	295	320	346
CT Combined Cycle 2on1 - 470MW	81	104	128	151	175	198	222	245	269	292	316
CT Combined Cycle - 345MW	89	113	136	159	182	206	229	252	275	298	322
CT with Cascaded Humidified Advanced Turbine-300MW	80	106	131	157	183	209	234	260	286	311	337
Phosphoric Acid Fuel Cell-2.5MW	1291	1324	1358	1391	1424	1458	1491	1524	1558	1591	1624
Molten Carbonate Fuel Cell-100MW	415	436	456	477	498	518	539	560	580	601	622
Solid Oxide Fuel Cell-100MW	206	226	246	265	285	305	324	344	364	383	403
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	342	435	528	621	713	806	899	992	1085	1178
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	204	227	250	273	296	319	342	365	388	411
Cane Run 3 Rehab w/ Natural Gas	133	168	204	239	275	310	346	381	417	453	488
Brown 5 CT 110MW	56	96	136	176	216	256	296	336	376	416	456
Brown 5 CT 164MW	57	92	127	162	197	232	267	302	337	372	407
Brown 5 CT 102MW	59	100	141	182	223	264	305	346	387	428	469
Brown 5 CT 159MW	53	89	125	161	197	233	269	305	341	377	413
Brown 5 CT 149MW	54	91	128	165	202	239	276	313	350	387	424
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	93	131	169	207	245	283	321	359	397	435
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	180	201	223	244	265	286	307	328	349	370
IAC at Brown 8-11	22	69	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	69	125	134	134	134	134	245	269	292	316

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	103	134	165	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	104	136	167	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	209	231	254	276	298	321	343	365	387	410
Pulverized Coal (LSFO)-400MW	207	229	252	274	296	318	341	363	385	408	430
Pulverized Coal (LSFO)-300MW	214	240	265	291	316	342	367	393	418	444	470
Pulverized Coal (LSFO)-200MW	260	283	306	329	352	375	398	421	444	467	491
Pulverized Coal (LSFO)-300MW X 2	191	214	236	259	281	304	327	349	372	394	417
Pulverized Coal Compliance (LSD)- 300MW	202	228	254	280	305	331	357	383	409	435	461
Pulverized Coal Supercritical (LSD)- 300MW	242	269	295	322	348	374	401	427	454	480	507
Pulverized Coal (Advanced LSFO)- 400MW	215	236	257	278	299	320	341	362	383	404	425
Atmosph Fluidized Bed (Circulating)-200MW	275	304	332	360	389	417	446	474	503	531	560
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	332	355	379	403	426	450	474	497	521	545
Press Fluidized Bed (Bubbling)-350MW	227	250	272	295	317	340	362	384	407	429	452
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	245	267	289	311	332	354	376	397	419	441
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	283	306	329	351	374	396	419	442	464	487
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	229	252	274	297	319	342	364	387	409	432
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	226	248	270	291	313	335	356	378	400	422
Foster Wheeler Advanced PFB (Circulating)-688MW	193	215	238	261	284	307	330	353	376	399	422
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	302	322	342	362	382	401	421	441	461	481
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	279	300	320	341	362	383	403	424	445	466
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	306	330	353	377	401	424	448	472	495	519
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	409	431	453	474	496	518	540	561	583	605
Advanced Int. Coal Gas-460MW	208	229	250	271	292	313	334	355	376	397	418
Combustion Turbine Heavy Duty-80MW	75	121	167	213	259	305	351	397	443	489	535
Combustion Turbine Heavy Duty-110MW	66	115	164	213	262	311	360	409	458	507	556
Combustion Turbine Heavy Duty-160MW	60	101	142	183	224	265	306	347	388	429	470
Combustion Turbine Aero- 45MW	122	160	198	236	274	312	350	388	426	464	502
CT Combined Cycle 2on1 - 330MW	92	119	147	174	202	229	257	284	312	340	367
CT Combined Cycle 2on1 - 470MW	81	106	132	157	183	208	234	259	285	310	336
CT Combined Cycle - 345MW	89	114	140	165	190	215	240	265	290	315	340
CT with Cascaded Humidified Advanced Turbine-300MW	80	108	135	163	191	219	246	274	302	329	357
Phosphoric Acid Fuel Cell-2.5MW	1291	1327	1363	1399	1435	1471	1507	1543	1579	1615	1651
Molten Carbonate Fuel Cell-100MW	415	437	459	481	503	525	547	569	591	613	635
Solid Oxide Fuel Cell-100MW	206	228	249	270	292	313	334	356	377	398	420
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	350	451	552	653	754	855	956	1057	1158	1259
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	205	230	254	279	303	327	352	376	401	425
Cane Run 3 Rehab w/ Natural Gas	133	171	210	249	287	326	364	403	442	480	519
Brown 5 CT 110MW	56	100	144	188	232	276	320	364	408	452	496
Brown 5 CT 164MW	57	95	133	171	209	247	285	323	361	399	437
Brown 5 CT 102MW	59	103	147	191	235	279	323	367	411	455	499
Brown 5 CT 159MW	53	92	131	170	209	248	287	326	365	404	443
Brown 5 CT 149MW	54	94	134	174	214	254	294	334	374	414	454
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	96	137	178	219	260	301	342	383	424	465
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	182	204	226	249	271	293	315	338	360	382
IAC at Brown 8-11	22	73	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	73	131	134	134	134	134	259	285	310	336

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	101	131	160	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	101	130	159	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	208	229	251	272	294	315	336	358	379	401
Pulverized Coal (LSFO)-400MW	207	228	250	271	292	314	335	357	378	399	421
Pulverized Coal (LSFO)-300MW	214	238	262	286	310	333	357	381	405	429	453
Pulverized Coal (LSFO)-200MW	260	282	304	326	348	370	392	414	436	458	480
Pulverized Coal (LSFO)-300MW X 2	191	212	234	256	277	299	320	342	363	385	406
Pulverized Coal Compliance (LSD)- 300MW	202	226	250	274	297	321	345	369	393	417	441
Pulverized Coal Supercritical (LSD)- 300MW	242	267	291	316	341	365	390	414	439	464	488
Pulverized Coal (Advanced LSFO)- 400MW	215	235	255	275	295	315	335	355	375	395	415
Atmosph Fluidized Bed (Circulating)-200MW	275	302	328	355	382	408	435	461	488	515	541
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	330	353	376	398	421	444	466	489	511	534
Press Fluidized Bed (Bubbling)-350MW	227	249	270	291	313	334	356	377	398	420	441
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	245	265	286	307	328	348	369	390	411	431
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	282	304	325	347	368	390	411	433	455	476
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	228	250	272	293	315	336	358	379	401	422
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	225	246	267	288	308	329	350	371	392	412
Foster Wheeler Advanced PFB (Circulating)-688MW	193	215	237	259	281	303	325	347	369	391	413
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	301	320	339	358	377	396	415	434	453	472
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	278	298	318	337	357	377	397	417	437	456
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	305	328	350	373	396	418	441	464	486	509
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	409	430	450	471	492	513	534	555	576	597
Advanced Int. Coal Gas-460MW	208	228	248	269	289	309	329	349	369	389	409
Combustion Turbine Heavy Duty-80MW	75	115	155	195	235	275	315	355	395	435	475
Combustion Turbine Heavy Duty-110MW	66	109	152	195	238	281	324	367	410	453	496
Combustion Turbine Heavy Duty-160MW	60	96	132	168	204	240	276	312	348	384	420
Combustion Turbine Aero- 45MW	122	155	188	221	254	287	320	353	386	419	452
CT Combined Cycle 2on1 - 330MW	92	116	140	165	189	213	238	262	286	310	335
CT Combined Cycle 2on1 - 470MW	81	103	126	148	170	193	215	238	260	283	305
CT Combined Cycle - 345MW	89	112	134	156	178	200	222	244	267	289	311
CT with Cascaded Humidified Advanced Turbine-300MW	80	105	130	154	179	204	229	253	278	303	328
Phosphoric Acid Fuel Cell-2.5MW	1291	1323	1355	1387	1419	1451	1483	1515	1547	1579	1611
Molten Carbonate Fuel Cell-100MW	415	435	454	474	494	513	533	553	572	592	612
Solid Oxide Fuel Cell-100MW	206	225	244	263	282	301	320	339	358	377	396
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	337	426	515	604	692	781	870	959	1047	1136
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	204	227	250	274	297	320	343	367	390	413
Cane Run 3 Rehab w/ Natural Gas	133	167	200	234	268	302	336	370	403	437	471
Brown 5 CT 110MW	56	95	134	173	212	251	290	329	368	407	446
Brown 5 CT 164MW	57	90	123	156	189	222	255	288	321	354	387
Brown 5 CT 102MW	59	98	137	176	215	254	293	332	371	410	449
Brown 5 CT 159MW	53	87	121	155	189	223	257	291	325	359	393
Brown 5 CT 149MW	54	89	124	159	194	229	264	299	334	369	404
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	92	129	166	203	240	277	314	351	388	425
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	181	202	223	244	265	287	308	329	350	372
IAC at Brown 8-11	22	68	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	68	121	134	134	134	134	238	260	283	305

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate- Base
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	102	133	163	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	103	134	165	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	209	231	253	275	297	320	342	364	386	408
Pulverized Coal (LSFO)-400MW	207	229	251	273	296	318	340	362	384	406	428
Pulverized Coal (LSFO)-300MW	214	239	264	289	314	340	365	390	415	440	465
Pulverized Coal (LSFO)-200MW	260	283	306	329	351	374	397	420	443	466	489
Pulverized Coal (LSFO)-300MW X 2	191	213	236	258	280	302	325	347	369	392	414
Pulverized Coal Compliance (LSD)- 300MW	202	227	253	278	303	328	353	379	404	429	454
Pulverized Coal Supercritical (LSD)- 300MW	242	268	294	320	346	371	397	423	449	475	501
Pulverized Coal (Advanced LSFO)- 400MW	215	236	257	278	298	319	340	361	381	402	423
Atmosph Fluidized Bed (Circulating)-200MW	275	303	331	359	386	414	442	470	498	526	554
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	331	355	378	401	425	448	472	495	518	542
Press Fluidized Bed (Bubbling)-350MW	227	249	272	294	316	338	360	382	404	427	449
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	245	267	288	310	331	353	375	396	418	439
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	283	306	328	351	373	395	418	440	463	485
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	229	252	274	296	318	341	363	385	408	430
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	226	248	269	291	312	334	355	377	398	420
Foster Wheeler Advanced PFB (Circulating)-688MW	193	215	238	261	284	306	329	352	375	397	420
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	302	322	341	361	381	400	420	440	460	479
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	279	299	320	340	361	382	402	423	444	464
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	306	330	353	377	401	424	448	472	495	519
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	409	431	453	474	496	518	540	561	583	605
Advanced Int. Coal Gas-460MW	208	229	250	270	291	312	333	353	374	395	416
Combustion Turbine Heavy Duty-80MW	75	119	163	207	251	295	339	383	427	471	515
Combustion Turbine Heavy Duty-110MW	66	113	160	207	254	301	348	395	442	489	536
Combustion Turbine Heavy Duty-160MW	60	100	140	180	220	260	300	340	380	420	460
Combustion Turbine Aero- 45MW	122	158	194	230	266	302	338	374	410	446	482
CT Combined Cycle 2on1 - 330MW	92	118	145	172	199	226	252	279	306	333	359
CT Combined Cycle 2on1 - 470MW	81	105	130	155	180	204	229	254	279	304	328
CT Combined Cycle - 345MW	89	114	138	162	187	211	235	260	284	308	332
CT with Cascaded Humidified Advanced Turbine-300MW	80	107	134	161	188	215	242	269	295	322	349
Phosphoric Acid Fuel Cell-2.5MW	1291	1326	1360	1395	1430	1464	1499	1534	1568	1603	1638
Molten Carbonate Fuel Cell-100MW	415	437	458	480	502	523	545	567	588	610	632
Solid Oxide Fuel Cell-100MW	206	227	248	268	289	310	330	351	372	392	413
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	347	444	542	640	738	835	933	1031	1129	1227
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	205	229	253	277	301	326	350	374	398	422
Cane Run 3 Rehab w/ Natural Gas	133	170	207	245	282	320	357	394	432	469	507
Brown 5 CT 110MW	56	98	140	182	224	266	308	350	392	434	476
Brown 5 CT 164MW	57	93	129	165	201	237	273	309	345	381	417
Brown 5 CT 102MW	59	102	145	188	231	274	317	360	403	446	489
Brown 5 CT 159MW	53	90	127	164	201	238	275	312	349	386	423
Brown 5 CT 149MW	54	92	130	168	206	244	282	320	358	396	434
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	95	135	175	215	255	295	335	375	415	455
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	181	204	226	248	270	292	314	337	359	381
IAC at Brown 8-11	22	71	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	71	127	134	134	134	134	254	279	304	328

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate- Base
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	104	135	167	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	105	138	171	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	210	234	257	281	304	328	351	375	399	422
Pulverized Coal (LSFO)-400MW	207	230	254	278	301	325	348	372	395	419	442
Pulverized Coal (LSFO)-300MW	214	241	268	295	322	349	376	403	430	456	483
Pulverized Coal (LSFO)-200MW	260	284	308	332	356	381	405	429	453	477	501
Pulverized Coal (LSFO)-300MW X 2	191	215	238	262	286	309	333	357	380	404	428
Pulverized Coal Compliance (LSD)- 300MW	202	229	256	283	310	337	365	392	419	446	473
Pulverized Coal Supercritical (LSD)- 300MW	242	270	298	325	353	381	408	436	464	491	519
Pulverized Coal (Advanced LSFO)- 400MW	215	237	259	281	303	325	346	368	390	412	434
Atmosph Fluidized Bed (Circulating)-200MW	275	305	335	365	394	424	454	484	514	544	574
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	333	357	382	407	432	456	481	506	531	556
Press Fluidized Bed (Bubbling)-350MW	227	251	274	297	321	344	368	391	414	438	461
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	247	269	292	315	338	360	383	406	429	451
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	284	308	332	355	379	403	427	450	474	498
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	230	254	278	301	325	348	372	395	419	442
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	227	250	272	295	318	340	363	386	408	431
Foster Wheeler Advanced PFB (Circulating)-688MW	193	216	240	264	288	312	336	359	383	407	431
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	303	324	345	365	386	407	428	448	469	490
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	280	302	324	345	367	389	411	433	455	476
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	307	332	357	382	407	432	457	482	507	532
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	410	433	456	478	501	523	546	569	591	614
Advanced Int. Coal Gas-460MW	208	230	252	273	295	317	339	360	382	404	426
Combustion Turbine Heavy Duty-80MW	75	123	171	219	267	315	363	411	459	507	555
Combustion Turbine Heavy Duty-110MW	66	117	168	219	270	321	372	423	474	525	576
Combustion Turbine Heavy Duty-160MW	60	103	146	189	232	275	318	361	404	447	490
Combustion Turbine Aero- 45MW	122	162	202	242	282	322	362	402	442	482	522
CT Combined Cycle 2on1 - 330MW	92	121	150	178	207	236	265	294	323	352	381
CT Combined Cycle 2on1 - 470MW	81	107	134	161	188	214	241	268	295	322	348
CT Combined Cycle - 345MW	89	116	142	168	195	221	247	274	300	326	352
CT with Cascaded Humidified Advanced Turbine-300MW	80	109	138	167	196	225	255	284	313	342	371
Phosphoric Acid Fuel Cell-2.5MW	1291	1329	1366	1404	1442	1479	1517	1555	1592	1630	1668
Molten Carbonate Fuel Cell-100MW	415	438	461	484	507	530	553	576	599	622	645
Solid Oxide Fuel Cell-100MW	206	229	252	274	297	320	342	365	388	410	433
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	355	461	568	674	780	887	993	1099	1206	1312
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	206	232	258	283	309	335	361	386	412	438
Cane Run 3 Rehab w/ Natural Gas	133	173	214	255	295	336	376	417	458	498	539
Brown 5 CT 110MW	56	102	148	194	240	286	332	378	424	470	516
Brown 5 CT 164MW	57	96	135	174	213	252	291	330	369	408	447
Brown 5 CT 102MW	59	105	151	197	243	289	335	381	427	473	519
Brown 5 CT 159MW	53	94	135	176	217	258	299	340	381	422	463
Brown 5 CT 149MW	54	96	138	180	222	264	306	348	390	432	474
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	98	141	184	227	270	313	356	399	442	485
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	183	206	230	253	277	301	324	348	371	395
IAC at Brown 8-11	22	75	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	75	134	134	134	134	134	268	295	322	348

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate- High
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	102	131	161	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	102	132	162	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	209	231	254	276	298	321	343	365	387	410
Pulverized Coal (LSFO)-400MW	207	229	252	274	296	318	341	363	385	408	430
Pulverized Coal (LSFO)-300MW	214	239	264	289	314	339	364	389	414	438	463
Pulverized Coal (LSFO)-200MW	260	283	306	329	352	375	398	421	444	467	491
Pulverized Coal (LSFO)-300MW X 2	191	213	236	258	281	303	326	348	371	393	416
Pulverized Coal Compliance (LSD)- 300MW	202	227	252	277	302	327	353	378	403	428	453
Pulverized Coal Supercritical (LSD)- 300MW	242	268	294	319	345	371	396	422	448	473	499
Pulverized Coal (Advanced LSFO)- 400MW	215	236	257	278	299	320	341	362	383	404	425
Atmosph Fluidized Bed (Circulating)-200MW	275	303	331	359	386	414	442	470	498	526	554
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	331	355	378	402	426	449	473	496	520	543
Press Fluidized Bed (Bubbling)-350MW	227	250	272	294	316	339	361	383	406	428	450
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	245	267	289	311	332	354	376	397	419	441
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	283	306	328	351	373	395	418	440	463	485
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	229	252	274	297	319	342	364	387	409	432
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	226	248	270	291	313	335	356	378	400	422
Foster Wheeler Advanced PFB (Circulating)-688MW	193	215	238	261	284	306	329	352	375	397	420
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	302	322	342	362	382	401	421	441	461	481
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	279	300	320	341	362	383	403	424	445	466
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	306	330	353	377	401	424	448	472	495	519
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	409	431	453	474	496	518	540	561	583	605
Advanced Int. Coal Gas-460MW	208	229	250	271	292	313	333	354	375	396	417
Combustion Turbine Heavy Duty-80MW	75	117	159	201	243	285	327	369	411	453	495
Combustion Turbine Heavy Duty-110MW	66	111	156	201	246	291	336	381	426	471	516
Combustion Turbine Heavy Duty-160MW	60	98	136	174	212	250	288	326	364	402	440
Combustion Turbine Aero- 45MW	122	157	192	227	262	297	332	367	402	437	472
CT Combined Cycle 2on1 - 330MW	92	117	143	168	194	219	245	270	296	322	347
CT Combined Cycle 2on1 - 470MW	81	104	128	151	175	198	222	245	269	292	316
CT Combined Cycle - 345MW	89	113	136	159	182	206	229	252	275	298	322
CT with Cascaded Humidified Advanced Turbine-300MW	80	106	132	158	183	209	235	261	287	313	339
Phosphoric Acid Fuel Cell-2.5MW	1291	1324	1358	1391	1424	1458	1491	1524	1558	1591	1624
Molten Carbonate Fuel Cell-100MW	415	436	456	477	498	518	539	560	580	601	622
Solid Oxide Fuel Cell-100MW	206	226	246	265	285	305	324	344	364	383	403
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	342	435	528	621	715	808	901	994	1087	1180
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	205	229	254	278	302	327	351	375	399	424
Cane Run 3 Rehab w/ Natural Gas	133	168	204	239	275	310	346	381	417	453	488
Brown 5 CT 110MW	56	96	136	176	216	256	296	336	376	416	456
Brown 5 CT 164MW	57	92	127	162	197	232	267	302	337	372	407
Brown 5 CT 102MW	59	100	141	182	223	264	305	346	387	428	469
Brown 5 CT 159MW	53	89	125	161	197	233	269	305	341	377	413
Brown 5 CT 149MW	54	91	128	165	202	239	276	313	350	387	424
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	93	131	169	207	245	283	321	359	397	435
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	182	204	226	249	271	293	315	338	360	382
IAC at Brown 8-11	22	69	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	69	125	134	134	134	134	245	269	292	316

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

Capital Cost- High
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	103	134	165	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	104	136	168	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	210	233	256	280	303	326	349	373	396	419
Pulverized Coal (LSFO)-400MW	207	230	253	277	300	323	346	370	393	416	439
Pulverized Coal (LSFO)-300MW	214	240	267	293	319	346	372	398	425	451	477
Pulverized Coal (LSFO)-200MW	260	284	308	332	356	380	404	428	452	476	500
Pulverized Coal (LSFO)-300MW X 2	191	214	238	261	284	308	331	355	378	401	425
Pulverized Coal Compliance (LSD)- 300MW	202	228	255	281	307	334	360	386	413	439	465
Pulverized Coal Supercritical (LSD)- 300MW	242	269	296	323	350	378	405	432	459	486	513
Pulverized Coal (Advanced LSFO)- 400MW	215	237	259	280	302	324	345	367	389	411	432
Atmosph Fluidized Bed (Circulating)-200MW	275	304	333	362	391	420	450	479	508	537	566
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	332	357	381	406	430	455	479	504	528	552
Press Fluidized Bed (Bubbling)-350MW	227	250	274	297	320	343	367	390	413	436	460
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	246	269	291	314	336	359	381	403	426	448
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	284	307	331	354	378	401	424	448	471	495
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	230	253	277	300	323	346	370	393	416	439
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	227	250	272	294	317	339	362	384	407	429
Foster Wheeler Advanced PFB (Circulating)-688MW	193	216	240	263	287	310	334	357	381	404	428
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	303	324	344	365	385	406	427	447	468	488
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	280	301	323	344	366	387	409	430	452	473
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	307	332	356	381	406	430	455	480	504	529
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	410	432	455	477	499	522	544	566	588	611
Advanced Int. Coal Gas-460MW	208	230	251	273	295	316	338	360	381	403	424
Combustion Turbine Heavy Duty-80MW	75	122	169	216	263	310	357	404	451	498	545
Combustion Turbine Heavy Duty-110MW	66	115	164	213	262	311	360	409	458	507	556
Combustion Turbine Heavy Duty-160MW	60	102	144	186	228	270	312	354	396	438	480
Combustion Turbine Aero- 45MW	122	160	198	236	274	312	350	388	426	464	502
CT Combined Cycle 2on1 - 330MW	92	120	148	176	204	232	260	288	316	344	372
CT Combined Cycle 2on1 - 470MW	81	106	132	158	184	210	236	262	287	313	339
CT Combined Cycle - 345MW	89	115	140	166	192	217	243	268	294	319	345
CT with Cascaded Humidified Advanced Turbine-300MW	80	108	136	165	193	221	249	277	305	333	362
Phosphoric Acid Fuel Cell-2.5MW	1291	1327	1364	1400	1436	1473	1509	1545	1582	1618	1654
Molten Carbonate Fuel Cell-100MW	415	437	460	482	504	527	549	571	594	616	638
Solid Oxide Fuel Cell-100MW	206	228	250	271	293	315	336	358	380	401	423
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	351	454	557	660	762	865	968	1071	1173	1276
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	206	231	257	282	308	333	358	384	409	435
Cane Run 3 Rehab w/ Natural Gas	133	172	211	250	290	329	368	407	447	486	525
Brown 5 CT 110MW	56	100	144	188	232	276	320	364	408	452	496
Brown 5 CT 164MW	57	95	133	171	209	247	285	323	361	399	437
Brown 5 CT 102MW	59	104	149	194	239	284	329	374	419	464	509
Brown 5 CT 159MW	53	92	131	170	209	248	287	326	365	404	443
Brown 5 CT 149MW	54	94	134	174	214	254	294	334	374	414	454
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	97	139	181	223	265	307	349	391	433	475
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	183	206	229	252	275	299	322	345	368	392
IAC at Brown 8-11	22	73	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	73	131	134	134	134	134	262	287	313	339

Levelized Dollars at Various Capacity Factors with SO2 Adders and with CO2 Adders at $50/ton

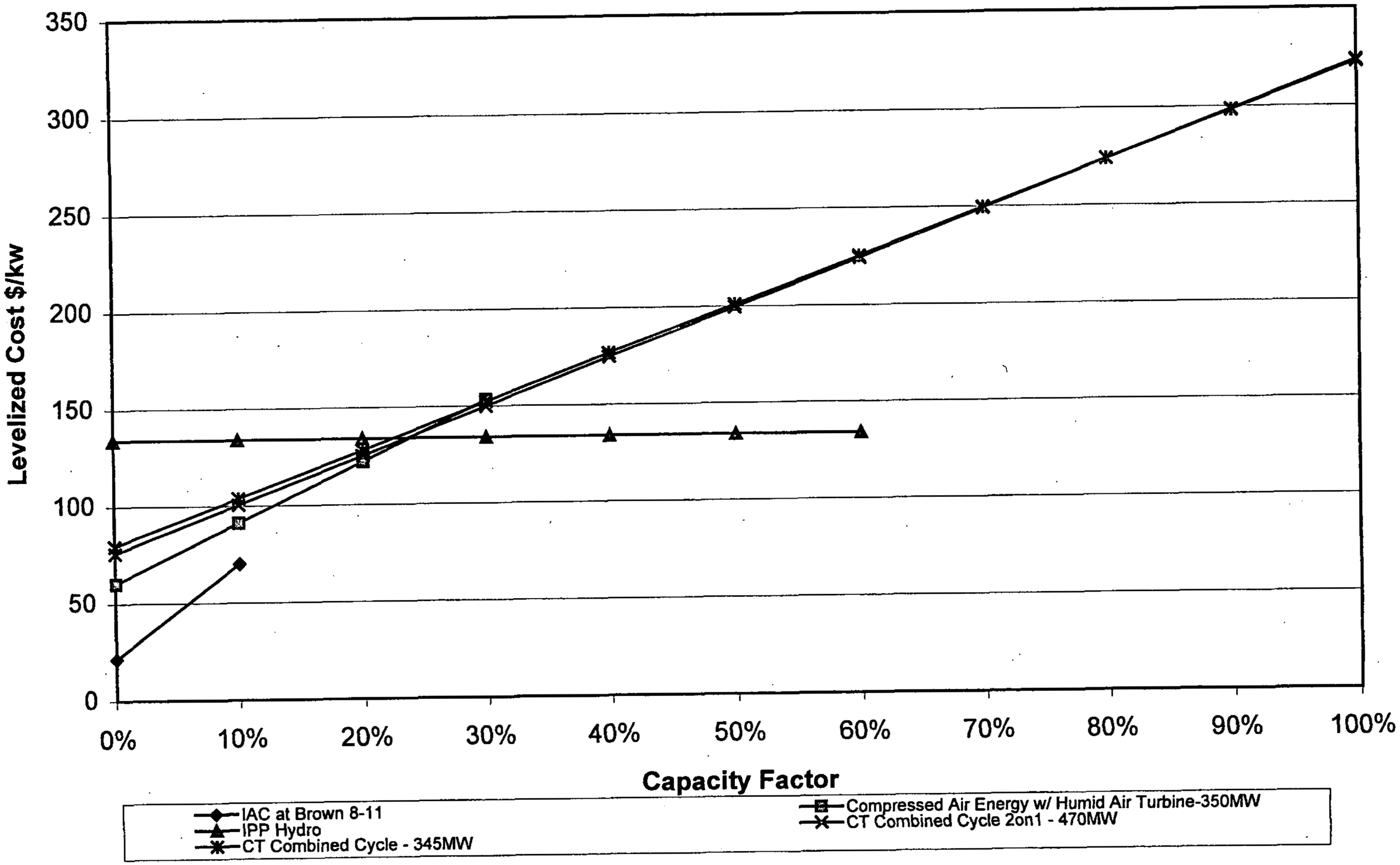
Capital Cost- High
Heat Rate- High
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	104	137	169	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	106	140	174	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	211	236	261	285	310	334	359	384	408	433
Pulverized Coal (LSFO)-400MW	207	232	256	281	305	330	355	379	404	428	453
Pulverized Coal (LSFO)-300MW	214	242	270	299	327	355	383	411	439	468	496
Pulverized Coal (LSFO)-200MW	260	285	311	336	361	387	412	437	463	488	514
Pulverized Coal (LSFO)-300MW X 2	191	216	240	265	290	315	340	364	389	414	439
Pulverized Coal Compliance (LSD)- 300MW	202	230	259	287	315	344	372	400	429	457	485
Pulverized Coal Supercritical (LSD)- 300MW	242	271	300	329	358	388	417	446	475	504	533
Pulverized Coal (Advanced LSFO)- 400MW	215	238	261	284	307	330	353	376	399	422	445
Atmosph Fluidized Bed (Circulating)-200MW	275	306	337	368	399	430	462	493	524	555	586
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	334	360	385	411	437	463	489	515	540	566
Press Fluidized Bed (Bubbling)-350MW	227	252	276	301	325	350	374	398	423	447	472
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	247	271	295	319	342	366	390	413	437	461
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	285	310	335	360	385	409	434	459	484	508
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	232	256	281	305	330	355	379	404	428	453
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	228	252	276	299	323	347	370	394	418	442
Foster Wheeler Advanced PFB (Circulating)-688MW	193	217	242	266	291	316	340	365	389	414	439
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	304	326	348	370	392	413	435	457	479	501
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	281	304	326	349	372	395	417	440	463	486
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	309	335	361	388	414	440	467	493	519	546
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	411	434	458	481	505	528	551	575	598	622
Advanced Int. Coal Gas-460MW	208	231	253	276	299	321	344	367	389	412	434
Combustion Turbine Heavy Duty-80MW	75	126	177	228	279	330	381	432	483	534	585
Combustion Turbine Heavy Duty-110MW	66	120	174	228	282	336	390	444	498	552	606
Combustion Turbine Heavy Duty-160MW	60	105	150	195	240	285	330	375	420	465	510
Combustion Turbine Aero- 45MW	122	163	204	245	286	327	368	409	450	491	532
CT Combined Cycle 2on1 - 330MW	92	122	153	183	214	244	274	305	335	366	396
CT Combined Cycle 2on1 - 470MW	81	109	137	165	193	221	250	278	306	334	362
CT Combined Cycle - 345MW	89	117	145	172	200	228	256	283	311	339	366
CT with Cascaded Humidified Advanced Turbine-300MW	80	110	141	171	201	232	262	292	323	353	383
Phosphoric Acid Fuel Cell-2.5MW	1291	1330	1370	1409	1448	1488	1527	1566	1606	1645	1684
Molten Carbonate Fuel Cell-100MW	415	439	464	488	512	537	561	585	610	634	658
Solid Oxide Fuel Cell-100MW	206	230	254	277	301	325	348	372	396	419	443
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	360	472	584	695	807	919	1031	1142	1254	1366
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	208	235	261	288	315	342	369	396	423	450
Cane Run 3 Rehab w/ Natural Gas	133	175	218	261	303	346	388	431	474	516	559
Brown 5 CT 110MW	56	104	152	200	248	296	344	392	440	488	536
Brown 5 CT 164MW	57	98	139	180	221	262	303	344	385	426	467
Brown 5 CT 102MW	59	108	157	206	255	304	353	402	451	500	549
Brown 5 CT 159MW	53	96	139	182	225	268	311	354	397	440	483
Brown 5 CT 149MW	54	98	142	186	230	274	318	362	406	450	494
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	100	145	190	235	280	325	370	415	460	505
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	184	209	233	258	282	307	332	356	381	405
IAC at Brown 8-11	22	77	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	77	134	134	134	134	134	278	306	334	362

Least Costly Technologies

Base Capital, Base Heatrate, Base Fuel



LOUISVILLE GAS AND ELECTRIC COMPANY/
KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to First Data Request of AG Dated January 25, 2000

Responding Witness: Lonnie E. Bellar

Q24. In Volume III, Section VII, the optimal IRP analysis is outlined. Please explain why it includes a sensitivity analysis for load and fuel prices, but fails to include the possibility of future environmental regulations such as carbon dioxide emission limitations?

A24. A sensitivity analysis to evaluate the potential impact of carbon dioxide emission limits was included as part of the supply-side screening analysis. As discussed in Volume III, Section V of the IRP, this sensitivity analysis did not change the selection of supply-side alternatives to be included in the integrated analysis. Therefore, this type of sensitivity analysis was not included in the integrated analysis.

LOUISVILLE GAS AND ELECTRIC COMPANY/
KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to First Data Request of AG Dated January 25, 2000

Responding Witness: H. Bruce Sauer

Q25. In Volume III, Section IX, on page PSC-6, the PSC said KU should incorporate potential environmental costs into forecasts and uncertainty analysis. The response in the IRP does not address the PSC's concern. Please explain why potential environmental costs were not included in the forecasts and uncertainty analysis in the 1999 IRP.

A25. The response offered by the Company in Volume III, Section IX, page PSC-6 states in the last sentence that KU's internal price forecast reflects expected environmental costs. In the years 2001-2003, environmental cost recovery charges are assumed due to NOx recovery expenditures. No additional increases are assumed thereafter.

RECEIVED

FEB 23 2000

PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

THE JOINT INTEGRATED RESOURCE PLAN)
OF LOUISVILLE GAS AND ELECTRIC COMPANY) CASE NO. 99-430
AND KENTUCKY UTILITIES COMPANY)

RESPONSES OF LOUISVILLE GAS AND ELECTRIC COMPANY AND KENTUCKY UTILITIES COMPANY TO THE KENTUCKY DIVISION OF ENERGY'S (DOE) FIRST SET OF INTERROGATORIES

DATED JANUARY 18, 2000

FILED: FEBRUARY 23, 2000

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q1. From where did the "long list" of DSM alternatives come (Volume III, Section IV, Exhibit DSM-l)?

A1. The long list of DSM alternatives were developed by the inter-departmental DSM team.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q2. Has either the Louisville Gas and Electric Company or Kentucky Utilities Company (hereinafter "the Companies") availed itself of information from organizations such as ESource, which is a source of comprehensive information on energy efficiency technologies and programs? To what extent, if any, was information from such sources used in developing the IRP?

A2. Information from a wide variety of sources was used to access demand-side technologies and programs in the development of the IRP, including ESource, the Electric Power Research Institute (EPRI), manufacturers, consultants, and other utilities. The information included program and technology descriptions and specifications, results of program implementation, including costs, energy impacts and customer acceptance.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q3. a. In developing the IRP, did the Companies perform a study to estimate the quantity of demand-side energy efficiency and load-shifting measures that would be available within the joint service area (i.e., a Technical Potential study), the cost of implementing such measures, and the revenue requirements that would be needed to acquire various portions of these potential resources through DSM programs?

b. If so, what is the size of these potential DSM resources?

c. If a Technical Potential study was done and was not included in the submittal, please provide it.

d. If a Technical Potential study was not done, why not?

A3. a. A Technical Potential study was not performed.

b. n/a

c. n/a

d. A Technical Potential study would be at best costly and time consuming, and by definition would result in a list of technologies that would be "technically feasible", without regard to cost, energy impacts, or customer acceptance. As part of the screening process used in the development of the IRP, the maturity of the technology and the reliability of the data related to the technology, were used as a screening criteria, in addition to customer cost, customer acceptance, and load shape objectives.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q4. Did the Companies estimate the square footage of residential, commercial, and industrial floor space that is being newly constructed each year in their combined service area? If so, what are the estimated square footage figures?

A4. No.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q5. Did the Companies survey the energy efficiency of the range of types of new buildings being constructed in their combined service area? If so, please provide the results of this analysis.

A5. No.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q6. Please describe the following programs from Exhibit DSM-1 in more detail:

a. House Doctor - energy audit (#16)
b. Energy efficient products (#20)
c. Smart thermostats (special rate) (#28)
d. Demand subscription (#31)
e. Efficient construction, residential (#32)
f. Education (#33, 60, 81)
g. Polarized refrigerant oxidant agent (#51)
h. Interruptible rates (#58, 79)
i. Construction building standards (#61)
j. Process and energy audit (#71)
k. Variable speed motors (#73)
1. High efficiency motor and adjustable speed drives (#74)

A6.

a. House Doctor is a residential energy audit program designed to improve the energy efficiency of residences.
b. Energy Efficiency Products is a program that promotes various energy efficient products by various means including education, improving availability by means such as selling the products via catalog, and direct installation.
c. Smart thermostats are used in conjunction with a TOU or real time rate, giving customers a more accurate price signal of the cost of service in order to change the usage pattern of the customer.
d. Demand subscription is a program where customers subscribe to a minimum level of service, which will satisfy their minimum energy needs during critical system peak periods. The utility installs a demand-limiting device in conjunction with the customer's metering equipment.
e. Residential Efficient Construction is a program that promotes energy efficiency in new residential construction by encouraging and educating homebuilders, buyers, and realtors on the advantages of energy efficient products and measures in the home.
f. Education programs provide information to customers regarding energy conservation and efficiency improvements.

A6.

g. Polarized refrigerant oxidant agent is an additive to refrigerant oil that displaces clumps of oil collected on the metal surfaces of evaporator and condenser coils.

h. Interruptible rate programs ask customers to declare a portion of their demand to be either interruptible or firm. The interruptible demand portion is available for curtailment by the utility.

i. Construction building standards would work to implement new building standards that require energy efficient building practices and measures.

j. Process and energy audit is an energy and process audit program for industrial customers.

k. Variable speed motors program promotes variable speed motors to industrial customers.

l. High efficiency motor and adjustable speed drives promotes high efficiency motor and adjustable speed drives to industrial customers.

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q7. "Efficient Construction" was included in the long list of residential programs (#32). In view of the emphasis placed on new commercial construction programs in the LG&E DSM Collaborative's 1996 DSM Program Plan, filed on December 1, 1995, and in the Collaborative's Joint Application, filed on February 18, 1997, why wasn't "Efficient Construction" included in the long list as a possible program for the commercial or industrial sectors?

A7. Commercial Construction Building Standards (# 61) was a consideration of commercial "Efficient Construction". Industrial "Efficient Construction" was not considered as a "package" due to several factors, including the vast diversity of industrial construction building types and the fact that the majority of energy use in the industrial segment is process related. In both the commercial and industrial segments, energy-using technologies were screened, including HVAC, lighting, thermal storage, energy management systems, and motors and drives.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q8. Approximately what fraction of the windows being sold in the Companies' service area are "low-e?" Please document the response.

A8. The percent of windows sold in the Companies' service territory that are "low-e", was not determined.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q9. What is the incremental cost of "low-e" windows compared to "non-low-e" windows? Please document the response.

A9. Calls made to window suppliers indicated an estimated incremental cost of $30 per "low-e" window compared to a "non-low-e" window.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q10. The last sentence of the paragraph after Exhibit DSM-2 (Volume III, Section IV) states, "The selected cutoff will be determined from any obvious breakpoints between the sorted weighted average scores of the measures." The decision to set the breakpoint at 3.0 caused 66 of the 82 items from the long list (i.e., 80% of the items) to be screened out. Why didn't the Companies set the breakpoint lower and thereby screen out fewer items?

A10. The purpose of screening the DSM options was two-fold: 1) to learn more about the DSM technologies available, 2) to narrow the number of alternatives to a manageable level before competing with the alternatives that passed the supply-side screening.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q11. Did the Companies consider the possibility that some of the items in the long list might not be ranked high when considered individually, but might be cost-effective if included in a package along with other complementary items? Please explain the response.

A11. The first level of screening of demand-side options was generally at the technology level and included the 82 options contained on the long list. This first qualitative screening resulted in 16 options to consider more closely, which were screened in the first phase of the quantitative screening, with zero administrative or programming costs. The 66 options were eliminated based on the criteria used in the qualitative screening which may or may not have been due to cost effectiveness.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q12. In Exhibit DSM-3, please explain why commercial thermal energy storage is rated 3,3,4,4 while industrial thermal energy storage is rated 2,3,3,3.

A12. The customer cost of thermal energy storage (TES) for commercial customers is less (compared to industrial customers) based on the larger diversity of load which allows for more off-peak time to generate and store ice or cold water which lowers capital cost. The maturity of technology and the data confidence of TES are greater for commercial customers based on the experience of sales of ice storage equipment to commercial size customers compared to industrial customers. The lower rating for meeting the load shape objective for the industrial TES is because of the flatter load curve or higher load factor for most industrial customers.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q13. Isn't it true that customer cost is a function of the design of a DSM program? In other words, if the utility pays 80% of the cost of installing a demand-side technology, wouldn't the customer cost be lower than if the utility pays only 10% of the cost?

A13. Yes.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

A14. Exhibit DSM-2 defines "Customer Acceptance" to mean, "Are there an acceptable number of customers willing to participate to create a successful program?" What was the number of customers that was considered necessary for a program to earn a rating of 1,2,3, or 4, respectively? If the interdepartmental DSM team did not actually think in terms of the number of customers, please provide a more accurate and complete definition for the criterion "Customer Acceptance."

A14. The number of customers that was considered necessary for a program to earn a rating of 1,2,3,or 4 for "Customer Acceptance" is relative to the other characteristics of the technology and program involved. A program such as residential air conditioning load control has high head-end costs related to controllers, software and a transmission function that would not make the program viable for a small number of customers such as 100. On the other hand, a program such as stand-by generation does not have large head-end costs and could be viable with 10 to 20 customers.

The number of customers that would be willing to accept a given technology is effected by numerous factors including cost, esthetics, availability, reliability, comfort, convenience, and etc. As an example, an interruptible rate for commercial customers might be very cost-effective to the customer, but due to reliability, safety, comfort, and convenience concerns, would result in an extremely low level of participation.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q15. Isn't it true that customer acceptance is a function of the design of a DSM program? In other words, if the utility pays a residential customer $100 a year to sign an interruptible service agreement, for example, wouldn't he or she be more likely to accept it than if the utility pays only $10 a year for the same agreement?

A15. Yes, to a large degree the design of a DSM program affects customer acceptance; however, other factors such as appearance, noise, safety, comfort and convenience also play a major role.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

A16. Please explain, providing as much detail as possible, why the criteria of "Maturity of Technology" and "Data Confidence" are combined.

A16. Originally these two criterion were separate but when the team began to try to develop weightings for each criterion it was determined that the two were very similar and the overlap was considerable. If a technology is very mature there is usually a lot of data available and the confidence of the data is usually higher than that of less mature technologies.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q17. Please explain, providing as much detail as possible, precisely what is meant by the criterion "Maturity of Technology (Is the technology commercially available?)".

A17. The higher the rating for the Maturity of Technology/Data Confidence criterion, the more likely the technology is commercially available and proven, and there is reliable load and market data available. The selected criteria used for the qualitative screening process is not intended to be precise, but rather provide a basis to reduce the number of technologies down to a reasonable number before designing DSM programs to be evaluated for implementation feasibility.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q18. Please explain, providing as much detail as possible, precisely what is meant by the criterion "Data Confidence (Is the necessary data available to evaluate this measure?)".

A18. See response to Question 17.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q19. Consider two hypothetical DSM programs that are identical in all respects (including total implementation costs) except for the following projected impacts: Company analysts are 95% confident that Program A will reduce demand uniformly throughout the year by an amount somewhere between 500 kW and 1,500 kW; while the analysts are 95% confident that Program B will reduce demand uniformly throughout the year by an amount somewhere between 399.99 kW and 400.01 kW. Which program should receive a higher priority for implementation? Please explain the response.

A19. Program A would receive a higher priority. In the example given, **all** factors of both programs are identical with the exception of the amount of demand reduction. Assuming normal distribution, there is a 97.5% probability that the minimum demand reduction would be greater than or equal to 500 kW for program A. Whereas, there is a 97.5% probability that the maximum demand reduction would be less than or equal to 400.01 kW for Program B. It is intuitive that Program A has greater benefits with all other factors, including cost, being equal.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q20. Consider the following three hypothetical commercial DSM programs:

a. Program A reduces demand by 1 kW uniformly throughout the year.
b. Program B reduces demand by 5kW on weekday afternoons from 1:00 pm to 6:00 pm during the months of May through September inclusive (i.e., a peak-shaving program with zero impact at other times).
c. Program C reduces demand by 6kW from 1:00 pm to 6:00 pm, and increases demand by 3kW from midnight to 5:00 am on weekdays during the months of May through September inclusive (i.e., some energy use is shifted from on-peak to off-peak hours; zero impact at other times).

Each program costs $1,000 to implement (including all program costs), 90% of which is paid by the utility (i.e., the cost to the participating commercial customer = $100). Assume that the measure life is 20 years and that there are no free riders. Please use DSManager to provide the present value dollar amounts of the benefits, costs, and benefit/cost ratios for each program using the following five standard "California" tests:

a. Participant
b. Utility Cost
c. RIM
d. TRC
e. Societal Cost

In the alternative, please provide the necessary information, software and methodology to allow the Division of Energy to do the calculations.

A20. This exercise is not relevant to the development of the IRP, which is fundamentally designed to determine which options result in the lowest present-value revenue requirements. The standard "California" tests were used only to screen the DSM programs that passed the qualitative screening process.
The Company is unable to provide copies of DSManager since it is proprietary software covered by copyright laws and licensing agreements.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q21. When deciding on the set of DSM programs to recommend for pilot-scale implementation, did the Companies consider "the extent to which the plan provides programs which are available, affordable, and useful to all customers" [Reference KRS 278.285 (l)(g)]? Please discuss the degree to which the set of recommended DSM programs meets this statutory criterion.

A21. Yes. The portion of KRS 278.285 quoted in the question is one of several factors to be considered when deciding on the reasonableness of DSM plans. Utilization of the screening and evaluation tools as described in the IRP fully provides an appropriate and reasonable basis for collective consideration of each of the factors.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q22. Section VIII in Volume III lists 53 transmission construction projects the Companies are planning to complete between 2000 and 2009 to maintain the adequacy of its transmission system to meet projected customer demands. The method of local integrated resource planning (LIRP), as described in the strategic issues paper titled, "Local Integrated Resource Planning: A New Tool for a Competitive Era" (E-Source, 1995) is designed to determine if costs could be reduced by deferring transmission and distribution upgrades through the use of geographically-focused demand-side programs. [Other names for LIRP include "targeted area planning, " "local area investment planning, " "distributed resources planning," or "area wide asset and customer service."]

a. Did the Companies use the LIRP approach to determine whether any planned transmission or distribution projects could economically be deferred? If so, please provide the results of the studies.
b. Do the Companies plan to use the LIRP approach in the future?

A22. a. No.

b. The Companies will evaluate all projects in the contexts of least cost planning. To the extent that transmission and distribution projects can be deferred by the implementation of planned DSM programs the Companies will certainly evaluate this alternative.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q23. Section 8.(3)(e)(4) (Volume I, page 8-83) refers to the NPV costs of certain demand-side programs. What discount rate was used to calculate the net present value (NPV)? What was the basis for the particular discount rate used?

A23. The discount rate used to calculate the NPV is 9.78% and is reported in Section 9 (Volume I, page 9-1). This value is the combined Company before-tax incremental weighted average cost of capital. The discount rate is based on the following table.

	Capitalization Component Ratios	Annual Cost Rate
Debt	45.35%	7.27%
Preferred Stock	5.23%	5.75%
Common Equity	49.42%	12.5%

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q24. The first sentence on page 8-84 reads, "The difference between the PVRR with and without the direct load control program is $32.1 million." Does this statement mean that the Companies' present value of revenue requirements (PVRR) would be reduced by $32.1 million if the direct load control program were to be implemented as projected? If this interpretation is incorrect, please explain.

A24. The comparison is between the NPV of revenue requirements of two future expansion plans. One with a direct load control program and the other without the direct load control program. Neither of the NPV of revenue requirement values reflect the Companies true or expected revenue requirement. These values are used to compare future expenditures required to meet the growing demand for electricity in our service territories with the continued level of reliable service.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q25. The first paragraph on page 8-121 states: "The plans developed utilizing PROSCREEN II, both in the supply-side optimization and the optimizations with DSM included, are rank-ordered based upon the plans PVRR. The plan with the lowest PVRR is considered the optimal integrated resource plan." Does the plan with the lowest PVRR have the minimum total resource cost (TRC)? Please explain the response.

A25. The TRC is not calculated in the optimal integrated resource plan analysis. The main criteria used to determine a cost-effective plan is the PVRR. TRC is usually reserved for screening of DSM options.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: William A. Bosta

Q26. Please provide a detailed description of the method the Companies use to determine how much to charge a new residential, commercial, or industrial customer to hook up their building to the grid. Please explain why this particular method or formula was chosen.

A26. Both LG&E and KU adhere to 807 KAR 5.041, Section 10, Service Connections, which indicates that the utility shall pay for all costs of a service drop or an initial connection to its line with the customer's service outlet, except the attachment of the wire support to customer premises. In addition, 807 KAR 5:041, Sections 11,12 and 21 outline the requirements followed by LG&E and KU with regard to all aspects of distribution line extensions. LG&E's and KU's Tariffs contain specific reference to the extension of service requirements. Please see Pages 27-31 of LG&E's PSC of Kentucky Tariff No.4, and Pages 25.3, 25.4, 29 and 29A of KU's PSC of Kentucky Tariff No.11.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q27. The section on biomass energy (Volume III, Section V) discusses only technologies that are fueled 100% by biomass. Did the Companies evaluate the cofiring of coal with sawdust at low percentages (e.g., less than 2 or 3 percent sawdust by weight) at existing coal-fired plants, which would provide a valuable service for the sawmill operations located in or near the Companies' service territory and also would reduce SO_2 emissions? Please explain the response.

A27. No. The Companies have not identified any cost effective proposals for co-firing with sawdust to evaluate. The Companies would evaluate such proposals consistent with applicable federal and state laws and regulations.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Gregory B. Fergason

Q28. Do the Companies intend to file proposed net metering pilot program tariffs with the PSC, which, if approved, would make net metering service available to small-scale customer-generators who produce electricity using renewables, fuel cells, or microturbines. If yes, when? If yes, do the Companies believe that net metered customer-generators will have a measurable impact on the system load during the planning period covered by the IRP? If so, what is the estimated impact during each future year? Please explain the response. If the Companies do not intend to file proposed net metering pilot program tariffs with the PSC, why not?

A28. No, not at the present time. The Companies will continue to monitor final federal rules and regulations that would effect Kentucky as well as proposed state rules and regulations that may become law, and take appropriate future action that is in the best interests of the Companies and their customers.

LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES COMPANY
CASE NO. 99-430

Response to DOE First Set of Interrogatories Dated January 18, 2000

Responding Witness: Lonnie E. Bellar

Q29. To what extent have the Companies encouraged the installation of combined heat and power (cogeneration) systems by industrial firms in its service area? Please provide quantitative information if available.

A29. The Companies have on file with the Public Service Commission rate schedules for small power production and co-generation facilities. These rate schedules are available to any customer in the Companies service territory that qualifies for such a rate. To the extent that an industrial firm wants to install a combined heat and power (co-generation) system, the Companies will evaluate the use of such facility as a resource pursuant to applicable authority.

LOUISVILLE RESOURCE CONSERVATION COUNCIL
P.O. Box 4174 • Louisville, Kentucky 40204-0174 • (502) 574-5351

RECEIVED
DEC 21 1999
PUBLIC SERVICE COMMISSION

December 20, 1999

Helen C. Helton
Executive Director
Public Service Commission
PO Box 615
Frankfort, Kentucky 40602
via mail and FAX 502-564-3460

RE: ***The Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company***
Case No. 99-430

Dear Ms. Helton:

Attached please find the Motion for Full Intervention by the Louisville Resource Conservation Council in the above referenced case. An original and ten copies of the motion, plus cover letter, follow this facsimile via US Mail.

Based on my conversation with Mr. Shaw today, it is my understanding that it is not necessary to send copies of this motion to the present parties to this case. If I am in error, please advise me as to who is presently on the service list for this case, and I will send copies immediately.

Sincerely,

Walter J. Bell

Walter F. Bell
Executive Director

RECEIVED
DEC 21 1999
PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE JOINT INTEGRATED RESOURCE PLAN OF)
LOUISVILLE GAS AND ELECTRIC COMPANY) Case No. 99-430
AND KENTUCKY UTILITIES COMPANY)

MOTION FOR FULL INTERVENTION

COMES NOW the Louisville Resource Conservation Council (LRCC), and moves, pursuant to 807 KAR 5:001 Section 3(8), for full intervention in the above-captioned proceeding. In support of this Motion for Full Intervention, LRCC states as follows:

1. LRCC is a 501(c)(3) non-profit agency established in 1990 and incorporated under the laws of the Commonwealth of Kentucky to promote and support conservation of energy, water, and other consumable natural resources. LRCC provides direct technical assistance in management of energy use and cost to public and private non-profit building operators served by Louisville Gas and Electric Company (LG&E), and has worked to develop utility and non-utility resources in support of energy conservation. LRCC's staff of two has 27 years experience in residential and commercial energy management and related service delivery programs.

2. LRCC was a party to the joint settlement agreement in Case No. 93-150, which led to demand-side management (DSM) programming for LG&E customers. As a member of the LG&E DSM Collaborative since its inception, LRCC has been an active participant in the design and implementation of LG&E's DSM programs. For two years LRCC operated LG&E's DSM program for non-profit community service agencies.

3. The agencies served by LRCC and other similarly situated energy users will be affected by the matters under consideration, and LRCC has a special interest in this regard that is not otherwise adequately represented by the parties to this proceeding. Full intervention status for LRCC will likely result in the presentation of issues and/or the development of facts that will assist the Commission in fully considering the matter without unduly complicating or disrupting the proceeding.

WHEREFORE, LRCC asks that this Motion for Full Intervention be granted, and that LRCC be provided with all pleadings, orders, testimony, or other documents that have been or will be filed in this matter.

Respectfully Submitted,

Walter F. Bell

Walter F. Bell
Executive Director
Louisville Resource Conservation Council
PO Box 4174
Louisville, Kentucky 40204-0174

RECEIVED
NOV 22 1999
PUBLIC SERVICE COMMISSION

LG&E
A SUBSIDIARY OF
LG&E ENERGY

KU
A SUBSIDIARY OF
LG&E ENERGY

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE JOINT INTEGRATED RESOURCE PLAN OF)
LOUISVILLE GAS AND ELECTRIC COMPANY AND) CASE NO. 99-430
KENTUCKY UTILITIES COMPANY)

Volume II
Integrated Resource Plan

November 22, 1999

Technical Appendix

TECHNICAL APPENDIX 1

Louisville Gas and Electric Co.

Section A

HISTORICAL DATA USED FOR THE 1999 IRP FORECASTING MODEL DEVELOPMENT

TABLE A1

History of MWh Usage by Customer Class

Date	Residential			General Service			Lg Comm	Lg Power	St Light	General Service			LC	LP	Total	Total	Fort
	Sp Heat	Other	Total	Sp Heat	Other	Total				Sp Heat	Other	Total	Total	Total	Pub Auth	Ult Cons	Knox
Jan-81	81,868	145,133	227,001	10,237	59,888	70,125	93,975	215,618	5,545	1,779	8,143	9,922	37,157	16,036	63,116	675,380	11,200
Feb-81	68,332	124,848	193,180	8,531	56,275	64,805	86,006	215,384	4,716	1,782	8,017	9,798	35,339	15,587	60,724	624,815	10,036
Mar-81	49,536	115,537	165,073	5,390	52,781	58,171	77,481	220,392	4,733	1,076	6,939	8,015	33,446	15,761	57,222	583,072	10,490
Apr-81	32,107	107,989	140,096	2,205	48,485	50,690	77,091	221,656	4,217	496	5,754	6,250	30,116	15,298	51,664	545,413	9,370
May-81	26,076	112,334	138,410	1,548	51,176	52,725	79,663	216,198	3,988	230	5,432	5,662	30,550	15,023	51,235	542,219	9,648
Jun-81	31,420	171,701	203,122	58	62,436	62,494	96,087	239,807	3,756	0	5,535	5,535	36,872	18,181	60,588	665,854	13,650
Jul-81	40,951	261,681	302,632	(17)	79,328	79,311	109,845	229,168	3,865	0	6,289	6,289	43,646	17,872	67,808	792,628	16,474
Aug-81	37,223	249,157	286,380	0	76,255	76,255	106,287	232,522	4,145	0	5,921	5,921	42,541	15,731	64,193	769,781	14,856
Sep-81	33,395	204,020	237,414	0	72,053	72,053	100,787	228,782	4,456	0	6,310	6,310	39,510	16,342	62,162	705,655	11,770
Oct-81	26,493	127,947	154,441	1,449	55,997	57,446	85,641	227,454	5,020	230	6,249	6,479	33,291	13,752	53,522	583,523	9,952
Nov-81	32,129	114,530	146,658	2,183	51,549	53,732	80,510	206,967	5,247	319	6,156	6,475	32,867	13,779	53,122	546,236	9,984
Dec-81	54,835	127,647	182,482	6,506	55,577	62,083	83,558	174,917	5,580	860	6,567	7,427	35,189	14,254	56,870	565,490	10,894
Jan-82	83,737	140,464	224,200	10,805	58,545	69,350	91,966	198,652	5,545	1,452	7,141	8,592	36,949	16,014	61,556	651,269	11,744
Feb-82	81,134	134,406	215,540	10,449	60,597	71,046	92,651	195,194	4,807	1,801	8,374	10,175	38,117	16,170	64,462	643,700	10,614
Mar-82	54,013	118,928	172,941	5,613	53,241	58,855	81,141	212,751	4,776	1,125	7,103	8,228	35,556	16,039	59,824	590,287	10,923
Apr-82	42,973	113,781	156,755	3,750	50,817	54,567	79,335	203,286	4,262	614	6,220	6,834	32,498	15,641	54,972	553,176	10,153
May-82	31,264	127,651	158,915	1,970	55,520	57,490	86,802	198,796	4,051	338	6,141	6,479	35,323	15,833	57,635	563,690	11,612
Jun-82	30,566	163,135	193,701	197	65,354	65,551	97,381	226,424	3,756	0	6,632	6,632	38,965	16,801	62,399	649,213	12,610
Jul-82	37,589	219,659	257,248	9	72,578	72,588	106,199	181,356	3,919	0	5,781	5,781	42,662	17,618	66,062	687,371	16,712
Aug-82	39,889	256,012	295,900	0	78,177	78,177	109,679	186,117	4,176	0	5,733	5,733	43,735	17,309	66,777	740,826	15,007
Sep-82	31,776	178,896	210,672	(0)	67,988	67,988	102,913	187,205	4,474	0	6,356	6,356	41,296	15,527	63,179	636,429	12,401
Oct-82	27,385	132,579	159,964	1,572	57,012	58,584	90,937	195,262	4,980	163	6,520	6,683	36,606	14,314	57,602	567,329	10,736
Nov-82	34,145	114,749	148,894	2,316	51,728	54,044	83,665	188,006	5,201	326	5,953	6,279	34,647	14,538	55,465	535,275	10,679
Dec-82	45,901	125,368	171,269	4,766	54,435	59,201	86,429	171,371	5,601	568	6,597	7,165	35,868	15,104	58,136	552,007	10,877
Jan-83	59,853	131,551	191,404	6,450	54,775	61,225	87,573	197,042	5,490	993	6,198	7,191	36,050	15,934	59,174	601,908	11,655
Feb-83	68,456	130,296	198,753	7,254	58,192	65,446	90,377	191,221	4,785	1,070	7,433	8,502	37,001	15,102	60,605	611,186	10,558
Mar-83	50,848	120,402	171,251	5,516	54,796	60,312	87,045	208,894	4,781	943	6,832	7,775	36,890	15,725	60,390	592,673	11,456
Apr-83	47,601	118,313	165,914	4,132	52,978	57,110	85,338	190,128	4,249	694	6,328	7,022	33,678	15,532	56,233	558,971	10,473
May-83	31,397	110,450	141,847	1,605	50,602	52,207	85,491	200,572	3,986	304	5,908	6,212	33,011	17,244	56,466	540,569	9,878
Jun-83	29,583	137,914	167,497	95	60,259	60,354	94,961	207,746	3,732	4	5,969	5,973	35,417	18,000	59,390	593,678	11,723
Jul-83	44,320	261,898	306,218	0	79,772	79,772	117,365	190,489	3,895	0	6,104	6,104	45,828	18,404	70,337	768,075	17,498
Aug-83	51,117	330,744	381,861	3,339	89,764	93,103	126,592	214,060	4,211	157	6,733	6,891	50,944	20,461	78,295	898,122	18,243
Sep-83	46,176	281,726	327,902	2,772	82,930	85,702	118,816	199,608	4,468	232	7,392	7,624	47,160	17,114	71,898	808,393	13,381
Oct-83	29,021	143,768	172,789	1,667	61,867	63,534	97,505	210,556	5,069	186	7,132	7,318	37,697	15,076	60,090	609,543	10,190
Nov-83	35,595	115,893	151,488	2,204	53,487	55,691	84,454	204,565	5,250	312	6,125	6,437	33,760	14,575	54,772	556,220	10,477
Dec-83	61,150	130,959	192,109	6,069	58,220	64,289	91,244	194,855	5,622	741	6,472	7,213	37,450	15,840	60,503	608,623	11,587
Jan-84	91,458	153,647	245,104	8,568	61,999	70,568	104,188	202,720	5,545	1,461	7,214	8,675	40,724	17,056	66,455	694,580	11,812
Feb-84	82,183	128,563	210,747	12,045	63,462	75,507	96,139	209,113	4,763	1,459	7,324	8,783	38,914	15,903	63,600	659,869	10,791
Mar-84	63,544	123,983	187,528	6,065	59,991	66,056	92,388	211,711	4,787	998	7,138	8,136	36,764	15,804	60,704	623,174	10,064
Apr-84	47,560	117,563	165,124	3,782	56,141	59,923	86,640	214,245	4,280	742	6,361	7,104	35,540	16,172	58,816	589,027	11,632
May-84	33,844	116,828	150,672	1,605	55,456	57,061	90,684	210,372	4,013	389	5,942	6,331	33,876	17,125	57,332	570,132	10,141
Jun-84	37,249	179,852	217,100	2,351	68,393	70,744	108,734	225,760	3,734	226	6,667	6,892	40,688	17,974	65,555	691,628	14,822
Jul-84	42,827	246,833	289,661	2,868	81,259	84,127	119,005	216,698	3,892	144	6,100	6,244	44,926	18,008	69,177	782,561	15,921
Aug-84	43,491	245,017	288,508	2,695	81,999	84,693	120,867	214,193	4,207	150	6,255	6,405	48,011	17,962	72,378	784,845	16,266
Sep-84	36,808	200,633	237,441	2,198	75,197	77,395	113,448	215,559	4,521	186	6,988	7,174	42,019	17,094	66,288	714,653	11,030
Oct-84	29,213	130,821	160,034	1,473	60,915	62,388	95,384	219,021	5,036	189	6,577	6,766	36,996	15,426	59,189	601,051	10,524
Nov-84	37,518	120,999	158,518	2,565	58,124	60,690	94,342	209,613	5,318	262	6,259	6,521	36,967	15,138	58,626	587,106	10,801
Dec-84	60,536	133,910	194,446	5,738	61,633	67,371	97,024	200,390	5,691	924	7,003	7,927	39,127	15,392	62,446	627,368	10,869

Note: Fort Knox sales are included in the sales to the Public Authority LC Class.

TABLE A1 (Continued.)

History of MWh Usage by Customer Class

Date	Residential			General Service			Lg Comm	Lg Power	St Light	General Service			LC	LP	Total	Total	Fort
	Sp Heat	Other	Total	Sp Heat	Other	Total				Sp Heat	Other	Total	Total	Total	Pub Auth	Util Cons	Knox
Jan-85	74,585	140,762	215,347	7,857	61,614	69,471	97,466	201,537	5,582	990	6,775	7,766	38,576	16,734	63,076	652,479	12,041
Feb-85	101,063	139,853	240,917	11,297	66,855	78,152	108,939	206,750	4,782	1,706	8,000	9,705	41,861	16,258	67,825	705,365	10,907
Mar-85	56,430	123,629	180,059	5,097	60,478	65,574	96,988	206,226	4,815	1,002	7,232	8,234	39,534	15,883	63,651	617,314	11,229
Apr-85	41,561	119,643	161,204	2,472	58,313	60,785	92,710	212,167	4,255	494	6,324	6,818	35,815	17,205	59,839	590,961	10,542
May-85	30,539	124,401	154,940	1,631	61,955	63,586	102,159	209,621	3,982	187	6,502	6,689	37,264	16,269	60,222	594,511	10,988
Jun-85	34,622	164,453	199,075	1,897	69,759	71,657	113,386	214,031	3,749	176	6,871	7,047	41,861	17,091	65,999	667,896	13,703
Jul-85	43,502	229,151	272,653	2,654	79,184	81,837	122,904	198,777	3,908	155	6,219	6,374	46,363	18,291	71,028	751,108	16,726
Aug-85	46,959	261,417	308,375	3,146	85,467	88,613	130,816	218,953	4,233	158	6,443	6,601	49,357	18,104	74,061	825,052	16,001
Sep-85	41,803	220,702	262,505	2,100	80,170	82,270	121,182	221,803	4,608	195	7,357	7,552	46,879	17,767	72,198	764,567	12,901
Oct-85	32,673	138,721	171,394	1,604	65,734	67,338	106,190	217,782	5,106	177	6,790	6,968	39,368	16,648	62,984	630,794	10,859
Nov-85	35,183	120,524	155,707	1,830	59,632	61,462	96,634	210,841	5,357	236	6,305	6,541	37,426	14,816	58,783	588,785	10,952
Dec-85	66,378	136,532	202,911	6,488	63,887	70,374	101,850	189,972	5,732	712	7,096	7,808	40,649	17,129	65,585	636,424	11,995
Jan-86	88,236	143,962	232,199	8,867	65,830	74,697	105,592	192,571	5,605	1,431	7,189	8,621	41,821	15,880	66,321	678,985	12,226
Feb-86	74,640	132,321	206,961	7,138	64,751	71,889	103,932	202,783	4,840	1,166	7,488	8,655	40,633	15,843	65,130	655,536	11,161
Mar-86	66,080	132,558	198,638	5,373	65,749	71,122	103,085	212,570	4,928	1,003	7,400	8,403	41,403	17,780	67,586	657,928	11,716
Apr-86	41,456	121,222	162,678	2,307	61,997	64,304	101,901	206,085	4,372	462	6,588	7,050	37,225	16,200	60,474	599,815	10,151
May-86	35,435	133,143	168,577	1,842	64,449	66,291	103,367	217,975	4,083	259	6,759	7,018	38,105	16,818	61,941	622,235	11,195
Jun-86	41,414	193,727	235,141	2,432	76,153	78,585	119,276	216,164	3,815	233	7,116	7,349	43,474	18,826	69,649	722,631	13,880
Jul-86	54,453	293,454	347,908	3,882	91,490	95,372	137,560	209,929	4,023	162	7,335	7,497	51,884	19,491	78,872	873,665	18,323
Aug-86	49,966	276,747	326,714	2,498	88,297	90,794	130,644	202,006	4,311	189	7,115	7,304	49,745	18,317	75,367	829,835	15,653
Sep-86	40,428	196,589	237,017	2,939	77,567	80,506	122,073	223,565	4,586	187	7,762	7,949	46,646	17,651	72,247	739,995	12,823
Oct-86	40,542	179,393	219,935	1,421	76,036	77,457	119,798	221,553	5,195	212	8,391	8,603	43,852	15,165	67,620	711,559	11,737
Nov-86	42,687	123,027	165,714	2,538	61,056	63,594	97,978	214,532	5,387	391	7,068	7,459	37,863	16,111	61,433	608,637	11,417
Dec-86	69,576	140,229	209,806	6,199	65,722	71,921	104,226	189,144	5,777	928	7,824	8,752	41,131	16,061	65,944	646,818	11,892
Jan-87	81,997	143,863	225,860	7,521	64,948	72,470	103,782	194,154	5,655	1,105	7,449	8,554	40,616	15,742	64,912	666,833	12,470
Feb-87	83,066	138,678	221,744	7,171	67,146	74,316	106,743	207,620	4,911	1,217	7,968	9,185	40,946	16,447	66,578	681,913	11,198
Mar-87	65,396	134,285	199,681	4,680	66,384	71,064	106,910	210,721	4,966	956	7,811	8,767	42,076	16,886	67,729	661,071	12,050
Apr-87	49,075	121,462	170,537	2,929	61,489	64,418	102,468	201,068	4,388	653	6,874	7,527	37,403	16,295	61,225	604,105	11,371
May-87	38,627	150,841	189,468	1,981	69,676	71,657	114,295	217,165	4,158	255	7,378	7,633	41,466	19,891	68,991	665,734	13,046
Jun-87	49,748	240,750	290,498	2,775	85,761	88,536	133,834	217,343	3,872	267	8,205	8,472	49,607	19,259	77,338	811,421	16,891
Jul-87	53,832	285,140	338,972	3,223	91,625	94,849	141,323	205,191	4,058	210	7,469	7,679	52,083	19,610	79,572	863,964	18,446
Aug-87	58,094	317,572	375,665	3,379	94,004	97,383	141,197	224,192	4,351	254	7,670	7,924	53,674	19,706	81,305	924,093	18,703
Sep-87	47,363	234,458	281,821	2,645	85,240	87,885	133,109	214,978	4,666	269	8,320	8,589	50,123	19,471	78,182	800,641	14,544
Oct-87	39,102	145,564	184,666	1,914	69,951	71,864	115,282	218,543	5,224	276	7,287	7,563	42,605	16,464	66,633	662,212	11,899
Nov-87	45,254	124,097	169,351	2,709	62,785	65,494	105,168	217,071	5,429	435	7,113	7,548	38,540	16,077	62,165	624,677	11,553
Dec-87	65,809	137,504	203,312	5,039	65,561	70,599	107,773	195,756	5,813	765	7,685	8,450	41,168	14,796	64,414	647,668	12,226
Jan-88	96,711	154,131	250,842	8,413	69,853	78,267	115,697	202,604	5,727	1,274	8,022	9,296	43,164	16,693	69,153	722,290	13,070
Feb-88	89,831	142,875	232,706	7,634	70,566	78,200	114,167	216,690	4,921	1,213	8,650	9,863	43,505	17,363	70,732	717,415	12,248
Mar-88	76,757	138,207	214,964	5,664	69,924	75,588	114,542	218,056	5,038	1,027	8,532	9,559	43,311	16,759	69,628	697,816	12,658
Apr-88	47,519	128,972	176,491	2,626	66,201	68,828	112,708	215,249	4,457	488	7,501	7,988	39,454	17,032	64,475	642,208	10,757
May-88	37,840	129,360	167,200	1,803	65,454	67,258	110,759	217,404	4,186	236	7,008	7,244	38,509	17,824	63,578	630,382	11,407
Jun-88	45,018	205,259	250,277	2,609	82,860	85,469	133,122	223,597	3,936	227	8,261	8,488	47,168	20,084	75,739	772,140	16,217
Jul-88	58,928	316,007	374,934	3,253	96,719	99,972	148,558	215,620	4,137	267	8,277	8,544	53,565	20,917	83,026	926,247	19,018
Aug-88	61,390	334,885	396,275	3,753	100,354	104,107	151,715	227,375	4,424	232	8,156	8,388	57,926	20,208	86,523	970,419	20,231
Sep-88	47,466	237,924	285,390	2,605	88,715	91,319	141,737	220,519	4,726	290	8,727	9,016	50,907	17,703	77,627	821,317	13,759
Oct-88	38,758	147,456	186,214	1,883	71,266	73,149	118,990	220,468	5,313	234	8,331	8,565	42,255	16,145	66,965	671,099	12,025
Nov-88	50,620	128,763	179,382	2,992	65,332	68,325	109,342	230,279	5,575	516	7,680	8,196	40,556	15,792	64,544	657,447	11,948
Dec-88	73,965	146,755	220,720	5,357	71,095	76,453	118,892	208,732	6,000	776	8,547	9,323	43,909	16,444	69,676	700,472	12,310
Jan-89	81,192	154,033	235,225	6,334	70,961	77,294	118,381	217,117	5,876	1,031	8,420	9,451	42,665	17,086	69,202	721,096	12,784
Feb-89	80,803	139,939	220,742	6,324	70,049	76,373	115,189	220,592	5,079	886	8,801	9,687	42,983	17,847	70,517	708,491	11,913
Mar-89	78,316	141,851	220,166	6,081	71,938	78,019	121,058	220,865	5,153	1,102	9,637	10,739	45,511	17,830	74,080	719,342	12,950
Apr-89	52,442	130,969	183,411	2,870	67,045	69,914	113,950	222,852	4,525	574	8,036	8,610	41,065	17,730	67,405	662,058	11,977
May-89	40,974	134,495	175,469	1,819	67,345	69,164	116,285	219,032	4,321	258	7,740	7,998	40,931	17,860	66,789	651,060	12,345
Jun-89	46,541	202,438	248,978	2,557	86,326	88,883	142,803	233,496	4,087	230	8,789	9,019	49,854	20,933	79,806	798,054	16,649
Jul-89	55,682	280,316	335,998	3,016	94,045	97,061	151,202	228,158	4,229	230	8,086	8,316	55,041	20,623	83,980	900,628	19,298
Aug-89	53,662	278,351	332,013	3,130	93,631	96,761	146,882	220,949	4,528	237	8,215	8,453	55,512	18,992	82,956	884,090	19,271
Sep-89	51,286	257,206	308,492	2,865	92,599	95,464	149,682	228,906	4,848	287	9,708	9,995	55,661	19,788	85,444	872,834	15,990
Oct-89	38,865	148,919	187,784	1,820	71,847	73,666	121,932	227,712	5,442	262	8,303	8,565	44,028	17,471	70,064	688,601	13,035
Nov-89	49,279	133,140	182,418	2,754	68,103	70,857	118,240	221,708	5,702	368	8,221	8,590	43,491	16,618	68,698	667,624	13,028
Dec-89	93,326	158,153	251,479	6,448	74,860	81,308	127,195	197,342	6,098	932	9,218	10,151	47,225	17,505	74,881	738,301	13,858

TABLE A1 (Continued.)

History of MWh Usage by Customer Class

Date	Residential			General Service			Lg Comm	Lg Power	St Light	General Service			LC	LP	Total	Total	Fort
	Sp Heat	Other	Total	Sp Heat	Other	Total				Sp Heat	Other	Total	Total	Total	Pub Auth	Ult Cons	Knox
Jan-90	105,839	165,987	271,827	8,981	75,794	84,776	127,931	221,698	6,051	1,519	9,081	10,600	47,113	17,971	75,684	787,966	13,591
Feb-90	69,578	140,405	209,982	4,705	71,011	75,716	116,881	213,478	5,210	777	8,666	9,443	42,939	17,291	69,673	690,940	12,145
Mar-90	63,997	138,279	202,276	3,842	70,738	74,580	117,998	224,269	5,248	743	8,570	9,313	45,332	17,464	72,108	696,480	13,502
Apr-90	55,323	133,674	188,998	2,769	69,047	71,816	117,114	229,813	4,661	591	8,285	8,876	42,969	17,166	69,031	681,432	12,958
May-90	40,773	138,266	179,039	1,937	70,636	72,573	122,396	227,549	4,406	280	8,161	8,441	44,435	18,423	71,300	677,262	13,633
Jun-90	43,631	188,613	232,244	2,130	80,844	82,974	135,529	230,985	4,147	139	9,183	9,322	50,134	20,163	79,619	765,498	17,978
Jul-90	58,675	302,453	361,128	3,232	100,542	103,774	155,143	231,765	4,297	267	8,540	8,808	58,405	20,836	88,048	944,175	20,546
Aug-90	52,607	269,541	322,148	3,053	95,227	98,280	148,033	217,835	4,641	228	8,485	8,713	56,396	18,136	83,244	874,182	20,019
Sep-90	54,607	281,292	335,898	2,788	98,251	101,038	154,691	232,124	4,976	282	11,003	11,285	59,808	18,887	89,981	918,707	17,316
Oct-90	38,465	160,198	198,663	1,772	76,481	78,253	127,833	235,148	5,539	230	9,180	9,410	47,761	17,028	74,198	719,634	13,634
Nov-90	51,162	141,198	192,360	2,435	72,653	75,088	124,102	226,361	5,909	424	9,482	9,906	45,944	18,124	73,974	697,794	12,564
Dec-90	64,419	147,296	211,715	4,273	71,154	75,427	118,840	210,063	6,251	681	8,901	9,581	45,660	16,742	71,984	694,280	13,288
Jan-91	96,524	168,516	265,040	6,982	75,544	82,526	128,853	220,476	6,135	1,130	9,846	10,976	48,425	18,367	77,768	780,797	14,299
Feb-91	87,691	151,610	239,301	6,250	75,329	81,579	125,610	210,493	5,289	1,116	10,133	11,249	46,909	18,576	76,734	739,006	13,021
Mar-91	72,372	146,340	218,712	4,477	72,641	77,118	121,762	210,639	5,348	859	9,563	10,422	47,293	19,800	77,515	711,095	13,501
Apr-91	47,615	134,831	182,446	2,126	71,941	74,067	122,683	215,582	4,742	457	8,628	9,085	43,639	18,559	71,284	670,804	12,645
May-91	40,916	157,939	198,855	1,901	75,059	76,960	130,164	215,012	4,477	268	9,113	9,381	49,595	19,795	78,771	704,238	16,754
Jun-91	55,464	283,474	338,938	2,869	97,810	100,679	155,448	228,507	4,182	361	10,251	10,612	59,274	21,572	91,458	919,212	19,231
Jul-91	64,974	350,589	415,563	3,457	107,541	110,998	166,947	218,340	4,383	363	10,296	10,659	64,829	21,893	97,381	1,013,611	22,341
Aug-91	57,919	317,289	375,208	3,137	100,978	104,115	156,941	209,523	4,727	356	10,009	10,365	62,395	18,947	91,708	942,220	20,922
Sep-91	57,048	298,594	355,642	2,829	100,351	103,180	157,449	234,087	5,070	334	11,508	11,842	63,197	19,655	94,694	950,121	17,630
Oct-91	41,012	167,447	208,459	1,840	76,495	78,334	129,263	229,787	5,615	309	9,965	10,274	48,689	17,730	76,693	728,152	13,601
Nov-91	57,232	147,718	204,951	3,238	76,011	79,249	129,777	227,761	5,965	469	9,268	9,737	47,104	16,969	73,810	721,514	13,109
Dec-91	73,391	158,973	232,364	4,694	72,192	76,886	127,803	206,705	6,382	718	9,412	10,128	47,826	17,398	75,351	725,491	13,205
Jan-92	90,952	167,942	258,894	6,649	76,762	83,410	129,424	217,339	6,278	933	9,302	10,236	48,363	17,637	76,236	771,582	13,954
Feb-92	85,430	154,280	239,710	5,778	75,418	81,197	124,090	227,645	5,403	965	9,720	10,685	47,848	17,245	75,777	753,821	12,886
Mar-92	64,337	143,265	207,602	3,754	72,841	76,595	122,226	217,037	5,451	883	9,293	10,176	47,654	16,903	74,733	703,644	13,579
Apr-92	58,228	141,239	199,467	3,089	72,272	75,361	121,456	212,900	4,836	656	8,944	9,600	44,742	17,655	71,997	686,016	12,891
May-92	42,608	150,989	193,597	1,827	74,173	76,000	131,828	229,743	4,592	326	8,415	8,741	47,475	18,421	74,636	710,395	14,008
Jun-92	42,795	182,319	225,114	2,004	81,541	83,545	138,086	223,354	4,256	260	8,216	8,477	51,174	18,672	78,322	752,677	16,504
Jul-92	55,355	284,254	339,608	3,040	98,722	101,762	160,337	224,003	4,473	298	8,693	8,991	60,109	20,441	89,541	919,726	21,867
Aug-92	53,719	286,861	340,581	2,920	100,617	103,537	157,215	233,855	4,850	305	8,951	9,257	59,844	20,481	89,582	929,619	19,172
Sep-92	47,913	230,876	278,789	2,207	91,078	93,285	150,487	226,170	5,144	311	9,620	9,930	58,922	16,136	84,988	838,863	16,933
Oct-92	38,637	153,813	192,449	1,617	74,208	75,825	131,508	226,885	5,842	289	8,511	8,800	48,201	22,814	79,815	712,322	13,243
Nov-92	49,847	141,781	191,629	2,432	71,219	73,651	123,497	226,764	6,030	366	7,808	8,174	46,459	14,727	69,360	690,932	12,936
Dec-92	80,385	165,758	246,143	5,547	76,675	82,222	130,141	207,321	6,501	665	8,826	9,492	49,523	17,946	76,961	749,288	13,702
Jan-93	89,033	174,942	263,975	5,903	77,267	83,170	134,630	212,671	8,419	884	8,843	9,728	49,406	18,824	77,957	778,821	14,027
Feb-93	87,853	157,830	245,683	5,879	74,161	80,041	128,864	225,718	5,497	766	6,643	7,409	51,094	18,878	77,382	763,185	12,841
Mar-93	94,140	159,482	253,622	6,434	77,459	83,893	130,042	221,884	5,536	890	8,702	9,592	51,003	19,505	80,099	775,076	13,978
Apr-93	56,028	142,638	198,666	2,804	72,775	75,580	126,458	220,128	4,933	477	7,800	8,278	46,306	20,779	75,383	701,128	12,890
May-93	40,924	151,353	192,277	1,680	75,153	76,833	130,682	233,574	4,667	197	8,057	8,254	47,584	19,513	75,351	713,385	13,723
Jun-93	45,438	209,503	254,941	2,149	87,309	89,458	147,573	236,338	4,368	177	8,125	8,302	54,673	20,667	83,642	816,317	17,613
Jul-93	63,814	364,191	428,005	3,379	110,726	114,104	174,399	224,688	4,591	237	9,541	9,778	66,140	23,074	98,992	1,044,779	23,472
Aug-93	58,483	338,246	396,729	3,044	106,690	109,734	164,581	238,222	4,898	235	8,809	9,044	65,296	20,938	95,278	1,009,442	21,799
Sep-93	56,189	302,331	358,520	2,748	102,879	105,627	165,265	239,262	5,270	235	10,447	10,682	65,043	21,397	97,122	971,065	16,502
Oct-93	37,782	153,553	191,335	1,529	76,683	78,212	134,184	232,161	5,862	159	8,439	8,598	49,272	18,340	76,209	717,964	13,282
Nov-93	54,127	146,521	200,648	2,756	73,452	76,208	125,636	231,235	6,165	274	7,400	7,674	47,553	19,458	74,684	714,577	13,621
Dec-93	75,436	169,902	245,337	4,801	79,976	84,777	134,993	220,378	6,627	482	8,371	8,853	50,972	19,516	79,341	771,454	13,588
Jan-94	113,092	189,768	302,860	8,494	81,503	89,997	143,093	215,521	6,557	1,047	8,729	9,776	52,966	20,757	83,499	841,527	14,549
Feb-94	114,465	176,586	291,051	8,144	80,263	88,407	136,620	234,255	5,586	1,057	9,271	10,328	50,541	21,003	81,872	837,792	12,982
Mar-94	76,706	155,200	231,906	4,880	77,689	82,569	132,480	227,560	5,740	641	8,607	9,248	50,746	20,133	80,127	760,382	13,917
Apr-94	54,638	148,021	202,660	2,522	74,038	76,561	130,787	235,129	4,922	347	8,519	8,866	47,232	21,684	77,782	727,839	12,875
May-94	40,412	148,899	189,311	1,686	75,618	77,304	132,131	238,300	4,721	161	7,643	7,804	49,196	20,838	77,837	717,605	14,098
Jun-94	49,823	244,741	294,564	2,596	95,048	97,643	157,916	251,227	4,409	217	8,838	9,054	60,436	22,919	92,409	898,168	20,848
Jul-94	61,742	354,444	416,185	3,335	110,639	113,974	174,976	235,051	4,629	237	9,639	9,875	67,332	23,724	100,932	1,045,747	22,224
Aug-94	56,539	313,986	370,525	3,004	107,697	110,701	169,428	262,814	5,015	243	9,110	9,352	65,629	23,635	98,616	1,017,099	20,656
Sep-94	48,538	254,581	303,119	2,405	97,247	99,652	159,414	253,477	5,338	284	9,474	9,758	62,179	22,151	94,087	915,088	15,775
Oct-94	37,915	165,078	202,993	1,603	80,875	82,477	135,761	244,630	5,977	185	8,050	8,235	51,358	20,111	79,702	751,540	13,602
Nov-94	43,430	144,398	187,827	2,057	74,665	76,722	130,185	248,828	6,237	233	7,266	7,500	47,715	20,349	75,564	725,363	12,718
Dec-94	64,737	161,522	226,258	3,757	75,697	79,454	129,629	228,237	6,656	409	7,708	8,117	48,027	19,222	75,365	745,599	13,115

TABLE A1 (Continued.)

History of MWh Usage by Customer Class

	Residential			General Service			Lg Comm	Lg Power	St Light	General Service			LC	LP	Total	Total	Fort
Date	Sp Heat	Other	Total	Sp Heat	Other	Total				Sp Heat	Other	Total	Total	Total	Pub Auth	Ult Cons	Knox
Jan-95	91,888	188,259	280,147	6,116	82,923	89,038	140,400	251,603	6,684	816	8,278	9,094	50,635	21,447	81,175	849,048	14,073
Feb-95	100,130	172,031	272,161	6,985	82,720	89,706	137,931	248,187	5,672	884	8,732	9,616	50,860	20,705	81,182	834,839	12,948
Mar-95	68,774	156,186	224,959	3,881	78,432	82,313	134,133	245,365	5,812	620	8,567	9,187	51,776	20,923	81,886	774,468	14,377
Apr-95	48,019	146,424	194,443	2,092	74,673	76,765	133,551	254,972	5,163	306	6,983	7,289	46,797	21,328	75,414	740,307	12,034
May-95	41,454	155,833	197,286	1,591	77,228	78,819	137,591	248,341	4,844	166	7,463	7,629	49,719	20,801	78,149	745,031	13,961
Jun-95	48,273	242,331	290,604	2,346	94,788	97,134	160,098	252,055	4,540	229	8,615	8,844	59,619	22,926	91,389	895,820	19,139
Jul-95	59,881	339,297	399,177	3,038	108,328	111,366	175,198	254,891	4,727	273	8,977	9,250	67,175	24,659	101,084	1,046,443	22,458
Aug-95	66,284	401,649	467,933	3,528	117,331	120,858	180,977	263,972	5,046	327	9,546	9,873	73,712	24,611	108,196	1,146,982	24,539
Sep-95	56,438	330,988	387,426	2,966	110,042	113,008	175,432	262,308	5,446	333	10,696	11,029	68,583	23,104	102,716	1,046,336	15,578
Oct-95	37,569	165,835	203,403	1,674	81,340	83,013	139,966	258,189	6,059	203	8,206	8,409	53,999	20,501	82,910	773,540	14,627
Nov-95	55,882	155,482	211,364	3,167	77,149	80,316	135,165	251,267	6,342	297	7,681	7,979	50,225	20,765	78,968	763,422	12,971
Dec-95	79,070	174,004	253,074	5,018	78,313	83,331	138,198	230,058	6,791	735	7,974	8,709	52,286	20,079	81,074	792,527	13,389
Jan-96	108,760	203,627	312,387	7,635	87,396	95,031	150,383	249,803	6,764	1,067	9,047	10,114	54,945	21,571	86,630	900,998	14,080
Feb-96	105,254	179,893	285,147	7,158	84,129	91,287	145,178	256,739	5,776	1,046	9,263	10,308	53,759	20,134	84,201	868,329	13,250
Mar-96	78,788	166,589	245,377	5,073	81,278	86,350	141,453	247,576	5,812	747	9,107	9,854	53,198	20,195	83,247	809,815	13,930
Apr-96	64,552	159,123	223,675	3,287	77,952	81,239	138,662	260,120	5,205	582	7,881	8,463	50,629	21,421	80,513	789,414	12,712
May-96	44,857	169,435	214,292	2,062	79,847	81,909	144,776	252,872	4,883	273	7,587	7,859	51,483	22,076	81,418	780,150	15,268
Jun-96	47,696	243,614	291,309	2,381	95,359	97,741	163,359	260,390	4,619	234	9,418	9,652	60,452	22,870	92,975	910,393	19,032
Jul-96	59,845	347,508	407,353	3,240	111,834	115,073	183,135	247,744	4,730	256	9,483	9,740	66,206	24,141	100,086	1,058,122	20,447
Aug-96	55,800	320,916	376,716	2,951	108,207	111,158	170,781	255,618	5,101	222	9,474	9,696	66,865	22,397	98,958	1,018,333	21,157
Sep-96	52,671	300,865	353,537	2,672	107,768	110,439	176,000	264,864	5,549	281	10,669	10,950	66,546	21,401	98,898	1,009,286	16,023
Oct-96	37,421	170,386	207,807	1,630	86,864	88,494	146,760	259,493	6,107	199	8,440	8,640	53,673	19,319	81,632	790,293	13,845
Nov-96	53,025	161,077	214,102	2,312	80,101	82,413	144,167	255,682	6,491	293	7,908	8,201	51,415	19,892	79,508	782,363	13,014
Dec-96	78,233	187,955	266,188	5,238	85,229	90,466	148,895	247,084	7,018	748	8,646	9,394	53,891	21,497	84,782	844,433	13,270
Jan-97	100,429	201,739	302,168	6,703	86,768	93,470	156,171	247,899	7,083	893	9,198	10,091	55,535	19,724	85,350	892,143	14,143
Feb-97	92,637	181,408	274,045	6,010	85,382	91,392	146,840	255,746	5,805	922	9,375	10,297	53,256	19,922	83,475	857,302	12,488
Mar-97	65,503	166,597	232,100	3,512	78,942	82,453	141,432	243,388	5,822	539	9,830	10,369	52,691	20,538	83,598	788,793	13,232
Apr-97	53,038	153,587	206,626	2,422	77,144	79,566	142,597	245,822	5,183	397	7,817	8,215	49,097	20,155	77,466	757,259	12,488
May-97	42,185	149,205	191,391	1,576	75,497	77,073	139,980	254,384	5,168	230	7,523	7,754	47,381	20,024	75,159	743,155	12,884
Jun-97	41,853	191,726	233,579	2,090	85,245	87,336	157,700	256,511	4,734	158	7,398	7,556	55,535	22,885	85,976	825,835	16,659
Jul-97	59,398	342,406	401,804	3,214	112,187	115,401	188,208	266,901	4,867	254	9,401	9,656	67,394	24,129	101,178	1,078,360	21,723
Aug-97	57,695	351,656	409,350	2,981	110,844	113,825	183,714	264,699	5,211	253	9,715	9,968	67,838	22,153	99,959	1,076,758	20,069
Sep-97	50,471	283,892	334,364	2,493	105,359	107,852	177,320	258,460	5,592	231	10,297	10,529	66,749	22,036	99,313	982,901	16,753
Oct-97	40,642	191,672	232,314	2,035	88,558	90,594	155,373	255,686	6,189	185	9,004	9,189	55,768	19,771	84,728	824,883	14,247
Nov-97	54,968	165,394	220,361	2,616	79,399	82,015	143,854	271,447	6,457	313	7,953	8,267	50,518	18,925	77,709	801,843	12,806
Dec-97	77,316	190,787	268,103	5,043	85,420	90,463	151,103	234,836	6,938	596	8,535	9,131	54,967	19,971	84,069	835,512	13,376
Jan-98	83,700	201,746	285,446	4,872	86,364	91,236	156,535	249,625	6,899	701	8,538	9,239	54,421	19,873	83,534	873,275	13,361
Feb-98	76,784	177,626	254,411	4,600	81,951	86,551	145,549	257,847	5,917	667	8,626	9,293	51,391	19,888	80,572	830,847	12,061
Mar-98	70,441	169,161	239,602	3,868	81,269	85,137	146,069	246,392	5,921	519	8,202	8,720	52,759	17,810	79,289	802,410	13,572
Apr-98	49,774	161,370	211,144	2,314	80,854	83,168	151,663	251,548	5,297	337	8,261	8,597	51,015	22,848	82,460	785,280	12,586
May-98	42,455	188,726	231,181	2,086	85,210	87,296	156,575	269,442	4,975	173	8,223	8,396	55,250	22,282	85,928	835,397	16,227
Jun-98	51,876	284,474	336,349	2,699	103,999	106,698	179,565	261,742	4,636	235	9,518	9,753	64,745	22,016	96,514	985,503	19,550
Jul-98	61,811	385,324	447,135	3,390	119,608	122,998	198,247	269,303	4,877	270	10,409	10,679	71,437	23,853	105,969	1,148,528	21,679
Aug-98	58,520	364,163	422,682	3,280	114,708	117,988	193,385	280,812	5,181	296	10,019	10,315	72,442	22,322	105,080	1,125,129	21,752
Sep-98	58,790	357,222	416,012	3,396	117,126	120,522	192,496	264,939	5,629	294	12,687	12,981	75,275	23,714	111,970	1,111,569	19,057
Oct-98	43,797	238,487	282,285	2,176	96,769	98,945	172,611	255,859	6,257	193	10,013	10,206	59,999	19,642	89,846	905,803	13,923
Nov-98	45,632	165,240	210,872	2,020	81,186	83,206	148,198	253,734	6,503	217	8,180	8,398	52,263	19,857	80,517	783,030	12,455
Dec-98	59,420	183,678	243,098	3,169	84,686	87,855	157,114	244,068	7,006	344	8,793	9,137	52,456	19,690	81,283	820,421	13,140

TABLE A2

HISTORY OF SUMMER PEAK DEMAND (MW)
(1969 - 1998)

Year	Month	Date	Hour Ending*	Day	MW	MW w/o Interrution	TempPK	CDH	DewTemPK	24AvgTmp	CDD24	THIPK	24AvgTHI	224AvgTm	CDD224
1969	7	17	1500	THU	1,107	1,107	91	26	68	83.0	18.0	81.2			
1970	7	2	1400	THU	1,230	1,230	95	30	75	85.0	20.0	84.8			
1971	7	9	1500	FRI	1,271	1,271	83	18	73	83.0	18.0	77.8			
1972	7	24	1400	MON	1,379	1,379	93	28	71	85.0	20.0	82.9			
1973	8	30	1700	THU	1,531	1,531	92	27	67	84.0	19.0	81.5			
1974	8	26	1500	MON	1,473	1,473	86	21	67	76.5	11.5	78.2	72.6	74.4	9.4
1975	8	25	1600	MON	1,543	1,543	93	28	69	83.4	18.4	82.5	77.6	80.4	15.4
1976	7	23	1500	FRI	1,583	1,583	94	29	71	83.1	18.1	83.4	77.8	81.0	16.0
1977	7	15	1600	FRI	1,705	1,705	95	30	71	86.8	21.8	84.0	80.0	82.3	17.3
1978	8	25	1500	FRI	1,699	1,699	87	22	69	82.3	17.3	79.2	76.6	82.6	17.6
1979	8	8	1700	WED	1,752	1,752	93	28	74	84.1	19.1	83.5	78.7	79.8	14.8
1980	8	11	1700	MON	1,815	1,815	95	30	72	87.0	22.0	84.2	79.8	87.6	22.6
1981	7	13	1700	MON	1,784	1,784	94	29	76	83.9	18.9	84.4	78.1	81.8	16.8
1982	8	4	1700	WED	1,662	1,662	92	27	71	82.5	17.5	82.3	76.9	81.0	16.0
1983	7	21	1500	THU	1,885	1,885	100	35	72	90.4	25.4	86.9	82.0	85.5	20.5
1984	7	10	1700	TUE	1,749	1,749	93	28	71	85.5	20.5	82.9	78.8	74.8	9.8
1985	8	13	1600	TUE	1,812	1,812	92	27	73	83.8	18.8	82.7	78.2	80.8	15.8
1986	7	18	1600	FRI	1,913	1,913	95	30	71	85.5	20.5	84.0	79.2	85.4	20.4
1987	7	24	1600	FRI	1,851	1,851	93	28	66	83.1	18.1	81.9	76.9	81.9	16.9
1988	8	16	1700	TUE	2,141	2,141	99	34	71	88.4	23.4	86.2	80.9	85.8	20.8
1989	7	11	1500	TUE	2,022	2,022	91	26	73	85.3	20.3	82.2	79.1	84.0	19.0
1990	7	10	1600	TUE	2,149	2,149	92	27	73	88.6	23.6	82.7	80.5	89.6	24.6
1991	7	22	1700	MON	2,125	2,125	98	33	66	87.5	22.5	84.6	79.7	85.5	20.5
1992	7	13	1700	MON	2,107	2,107	93	28	70	84.9	19.9	82.7	78.3	81.0	16.0
1993	8	30	1700	MON	2,239	2,239	94	29	71	83.9	18.9	83.4	78.3	81.3	16.3
1994	6	15	1700	WED	2,219	2,219	95	30	66	84.5	19.5	83.0	78.4		
1995	8	17	1600	THU	2,357	2,406	93	28	77	85.9	20.9	84.1	80.2		
1996	8	7	1600	WED	2,282	2,331	93	28	71	83.5	18.5	82.9	78.1		
1997	7	21	1500	MON	2,414	2,463	93	28	70	84.5	19.5	82.7	77.4		
1998	8	25	1600	TUE	2,427	2,476	94	29	72	84.3	19.3	83.5	78.1		
20-Yr. Avg. (1979-1998)							94.1	29.1	71.3	85.4	20.4	83.5	78.9		

*The peak-demand hour was recorded as the "Eastern Standard" time.

TABLE A3

HISTORY OF WINTER PEAK DEMAND (MW)
(1969 - 1998)

Year	Month	Date	Hour Ending	MW	TempPK	HDH	WindPK (meter/sec.)	WchillPK	24AvgTmp	HDD24	WindPK (Knot or MPH)
1969	12	15	1100	789	33	32	4	1,540.8	35	30	8
1970	11	23	1900	851	18	47	6	2,691.7	26	39	12
1971	11	1	1900	908	72	-7	3	412.0	64	1	6
1972	12	11	1900	989	31	34	3	1,127.5	24	41	5
1973	12	10	1900	970	22	43	6	2,545.1	31	34	12
1974	12	9	1900	979	24	41	4	1,604.9	25	40	7
1975	12	18	1900	1,068	17	48	5	2,345.7	18	47	10
1976	11	29	1900	1,087	21	44	5	2,219.6	21	44	10
1977	12	6	1900	1,243	8	57	8	3,702.0	24	41	15
1978	1	9	1900	1,247	8	57	8	3,702.0	8	57	15
1979	1	15	900	1,288	4	61	3	1,631.5	8	57	5
1980	3	3	900	1,209	15	50	2	1,033.1	11	54	3
1981	1	12	900	1,310	10	55	2	1,100.7	12	53	3
1982	1	11	1200	1,370	9	56	9	4,081.5	0	65	17
1983	12	19	1100	1,235	10	55	4	2,147.6	18	47	8
1984	1	19	900	1,311	2	63	3	1,668.8	11	54	5
1985	1	21	1000	1,415	1	64	6	3,315.2	-8	73	12
1986	1	27	1100	1,387	4	61	8	4,104.4	15	50	16
1987	1	27	900	1,358	16	49	4	1,795.4	18	47	7
1988	1	6	1000	1,443	6	59	3	1,594.1	9	56	5
1989	12	22	1100	1,616	-12	77	2	1,664.2	-5	70	4
1990	2	26	1000	1,379	22	43	4	1,831.0	22	44	8
1991	2	15	1000	1,493	12	53	9	3,932.9	23	42	17
1992	1	16	800	1,525	5	60	4	2,279.5	17	49	8
1993	2	18	900	1,549	5	60	4	2,279.5	14	51	8
1994	1	15	2000	1,538	0	65	5	2,881.6	3	62	10
1995	1	5	800	1,593	7	58	1	1,055.9	14	51	3
1996	2	5	800	1,696	3	62	4	2,291.5	4	61	9
1997	1	17	800	1,720	6	59	5	2,786.4	8	57	12
1998	3	11	1900	1,586	22	43	4	1,954.1	22	43	10
20-Yr. Avg. (1979-1998)					7.4	57.7	4.3	2271.4	10.8	54.2	

TABLE A4
HISTORY OF NUMBER OF CUSTOMERS BY CLASS

									Public Authority					
	Residential			General Service		Lg Com	Lg Power	Street Light	General Service		Lg Com	Lg Power	Total	Total
	Sp Heat	Other	Total	Sp Heat	Total	Total	Total		Sp Heat	Total	Total	Total	Pub Auth	Ult Cons
				MEMO					MEMO					
Jan-81	23,757	240,168	263,925	1,072	26,479	1,374	295	2,216	110	1,475	158	27	1,660	295,949
Feb-81	24,047	240,562	264,609	1,069	26,456	1,383	296	2,236	109	1,467	159	27	1,653	296,633
Mar-81	24,130	240,086	264,216	1,055	26,427	1,390	294	2,243	109	1,471	160	27	1,658	296,228
Apr-81	24,360	239,870	264,230	1,063	26,514	1,391	294	2,253	107	1,473	160	27	1,660	296,342
May-81	24,460	239,966	264,426	1,059	26,551	1,397	295	2,254	106	1,479	159	27	1,665	296,588
Jun-81	24,764	240,399	265,163	1,059	26,614	1,401	295	2,261	106	1,477	160	27	1,664	297,398
Jul-81	24,942	240,121	265,063	1,059	26,772	1,402	296	2,255	106	1,480	160	27	1,667	297,455
Aug-81	24,947	239,957	264,904	1,059	26,771	1,405	296	2,253	106	1,456	160	27	1,643	297,272
Sep-81	25,071	240,068	265,139	1,059	26,751	1,407	296	2,275	106	1,474	160	27	1,661	297,529
Oct-81	25,312	239,850	265,162	1,071	26,861	1,410	293	2,273	101	1,471	159	27	1,657	297,656
Nov-81	25,371	239,869	265,240	1,076	26,858	1,415	295	2,272	98	1,462	160	27	1,649	297,729
Dec-81	25,250	238,657	263,907	1,071	26,905	1,414	296	2,278	96	1,452	161	27	1,640	296,440
Jan-82	25,351	238,839	264,190	1,080	26,997	1,415	296	2,293	96	1,448	161	27	1,636	296,827
Feb-82	25,632	239,830	265,462	1,087	27,033	1,420	296	2,302	98	1,451	161	27	1,639	298,152
Mar-82	25,703	239,766	265,469	1,088	26,976	1,409	298	2,301	98	1,460	161	28	1,649	298,102
Apr-82	25,759	239,948	265,707	1,078	27,034	1,417	301	2,311	98	1,472	161	27	1,660	298,430
May-82	25,781	239,547	265,328	1,076	27,039	1,414	301	2,320	97	1,464	161	27	1,652	298,054
Jun-82	25,827	239,923	265,750	1,076	27,026	1,415	301	2,351	97	1,467	162	27	1,656	298,499
Jul-82	25,900	239,138	265,038	1,076	27,006	1,423	302	2,371	97	1,475	161	27	1,663	297,803
Aug-82	25,995	239,628	265,623	1,076	26,925	1,421	300	2,380	97	1,465	161	27	1,653	298,302
Sep-82	25,951	239,084	265,035	1,076	26,937	1,426	298	2,392	97	1,469	162	27	1,658	297,746
Oct-82	25,896	238,389	264,285	1,074	26,980	1,423	297	2,391	97	1,474	163	27	1,664	297,040
Nov-82	25,957	238,553	264,510	1,069	27,056	1,426	297	2,404	106	1,489	163	26	1,678	297,371
Dec-82	26,009	238,444	264,453	1,059	27,139	1,434	295	2,417	83	1,469	163	27	1,659	297,397
Jan-83	25,998	238,193	264,191	1,073	27,113	1,439	295	2,427	85	1,464	163	27	1,654	297,119
Feb-83	26,365	239,469	265,834	1,074	27,239	1,448	294	2,433	83	1,465	163	27	1,655	298,903
Mar-83	26,340	238,862	265,202	1,065	27,323	1,454	292	2,455	83	1,463	163	27	1,653	298,379
Apr-83	26,487	239,159	265,646	1,078	27,232	1,457	292	2,426	84	1,461	163	27	1,651	298,704
May-83	26,673	239,312	265,985	1,063	27,319	1,464	293	2,434	83	1,460	163	27	1,650	299,145
Jun-83	26,836	239,383	266,219	1,063	27,357	1,468	292	2,435	83	1,457	164	27	1,648	299,419
Jul-83	27,063	239,072	266,135	1,063	27,404	1,471	294	2,454	83	1,461	164	27	1,652	299,410
Aug-83	27,558	239,558	267,116	1,067	27,408	1,471	292	2,451	81	1,450	166	27	1,643	300,381
Sep-83	27,434	238,985	266,419	1,054	27,406	1,469	291	2,455	75	1,450	165	28	1,643	299,683
Oct-83	27,563	238,704	266,267	1,049	27,414	1,479	292	2,455	77	1,461	165	28	1,654	299,561
Nov-83	27,648	238,690	266,338	1,046	27,445	1,484	293	2,465	73	1,450	165	28	1,643	299,668
Dec-83	27,595	237,895	265,490	1,067	27,469	1,493	294	2,468	74	1,443	165	28	1,636	298,850
Jan-84	27,640	238,419	266,059	1,082	27,607	1,489	294	2,470	73	1,450	165	28	1,643	299,562
Feb-84	27,974	238,875	266,849	1,085	27,638	1,492	294	2,469	73	1,452	165	28	1,645	300,387
Mar-84	28,033	238,697	266,730	1,078	27,623	1,496	294	2,486	73	1,441	165	28	1,634	300,263
Apr-84	28,291	239,779	268,070	1,085	27,753	1,500	296	2,484	73	1,435	166	28	1,629	301,732
May-84	28,251	238,934	267,185	1,092	27,794	1,506	297	2,488	73	1,440	166	28	1,634	300,904
Jun-84	28,667	239,200	267,867	1,080	27,690	1,500	300	2,497	73	1,449	166	28	1,643	301,497
Jul-84	28,948	238,797	267,745	1,080	27,830	1,501	300	2,504	73	1,457	167	28	1,652	301,532
Aug-84	28,868	238,951	267,819	1,080	27,797	1,507	304	2,513	72	1,450	169	28	1,647	301,587
Sep-84	29,025	238,093	267,118	1,077	27,784	1,518	305	2,515	72	1,457	169	28	1,654	300,894
Oct-84	29,280	238,034	267,314	1,082	27,817	1,522	306	2,521	72	1,462	169	28	1,659	301,139
Nov-84	29,449	238,401	267,850	1,078	27,888	1,531	307	2,546	72	1,447	169	28	1,644	301,766
Dec-84	29,600	238,425	268,025	1,107	27,977	1,531	306	2,557	72	1,453	169	28	1,650	302,046

TABLE A4 (Continued.)
HISTORY OF NUMBER OF CUSTOMERS BY CLASS

									Public Authority					
	Residential			General Service		Lg Com	Lg Power	Street Light	General Service		Lg Com	Lg Power	Total	Total
	Sp Heat	Other	Total	Sp Heat	Total	Total	Total		Sp Heat	Total	Total	Total	Pub Auth	Ult Cons
Jan-85	29,916	238,081	267,997	1,088	27,989	1,543	306	2,560	72	1,451	170	27	1,648	302,043
Feb-85	30,183	239,062	269,245	1,075	27,983	1,545	308	2,575	71	1,459	171	26	1,656	303,312
Mar-85	30,396	239,251	269,647	1,088	27,922	1,548	306	2,565	71	1,469	171	25	1,665	303,653
Apr-85	30,553	239,700	270,253	1,074	28,019	1,550	307	2,566	71	1,467	171	25	1,663	304,358
May-85	30,558	238,442	269,000	1,079	28,005	1,553	305	2,564	70	1,462	171	26	1,659	303,086
Jun-85	30,865	239,166	270,031	1,092	28,113	1,550	305	2,560	70	1,466	172	26	1,664	304,223
Jul-85	31,054	238,939	269,993	1,090	28,360	1,552	304	2,563	70	1,464	172	26	1,662	304,434
Aug-85	31,519	239,384	270,903	1,096	28,188	1,557	305	2,558	70	1,460	172	26	1,658	305,169
Sep-85	31,779	239,352	271,131	1,103	28,223	1,552	307	2,569	69	1,459	173	26	1,658	305,440
Oct-85	32,145	239,645	271,790	1,099	28,347	1,555	308	2,575	69	1,462	173	26	1,661	306,236
Nov-85	32,496	239,569	272,065	1,098	28,389	1,555	309	2,578	68	1,463	173	26	1,662	306,558
Dec-85	29,427	238,776	268,203	1,098	28,442	1,563	309	2,590	69	1,460	173	26	1,659	302,766
Jan-86	32,613	238,824	271,437	1,107	28,525	1,562	309	2,601	66	1,458	173	26	1,657	306,091
Feb-86	32,968	240,083	273,051	1,097	28,597	1,574	308	2,609	67	1,455	173	26	1,654	307,793
Mar-86	33,434	241,117	274,551	1,109	28,666	1,571	307	2,630	68	1,461	173	26	1,660	309,385
Apr-86	33,213	239,838	273,051	1,112	28,569	1,574	307	2,626	68	1,448	173	26	1,647	307,774
May-86	33,673	240,033	273,706	1,107	28,670	1,574	306	2,627	68	1,448	173	26	1,647	308,530
Jun-86	34,024	240,094	274,118	1,104	28,711	1,580	306	2,624	68	1,455	173	26	1,654	308,993
Jul-86	33,883	239,426	273,309	1,098	28,749	1,585	305	2,627	69	1,458	173	26	1,657	308,232
Aug-86	34,327	240,214	274,541	1,101	28,745	1,584	307	2,629	69	1,461	173	28	1,662	309,468
Sep-86	34,391	240,376	274,767	1,093	28,801	1,591	310	2,640	69	1,470	174	28	1,672	309,781
Oct-86	34,297	240,054	274,351	1,096	28,820	1,592	312	2,675	69	1,471	173	28	1,672	309,422
Nov-86	34,766	241,165	275,931	1,103	28,982	1,601	311	2,669	71	1,508	173	36	1,717	311,211
Dec-86	34,602	239,831	274,433	1,108	28,919	1,605	303	2,676	71	1,509	173	37	1,719	309,655
Jan-87	34,645	240,297	274,942	1,108	29,048	1,612	303	2,700	71	1,508	173	37	1,718	310,323
Feb-87	35,270	241,657	276,927	1,107	29,144	1,629	306	2,705	72	1,519	173	37	1,729	312,440
Mar-87	35,329	241,390	276,719	1,116	29,098	1,637	308	2,713	69	1,516	174	35	1,725	312,200
Apr-87	35,418	241,158	276,576	1,098	29,063	1,643	308	2,729	69	1,523	174	35	1,732	312,051
May-87	35,671	241,628	277,299	1,095	29,185	1,642	308	2,726	69	1,528	174	35	1,737	312,897
Jun-87	35,804	241,803	277,607	1,092	29,243	1,653	308	2,732	69	1,530	174	35	1,739	313,282
Jul-87	35,666	241,399	277,065	1,105	29,221	1,655	309	2,736	70	1,546	174	35	1,755	312,741
Aug-87	35,908	242,046	277,954	1,103	29,336	1,660	308	2,737	68	1,546	174	36	1,756	313,751
Sep-87	35,905	242,204	278,109	1,097	29,371	1,662	310	2,739	68	1,547	174	36	1,757	313,948
Oct-87	36,036	242,000	278,036	1,111	29,460	1,677	311	2,740	69	1,553	174	36	1,763	313,987
Nov-87	36,508	242,749	279,257	1,111	29,629	1,681	310	2,736	67	1,565	174	35	1,774	315,387
Dec-87	36,384	241,190	277,574	1,105	29,534	1,684	311	2,744	67	1,548	174	35	1,757	313,604
Jan-88	36,453	241,698	278,151	1,105	29,664	1,690	309	2,754	66	1,561	174	35	1,770	314,338
Feb-88	36,789	242,939	279,728	1,102	29,624	1,689	306	2,777	66	1,567	174	35	1,776	315,900
Mar-88	36,734	242,983	279,717	1,108	29,595	1,697	307	2,792	65	1,578	175	35	1,788	315,896
Apr-88	37,013	243,231	280,244	1,109	29,603	1,695	307	2,792	65	1,569	175	35	1,779	316,420
May-88	36,887	243,058	279,945	1,094	29,706	1,697	306	2,813	65	1,569	175	35	1,779	316,246
Jun-88	36,913	243,273	280,186	1,090	29,746	1,701	305	2,810	65	1,577	175	36	1,788	316,536
Jul-88	37,420	243,804	281,224	1,092	29,853	1,717	308	2,829	65	1,575	178	36	1,789	317,720
Aug-88	37,373	244,069	281,442	1,093	29,813	1,723	308	2,834	64	1,585	178	36	1,799	317,919
Sep-88	37,315	244,127	281,442	1,092	29,954	1,721	310	2,837	64	1,601	179	37	1,817	318,081
Oct-88	37,365	243,689	281,054	1,096	29,948	1,722	310	2,860	64	1,592	179	39	1,810	317,704
Nov-88	37,409	243,890	281,299	1,081	29,945	1,723	310	2,858	64	1,606	180	39	1,825	317,960
Dec-88	37,335	243,426	280,761	1,097	30,105	1,728	309	2,863	65	1,625	179	39	1,843	317,609

TABLE A4 (Continued.)
HISTORY OF NUMBER OF CUSTOMERS BY CLASS

	Residential			General Service		Lg Com	Lg Power	Street Light	Public Authority				Total	Total
									General Service		Lg Com	Lg Power		
	Sp Heat	Other	Total	Sp Heat	Total	Total	Total		Sp Heat	Total	Total	Total	Pub Auth	Ult Cons
Jan-89	37,375	243,667	281,042	1,104	30,253	1,733	312	2,871	64	1,631	179	39	1,849	318,060
Feb-89	37,697	244,807	282,504	1,097	30,193	1,737	313	2,868	65	1,641	180	39	1,860	319,475
Mar-89	37,697	244,419	282,116	1,103	30,136	1,736	313	2,878	64	1,646	182	38	1,866	319,045
Apr-89	37,834	244,859	282,693	1,104	30,251	1,736	312	2,889	64	1,646	181	38	1,865	319,746
May-89	37,990	244,830	282,820	1,100	30,312	1,740	313	2,887	64	1,644	183	37	1,864	319,936
Jun-89	38,189	245,668	283,857	1,104	30,392	1,747	314	2,908	65	1,636	184	37	1,857	321,075
Jul-89	38,298	246,007	284,305	1,106	30,334	1,747	316	2,914	62	1,631	184	35	1,850	321,466
Aug-89	38,098	245,131	283,229	1,097	30,338	1,759	314	2,925	63	1,648	184	35	1,867	320,432
Sep-89	38,127	245,367	283,494	1,107	30,397	1,762	315	2,931	61	1,647	184	35	1,866	320,765
Oct-89	38,125	245,321	283,446	1,094	30,435	1,764	317	2,935	60	1,652	184	35	1,871	320,768
Nov-89	38,349	245,616	283,965	1,093	30,491	1,772	320	2,923	60	1,668	184	35	1,887	321,358
Dec-89	38,200	244,956	283,156	1,105	30,523	1,770	319	2,913	60	1,668	184	35	1,887	320,568
Jan-90	38,393	245,675	284,068	1,107	30,604	1,767	324	2,929	60	1,671	184	35	1,890	321,582
Feb-90	38,585	246,826	285,411	1,106	30,617	1,761	325	2,934	62	1,686	183	35	1,904	322,952
Mar-90	38,390	246,297	284,687	1,109	30,714	1,758	326	2,954	61	1,669	183	36	1,888	322,327
Apr-90	38,739	246,873	285,612	1,105	30,806	1,755	329	2,963	62	1,675	183	36	1,894	323,359
May-90	38,625	246,548	285,173	1,098	30,740	1,756	329	2,967	62	1,674	183	36	1,893	322,858
Jun-90	38,809	246,806	285,615	1,108	30,815	1,755	330	2,976	62	1,678	183	36	1,897	323,388
Jul-90	39,224	247,815	287,039	1,106	30,899	1,760	332	2,989	63	1,706	183	36	1,925	324,944
Aug-90	38,963	247,336	286,299	1,106	30,885	1,764	332	2,988	61	1,673	183	35	1,891	324,159
Sep-90	39,003	247,711	286,714	1,103	30,937	1,765	333	2,987	62	1,687	184	35	1,906	324,642
Oct-90	38,938	247,217	286,155	1,107	30,855	1,769	332	2,976	64	1,691	184	35	1,910	323,997
Nov-90	38,992	247,775	286,767	1,104	30,957	1,773	333	3,000	64	1,700	185	37	1,922	324,752
Dec-90	38,979	247,594	286,573	1,108	30,920	1,780	333	2,994	63	1,707	185	37	1,929	324,529
Jan-91	38,869	247,318	286,187	1,108	30,916	1,787	330	3,002	63	1,710	185	38	1,933	324,155
Feb-91	39,224	248,706	287,930	1,113	30,941	1,790	333	3,070	67	1,714	186	38	1,938	326,002
Mar-91	39,472	248,877	288,349	1,116	30,946	1,794	335	3,096	67	1,725	186	38	1,949	326,469
Apr-91	39,432	248,565	287,997	1,110	31,025	1,796	332	3,102	65	1,736	186	39	1,961	326,213
May-91	39,543	248,730	288,273	1,104	31,116	1,797	330	3,135	65	1,748	186	40	1,974	326,625
Jun-91	40,023	249,991	290,014	1,101	31,173	1,801	329	3,119	66	1,756	186	41	1,983	328,419
Jul-91	39,826	249,771	289,597	1,103	31,206	1,804	330	3,152	64	1,750	186	41	1,977	328,066
Aug-91	39,796	249,651	289,447	1,098	31,208	1,811	332	3,156	64	1,752	187	41	1,980	327,934
Sep-91	39,955	250,185	290,140	1,107	31,219	1,809	335	3,157	67	1,761	188	41	1,990	328,650
Oct-91	39,511	249,365	288,876	1,110	31,362	1,806	333	3,154	65	1,756	188	41	1,985	327,516
Nov-91	39,752	250,241	289,993	1,102	31,427	1,802	334	3,165	68	1,758	187	41	1,986	328,707
Dec-91	39,451	249,396	288,847	1,126	31,374	1,812	335	3,168	66	1,756	187	41	1,984	327,520
Jan-92	39,454	249,947	289,401	1,110	31,442	1,817	335	3,220	68	1,755	187	41	1,983	328,198
Feb-92	39,612	251,151	290,763	1,107	31,434	1,824	338	3,229	68	1,762	193	41	1,996	329,584
Mar-92	39,422	250,927	290,349	1,096	31,443	1,818	338	3,264	68	1,769	192	41	2,002	329,214
Apr-92	39,715	251,927	291,642	1,104	31,561	1,820	343	3,233	68	1,776	193	42	2,011	330,610
May-92	39,778	251,941	291,719	1,094	31,644	1,845	345	3,245	68	1,768	206	59	2,033	330,831
Jun-92	39,967	252,759	292,726	1,093	31,604	1,848	344	3,232	68	1,742	207	62	2,011	331,765
Jul-92	39,787	252,329	292,116	1,092	31,727	1,848	344	3,237	69	1,747	207	62	2,016	331,288
Aug-92	40,186	253,640	293,826	1,085	31,662	1,827	341	3,247	69	1,746	207	63	2,016	332,919
Sep-92	39,663	253,027	292,690	1,100	31,754	1,833	335	3,239	72	1,750	210	62	2,022	331,873
Oct-92	39,538	252,954	292,492	1,073	31,746	1,840	343	3,254	72	1,746	210	65	2,021	331,696
Nov-92	39,997	254,238	294,235	1,081	31,820	1,869	341	3,264	69	1,751	213	65	2,029	333,558
Dec-92	39,743	253,310	293,053	1,080	31,785	1,873	338	3,262	68	1,744	214	64	2,022	332,333

TABLE A4 (Continued.)
HISTORY OF NUMBER OF CUSTOMERS BY CLASS

									Public Authority					
	Residential			General Service		Lg Com	Lg Power	Street Light	General Service		Lg Com	Lg Power	Total	Total
	Sp Heat	Other	Total	Sp Heat	Total	Total	Total		Sp Heat	Total	Total	Total	Pub Auth	Ult Cons
Jan-93	39,652	253,072	292,724	1,080	31,829	1,876	347	3,293	68	1,743	220	65	2,028	332,097
Feb-93	39,818	254,577	294,395	1,078	31,919	1,876	340	3,315	66	1,741	220	66	2,027	333,872
Mar-93	39,497	253,926	293,423	1,082	31,783	1,892	346	3,304	66	1,744	222	69	2,035	332,783
Apr-93	39,677	254,855	294,532	1,083	31,882	1,892	355	3,314	66	1,741	224	71	2,036	334,011
May-93	39,973	254,803	294,776	1,075	31,942	1,900	350	3,333	66	1,742	225	70	2,037	334,338
Jun-93	40,179	255,778	295,957	1,075	31,994	1,899	353	3,331	67	1,756	224	68	2,048	335,582
Jul-93	40,161	255,948	296,109	1,078	32,054	1,899	356	3,351	66	1,738	223	68	2,029	335,798
Aug-93	40,198	256,359	296,557	1,080	32,084	1,903	358	3,343	65	1,787	227	71	2,085	336,330
Sep-93	39,920	256,251	296,171	1,075	32,140	1,913	356	3,360	65	1,778	226	71	2,075	336,015
Oct-93	39,780	256,053	295,833	1,075	32,218	1,907	359	3,349	66	1,782	229	72	2,083	335,749
Nov-93	40,013	257,100	297,113	1,070	32,290	1,923	361	3,379	66	1,767	229	73	2,069	337,135
Dec-93	39,904	256,278	296,182	1,071	32,217	1,914	351	3,379	67	1,767	227	74	2,068	336,111
Jan-94	39,637	255,955	295,592	1,071	32,292	1,931	357	3,412	65	1,779	229	75	2,083	335,667
Feb-94	39,906	257,709	297,615	1,069	32,411	1,920	359	3,402	66	1,784	229	70	2,083	337,790
Mar-94	39,820	257,237	297,057	1,070	32,456	1,941	336	3,397	67	1,790	224	70	2,084	337,271
Apr-94	39,910	257,254	297,164	1,061	32,379	1,940	358	3,418	67	1,773	229	75	2,077	337,336
May-94	40,215	258,760	298,975	1,055	31,921	1,929	361	3,425	68	1,755	229	71	2,055	338,666
Jun-94	40,192	259,094	299,286	1,122	31,851	1,930	363	3,420	67	1,725	228	71	2,024	338,874
Jul-94	40,688	261,035	301,723	1,144	32,251	1,916	373	3,426	68	1,748	228	74	2,050	341,739
Aug-94	40,501	260,727	301,228	1,111	32,226	1,932	378	3,420	67	1,746	232	74	2,052	341,236
Sep-94	40,303	260,759	301,062	1,124	32,169	1,941	383	3,429	72	1,758	233	75	2,066	341,050
Oct-94	40,115	261,226	301,341	1,130	32,172	1,941	383	3,434	68	1,742	232	73	2,047	341,318
Nov-94	40,191	261,644	301,835	1,049	32,205	1,941	384	3,434	69	1,765	233	76	2,074	341,873
Dec-94	39,946	260,833	300,779	1,043	32,210	1,935	384	3,423	69	1,758	231	75	2,064	340,795
Jan-95	40,092	262,175	302,267	1,059	32,343	1,943	380	3,463	66	1,772	231	74	2,077	342,473
Feb-95	40,113	262,832	302,945	1,075	32,450	1,944	388	3,462	65	1,771	232	74	2,077	343,266
Mar-95	39,898	262,169	302,067	1,061	32,433	1,943	390	3,492	65	1,782	234	74	2,090	342,415
Apr-95	40,363	263,925	304,288	1,043	32,445	1,959	394	3,499	62	1,771	233	73	2,077	344,662
May-95	40,074	263,238	303,312	1,070	32,406	1,961	395	3,511	65	1,768	233	75	2,076	343,661
Jun-95	40,353	264,492	304,845	1,055	32,645	1,962	395	3,511	57	1,776	236	73	2,085	345,443
Jul-95	40,656	265,460	306,116	1,036	32,725	1,983	399	3,498	63	1,756	239	69	2,064	346,785
Aug-95	40,435	265,396	305,831	1,031	32,486	1,969	400	3,533	66	1,733	236	68	2,037	346,256
Sep-95	40,471	265,341	305,812	1,068	32,587	1,964	394	3,557	64	1,746	247	68	2,061	346,375
Oct-95	40,246	265,332	305,578	1,033	32,658	1,948	394	3,557	64	1,739	240	68	2,045	346,180
Nov-95	40,236	265,654	305,890	1,014	32,600	1,989	399	3,568	62	1,746	249	68	2,063	346,509
Dec-95	40,139	265,080	305,219	1,020	32,845	1,993	391	3,569	65	1,746	249	68	2,063	346,080
Jan-96	40,035	264,840	304,875	1,040	32,949	2,010	397	3,585	66	1,755	245	66	2,066	345,882
Feb-96	40,177	265,639	305,816	1,035	33,088	2,024	400	3,607	66	1,785	248	64	2,097	347,032
Mar-96	40,221	265,924	306,145	1,038	33,138	2,012	405	3,610	64	1,799	251	66	2,116	347,426
Apr-96	40,520	266,920	307,440	1,041	33,416	2,021	392	3,643	66	1,798	248	67	2,113	349,025
May-96	40,359	267,051	307,410	1,027	33,513	2,031	402	3,645	66	1,795	252	66	2,113	349,114
Jun-96	40,716	267,823	308,539	1,042	33,631	2,027	406	3,647	66	1,783	254	63	2,100	350,350
Jul-96	40,565	267,833	308,398	1,055	33,829	2,062	403	3,626	66	1,791	252	67	2,110	350,428
Aug-96	40,689	268,938	309,627	1,033	33,904	1,992	402	3,639	66	1,793	252	67	2,112	351,676
Sep-96	40,572	268,804	309,376	1,042	34,091	2,015	411	3,668	65	1,804	248	66	2,118	351,679
Oct-96	40,569	268,715	309,284	1,022	34,101	2,008	412	3,643	65	1,814	251	68	2,133	351,581
Nov-96	40,527	269,626	310,153	975	34,285	2,025	423	3,655	64	1,802	247	66	2,115	352,656
Dec-96	40,258	268,606	308,864	1,084	34,304	2,010	409	3,574	67	1,807	242	63	2,112	351,273

TABLE A4 (Continued.)
HISTORY OF NUMBER OF CUSTOMERS BY CLASS

									Public Authority					
	Residential			General Service		Lg Com	Lg Power	Street Light	General Service		Lg Com	Lg Power	Total	Total
	Sp Heat	Other	Total	Sp Heat	Total	Total	Total		Sp Heat	Total	Total	Total	Pub Auth	Ult Cons
Jan-97	40,250	269,219	309,469	1,042	34,561	1,992	417	3,578	64	1,817	251	68	2,136	352,153
Feb-97	40,681	270,202	310,883	1,025	34,755	2,035	418	3,561	62	1,827	255	66	2,148	353,800
Mar-97	40,862	270,653	311,515	1,047	34,686	2,042	419	3,553	61	1,821	250	61	2,132	354,347
Apr-97	40,504	270,438	310,942	1,024	34,705	2,050	422	3,579	65	1,820	256	64	2,140	353,838
May-97	40,644	271,041	311,685	1,018	34,655	2,041	422	3,576	62	1,830	250	66	2,146	354,525
Jun-97	40,671	270,671	311,342	1,027	34,692	2,042	418	3,564	62	1,823	250	65	2,138	354,196
Jul-97	40,989	272,288	313,277	1,030	34,681	2,048	417	3,563	64	1,810	243	64	2,117	356,103
Aug-97	40,684	271,901	312,585	1,026	34,754	2,064	421	3,564	59	1,817	245	67	2,129	355,517
Sep-97	40,832	272,233	313,065	1,007	34,742	2,061	424	3,553	60	1,812	251	66	2,129	355,974
Oct-97	40,623	271,539	312,162	1,033	34,672	2,054	420	3,549	57	1,806	253	67	2,126	354,983
Nov-97	40,603	272,765	313,368	968	34,731	2,054	423	3,548	60	1,809	246	68	2,123	356,247
Dec-97	40,388	272,747	313,135	1,056	34,752	2,052	420	3,555	59	1,816	245	66	2,127	356,041
Jan-98	40,614	273,378	313,992	1,015	35,102	2,082	426	3,562	58	1,833	252	67	2,152	357,316
Feb-98	40,478	273,335	313,813	1,027	35,044	2,037	425	3,561	57	1,849	254	60	2,163	357,043
Mar-98	40,668	273,541	314,209	1,013	35,143	2,090	425	3,576	57	1,841	257	65	2,163	357,606
Apr-98	40,668	274,193	314,861	1,002	35,186	2,080	426	3,579	58	1,855	261	66	2,182	358,314
May-98	40,933	275,360	316,293	1,010	35,232	2,113	427	3,560	55	1,844	260	65	2,169	359,794
Jun-98	40,900	275,615	316,515	1,013	35,307	2,079	425	3,571	56	1,851	246	61	2,158	360,055
Jul-98	40,879	275,597	316,476	974	35,286	2,030	416	3,563	47	1,839	241	62	2,142	359,913
Aug-98	40,924	275,346	316,270	998	35,223	1,923	417	3,548	60	1,802	233	61	2,096	359,477
Sep-98	40,733	275,634	316,367	1,039	35,224	2,039	425	3,563	59	1,831	243	59	2,133	359,751
Oct-98	40,591	275,823	316,414	1,008	35,195	2,080	425	3,559	56	1,818	255	59	2,132	359,805
Nov-98	40,876	278,026	318,902	955	35,328	2,073	427	3,563	56	1,826	260	57	2,143	362,436
Dec-98	40,412	276,112	316,524	1,041	35,284	2,105	422	3,537	55	1,807	246	55	2,108	359,980

TABLE A5
BREAKDOWNS OF ANNUAL KWH SALES BY BASE AND WEATHER-SENSITIVE LOAD
(1981 - 1998)

	Residential					General Service					Large Commercial			
Year	All-Elec. SH	Comb. SH	Air-Cond.	Base	Total	SH-Rate SH	Reg. SH	Air Cond.	Base	Total	SH	Air Cond.	Base	Total
1981	162,351,546	87,750,654	518,011,616	1,608,774,732	2,376,888,548	43,141,188	40,696,872	109,267,680	650,865,804	843,971,544	59,493,215	161,479,098	1,286,482,356	1,507,454,669
1982	181,473,454	65,007,384	425,523,859	1,693,995,660	2,366,000,357	45,892,779	28,527,415	93,510,888	684,449,040	852,380,122	57,834,246	161,510,366	1,341,971,112	1,561,315,724
1983	151,754,038	84,715,201	658,912,099	1,673,650,656	2,569,031,994	38,285,825	32,778,763	133,823,892	678,117,492	883,005,972	31,574,680	181,501,657	1,418,568,948	1,631,645,285
1984	212,151,683	77,697,050	462,538,178	1,752,494,472	2,504,881,383	46,602,919	34,263,201	105,840,554	736,771,932	923,478,606	65,680,046	161,560,360	1,466,158,584	1,693,398,990
1985	191,967,626	63,085,102	467,851,597	1,802,182,968	2,525,087,293	41,995,945	24,685,356	106,887,163	775,652,676	949,221,140	55,300,449	186,580,956	1,542,297,168	1,784,178,573
1986	170,068,638	65,989,056	595,353,729	1,879,876,224	2,711,287,647	39,904,421	19,914,623	123,877,972	817,497,372	1,001,194,388	41,745,022	191,380,612	1,630,087,248	1,863,212,882
1987	158,836,596	71,117,696	700,558,657	1,921,062,288	2,851,575,237	37,415,238	23,032,453	147,615,721	820,362,696	1,028,426,108	34,365,348	229,371,156	1,678,455,732	1,942,192,236
1988	208,361,246	67,127,533	660,673,129	1,999,233,348	2,935,395,256	40,019,233	27,127,482	134,704,147	869,552,652	1,071,403,514	43,643,816	199,606,476	1,791,207,444	2,034,457,736
1989	204,277,546	72,270,671	567,622,919	2,038,005,108	2,882,176,244	37,781,247	24,806,416	120,785,097	900,965,340	1,084,338,100	44,862,128	199,723,340	1,860,179,160	2,104,764,628
1990	181,838,583	64,793,392	593,978,813	2,065,668,600	2,906,279,388	33,958,299	19,394,060	126,665,731	927,972,960	1,107,991,050	32,325,771	200,065,981	1,920,995,076	2,153,386,828
1991	189,328,658	99,003,360	838,182,656	2,108,964,768	3,235,479,442	34,684,930	29,094,035	163,812,829	942,829,524	1,170,421,318	39,749,936	246,256,549	1,995,868,020	2,281,874,505
1992	201,328,546	66,832,147	486,912,188	2,158,508,496	2,913,581,377	33,870,258	24,914,203	111,832,319	948,331,296	1,118,948,076	38,234,535	197,995,980	1,994,377,008	2,230,607,523
1993	233,068,241	95,484,105	736,142,878	2,165,043,360	3,229,738,584	34,229,227	19,394,887	143,294,226	966,907,836	1,163,826,176	40,373,864	228,107,420	2,073,165,996	2,341,647,280
1994	242,073,598	109,109,701	680,323,858	2,187,752,112	3,219,259,269	35,435,308	22,370,300	142,397,177	983,172,084	1,183,374,869	34,088,693	219,821,244	2,131,865,640	2,385,775,577
1995	222,233,920	113,840,698	837,986,812	2,207,917,344	3,381,978,774	32,675,771	32,491,428	167,543,911	979,864,908	1,212,576,018	39,866,858	259,982,268	2,164,177,692	2,464,026,818
1996	271,518,607	103,525,415	664,311,722	2,358,533,568	3,397,889,312	37,520,506	50,941,365	162,022,734	993,989,892	1,244,474,497	50,829,795	214,290,856	2,271,489,660	2,536,610,311
1997	201,584,028	164,280,512	662,175,494	2,278,164,264	3,306,204,298	31,771,168	47,639,573	146,799,845	996,250,572	1,222,461,158	73,892,401	238,793,118	2,248,335,252	2,561,020,771
1998	132,365,196	90,603,957	911,356,073	2,445,891,888	3,580,217,114	25,886,621	30,220,695	197,828,647	1,033,378,884	1,287,314,847	37,789,869	310,384,890	2,363,284,404	2,711,459,163

TABLE A6
ANNUAL PER CUSTOMER KWH SALES BY BASE AND WEATHER-SENSITIVE LOAD
(1981 - 1998)

	Residential					General Service					Large Commercial			
Year	All-Elec. SH	Comb. SH	Air-Cond.	Base	Total	SH-Rate SH	Reg. SH	Air Cond.	Base	Total	SH	Air Cond.	Base	Total
1981	6,573	366	1,957	6,079	8,981	36,894	1,509	3,884	23,135	29,999	38,167	103,595	825,329	967,092
1982	7,030	272	1,605	6,391	8,926	39,124	1,045	3,283	24,033	29,930	36,560	102,098	848,320	986,977
1983	5,628	355	2,478	6,294	9,662	33,472	1,185	4,646	23,545	30,659	19,365	111,317	870,021	1,000,702
1984	7,400	325	1,730	6,554	9,368	40,299	1,221	3,623	25,218	31,609	39,216	96,464	875,406	1,011,085
1985	6,211	264	1,733	6,674	9,351	36,203	867	3,608	26,181	32,039	32,081	108,241	894,734	1,035,056
1986	5,024	275	2,173	6,862	9,897	34,063	686	4,102	27,073	33,156	23,775	108,997	928,384	1,061,156
1987	4,448	294	2,526	6,927	10,282	31,897	777	4,791	26,624	33,376	18,812	125,562	918,821	1,063,195
1988	5,619	276	2,356	7,129	10,467	34,457	898	4,293	27,710	34,143	23,149	105,873	950,075	1,079,097
1989	5,376	295	2,005	7,200	10,182	32,463	805	3,776	28,169	33,902	23,209	103,323	962,328	1,088,859
1990	4,686	262	2,078	7,227	10,167	29,080	619	3,898	28,556	34,095	16,601	102,747	986,559	1,105,908
1991	4,785	397	2,902	7,302	11,203	29,551	917	4,979	28,655	35,572	20,002	123,918	1,004,337	1,148,257
1992	5,066	265	1,667	7,390	9,975	29,152	773	3,349	28,402	33,512	18,726	96,974	976,798	1,092,498
1993	5,842	374	2,493	7,331	10,937	29,947	594	4,241	28,618	34,446	19,007	107,387	975,990	1,102,384
1994	6,034	421	2,272	7,305	10,750	30,675	682	4,192	28,941	34,834	15,761	101,636	985,682	1,103,079
1995	5,520	431	2,752	7,251	11,106	29,418	979	4,883	28,559	35,341	18,110	118,098	983,084	1,119,291
1996	6,715	387	2,157	7,658	11,032	34,055	1,482	4,566	28,015	35,074	22,403	94,446	1,001,134	1,117,983
1997	4,960	606	2,123	7,303	10,598	29,242	1,345	4,020	27,282	33,477	32,209	104,087	980,023	1,116,319
1998	3,250	329	2,885	7,743	11,334	24,328	840	5,340	27,895	34,749	16,348	134,274	1,022,366	1,172,988

TABLE A7
POPULATION BY COUNTY AND NUMBER OF ELECTRIC RESIDENTIAL CUSTOMERS

	Bullitt	Jefferson	Meade	Oldham	LG&E Area Population	G.R.(%)	Electric Customers	G.R.(%)	Pop/RsCust
1970	26,500	696,200	18,600	14,700	721,132		217,486		3.3158
1971	28,300	705,600	18,100	14,800	731,162	1.39%	223,617	2.82%	3.2697
1972	30,200	703,300	18,000	14,900	729,595	-0.21%	232,375	3.92%	3.1397
1973	31,100	709,600	18,100	16,000	737,162	1.04%	242,351	4.29%	3.0417
1974	33,200	711,600	18,700	16,700	740,594	0.47%	248,446	2.51%	2.9809
1975	34,600	708,200	19,000	18,200	739,010	-0.21%	251,707	1.31%	2.9360
1976	36,700	704,900	19,900	19,900	738,043	-0.13%	253,709	0.80%	2.9090
1977	39,000	698,300	21,000	22,100	734,305	-0.51%	255,731	0.80%	2.8714
1978	41,200	695,600	21,600	24,100	734,177	-0.02%	258,043	0.90%	2.8452
1979	42,700	692,100	22,000	26,300	733,140	-0.14%	261,305	1.26%	2.8057
1980	43,500	684,300	22,900	27,900	727,133	-0.82%	263,044	0.67%	2.7643
1981	44,000	681,500	22,900	28,100	724,678	-0.34%	264,665	0.62%	2.7381
1982	43,900	683,000	22,300	28,700	726,551	0.26%	265,071	0.15%	2.7410
1983	43,800	681,300	22,500	29,100	725,190	-0.19%	265,904	0.31%	2.7273
1984	44,200	678,600	22,800	29,600	723,106	-0.29%	267,386	0.56%	2.7044
1985	45,000	675,000	22,600	29,500	719,667	-0.48%	270,022	0.99%	2.6652
1986	45,300	674,100	23,300	30,100	718,815	-0.12%	273,937	1.45%	2.6240
1987	45,800	672,700	23,300	31,000	718,350	-0.06%	277,339	1.24%	2.5902
1988	46,600	667,600	23,600	31,500	713,995	-0.61%	280,433	1.12%	2.5460
1989	47,100	665,000	23,900	32,500	712,463	-0.21%	283,052	0.93%	2.5171
1990	47,914	665,331	24,313	33,569	714,045	0.22%	285,843	0.99%	2.4980
1991	49,214	666,706	23,773	35,106	716,845	0.39%	288,804	1.04%	2.4821
1992	50,930	669,133	24,135	36,361	720,976	0.58%	292,084	1.14%	2.4684
1993	53,013	670,011	25,367	38,123	724,245	0.45%	295,314	1.11%	2.4525
1994	54,730	670,590	25,994	39,826	726,695	0.34%	299,471	1.41%	2.4266
1995	55,968	671,336	26,969	41,010	729,004	0.32%	304,514	1.68%	2.3940
1996	57,154	670,711	27,485	42,114	730,719	0.24%	307,994	1.14%	2.3725
1997	57,874	671,735	28,217	43,237	733,061	0.32%	311,952	1.29%	2.3499
1998	58,988	674,102	28,702	44,326	736,970	0.53%	315,886	1.26%	2.3330

Notes: 1) The annual population figures are as of July of each year, while numbers of residential customers are annual average figures.

2) The estimates of county population in 1991-1998 are based on the population estimates released by the Kentucky State Data Center in January, 1999.

3) Proportions of the county population served by LG&E were:

	1970-85	1986-90	1991-93	1994-95	1996-97	1998
Bullitt	35.0%	34.0%	34.0%	34.5%	35.0%	35.5%
Jefferson	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Meade	17.0%	16.0%	15.0%	14.5%	15.0%	14.5%
Oldham	85.0%	85.0%	85.0%	84.0%	85.2%	85.2%

4) Pop/RsCust = Number of Persons per Residential Customer Count

TABLE A8
LG&E ELECTRIC SERVICE AREA POPULATION AND GENERAL SERVICE CUSTOMERS, 1970 - 1998

Year	GS Comm. Customers	G.R.	Increase in GS Comm.	Pop/Cust	GS P.A. Customers	G.R.	Increase in GS P.A.	Pop/Cust	Total GS Customers	G.R.	Increase in Total GS	LGE Area Population
1970	22,007			32.77	1,158			622.74	23,165			721,132
1971	22,498	2.23%	491	32.50	1,164	0.52%	6	628.15	23,662	2.15%	497	731,162
1972	23,048	2.44%	550	31.66	1,182	1.55%	18	617.25	24,230	2.40%	568	729,595
1973	23,828	3.38%	780	30.94	1,205	1.95%	23	611.75	25,033	3.31%	803	737,162
1974	24,369	2.27%	541	30.39	1,276	5.89%	71	580.40	25,645	2.44%	612	740,594
1975	24,740	1.52%	371	29.87	1,319	3.37%	43	560.28	26,059	1.61%	414	739,010
1976	25,048	1.24%	308	29.47	1,350	2.35%	31	546.70	26,398	1.30%	339	738,043
1977	25,302	1.01%	254	29.02	1,387	2.74%	37	529.42	26,689	1.10%	291	734,305
1978	25,769	1.85%	467	28.49	1,431	3.17%	44	513.05	27,200	1.91%	511	734,177
1979	26,073	1.18%	304	28.12	1,437	0.42%	6	510.19	27,510	1.14%	310	733,140
1980	26,233	0.61%	160	27.72	1,445	0.56%	8	503.21	27,678	0.61%	168	727,133
1981	26,663	1.64%	430	27.18	1,470	1.73%	25	492.98	28,133	1.64%	455	724,678
1982	27,012	1.31%	349	26.90	1,467	-0.20%	-3	495.26	28,479	1.23%	346	726,551
1983	27,344	1.23%	332	26.52	1,457	-0.68%	-10	497.73	28,801	1.13%	322	725,190
1984	27,767	1.55%	423	26.04	1,449	-0.55%	-8	499.04	29,216	1.44%	415	723,106
1985	28,165	1.43%	398	25.55	1,462	0.90%	13	492.25	29,627	1.41%	411	719,667
1986	28,730	2.01%	565	25.02	1,467	0.34%	5	489.99	30,197	1.92%	570	718,815
1987	29,278	1.91%	548	24.54	1,536	4.70%	69	467.68	30,814	2.04%	617	718,350
1988	29,796	1.77%	518	23.96	1,584	3.13%	48	450.75	31,380	1.84%	566	713,995
1989	30,338	1.82%	542	23.48	1,647	3.98%	63	432.58	31,985	1.93%	605	712,463
1990	30,812	1.56%	474	23.17	1,685	2.31%	38	423.77	32,497	1.60%	512	714,045
1991	31,159	1.13%	347	23.01	1,744	3.50%	59	411.03	32,903	1.25%	406	716,845
1992	31,635	1.53%	476	22.79	1,755	0.63%	11	410.81	33,390	1.48%	487	720,976
1993	32,029	1.25%	394	22.61	1,757	0.11%	2	412.21	33,786	1.19%	396	724,245
1994	32,212	0.57%	183	22.56	1,760	0.17%	3	412.89	33,972	0.55%	186	726,695
1995	32,552	1.06%	340	22.40	1,759	-0.06%	-1	414.44	34,311	1.00%	339	729,004
1996	33,687	3.49%	1,135	21.69	1,794	1.99%	35	407.31	35,481	3.41%	1,170	730,719
1997	34,699	3.00%	1,012	21.13	1,817	1.30%	23	403.37	36,516	2.92%	1,035	733,061
1998	35,213	1.48%	514	20.93	1,833	0.86%	16	402.06	37,046	1.45%	530	736,970

Note: The numbers of customers shown above are annual average figures while the service area population figures are for July of each years.

TABLE A9
HISTORY OF ELCTRICITY PRICE BY CLASS

	Nominal Price					Real Price					
Year	Residential	Small Commercial	Large Commercial	Lg. Power	Total	Residential	Small Commercial	Large Commercial	Lg. Power	Total	CPI '82-'84=100
1981	$47.60	$54.03	$40.10	$31.99	$41.00	$52.37	$59.44	$44.11	$35.20	$45.10	90.9
1982	$52.93	$60.22	$45.04	$37.22	$46.65	$54.85	$62.40	$46.67	$38.57	$48.34	96.5
1983	$58.98	$64.67	$49.44	$40.02	$51.18	$59.22	$64.93	$49.64	$40.18	$51.38	99.6
1984	$62.55	$67.59	$52.71	$42.58	$54.05	$60.21	$65.05	$50.73	$40.99	$52.02	103.9
1985	$64.70	$69.45	$54.13	$43.72	$55.76	$60.13	$64.54	$50.31	$40.63	$51.82	107.6
1986	$64.09	$69.05	$53.44	$43.20	$55.46	$58.48	$63.01	$48.76	$39.42	$50.60	109.6
1987	$62.50	$67.51	$51.34	$41.24	$53.78	$55.02	$59.43	$45.19	$36.30	$47.34	113.6
1988	$61.89	$67.06	$50.72	$40.28	$53.06	$52.31	$56.68	$42.88	$34.05	$44.85	118.3
1989	$61.23	$66.66	$50.14	$39.68	$52.35	$49.38	$53.75	$40.43	$32.00	$42.22	124.0
1990	$60.74	$66.02	$49.55	$39.41	$51.88	$46.47	$50.51	$37.91	$30.15	$39.69	130.7
1991	$60.10	$65.44	$48.40	$39.12	$51.68	$44.13	$48.05	$35.54	$28.72	$37.94	136.2
1992	$59.63	$65.18	$48.46	$38.17	$50.81	$42.50	$46.46	$34.54	$27.20	$36.21	140.3
1993	$60.43	$66.12	$48.94	$38.26	$51.54	$41.82	$45.76	$33.87	$26.48	$35.67	144.5
1994	$60.15	$65.95	$48.48	$37.74	$50.96	$40.59	$44.50	$32.71	$25.46	$34.39	148.2
1995	$60.10	$65.51	$47.75	$36.83	$50.40	$39.41	$42.96	$31.31	$24.15	$33.05	152.5
1996	$58.18	$64.96	$47.08	$36.27	$49.38	$37.08	$41.40	$30.01	$23.12	$31.47	156.9
1997	$59.00	$65.06	$46.92	$36.21	$49.49	$36.76	$40.54	$29.23	$22.56	$30.83	160.5
1998	$61.18	$65.34	$46.77	$36.53	$50.53	$37.51	$40.06	$28.67	$22.40	$30.98	163.1

	Nominal Price, Summer Months (June-September)			Real Price, Summer Months (June-September)		
1981	$49.13	$58.41	$43.37	$54.05	$64.26	$47.72
1982	$57.78	$66.05	$48.29	$59.88	$68.45	$50.05
1983	$64.96	$71.38	$54.35	$65.22	$71.67	$54.57
1984	$70.08	$75.19	$58.09	$67.45	$72.37	$55.91
1985	$69.51	$74.59	$57.29	$64.61	$69.33	$53.24
1986	$69.19	$74.28	$56.86	$63.13	$67.77	$51.88
1987	$66.78	$72.26	$54.04	$58.79	$63.60	$47.57
1988	$67.02	$72.49	$54.29	$56.65	$61.28	$45.89
1989	$65.85	$71.31	$52.90	$53.11	$57.51	$42.66
1990	$65.99	$71.38	$53.32	$50.49	$54.61	$40.79
1991	$64.72	$70.28	$51.16	$47.52	$51.60	$37.56
1992	$65.31	$70.63	$52.41	$46.55	$50.34	$37.35
1993	$65.37	$70.97	$52.38	$45.24	$49.12	$36.25
1994	$65.72	$71.20	$52.03	$44.34	$48.04	$35.10
1995	$65.50	$70.77	$51.16	$42.95	$46.41	$33.55
1996	$63.64	$70.21	$50.95	$40.56	$44.75	$32.47
1997	$64.97	$70.25	$50.78	$40.48	$43.77	$31.64
1998	$66.76	$70.22	$50.19	$40.93	$43.05	$30.77

	Nominal Price, Winter Months (October-May)			Real Price, Winter Months (October-May)		
1981	$46.44	$51.43	$38.07	$51.09	$56.58	$41.88
1982	$49.63	$56.90	$43.10	$51.43	$58.96	$44.67
1983	$53.88	$60.35	$46.30	$54.09	$60.59	$46.49
1984	$57.27	$63.08	$49.45	$55.12	$60.71	$47.60
1985	$61.31	$66.42	$52.22	$56.98	$61.73	$48.53
1986	$60.36	$65.92	$51.38	$55.07	$60.15	$46.88
1987	$58.99	$64.47	$49.62	$51.92	$56.75	$43.68
1988	$57.76	$63.61	$48.48	$48.83	$53.77	$40.98
1989	$57.80	$63.78	$48.42	$46.62	$51.44	$39.05
1990	$56.77	$62.70	$47.24	$43.44	$47.97	$36.14
1991	$56.19	$62.28	$46.64	$41.25	$45.72	$34.25
1992	$55.74	$61.92	$46.09	$39.73	$44.13	$32.85
1993	$56.46	$62.98	$46.78	$39.07	$43.59	$32.37
1994	$55.95	$62.61	$46.26	$37.76	$42.25	$31.22
1995	$55.55	$62.05	$45.56	$36.43	$40.69	$29.88
1996	$54.22	$61.72	$44.75	$34.56	$39.34	$28.52
1997	$54.72	$61.92	$44.58	$34.09	$38.58	$27.78
1998	$56.56	$62.12	$44.61	$34.68	$38.09	$27.35

TABLE A10
HISTORY OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1981-1998

Year	Population	G.R.	Res. Cust.	G.R.	Res. SH Cust.	G.R.	Res. NSH Cust.	GS Cust.	G.R.	GS SH Cust.	GS SH/ GS Total Cust.
1981	724,678		264,665		24,701		239,964	28,133		1,169	4.16%
1982	726,551	0.26%	265,071	0.15%	25,813	4.50%	239,258	28,479	1.23%	1,173	4.12%
1983	725,190	-0.19%	265,904	0.31%	26,963	4.45%	238,941	28,801	1.13%	1,144	3.97%
1984	723,106	-0.29%	267,386	0.56%	28,669	6.33%	238,717	29,216	1.44%	1,156	3.96%
1985	719,667	-0.48%	270,022	0.99%	30,908	7.81%	239,114	29,627	1.41%	1,160	3.92%
1986	718,815	-0.12%	273,937	1.45%	33,849	9.52%	240,088	30,196	1.92%	1,172	3.88%
1987	718,350	-0.06%	277,339	1.24%	35,712	5.50%	241,627	30,813	2.04%	1,173	3.81%
1988	713,995	-0.61%	280,433	1.12%	37,084	3.84%	243,349	31,380	1.84%	1,161	3.70%
1989	712,463	-0.21%	283,052	0.93%	37,998	2.47%	245,054	31,984	1.93%	1,164	3.64%
1990	714,045	0.22%	285,843	0.99%	38,803	2.12%	247,040	32,497	1.60%	1,168	3.59%
1991	716,845	0.39%	288,804	1.04%	39,571	1.98%	249,233	32,903	1.25%	1,174	3.57%
1992	720,976	0.58%	292,084	1.14%	39,739	0.42%	252,346	33,390	1.48%	1,162	3.48%
1993	724,245	0.45%	295,314	1.11%	39,898	0.40%	255,416	33,787	1.19%	1,143	3.38%
1994	726,695	0.34%	299,471	1.41%	40,119	0.55%	259,352	33,972	0.55%	1,155	3.40%
1995	729,004	0.32%	304,514	1.68%	40,256	0.34%	264,258	34,311	1.00%	1,111	3.24%
1996	730,719	0.24%	307,994	1.14%	40,434	0.44%	267,560	35,481	3.41%	1,102	3.11%
1997	733,061	0.32%	311,952	1.29%	40,644	0.52%	271,308	36,516	2.92%	1,087	2.98%
1998	736,970	0.53%	315,886	1.26%	40,723	0.19%	275,163	37,046	1.45%	1,064	2.87%

TABLE A10 (Continued.)
HISTORY OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1981-1998

Year	Real Per Capita ncome (92$	G.R.	Res $/KWH	Res Winter $/KWH	Res Summer $/KWH	GS $/KWH	GS Winter $/KWH	GS Summer $/KWH	LC $/KWH	LP $/KWH	Non-Res. Real $/KWH G.R.
1981	16,731		52.37	51.09	54.05	59.44	56.58	64.26	44.11	35.20	
1982	16,580	-0.90%	54.85	51.43	59.88	62.40	58.96	68.45	46.67	38.57	7.19%
1983	16,781	1.21%	59.22	54.09	65.22	64.93	60.59	71.67	49.64	40.18	6.29%
1984	17,694	5.44%	60.21	55.12	67.45	65.05	60.71	72.37	50.73	40.99	1.24%
1985	17,990	1.67%	60.13	56.98	64.61	64.54	61.73	69.33	50.31	40.63	-0.39%
1986	18,458	2.60%	58.48	55.07	63.13	63.01	60.15	67.77	48.76	39.42	-2.35%
1987	18,971	2.78%	55.02	51.92	58.79	59.43	56.75	63.60	45.19	36.30	-6.45%
1988	19,519	2.89%	52.31	48.83	56.65	56.68	53.77	61.28	42.88	34.05	-5.26%
1989	19,944	2.18%	49.38	46.62	53.11	53.75	51.44	57.51	40.43	32.00	-5.87%
1990	20,084	0.70%	46.47	43.44	50.49	50.51	47.97	54.61	37.91	30.15	-5.97%
1991	20,021	-0.31%	44.13	41.25	47.52	48.05	45.72	51.60	35.54	28.72	-4.41%
1992	20,654	3.16%	42.50	39.73	46.55	46.46	44.13	50.34	34.54	27.20	-4.56%
1993	20,972	1.54%	41.82	39.07	45.24	45.76	43.59	49.12	33.87	26.48	-1.50%
1994	21,320	1.66%	40.59	37.76	44.34	44.50	42.25	48.04	32.71	25.46	-3.60%
1995	22,002	3.20%	39.41	36.43	42.95	42.96	40.69	46.41	31.31	24.15	-3.89%
1996	22,564	2.55%	37.08	34.56	40.56	41.40	39.34	44.75	30.01	23.12	-4.78%
1997	22,596	0.14%	36.76	34.09	40.48	40.54	38.58	43.77	29.23	22.56	-2.03%
1998	23,529	4.13%	37.51	34.68	40.93	40.06	38.09	43.05	28.67	22.40	0.47%

TABLE A10 (Continued.)
HISTORY OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1981-1998

Year	Mfg. Emp.	G.R.	Non-Mfg. Emp.	G.R.	Total Emp.	G.R.	Trade & Serv. Emp	G.R.	Serv Emp/ GS Cust.	G.R.	HDD	CDD	A/C Sat.
1981	103,469		380,455		483,924		344,418		12.24		4,383	1,423	0.6296
1982	91,003	-12.05%	376,708	-0.98%	467,711	-3.35%	342,344	-0.60%	12.02	-1.81%	4,532	1,213	0.6635
1983	85,910	-5.60%	382,051	1.42%	467,961	0.05%	346,712	1.28%	12.04	0.14%	4,387	1,606	0.6952
1984	90,433	5.26%	393,629	3.03%	484,062	3.44%	357,124	3.00%	12.22	1.54%	4,799	1,359	0.7245
1985	88,119	-2.56%	405,199	2.94%	493,318	1.91%	368,139	3.08%	12.43	1.65%	4,148	1,349	0.7515
1986	87,524	-0.68%	418,226	3.21%	505,750	2.52%	379,058	2.97%	12.55	1.02%	4,232	1,598	0.7763
1987	87,313	-0.24%	430,052	2.83%	517,365	2.30%	389,748	2.82%	12.65	0.76%	4,148	1,650	0.7990
1988	88,930	1.85%	448,999	4.41%	537,929	3.97%	408,455	4.80%	13.02	2.91%	4,500	1,596	0.8196
1989	89,270	0.38%	459,966	2.44%	549,236	2.10%	418,993	2.58%	13.10	0.64%	4,366	1,401	0.8383
1990	89,100	-0.19%	472,023	2.62%	561,123	2.16%	430,189	2.67%	13.24	1.05%	3,731	1,566	0.8553
1991	87,514	-1.78%	473,946	0.41%	561,460	0.06%	434,033	0.89%	13.19	-0.35%	3,881	2,020	0.8706
1992	87,838	0.37%	483,634	2.04%	571,472	1.78%	442,427	1.93%	13.25	0.45%	3,914	1,246	0.8844
1993	89,234	1.59%	496,890	2.74%	586,124	2.56%	453,570	2.52%	13.42	1.31%	4,336	1,557	0.8968
1994	92,405	3.55%	511,508	2.94%	603,913	3.04%	466,246	2.79%	13.72	2.23%	4,280	1,445	0.9080
1995	92,229	-0.19%	527,170	3.06%	619,399	2.56%	481,189	3.20%	14.02	2.19%	4,171	1,629	0.9180
1996	90,437	-1.94%	536,291	1.73%	626,728	1.18%	489,352	1.70%	13.79	-1.66%	4,757	1,378	0.9270
1997	89,959	-0.53%	547,030	2.00%	636,989	1.64%	497,490	1.66%	13.62	-1.22%	4,322	1,293	0.9350
1998	90,810	0.95%	564,882	3.26%	655,691	2.94%	514,931	3.51%	13.90	2.03%	3,381	1,816	0.9422

Section B

INPUT ASSUMPTIONS MADE FOR THE 1999 IRP MODEL FORECASTS

TABLE B1
PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013
(Base-Growth Scenario)

Year	Population	G.R.	Res. Cust.	G.R.	Res. SH Cust.	G.R.	Res. NSH Cust.	GS Cust.	G.R.	GS SH Cust.	GS SH/ GS Total Cust.
1999	741,318	0.59%	319,820	1.25%	40,865	0.35%	278,955	37,575	1.43%	1,045	2.78%
2000	744,936	0.49%	323,383	1.11%	40,992	0.31%	282,391	38,094	1.38%	1,025	2.69%
2001	748,349	0.46%	326,800	1.06%	41,113	0.29%	285,688	38,604	1.34%	1,005	2.60%
2002	752,017	0.49%	330,274	1.06%	41,235	0.30%	289,039	39,129	1.36%	986	2.52%
2003	755,927	0.52%	333,800	1.07%	41,357	0.30%	292,442	39,669	1.38%	967	2.44%
2004	759,954	0.53%	337,326	1.06%	41,479	0.29%	295,847	40,216	1.38%	949	2.36%
2005	764,137	0.55%	340,872	1.05%	41,601	0.29%	299,271	40,773	1.39%	931	2.28%
2006	768,427	0.56%	344,418	1.04%	41,722	0.29%	302,696	41,338	1.38%	914	2.21%
2007	772,510	0.53%	347,823	0.99%	41,837	0.28%	305,986	41,892	1.34%	896	2.14%
2008	776,704	0.54%	351,233	0.98%	41,951	0.27%	309,281	42,454	1.34%	879	2.07%
2009	780,901	0.54%	354,599	0.96%	42,064	0.27%	312,535	43,017	1.33%	862	2.00%
2010	785,110	0.54%	357,926	0.94%	42,174	0.26%	315,752	43,582	1.31%	845	1.94%
2011	789,243	0.53%	361,175	0.91%	42,281	0.25%	318,894	44,142	1.29%	829	1.88%
2012	793,322	0.52%	364,358	0.88%	42,385	0.25%	321,973	44,700	1.26%	812	1.82%
2013	797,321	0.50%	367,463	0.85%	42,486	0.24%	324,978	45,254	1.24%	796	1.76%

TABLE B1 (Continued.)
PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013
(Base-Growth Scenario)

Year	Real Per Capita Income (92$)	G.R.	Res $/KWH	Res Winter $/KWH	Res Summer $/KWH	Residential Real $/KWH G.R.	GS $/KWH	GS Winter $/KWH	GS Summer $/KWH	LC $/KWH	LP $/KWH	Non-Res. Real $/KWH G.R.
1999	24,212	2.90%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	24,755	2.24%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	25,358	2.44%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	25,883	2.07%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	26,379	1.92%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	26,889	1.93%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	27,361	1.75%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	27,878	1.89%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	28,387	1.82%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	28,899	1.81%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	29,419	1.80%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	29,941	1.78%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	30,470	1.77%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	31,008	1.77%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	31,593	1.89%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

TABLE B1 (Continued.)
PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013
(Base-Growth Scenario)

Year	Mfg. Emp.	G.R.	Non-Mfg. Emp.	G.R.	Total Emp.	G.R.	Trade & Serv. Emp	G.R.	Serv Emp/ GS Cust.	G.R.	HDD	CDD	A/C Sat.
1999	90,252	-0.61%	577,076	2.16%	667,328	1.77%	525,663	2.08%	13.99	0.65%	4,290	1,506	0.9486
2000	89,989	-0.29%	579,506	0.42%	669,495	0.32%	527,868	0.42%	13.86	-0.95%	4,290	1,506	0.9543
2001	90,600	0.68%	584,849	0.92%	675,449	0.89%	532,568	0.89%	13.80	-0.44%	4,290	1,506	0.9594
2002	91,303	0.78%	591,331	1.11%	682,633	1.06%	538,318	1.08%	13.76	-0.28%	4,290	1,506	0.9639
2003	91,888	0.64%	596,741	0.91%	688,629	0.88%	543,198	0.91%	13.69	-0.47%	4,290	1,506	0.9679
2004	92,625	0.80%	601,858	0.86%	694,483	0.85%	547,685	0.83%	13.62	-0.55%	4,290	1,506	0.9715
2005	92,796	0.18%	608,056	1.03%	700,851	0.92%	553,310	1.03%	13.57	-0.35%	4,290	1,506	0.9747
2006	92,747	-0.05%	614,692	1.09%	707,439	0.94%	559,333	1.09%	13.53	-0.29%	4,290	1,506	0.9776
2007	92,538	-0.22%	621,722	1.14%	714,260	0.96%	565,749	1.15%	13.50	-0.19%	4,290	1,506	0.9801
2008	92,175	-0.39%	629,164	1.20%	721,339	0.99%	572,566	1.20%	13.49	-0.13%	4,290	1,506	0.9823
2009	91,761	-0.45%	637,173	1.27%	728,934	1.05%	579,954	1.29%	13.48	-0.04%	4,290	1,506	0.9843
2010	91,398	-0.40%	645,706	1.34%	737,104	1.12%	587,867	1.36%	13.49	0.05%	4,290	1,506	0.9861
2011	90,915	-0.53%	654,291	1.33%	745,206	1.10%	595,831	1.35%	13.50	0.07%	4,290	1,506	0.9877
2012	90,460	-0.50%	662,938	1.32%	753,398	1.10%	603,855	1.35%	13.51	0.08%	4,290	1,506	0.9890
2013	90,019	-0.49%	671,633	1.31%	761,653	1.10%	611,923	1.34%	13.52	0.10%	4,290	1,506	0.9903

TABLE B2
OPTIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

Year	Population	G.R.	Res. Cust.	G.R.	Res. SH Cust.	G.R.	Res. NSH Cust.	GS Cust.	G.R.	GS SH Cust.	GS SH/ GS Total Cust.
1999	744,835	1.07%	321,337	1.73%	40,919	0.48%	280,418	37,753	1.91%	1,049	2.78%
2000	751,502	0.90%	326,233	1.52%	41,093	0.43%	285,140	38,430	1.79%	1,034	2.69%
2001	757,043	0.74%	330,597	1.34%	41,247	0.37%	289,350	39,052	1.62%	1,017	2.60%
2002	762,918	0.78%	335,061	1.35%	41,402	0.38%	293,659	39,696	1.65%	1,000	2.52%
2003	768,663	0.75%	339,424	1.30%	41,553	0.36%	297,871	40,337	1.61%	984	2.44%
2004	774,533	0.76%	343,797	1.29%	41,702	0.36%	302,095	40,987	1.61%	967	2.36%
2005	780,550	0.78%	348,193	1.28%	41,851	0.36%	306,342	41,649	1.61%	951	2.28%
2006	786,266	0.73%	352,413	1.21%	41,992	0.34%	310,421	42,297	1.56%	935	2.21%
2007	791,746	0.70%	356,484	1.16%	42,128	0.32%	314,356	42,936	1.51%	919	2.14%
2008	797,309	0.70%	360,551	1.14%	42,262	0.32%	318,289	43,581	1.50%	902	2.07%
2009	802,855	0.70%	364,568	1.11%	42,393	0.31%	322,174	44,227	1.48%	886	2.00%
2010	808,375	0.69%	368,532	1.09%	42,522	0.30%	326,010	44,873	1.46%	870	1.94%
2011	813,667	0.65%	372,352	1.04%	42,645	0.29%	329,707	45,509	1.42%	854	1.88%
2012	818,907	0.64%	376,109	1.01%	42,765	0.28%	333,344	46,142	1.39%	838	1.82%
2013	824,582	0.69%	380,027	1.04%	42,890	0.29%	337,138	46,801	1.43%	823	1.76%

TABLE B2 (Continued.)
OPTIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

Year	Real Per Capita Income (92$)	G.R.	Res $/KWH	Res Winter $/KWH	Res Summer $/KWH	Residential Real $/KWH G.R.	GS $/KWH	GS Winter $/KWH	GS Summer $/KWH	LC $/KWH	LP $/KWH	Non-Res. Real $/KWH G.R.
1999	24,183	2.78%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	24,718	2.21%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	25,332	2.48%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	25,860	2.09%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	26,367	1.96%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	26,895	2.00%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	27,378	1.80%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	27,917	1.97%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	28,450	1.91%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	28,989	1.89%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	29,536	1.89%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	30,089	1.87%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	30,641	1.83%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	31,205	1.84%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	31,803	1.92%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

TABLE B2 (Continued.)
OPTIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

Year	Mfg. Emp.	G.R.	Non-Mfg. Emp.	G.R.	Total Emp.	G.R.	Trade & Serv. Emp	G.R.	Serv Emp/ GS Cust.	G.R.	HDD	CDD	A/C Sat.
1999	90,445	-0.40%	578,486	2.41%	668,931	2.02%	526,729	2.29%	13.95	0.37%	4,290	1,506	0.9486
2000	90,328	-0.13%	582,115	0.63%	672,442	0.52%	530,088	0.64%	13.79	-1.13%	4,290	1,506	0.9543
2001	91,128	0.89%	588,629	1.12%	679,757	1.09%	535,885	1.09%	13.72	-0.52%	4,290	1,506	0.9594
2002	92,035	1.00%	596,393	1.32%	688,428	1.28%	542,846	1.30%	13.67	-0.34%	4,290	1,506	0.9639
2003	92,798	0.83%	603,079	1.12%	695,878	1.08%	548,919	1.12%	13.61	-0.49%	4,290	1,506	0.9679
2004	93,685	0.96%	609,511	1.07%	703,196	1.05%	554,670	1.05%	13.53	-0.56%	4,290	1,506	0.9715
2005	94,122	0.47%	617,076	1.24%	711,199	1.14%	561,552	1.24%	13.48	-0.37%	4,290	1,506	0.9747
2006	94,257	0.14%	625,137	1.31%	719,393	1.15%	568,931	1.31%	13.45	-0.24%	4,290	1,506	0.9776
2007	94,246	-0.01%	633,591	1.35%	727,837	1.17%	576,702	1.37%	13.43	-0.14%	4,290	1,506	0.9801
2008	94,055	-0.20%	642,460	1.40%	736,515	1.19%	584,869	1.42%	13.42	-0.08%	4,290	1,506	0.9823
2009	93,786	-0.29%	651,999	1.48%	745,785	1.26%	593,652	1.50%	13.42	0.02%	4,290	1,506	0.9843
2010	93,511	-0.29%	662,067	1.54%	755,578	1.31%	602,962	1.57%	13.44	0.10%	4,290	1,506	0.9861
2011	93,257	-0.27%	672,349	1.55%	765,606	1.33%	612,483	1.58%	13.46	0.16%	4,290	1,506	0.9877
2012	92,965	-0.31%	682,799	1.55%	775,765	1.33%	622,171	1.58%	13.48	0.19%	4,290	1,506	0.9890
2013	92,747	-0.24%	693,356	1.55%	786,103	1.33%	631,963	1.57%	13.50	0.14%	4,290	1,506	0.9903

TABLE B3
PESSIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

Year	Population	G.R.	Res. Cust.	G.R.	Res. SH Cust.	G.R.	Res. NSH Cust.	GS Cust.	G.R.	GS SH Cust.	GS SH/ GS Total Cust.
1999	739,042	0.28%	318,838	0.93%	40,829	0.26%	278,009	37,460	1.12%	1,041	2.78%
2000	740,720	0.23%	321,553	0.85%	40,926	0.24%	280,627	37,878	1.12%	1,019	2.69%
2001	742,801	0.28%	324,377	0.88%	41,027	0.25%	283,351	38,318	1.16%	998	2.60%
2002	745,103	0.31%	327,237	0.88%	41,128	0.25%	286,110	38,769	1.18%	977	2.52%
2003	747,895	0.37%	330,253	0.92%	41,233	0.26%	289,019	39,247	1.23%	957	2.44%
2004	750,810	0.39%	333,267	0.91%	41,338	0.25%	291,929	39,732	1.24%	938	2.36%
2005	753,896	0.41%	336,303	0.91%	41,444	0.25%	294,860	40,227	1.25%	919	2.28%
2006	757,343	0.46%	339,449	0.94%	41,552	0.26%	297,898	40,741	1.28%	901	2.21%
2007	760,606	0.43%	342,463	0.89%	41,655	0.25%	300,809	41,247	1.24%	882	2.14%
2008	763,999	0.45%	345,487	0.88%	41,757	0.25%	303,730	41,760	1.24%	865	2.07%
2009	767,414	0.45%	348,474	0.86%	41,858	0.24%	306,616	42,274	1.23%	847	2.00%
2010	770,867	0.45%	351,432	0.85%	41,957	0.24%	309,475	42,791	1.22%	830	1.94%
2011	774,336	0.45%	354,354	0.83%	42,055	0.23%	312,299	43,309	1.21%	813	1.88%
2012	777,751	0.44%	357,207	0.81%	42,149	0.22%	315,058	43,823	1.19%	796	1.82%
2013	780,776	0.39%	359,838	0.74%	42,236	0.21%	317,602	44,315	1.12%	779	1.76%

TABLE B3 (Continued.)
PESSIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

Year	Real Per Capita Income (92$)	G.R.	Res $/KWH	Res Winter $/KWH	Res Summer $/KWH	Residential Real $/KWH G.R.	GS $/KWH	GS Winter $/KWH	GS Summer $/KWH	LC $/KWH	LP $/KWH	Non-Res. Real $/KWH G.R.
1999	24,242	3.03%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	24,792	2.27%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	25,384	2.39%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	25,907	2.06%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	26,392	1.87%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	26,884	1.86%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	27,343	1.71%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	27,840	1.82%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	28,323	1.74%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	28,810	1.72%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	29,302	1.71%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	29,793	1.68%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	30,299	1.70%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	30,812	1.69%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	31,382	1.85%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

TABLE B3 (Continued.)
PESSIMISTIC PROJECTIONS OF ECONOMIC AND DEMOGRAPHIC VARIABLES, 1999-2013

	Mfg.		Non-Mfg.		Total		Trade &		Serv Emp/				
Year	Emp.	G.R.	Emp.	G.R.	Emp.	G.R.	Serv. Emp	G.R.	GS Cust.	G.R.	HDD	CDD	A/C Sat.
1999	90,085	-0.80%	575,923	1.95%	666,008	1.57%	524,383	1.84%	14.00	0.71%	4,290	1,506	0.9486
2000	89,503	-0.65%	576,992	0.19%	666,495	0.07%	525,321	0.18%	13.87	-0.93%	4,290	1,506	0.9543
2001	89,782	0.31%	580,885	0.67%	670,667	0.63%	528,697	0.64%	13.80	-0.51%	4,290	1,506	0.9594
2002	90,375	0.66%	585,834	0.85%	676,209	0.83%	533,048	0.82%	13.75	-0.35%	4,290	1,506	0.9639
2003	90,792	0.46%	589,703	0.66%	680,495	0.63%	536,512	0.65%	13.67	-0.58%	4,290	1,506	0.9679
2004	91,278	0.54%	593,324	0.61%	684,602	0.60%	539,658	0.59%	13.58	-0.64%	4,290	1,506	0.9715
2005	91,264	-0.02%	597,955	0.78%	689,219	0.67%	543,826	0.77%	13.52	-0.47%	4,290	1,506	0.9747
2006	91,028	-0.26%	603,013	0.85%	694,041	0.70%	548,409	0.84%	13.46	-0.43%	4,290	1,506	0.9776
2007	90,611	-0.46%	608,335	0.88%	698,946	0.71%	553,255	0.88%	13.41	-0.35%	4,290	1,506	0.9801
2008	90,043	-0.63%	614,037	0.94%	704,080	0.73%	558,480	0.94%	13.37	-0.30%	4,290	1,506	0.9823
2009	89,419	-0.69%	620,295	1.02%	709,713	0.80%	564,257	1.03%	13.35	-0.20%	4,290	1,506	0.9843
2010	88,736	-0.76%	627,026	1.09%	715,762	0.85%	570,504	1.11%	13.33	-0.11%	4,290	1,506	0.9861
2011	88,121	-0.69%	633,888	1.09%	722,008	0.87%	576,884	1.12%	13.32	-0.09%	4,290	1,506	0.9877
2012	87,484	-0.72%	640,771	1.09%	728,255	0.87%	583,284	1.11%	13.31	-0.08%	4,290	1,506	0.9890
2013	86,897	-0.67%	647,688	1.08%	734,584	0.87%	589,718	1.10%	13.31	-0.02%	4,290	1,506	0.9903

Section C

1999 IRP MODEL FORECASTS OF ENERGY SALES, PEAK LOADS AND NUMBER OF CUSTOMERS

TABLE C1
PROJECTIONS OF NET GENERATION (MWH) AND DEMAND (MW) REQUIREMENTS, 1999 - 2013
(BASE, OPTIMISTIC AND PESSIMISTIC GROWTH SCENARIOS)

	Base					Optimistic					Pessimistic				
Year	Net Generation	G.R.	Peak Demand	G.R.	Load Factor	Net Generation	G.R.	Peak Demand	G.R.	Load Factor	Net Generation	G.R.	Peak Demand	G.R.	Load Factor
1999	11,729,299	0.94%	2,579	4.18%	51.91%	11,771,381	1.30%	2,604	5.15%	51.61%	11,695,451	0.64%	2,564	3.55%	52.08%
2000	11,981,818	2.15%	2,636	2.21%	51.74%	12,076,625	2.59%	2,682	3.03%	51.25%	11,915,674	1.88%	2,607	1.69%	52.03%
2001	12,396,340	3.46%	2,692	2.10%	52.57%	12,527,701	3.74%	2,754	2.66%	51.93%	12,299,244	3.22%	2,652	1.74%	52.93%
2002	12,660,709	2.13%	2,748	2.11%	52.44%	12,828,264	2.40%	2,828	2.68%	51.79%	12,530,958	1.88%	2,699	1.75%	53.01%
2003	12,845,993	1.46%	2,807	2.12%	52.25%	13,048,494	1.72%	2,901	2.58%	51.35%	12,683,370	1.22%	2,748	1.83%	52.69%
2004	13,056,708	1.64%	2,865	2.09%	51.88%	13,295,194	1.89%	2,975	2.56%	50.88%	12,861,734	1.41%	2,798	1.81%	52.34%
2005	13,278,657	1.70%	2,925	2.08%	51.82%	13,553,654	1.94%	3,050	2.54%	50.72%	13,050,477	1.47%	2,848	1.81%	52.31%
2006	13,509,858	1.74%	2,985	2.06%	51.66%	13,820,558	1.97%	3,124	2.40%	50.51%	13,249,216	1.52%	2,901	1.85%	52.14%
2007	13,739,686	1.70%	3,044	1.96%	51.53%	14,086,268	1.92%	3,195	2.29%	50.33%	13,444,580	1.47%	2,952	1.76%	51.99%
2008	13,972,286	1.69%	3,103	1.94%	51.40%	14,355,553	1.91%	3,267	2.26%	50.15%	13,642,288	1.47%	3,004	1.75%	51.85%
2009	14,218,050	1.76%	3,162	1.90%	51.33%	14,638,863	1.97%	3,340	2.21%	50.04%	13,851,660	1.53%	3,055	1.71%	51.76%
2010	14,459,917	1.70%	3,221	1.86%	51.25%	14,919,015	1.91%	3,412	2.16%	49.92%	14,056,662	1.48%	3,107	1.68%	51.65%
2011	14,707,251	1.71%	3,279	1.80%	51.21%	15,207,969	1.94%	3,482	2.05%	49.86%	14,267,415	1.50%	3,158	1.65%	51.58%
2012	14,950,453	1.65%	3,336	1.75%	51.16%	15,492,089	1.87%	3,551	2.00%	49.80%	14,474,036	1.45%	3,208	1.59%	51.51%
2013	15,189,858	1.60%	3,392	1.69%	51.12%	15,776,424	1.84%	3,625	2.06%	49.69%	14,673,034	1.37%	3,255	1.46%	51.46%

TABLE C2

1999-MODEL FORECASTS OF ELECTRIC ENERGY SALES (MWH) BY CLASS AND PEAK LOAD (MW), 1999 - 2013

(Base Scenario)

Year	Residential	G.R.	Small Commercial	G.R.	Large Commercial	G.R.	Large Industrial	G.R.	Street Lighting	G.R.	Total Sales	G.R.	Line Losses & Co. Uses	Net Generation	G.R.	Annual Peak Load	G.R.	Annual Load Factor
1999	3,599,232	0.53%	1,291,828	0.35%	2,743,328	1.18%	3,405,841	1.39%	70,000	1.31%	11,110,228	0.94%	619,071	11,729,299	0.94%	2,579	4.18%	51.91%
2000	3,670,659	1.98%	1,319,228	2.12%	2,867,009	4.51%	3,421,626	0.46%	70,897	1.28%	11,349,419	2.15%	632,399	11,981,818	2.15%	2,636	2.21%	51.74%
2001	3,723,702	1.45%	1,339,515	1.54%	3,119,916	8.82%	3,487,123	1.91%	71,806	1.28%	11,742,062	3.46%	654,277	12,396,340	3.46%	2,692	2.10%	52.57%
2002	3,787,773	1.72%	1,364,040	1.83%	3,237,657	3.77%	3,530,281	1.24%	72,727	1.28%	11,992,479	2.13%	668,231	12,660,709	2.13%	2,748	2.11%	52.44%
2003	3,851,422	1.68%	1,389,622	1.88%	3,295,186	1.78%	3,558,093	0.79%	73,660	1.28%	12,167,983	1.46%	678,010	12,845,993	1.46%	2,807	2.12%	52.25%
2004	3,928,810	2.01%	1,420,743	2.24%	3,353,475	1.77%	3,589,944	0.90%	74,604	1.28%	12,367,576	1.64%	689,132	13,056,708	1.64%	2,865	2.09%	51.88%
2005	3,989,718	1.55%	1,446,982	1.85%	3,417,815	1.92%	3,647,739	1.61%	75,556	1.28%	12,577,811	1.70%	700,846	13,278,657	1.70%	2,925	2.08%	51.82%
2006	4,052,350	1.57%	1,474,858	1.93%	3,486,434	2.01%	3,706,657	1.62%	76,510	1.26%	12,796,809	1.74%	713,049	13,509,858	1.74%	2,985	2.06%	51.66%
2007	4,111,443	1.46%	1,503,706	1.96%	3,556,373	2.01%	3,765,557	1.59%	77,428	1.20%	13,014,507	1.70%	725,179	13,739,686	1.70%	3,044	1.96%	51.53%
2008	4,170,693	1.44%	1,534,013	2.02%	3,628,485	2.03%	3,823,290	1.53%	78,349	1.19%	13,234,831	1.69%	737,456	13,972,286	1.69%	3,103	1.94%	51.40%
2009	4,231,882	1.47%	1,566,572	2.12%	3,707,541	2.18%	3,882,368	1.55%	79,260	1.16%	13,467,623	1.76%	750,427	14,218,050	1.76%	3,162	1.90%	51.33%
2010	4,288,564	1.34%	1,600,552	2.17%	3,786,744	2.14%	3,940,701	1.50%	80,163	1.14%	13,696,724	1.70%	763,193	14,459,917	1.70%	3,221	1.86%	51.25%
2011	4,346,691	1.36%	1,635,179	2.16%	3,868,923	2.17%	3,999,165	1.48%	81,046	1.10%	13,931,004	1.71%	776,247	14,707,251	1.71%	3,279	1.80%	51.21%
2012	4,402,316	1.28%	1,670,076	2.13%	3,950,374	2.11%	4,056,691	1.44%	81,913	1.07%	14,161,370	1.65%	789,083	14,950,453	1.65%	3,336	1.75%	51.16%
2013	4,455,273	1.20%	1,705,047	2.09%	4,030,115	2.02%	4,114,943	1.44%	82,760	1.03%	14,388,139	1.60%	801,719	15,189,858	1.60%	3,392	1.69%	51.12%

TABLE C3
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-99	299,020	104,655	211,332	262,056	6,707	883,770
Feb-99	250,453	94,959	196,797	279,778	5,962	827,949
Mar-99	239,661	98,353	210,732	275,767	5,895	830,407
Apr-99	216,896	93,712	203,676	283,011	5,348	802,644
May-99	268,393	103,627	228,984	292,066	4,990	898,061
Jun-99	369,146	118,742	252,822	289,530	4,786	1,035,026
Jul-99	459,987	136,678	288,601	294,493	5,023	1,184,782
Aug-99	430,755	133,154	283,484	292,893	5,304	1,145,590
Sep-99	307,690	110,123	239,086	300,219	5,854	962,972
Oct-99	232,597	98,384	210,979	273,035	6,332	821,326
Nov-99	238,195	96,654	205,351	287,898	6,659	834,757
Dec-99	286,439	102,786	211,483	275,095	7,141	882,944
Total	3,599,232	1,291,828	2,743,328	3,405,841	70,000	11,110,228

TABLE C3 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-00	300,992	106,831	215,723	266,024	6,793	896,363
Feb-00	260,516	99,780	203,685	285,148	6,038	855,168
Mar-00	244,057	101,247	214,989	272,495	5,971	838,758
Apr-00	220,812	95,507	206,999	278,848	5,417	807,583
May-00	274,763	105,200	234,867	283,580	5,054	903,464
Jun-00	378,260	120,566	261,800	287,450	4,848	1,052,924
Jul-00	467,198	138,093	300,537	298,646	5,087	1,209,561
Aug-00	442,195	135,764	300,397	297,172	5,372	1,180,900
Sep-00	310,984	110,898	256,378	304,438	5,929	988,626
Oct-00	236,560	100,906	227,435	275,793	6,413	847,106
Nov-00	241,743	98,564	218,058	293,416	6,744	858,526
Dec-00	292,579	105,872	226,141	278,617	7,232	910,441
Total	3,670,659	1,319,228	2,867,009	3,421,626	70,897	11,349,419

TABLE C3 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-01	305,158	109,534	230,990	269,262	6,880	921,825
Feb-01	255,106	98,605	212,387	289,604	6,115	861,818
Mar-01	247,613	103,663	231,720	278,598	6,047	867,643
Apr-01	225,076	97,691	222,225	287,504	5,486	837,983
May-01	280,525	106,763	258,663	292,206	5,119	943,277
Jun-01	384,830	121,840	292,974	295,602	4,910	1,100,157
Jul-01	475,893	139,787	334,208	302,771	5,152	1,257,811
Aug-01	449,255	137,059	327,230	301,279	5,441	1,220,265
Sep-01	317,687	112,102	276,911	309,175	6,005	1,021,879
Oct-01	241,814	103,290	248,002	279,932	6,495	879,534
Nov-01	245,153	101,099	238,707	298,202	6,831	889,991
Dec-01	295,589	108,081	245,897	282,988	7,325	939,881
Total	3,723,702	1,339,515	3,119,916	3,487,123	71,806	11,742,062

TABLE C3 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-02	309,321	112,048	250,385	272,704	6,968	951,427
Feb-02	258,464	100,920	227,707	292,435	6,194	885,720
Mar-02	252,315	106,626	248,863	280,576	6,125	894,505
Apr-02	228,479	99,563	239,032	292,183	5,557	864,813
May-02	286,386	108,401	270,575	297,099	5,185	967,646
Jun-02	392,552	123,439	299,012	300,160	4,973	1,120,136
Jul-02	483,415	141,259	338,753	305,277	5,218	1,273,923
Aug-02	456,719	138,487	332,677	301,425	5,511	1,234,819
Sep-02	326,449	113,694	283,175	312,596	6,082	1,041,996
Oct-02	247,139	105,376	253,044	291,226	6,578	903,363
Nov-02	248,011	103,655	243,679	300,480	6,918	902,743
Dec-02	298,522	110,573	250,755	284,120	7,419	951,390
Total	3,787,773	1,364,040	3,237,657	3,530,281	72,727	11,992,479

TABLE C3 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-03	312,927	114,518	254,643	275,651	7,058	964,797
Feb-03	262,751	103,737	232,298	295,637	6,273	900,697
Mar-03	253,936	108,587	251,725	283,663	6,203	904,114
Apr-03	233,322	102,172	243,110	295,320	5,628	879,552
May-03	293,374	110,413	275,559	300,284	5,251	984,881
Jun-03	398,553	124,481	303,953	303,430	5,036	1,135,454
Jul-03	491,770	142,978	344,967	308,626	5,285	1,293,626
Aug-03	464,658	140,103	338,613	304,748	5,582	1,253,704
Sep-03	333,888	115,164	289,200	314,768	6,160	1,059,180
Oct-03	251,889	107,536	256,934	285,029	6,663	908,050
Nov-03	251,934	106,713	249,049	303,835	7,007	918,538
Dec-03	302,419	113,220	255,134	287,101	7,514	965,388
Total	3,851,422	1,389,622	3,295,186	3,558,093	73,660	12,167,983

TABLE C3 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF ENERGY SALES BY CLASS

Month	Residential	Small Commercial	Large Commercial	Large Industrial	Street Lighting	Total Sales
Jan-04	318,495	117,242	258,880	278,097	7,148	979,862
Feb-04	276,476	109,972	238,171	298,291	6,354	929,263
Mar-04	257,447	111,013	255,801	286,215	6,283	916,759
Apr-04	238,130	104,658	247,349	297,914	5,700	893,750
May-04	300,530	112,561	280,457	302,928	5,319	1,001,794
Jun-04	407,427	126,168	309,106	306,153	5,101	1,153,955
Jul-04	501,406	145,016	351,023	311,394	5,353	1,314,193
Aug-04	471,358	141,989	344,509	307,544	5,653	1,271,053
Sep-04	336,641	116,582	294,243	317,684	6,239	1,071,388
Oct-04	255,392	110,158	261,104	287,578	6,748	920,980
Nov-04	256,321	109,198	253,226	306,589	7,097	932,430
Dec-04	309,189	116,188	259,606	289,557	7,610	982,150
Total	3,928,810	1,420,743	3,353,475	3,589,944	74,604	12,367,576

TABLE C4
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-99	10,356	55,260	19,780	85,396
Feb-99	9,596	52,426	20,442	82,464
Mar-99	9,430	54,672	20,410	84,512
Apr-99	8,281	52,234	21,406	81,921
May-99	8,567	61,577	21,566	91,709
Jun-99	9,470	66,976	23,276	99,722
Jul-99	10,772	75,506	24,373	110,650
Aug-99	11,244	76,216	22,273	109,733
Sep-99	10,130	64,381	22,734	97,246
Oct-99	8,724	53,246	19,699	81,669
Nov-99	8,686	51,979	20,030	80,696
Dec-99	9,589	55,189	20,492	85,270
Total	114,845	719,662	256,482	1,090,989

Note: Large commercial public authority sales include sales to Fort Knox.

TABLE C4 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-00	10,487	57,233	19,987	87,708
Feb-00	10,079	55,432	20,657	86,167
Mar-00	9,730	56,973	20,625	87,328
Apr-00	8,341	54,623	21,630	84,595
May-00	8,676	63,822	21,792	94,290
Jun-00	9,631	70,167	23,520	103,319
Jul-00	10,888	78,572	24,628	114,089
Aug-00	11,637	79,635	22,507	113,779
Sep-00	10,335	66,708	22,973	100,016
Oct-00	8,877	55,091	19,906	83,874
Nov-00	8,780	52,899	20,240	81,919
Dec-00	9,801	56,048	20,707	86,556
Total	117,262	747,205	259,173	1,123,639

TABLE C4 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-01	10,680	57,959	20,197	88,836
Feb-01	9,888	54,236	20,873	84,997
Mar-01	9,892	57,612	20,841	88,345
Apr-01	8,501	55,162	21,857	85,520
May-01	8,818	64,673	22,021	95,512
Jun-01	9,770	70,721	23,767	104,258
Jul-01	11,051	79,871	24,887	115,809
Aug-01	11,750	81,221	22,743	115,715
Sep-01	10,470	67,830	23,214	101,515
Oct-01	9,039	55,966	20,115	85,119
Nov-01	8,937	53,746	20,453	83,135
Dec-01	9,926	56,633	20,924	87,483
Total	118,723	755,629	261,892	1,136,245

TABLE C4 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-02	10,831	58,615	20,409	89,855
Feb-02	10,034	54,795	21,092	85,922
Mar-02	10,105	58,482	21,060	89,646
Apr-02	8,633	55,547	22,087	86,266
May-02	8,968	65,664	22,252	96,883
Jun-02	9,938	71,812	24,016	105,766
Jul-02	11,200	80,379	25,148	116,728
Aug-02	11,830	81,693	22,982	116,506
Sep-02	10,599	69,091	23,458	103,148
Oct-02	9,182	56,925	20,326	86,433
Nov-02	9,093	54,583	20,667	84,343
Dec-02	10,060	57,481	21,144	88,685
Total	120,475	765,067	264,640	1,150,181

TABLE C4 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-03	10,969	59,347	20,623	90,939
Feb-03	10,220	55,652	21,314	87,186
Mar-03	10,210	59,067	21,281	90,558
Apr-03	8,798	56,256	22,318	87,373
May-03	9,152	66,489	22,485	98,127
Jun-03	10,060	72,662	24,268	106,990
Jul-03	11,367	81,471	25,412	118,249
Aug-03	11,979	82,703	23,223	117,906
Sep-03	10,761	70,234	23,704	104,699
Oct-03	9,320	57,601	20,539	87,461
Nov-03	9,380	55,524	20,884	85,788
Dec-03	10,303	58,132	21,365	89,801
Total	122,519	775,138	267,417	1,165,075

TABLE C4 (Continued.)
1999 SHORT-TERM MODEL FORECASTS OF PUBLIC AUTHORITY SALES BY RATE CLASS

Month	Small Commercial/ General Service	Large Commercial	Large Power/ Industrial	Total
Jan-04	11,131	59,971	20,840	91,941
Feb-04	10,735	58,257	21,537	90,529
Mar-04	10,277	59,579	21,504	91,360
Apr-04	8,981	57,039	22,553	88,573
May-04	9,593	67,519	22,721	99,833
Jun-04	10,416	73,535	24,523	108,475
Jul-04	11,607	82,652	25,679	119,937
Aug-04	12,324	83,864	23,467	119,655
Sep-04	11,103	71,226	23,953	106,281
Oct-04	9,500	58,084	20,755	88,339
Nov-04	9,526	56,120	21,103	86,750
Dec-04	10,452	58,960	21,565	90,976
Total	125,645	786,807	270,198	1,182,650

TABLE C5

1999 LONG-TERM MODEL FORECASTS OF RESIDENTIAL ENERGY SALES BY END USE (MWH), 1999 - 2013

	Residential									
Year	Base Load	G.R.	Elec. SH	G.R.	Comb. SH	G.R.	Air Cond.	G.R.	Total	G.R.
1999	2,431,715	-0.58%	205,801	55.48%	119,261	31.63%	756,800	-16.96%	3,513,577	-1.86%
2000	2,468,109	1.50%	202,094	-1.80%	120,953	1.42%	765,582	1.16%	3,556,739	1.23%
2001	2,504,407	1.47%	200,119	-0.98%	123,502	2.11%	774,603	1.18%	3,602,631	1.29%
2002	2,540,823	1.45%	198,186	-0.97%	125,995	2.02%	783,287	1.12%	3,648,291	1.27%
2003	2,576,879	1.42%	195,733	-1.24%	128,067	1.65%	791,382	1.03%	3,692,061	1.20%
2004	2,613,288	1.41%	194,005	-0.88%	130,520	1.91%	799,589	1.04%	3,737,403	1.23%
2005	2,649,581	1.39%	192,263	-0.90%	132,887	1.81%	807,493	0.99%	3,782,223	1.20%
2006	2,686,110	1.38%	191,021	-0.65%	135,531	1.99%	815,491	0.99%	3,828,153	1.21%
2007	2,721,138	1.30%	189,536	-0.78%	137,893	1.74%	822,770	0.89%	3,871,336	1.13%
2008	2,756,114	1.29%	188,174	-0.72%	140,281	1.73%	829,923	0.87%	3,914,493	1.11%
2009	2,791,199	1.27%	187,437	-0.39%	143,074	1.99%	837,207	0.88%	3,958,918	1.13%
2010	2,825,064	1.21%	185,932	-0.80%	145,216	1.50%	843,726	0.78%	3,999,937	1.04%
2011	2,858,775	1.19%	185,028	-0.49%	147,749	1.74%	850,324	0.78%	4,041,876	1.05%
2012	2,891,558	1.15%	183,861	-0.63%	150,004	1.53%	856,465	0.72%	4,081,887	0.99%
2013	2,923,312	1.10%	182,429	-0.78%	151,963	1.31%	862,166	0.67%	4,119,871	0.93%

TABLE C5 (Continued.)

999 LONG-TERM MODEL FORECASTS OF SMALL COMMERCIAL ENERGY SALES BY END USE (MWH), 1999 - 201

	Small Commercial									
Year	Base Load	G.R.	SH-Rate	G.R.	Reg. SH	G.R.	Air Cond.	G.R.	Total	G.R.
1999	1,085,006	5.00%	31,636	22.21%	39,416	30.43%	166,108	-16.03%	1,322,167	2.71%
2000	1,093,023	0.74%	30,910	-2.30%	40,066	1.65%	167,326	0.73%	1,331,325	0.69%
2001	1,104,389	1.04%	30,194	-2.32%	41,027	2.40%	169,113	1.07%	1,344,722	1.01%
2002	1,117,345	1.17%	29,506	-2.28%	41,945	2.24%	171,137	1.20%	1,359,933	1.13%
2003	1,129,230	1.06%	28,844	-2.24%	42,705	1.81%	172,968	1.07%	1,373,747	1.02%
2004	1,140,638	1.01%	28,202	-2.23%	43,591	2.07%	174,741	1.02%	1,387,172	0.98%
2005	1,153,715	1.15%	27,579	-2.21%	44,497	2.08%	176,774	1.16%	1,402,564	1.11%
2006	1,167,412	1.19%	26,974	-2.20%	45,498	2.25%	178,914	1.21%	1,418,799	1.16%
2007	1,181,561	1.21%	26,373	-2.22%	46,422	2.03%	181,116	1.23%	1,435,472	1.18%
2008	1,196,334	1.25%	25,789	-2.21%	47,321	1.94%	183,411	1.27%	1,452,856	1.21%
2009	1,211,914	1.30%	25,217	-2.22%	48,397	2.27%	185,854	1.33%	1,471,383	1.28%
2010	1,228,239	1.35%	24,656	-2.22%	49,276	1.82%	188,387	1.36%	1,490,559	1.30%
2011	1,244,598	1.33%	24,104	-2.24%	50,287	2.05%	190,944	1.36%	1,509,934	1.30%
2012	1,261,016	1.32%	23,562	-2.25%	51,218	1.85%	193,499	1.34%	1,529,295	1.28%
2013	1,277,451	1.30%	23,027	-2.27%	52,017	1.56%	196,041	1.31%	1,548,535	1.26%

TABLE C5 (Continued.)

1999 LONG-TERM MODEL FORECASTS OF ELECTRIC ENERGY SALES BY CLASS (MWH), 1999 - 2013

Year	Large Commercial	G.R.	Large Industrial	G.R.	Street Lighting	G.R.	Total KWHSales	G.R.
1999	2,719,773	0.31%	3,432,038	2.69%	69,973	1.27%	11,057,528	0.46%
2000	2,740,206	0.75%	3,438,958	0.20%	70,765	1.13%	11,137,994	0.73%
2001	2,772,671	1.18%	3,367,189	-2.08%	71,526	1.07%	11,158,740	0.19%
2002	2,807,872	1.27%	3,405,844	1.14%	72,299	1.08%	11,294,239	1.21%
2003	2,837,573	1.06%	3,455,525	1.45%	73,084	1.09%	11,431,990	1.22%
2004	2,867,033	1.04%	3,510,764	1.59%	73,869	1.07%	11,576,239	1.26%
2005	2,899,779	1.14%	3,567,566	1.61%	74,658	1.07%	11,726,791	1.30%
2006	2,934,437	1.20%	3,625,472	1.62%	75,448	1.06%	11,882,308	1.33%
2007	2,969,481	1.19%	3,683,360	1.59%	76,207	1.01%	12,035,855	1.29%
2008	3,005,325	1.21%	3,740,101	1.53%	76,966	1.00%	12,189,741	1.28%
2009	3,044,306	1.30%	3,798,163	1.55%	77,716	0.97%	12,350,486	1.32%
2010	3,083,021	1.27%	3,855,495	1.50%	78,458	0.95%	12,507,469	1.27%
2011	3,122,852	1.29%	3,912,953	1.48%	79,182	0.92%	12,666,797	1.27%
2012	3,161,990	1.25%	3,969,492	1.44%	79,891	0.90%	12,822,555	1.23%
2013	3,199,988	1.20%	4,026,742	1.44%	80,584	0.87%	12,975,720	1.19%

TABLE C6
POPULATION AND RESIDENTIAL ELECTRIC CUSTOMER PROJECTIONS, 1999-2013
(Base-Growth Scenario)

					LGE Area	Annual	Electric	Annual		Population G.R. by County			
Year	Bullitt	Jefferson	Meade	Oldham	Population	G.R.	Res. Cust.	G.R.	Pop/RsCust	Bullitt	Jefferson	Meade	Oldham
1999	60,553	676,942	29,039	45,386	741,318	0.59%	319,820	1.25%	2.3179	2.33%	0.42%	1.73%	2.56%
2000	61,857	679,074	29,450	46,517	744,936	0.49%	323,383	1.11%	2.3036	2.15%	0.31%	1.41%	2.49%
2001	63,166	680,977	29,931	47,662	748,349	0.46%	326,800	1.06%	2.2899	2.12%	0.28%	1.63%	2.46%
2002	64,511	683,129	30,356	48,809	752,017	0.49%	330,274	1.06%	2.2770	2.13%	0.32%	1.42%	2.41%
2003	65,953	685,403	30,872	50,040	755,927	0.52%	333,800	1.07%	2.2646	2.23%	0.33%	1.70%	2.52%
2004	67,466	687,735	31,380	51,314	759,954	0.53%	337,326	1.06%	2.2529	2.29%	0.34%	1.64%	2.55%
2005	69,050	690,055	31,875	52,755	764,137	0.55%	340,872	1.05%	2.2417	2.35%	0.34%	1.58%	2.81%
2006	70,697	692,405	32,377	54,261	768,427	0.56%	344,418	1.04%	2.2311	2.39%	0.34%	1.57%	2.85%
2007	72,340	694,540	32,876	55,777	772,510	0.53%	347,823	0.99%	2.2210	2.32%	0.31%	1.54%	2.80%
2008	74,001	696,742	33,382	57,337	776,704	0.54%	351,233	0.98%	2.2114	2.30%	0.32%	1.54%	2.80%
2009	75,660	698,918	33,892	58,931	780,901	0.54%	354,599	0.96%	2.2022	2.24%	0.31%	1.53%	2.78%
2010	77,313	701,075	34,410	60,563	785,110	0.54%	357,926	0.94%	2.1935	2.18%	0.31%	1.53%	2.77%
2011	78,956	703,129	34,936	62,228	789,243	0.53%	361,175	0.91%	2.1852	2.12%	0.29%	1.53%	2.75%
2012	80,591	705,101	35,471	63,929	793,322	0.52%	364,358	0.88%	2.1773	2.07%	0.28%	1.53%	2.73%
2013	82,217	706,970	36,011	65,661	797,321	0.50%	367,463	0.85%	2.1698	2.02%	0.26%	1.52%	2.71%

Notes: 1) Proportions of the county population to be served for electricity are assumed to be 35% for Bullitt, 100% for Jefferson, 15% for Meade and 85.2% for Oldham County.

2) Pop/RsCust = Number of persons per residential customer count.

TABLE C7
POPULATION AND GENERAL SERVICE ELECTRIC CUSTOMER PROJECTIONS, 1999 - 2013
(Base-Growth Scenario)

Year	GS Comm. Customers	G.R.	Increase in GS Comm.	Pop/Cust	GS P.A. Customers	G.R.	Increase in GS P.A.	Pop/Cust	Total GS Customers	G.R.	Increase in Total GS	LGE Area Population
1999	35,754	1.54%	541	20.73	1,821	-0.65%	-12	407.06	37,575	1.43%	529	741,318
2000	36,262	1.42%	508	20.54	1,832	0.59%	11	406.65	38,094	1.38%	519	744,936
2001	36,762	1.38%	500	20.36	1,842	0.56%	10	406.25	38,604	1.34%	510	748,349
2002	37,276	1.40%	514	20.17	1,853	0.59%	11	405.85	39,129	1.36%	525	752,017
2003	37,804	1.42%	528	20.00	1,864	0.62%	11	405.44	39,669	1.38%	539	755,927
2004	38,340	1.42%	536	19.82	1,876	0.63%	12	405.04	40,216	1.38%	547	759,954
2005	38,885	1.42%	545	19.65	1,888	0.65%	12	404.64	40,773	1.39%	557	764,137
2006	39,437	1.42%	552	19.49	1,901	0.66%	12	404.24	41,338	1.38%	565	768,427
2007	39,980	1.38%	543	19.32	1,913	0.63%	12	403.83	41,892	1.34%	555	772,510
2008	40,529	1.37%	550	19.16	1,925	0.64%	12	403.43	42,454	1.34%	562	776,704
2009	41,080	1.36%	551	19.01	1,938	0.64%	12	403.03	43,017	1.33%	563	780,901
2010	41,632	1.34%	552	18.86	1,950	0.64%	12	402.63	43,582	1.31%	564	785,110
2011	42,180	1.32%	548	18.71	1,962	0.63%	12	402.23	44,142	1.29%	561	789,243
2012	42,726	1.29%	546	18.57	1,974	0.62%	12	401.83	44,700	1.26%	558	793,322
2013	43,268	1.27%	541	18.43	1,986	0.60%	12	401.43	45,254	1.24%	553	797,321

TABLE C8
ANNUAL NUMBER OF ELECTRIC LARGE COMMERCIAL CUSTOMERS, 1981-2004

Year	Non-P.A. Customers	G.R.	Increase	Public Auth. Customers	G.R.	Increase	Total L.C. Customers	G.R.	Increase
1981	1,399			160			1,559		
1982	1,420	1.50%	21	162	1.25%	2	1,582	1.48%	23
1983	1,466	3.24%	46	164	1.23%	2	1,630	3.03%	48
1984	1,508	2.86%	42	167	1.83%	3	1,675	2.76%	45
1985	1,552	2.92%	44	172	2.99%	5	1,724	2.93%	49
1986	1,583	2.00%	31	173	0.58%	1	1,756	1.86%	32
1987	1,653	4.42%	70	174	0.58%	1	1,827	4.04%	71
1988	1,709	3.39%	56	177	1.72%	3	1,886	3.23%	59
1989	1,750	2.40%	41	183	3.39%	6	1,933	2.49%	47
1990	1,764	0.80%	14	184	0.55%	1	1,948	0.78%	15
1991	1,801	2.10%	37	187	1.63%	3	1,988	2.05%	40
1992	1,839	2.11%	38	203	8.56%	16	2,042	2.72%	54
1993	1,900	3.32%	61	225	10.84%	22	2,125	4.06%	83
*1994	1,933	1.74%	33	230	2.22%	5	2,163	1.79%	38
1995	1,963	1.55%	30	238	3.48%	8	2,201	1.76%	38
1996	2,020	2.90%	57	249	4.62%	11	2,269	3.09%	68
1997	2,045	1.24%	25	250	0.40%	1	2,295	1.15%	26
1998	2,061	0.78%	16	251	0.40%	1	2,312	0.74%	17
1999	2,096	1.70%	35	254	1.20%	3	2,350	1.64%	38
2000	2,121	1.19%	25	257	1.18%	3	2,378	1.19%	28
2001	2,151	1.41%	30	260	1.17%	3	2,411	1.39%	33
2002	2,186	1.63%	35	263	1.15%	3	2,449	1.58%	38
2003	2,221	1.60%	35	266	1.14%	3	2,487	1.55%	38
2004	2,256	1.58%	35	269	1.13%	3	2,525	1.53%	38

Note: When the customer accounting system was converted from CIS-I to CIS-II, there was a change in the way of billing multi-metered customers. Consequently, number of non-public-authority LC customers in May, 1994 and thereafter was lowered by 10 to fit the new way of billing under CIS-II. Therefore, true growth of customers in 1994 was more likely 40, rather than 33.

TABLE C9

PROJECTED NUMBER OF RETAIL ELECTRIC CUSTOMERS BY CLASS, 1999-2004

(Annual Average)

	Residential			Small Commercial			Large Commercial			Large Power			Public Authority			Total		
Year	Customers	Incr.	Annual G.R.	Customers	Incr.	Annual G.R.	Customers	Incr.	Annual G.R.	Customers	Incr.	Annual G.R.	Customers	Incr.	Annual G.R.	Customers	Incr.	Annual G.R.
1999	319,820	3,934	1.25%	35,754	541	1.54%	2,096	35	1.70%	426	2	0.47%	2,131	-14	-0.65%	360,227	4,498	1.26%
2000	323,383	3,563	1.11%	36,262	508	1.42%	2,121	25	1.19%	428	2	0.47%	2,145	14	0.64%	364,339	4,112	1.14%
2001	326,800	3,417	1.06%	36,762	500	1.38%	2,151	30	1.41%	431	3	0.70%	2,158	13	0.62%	368,302	3,964	1.09%
2002	330,274	3,473	1.06%	37,276	514	1.40%	2,186	35	1.63%	436	5	1.16%	2,172	14	0.64%	372,344	4,041	1.10%
2003	333,800	3,526	1.07%	37,804	528	1.42%	2,221	35	1.60%	441	5	1.15%	2,186	14	0.67%	376,452	4,108	1.10%
2004	337,326	3,527	1.06%	38,340	536	1.42%	2,256	35	1.58%	446	5	1.13%	2,201	15	0.68%	380,569	4,117	1.09%

*Street lighting customers are not included in this table.

Section D

REGIONAL ECONOMIC AND DEMOGRAPHIC FORECAST REPORTS PREPARED BY UNIVERSITY OF LOUISVILLE AND REGIONAL FINANCIAL ASSOCIATES

Economic, Demographic, and Industrial Electricity Forecasts
1999 to 2020
for the Louisville Region

for

Louisville Gas and Electric Company

by

Nan-Ting Chou, Ph.D.
Associate Professor of Economics

Barry Kornstein
Senior Research Analyst

University of Louisville

August 1999

Economic, Demographic, and Industrial Electricity Forecasts
1999 to 2020
for the Louisville Region

August 1999

Executive Summary

The Louisville area economy has revitalized during the past decade, and out-performed the United States economy during the first half the 1990s. Manufacturing expansions led to employment increases at area factories, even as the US economy was shedding one million workers in that key industry. UPS's international air freight hub in Louisville has added over 10,000 workers in the last ten years, and another major expansion is underway.

The relatively strong economic growth has caused a turnaround in the demographic outlook for the Louisville area. The Louisville Metropolitan Statistical Area (MSA) has added around 50,000 persons so far this decade, after posting zero net growth during the 1980s. The steady economic and demographic growth, combined with low interest rates, has led to a strong market for new housing in Louisville - our area has added more new homes every year this decade than any year last decade.

Louisville's economic growth has been strong and steady over the past two years. On average, the fastest growing metropolitan area economies in the country are now also the largest. These expansions in New York, Philadelphia, Boston, Los Angeles, San Diego, San Francisco, and other large metros have put new life into the national economy and have led to good business conditions for Louisville products and services.

This is the general backdrop for the current long-term forecasts for the Louisville area. This forecast updates the one published in August 1998. In this report, we take account of an additional year of data and a new national outlook to produce a fresh forecast of economic and demographic activity in the region. We use the first quarter 1999 national forecast produced by the WEFA Group.

The analysis also covers the six Kentucky counties surrounding the seven-county Louisville MSA. In percentage terms, the greatest demographic growth is occurring in the ring, or exurban, counties. The counties outside of Jefferson, and within a commuting distance of the Louisville economy, offer the greatest sales growth potential for Louisville-based utilities. For the most important variables - population, jobs, income - we provide forecasts for each of the thirteen counties of interest to the research sponsors.

In addition, we have developed a regression model of electricity usage by LGE industrial customers. We examined 18 years of electricity usage for the 25 largest individual industrial customers. For each customer we attempted to explain usage by the volume of production in each industry, and by evident trends in intensity of electricity usage in each industry nationally. This group of industial customers accounts for roughly 73 percent of the annual electricity usage by LGE industrial customers over the past two decades.

Among the most important forecast results are:

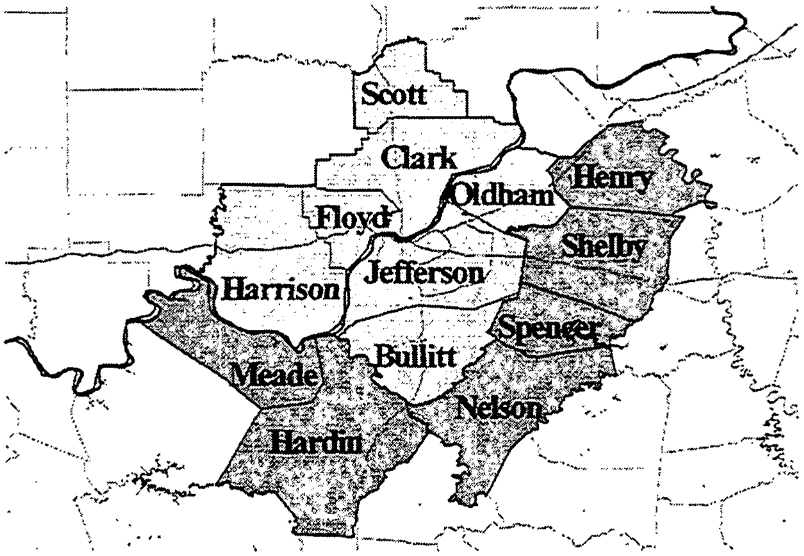
- around 166,000 net new jobs are expected to be generated in the Louisville market in the 22 year period 1999-2020, over half of these to be based in Jefferson County.
- over the period, the population of the MSA is expected to grow by 154,000 in the MSA and around 196,000 in the thirteen county region.
- due to the steady job and earnings growth, combined with the below average population growth, the per capita personal income of Louisville MSA residents is expected to surpass that for the United States as a whole by over 5.4 percent by the year 2020.
- in terms of residents, the fastest growing counties in percentage terms are expected to be Oldham, Bullitt, Nelson, and Shelby.
- in terms of jobs by place of work, the fastest growing counties in percentage terms are expected to be Nelson, Shelby, and Oldham, and Bullitt.
- industrial electricity usage is likely to grow at an average annual rate of about 1.29 percent over the forecast period 1999-2020. This is lower than the average annual rate of 2.04 percent experienced during the period 1983-1998. Part of it is due to the scheduled closure of the Phillip Morris facility in the year 2000.
- the industrial sectors projected to have the fastest growing electricity usage for the forecast period are Plastic Products, not elsewhere classified (SIC 308), with an average annual growth rate of 3.3 percent; Foods (SIC 201-207), with an average annual growth rate of 2.5 percent; Beverages (SIC 208), with an average annual growth rate of 2.2 percent; Motor Vehicles (SIC 3711), with an average annual growth rate of 2.1 percent; and Clay, Glass, Stone, and Concrete Products (SIC 32), with an average annual growth rate of 2.0 percent;.
- local firms represented among the industrial sectors with the fastest growing electricity usage are DJ, Inc., Protein Technologies (Ralston Purina), Swift & Co. (Monfort), Fischer Packing, Liqui-Dri Foods, Brown Forman, Ford, Kosmos Cement, and Corhart Refractories.
- the industrial sectors projected to have the slowest growing electricity usage for the forecast period are Household Appliances (SIC 363), with an average annual growth rate of -2.0 percent; Newspapers (SIC 271), with an average annual growth rate of -0.7 percent; Nonferrous Mill Products (SIC 335), with an average annual growth rate of -0.6 percent; Basic Chemicals (SIC 281) and Soap and Toiletries (SIC 284), with an average annual growth rate of 0.7 percent; and Tobacco (SIC 21) which is scheduled to cease production in December 2000.
- local firms represented among the industrial sectors with the slowest growing electricity usage are General Electric, Courier Journal, Alcan Rolled, Reynolds Metals, Carbide Graphite, Rohm & Haas, United Catalyst, Johnson Controls, and Olin Mathieson.

Economic and Demographic Forecast Methodology, and Detailed Results

The forecasts have been prepared using simple techniques and straightforward assumptions. The methods used are dictated largely by data constraints. Unlike at the national level, there are no regular detailed county or MSA-level estimates of industrial output, wage rates, product prices, household formation, labor force participation, or commuting patterns. Regional analysts must try to use whatever clean data they can obtain to produce useful and consistent forecasts, given a national scenario and their knowledge of the local economy.

The steps used in this forecast are outlined below. We perform a shift-share analysis of Louisville area wage and salary job growth over the last 38 years. We use this information, along with forecasts of the number of wage and salary jobs by industry for the United States provided by the WEFA Group, to produce a forecast of Louisville's growth rate for wage and salary jobs by industry. We then use historical relationships to construct a forecast of all jobs, including the self-employed. Next we model and forecast earnings per job in each industry, based upon trend relationships between Louisville area and national earnings. This becomes the foundation for a forecast of the personal income - wages, salaries, dividends, interest, rent, transfer payments - of Louisville area residents. Finally, we examine the county-level shares of economic and demographic activity, and forecast the key variables for each of the 13 counties in our analysis.

The Louisville Metropolitan Statistical Area
and Surrounding Kentucky Counties



Due to service area restrictions set by the Kentucky Public Service Commission, most of LGE's customers are in Jefferson, Oldham, and Bullitt counties. However, it is important to understand economic and demographic trends throughout the region. The geography most coterminous with an economic market is the Metropolitan Statistical Area (MSA). This includes Bullitt, Jefferson, and Oldham counties in Kentucky; and Clark, Floyd, Harrison, and Scott counties in Indiana. The MSA is defined by commuting patterns of workers and as such is closely aligned with labor, housing, media, retail, and transportation markets. We conduct most of our economic analysis first in terms of the MSA, and then in terms of each county's share of that economic activity.

Louisville-based utilities are also naturally interested in growth in the surrounding exurban Kentucky counties: Henry, Shelby, Spencer, Nelson, Hardin, and Meade. Several of these counties have experienced strong population growth this decade and are the source of many of the long-distance commuters who are filling jobs in the central county. Hence, we have also developed forecasts of population and jobs for these six surrounding Kentucky counties.

Wage and salary jobs by industry for the Louisville MSA were forecast using the results of a shift-share analysis over the last 38 years of data on Louisville and US job growth. We used 24 industrial categories. The growth in jobs in each Louisville industry was decomposed into three components: national growth, industry mix, and local competitiveness. The national component quantifies the extent to which the growth of the region may be attributed simply to the fact that the nation is growing. The industry mix component can be attributed to the mix of industries in the region. If the region happens to have more than its share of fast or slow growth industries, its growth rate will be greater than or less than that of the nation. The competitive component recognizes that the local firms may grow faster or slower than other firms in their industries located outside the region. WEFA forecasts of national job growth by industry were used to forecast the first two components. We then applied our estimates of future local competitiveness by industry to arrive at our final forecasts of wage and salary job growth in the Louisville MSA. See Appendix A Table 1 for our estimate of the competitive components, as well as the forecasted distribution of jobs by industry. *Excel spreadsheet name: Shift-Share W&S Job Forecast.*

The competitive components for manufacturing sectors derived from the shift-share analysis indicate that Louisville is most competitive in the other nondurables, transportation & public utilities, transportation equipment, printing & publishing, and contract construction industries. Consistent with national trends, Louisville's manufacturing industries are expected to account for only 11.1 percent of area wage and salary jobs in twenty years, down from 16.0 percent today.

Appendix A Table 2 provides our forecast of job levels by industry for the Louisville MSA. Keep in mind that the job estimates are on a place-of-work basis, and may be filled by nonresident commuters as well as the MSA resident workforce. Also, multiple job holders are double (and triple) counted; this is a job forecast, not a forecast of employed persons.

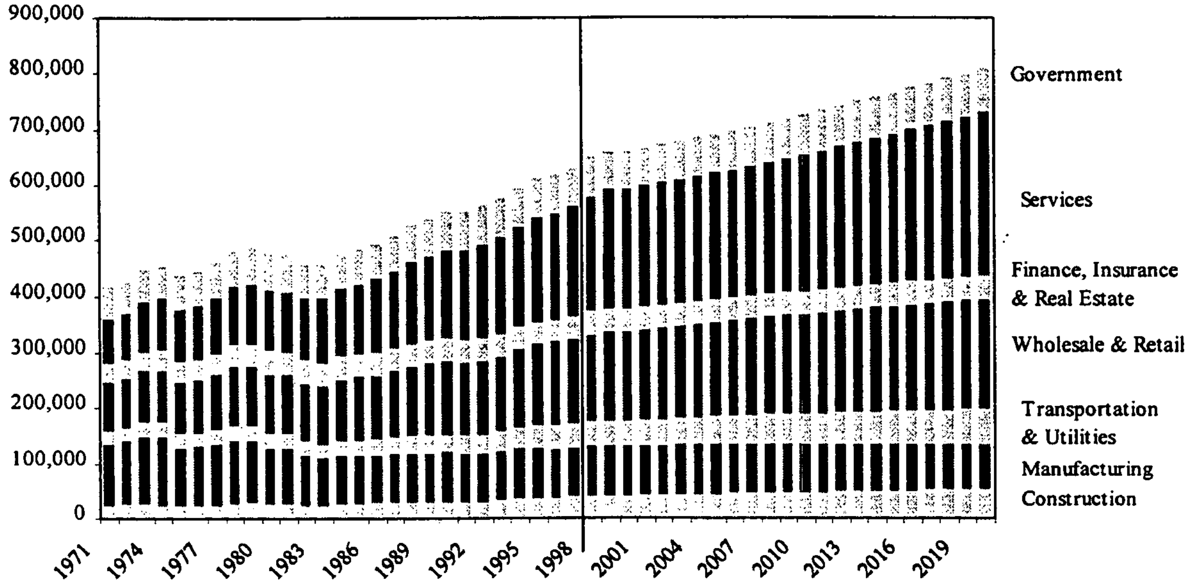
Labor and proprietors jobs by industry for the Louisville MSA were forecast using ratios of total jobs to wage and salary jobs for each industry. This allows us to account for all jobs, including the roughly 89,000 proprietors in the MSA, and to make our forecast definitionally equivalent to the comprehensive database produced by the US Bureau of Economic Analysis for all counties. The ratios of labor and proprietors jobs to wage and salary jobs by industry are fairly constant and predictable over time. Appendix A Table 3 provides forecast data at the major industry level, as portrayed in the accompanying chart. *Excel spreadsheet name: Jobs - Labor&Proprietors.*

Reconciliation of job and population forecasts. As in our previous report, we found that our population forecasts from the Cornerstone 2020 exercise were tracking resonably well, but that an unexpectedly large portion of Louisville MSA jobs were being filled by nonresidents. Exurban counties have the highest population growth rates in the region, but are gaining relatively few jobs. This reinforces the notion that more people are commuting in to Louisville from surrounding rural counties. We update this data in the table at the top of page 6. *Excel spreadsheet name: Labor Force and Population.*

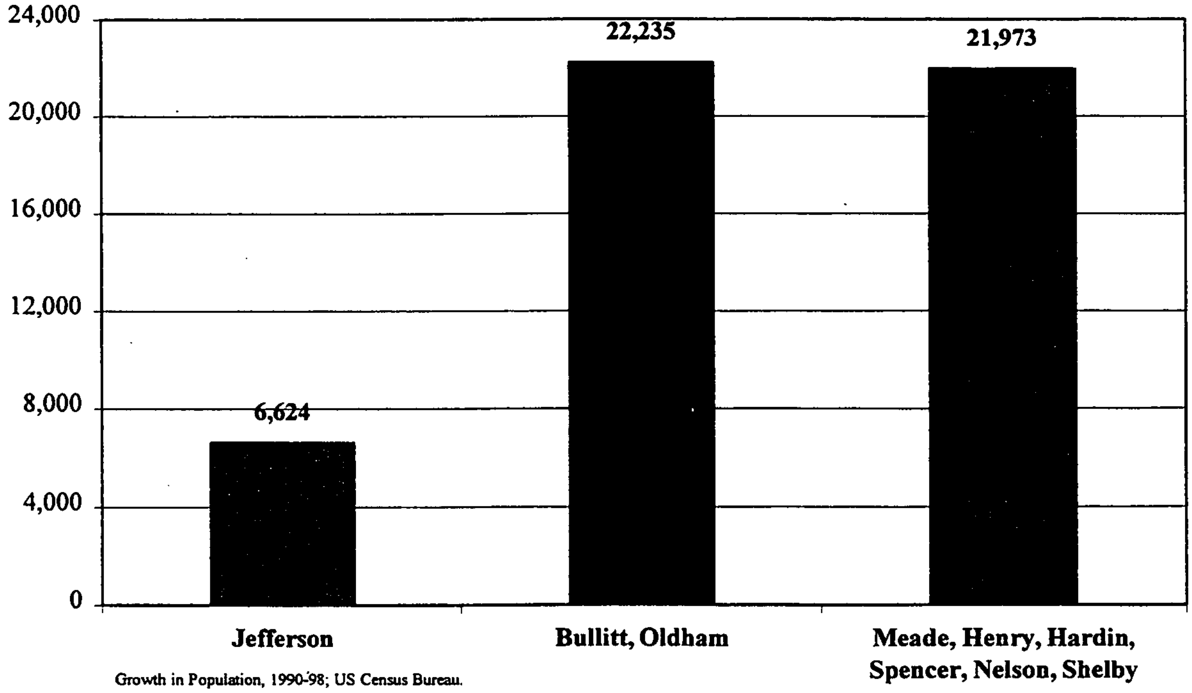
The pattern of exurban population growth coupled with more centrally located job growth can be seen clearly in the table. We estimate that job growth outstripped population growth in the MSA by 47,000 from 1990 to 1998. Part of the discrepancy is due to an increase in percentage of persons employed, yet there remains a difference of 26,000 between job growth and the growth in employed persons in the metro area. In contrast, the exurban counties added about 5,000 more people than jobs.

The gap between employment and population growth can be narrowed somewhat by adjusting the population figures to account for the loss in military personnel (and nonworking dependents). We know from military employment data that the MSA counties lost on net around 1,100 military personnel, and the six

Labor and Proprietors Jobs by Industry, Louisville MSA



Population Growth in the 1990s
Jefferson and Surrounding Kentucky Counties



Growth in Population, 1990-98; US Census Bureau.

Estimated Growth: 1990-1998

	Jobs* (civilian) by place of work	Employed Persons (civilian) by place of residence	Number of Residents
Bullitt County, KY	4,871	7,505	11,408
Clark County, IN	9,569	8,344	6,109
Floyd County, IN	7,937	7,272	7,173
Harrison County, IN	2,471	3,795	4,793
Jefferson County, KY	63,857	34,058	6,624
Oldham County, KY	4,545	6,471	10,827
Scott County, IN	2,466	1,991	1,913
Louisville MSA	95,716	69,436	48,847
Hardin County, KY	7,516	1,937	2,013
Henry County, KY	668	686	1,915
Meade County, KY	860	1,743	4,515
Nelson County, KY	3,680	3,494	6,109
Shelby County, KY	3,909	3,211	4,607
Spencer County, KY	548	1,243	2,814
6 Exurban Counties	17,182	12,314	21,973
13 County Region	112,898	81,750	70,820

Sources:

Jobs from U.S. Bureau of Economic Analysis, "Local Area Personal Income, 1969-96", August 1998.
Employed Persons from US Bureau of Labor Statistics, "Local Area Unemployment Statistics," April 1999.
Population from U.S. Census Bureau, April 1999.

• 1990-98 jobs are estimated from historical ratios of total jobs to wage and salary jobs by industry and adjusted according to military employment data through 1996.

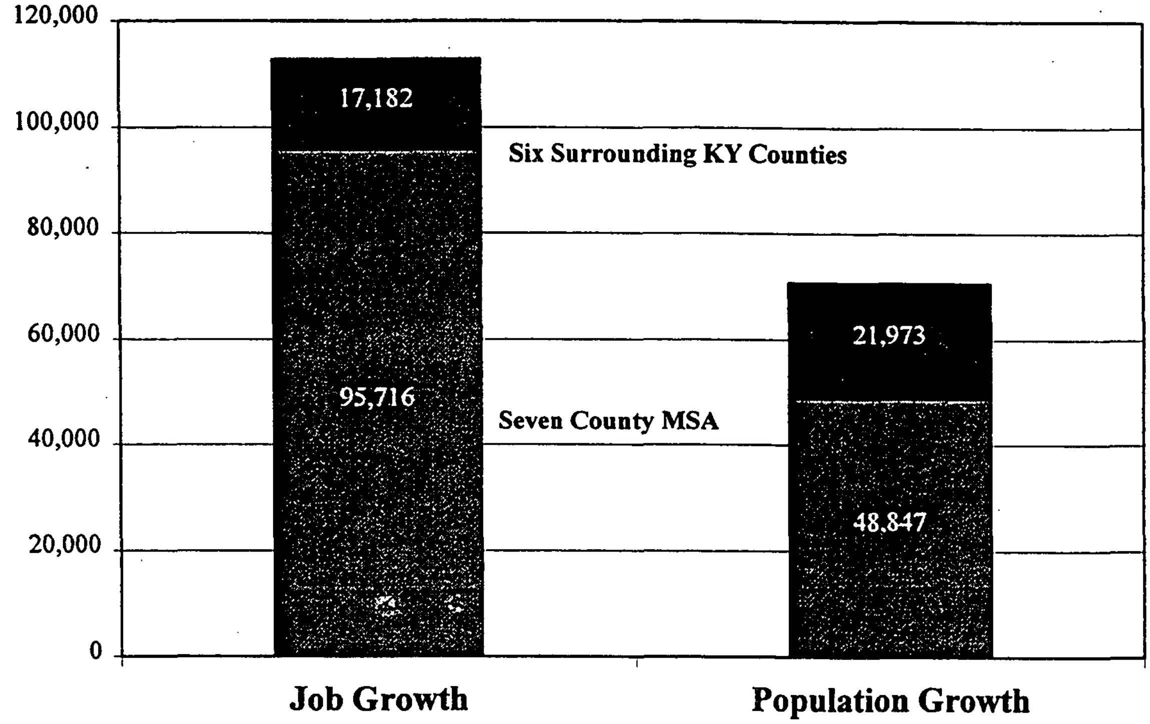
Forecasted Annual Change (1999-2020) in County Shares of Regional Sub-Totals

	Population	Jobs
Bullitt County, KY	0.080%	0.048%
Clark County, IN	0.003%	0.025%
Floyd County, IN	0.040%	0.020%
Harrison County, IN	0.030%	0.007%
Jefferson County, KY	-0.239%	-0.160%
Oldham County, KY	0.085%	0.050%
Scott County, IN	0.001%	0.010%
Louisville MSA	0.000%	0.000%
Hardin County, KY	-0.230%	-0.263%
Henry County, KY	0.010%	-0.007%
Meade County, KY	0.040%	0.010%
Nelson County, KY	0.070%	0.150%
Shelby County, KY	0.060%	0.100%
Spencer County, KY	0.050%	0.010%
6 KY Exurban Counties	0.000%	0.000%

exurban counties lost around 5,200 military personnel. We do not know how many nonworking military dependents left the area with the military personnel. If we assume that the average soldier has .5 nonworking dependents, then we could reasonably add 10,000 persons to the civilian population estimate. This would still leave us with civilian job growth exceeding civilian population growth by about 27,000 since 1990 in the 13 county region. In addition, the table shows job growth exceeding civilian labor force growth by about 31,000. Two factors may account for such disparities. First, the Census Bureau population estimates may be significantly undercounting parts of the MSA, especially Jefferson County. Second, there may be exceptional growth in the number of multiple job holders. No regional data exist upon which to make more precise statements about multiple job holding.

Finally, we have reexamined the recent patterns of job and population growth among the 13 counties and have modified our forecasts of MSA and exurban county shares. See the table at the bottom of page 6 for county share adjustments.

Job and Population Growth, 1990-98
Louisville MSA plus 6 KY Counties



<u>Earnings per labor and proprietors job</u> by industry in the Louisville MSA were forecast using relationships to national compensation measures. WEFA forecasts hourly earnings in a number of important industrial categories. For other industries, such as Trade and Government, we used WEFA's forecast of a national index of labor compensation per hour. Earnings per job were multiplied by jobs to arrive at a forecast of total labor and proprietors earnings in the Louisville MSA on a place of work basis. *Excel spreadsheet name: Earnings and Income.*

<u>The components of personal income</u> for Louisville MSA residents were forecast using historical relationships between Louisville and national measures. For example, employee contributions to social insurance programs (primarily Social Security) in Louisville are tightly related to the comparable national measure. Similarly, income per Louisville resident derived from transfer payments, dividends, interest, and rent are

Components of Personal Income: Louisville MSA and United States (Baseline)

	1970	1980	1990	1996	2000	2010	2020
Louisville MSA							
Earnings by Place of Work ($000)	$3,041,131	$7,197,385	$13,003,531	$17,812,113	$21,923,908	$34,545,260	$54,227,574
- Personal Contributions for Social Insurance	$128,539	$380,998	$877,433	$1,253,933	$1,577,346	$2,614,871	$4,625,515
- Adjustment to Place of Residence Basis	$72,251	$231,960	$357,109	$466,853	$589,391	$1,055,510	$1,890,257
= Net Earnings by Place of Residence	$2,840,341	$6,584,427	$11,768,989	$16,091,327	$20,935,954	$32,985,898	$51,492,316
+ Dividends, Interest and Rent Income	$434,191	$1,323,858	$3,406,723	$4,521,851	$4,738,618	$7,114,444	$10,864,249
+ Transfer Payments	$306,190	$1,265,476	$2,558,744	$3,873,617	$4,365,043	$7,668,535	$13,474,614
= Total Personal Income of Residents ($000)	$3,580,722	$9,173,761	$17,734,456	$24,486,795	$30,039,614	$47,768,878	$75,831,179
Population	906,870	953,944	950,420	988,802	1,002,807	1,081,441	1,153,394
Per Capita Income	$3,948	$9,617	$18,660	$24,764	$29,956	$44,172	$65,746
Average Compound Growth Rate		9.31%	6.85%	4.83%	4.87%	3.96%	4.06%
United States							
Earnings by Place of Work ($000)	$657,814,000	$1,686,882,000	$3,414,296,000	$4,548,259,000	$5,644,577,500	$8,636,635,000	$13,207,742,500
- Personal Contributions for Social Insurance	$27,624,000	$88,283,000	$223,152,000	$305,842,000	$388,303,775	$626,502,000	$1,084,939,325
- Adjustment to Place of Residence Basis	$186,000	$488,000	$790,000	$3,399,000	$3,775	-500	$1,825
= Net Earnings by Place of Residence	$630,004,000	$1,598,111,000	$3,190,354,000	$4,239,018,000	$5,256,277,500	$8,010,132,500	$12,122,805,000
+ Dividends, Interest and Rent Income	$116,198,000	$366,045,000	$908,201,000	$1,173,114,000	$1,297,110,000	$1,958,240,000	$2,907,170,000
+ Transfer Payments	$84,646,000	$322,202,000	$687,738,000	$1,067,899,000	$1,257,737,500	$2,221,845,000	$3,968,632,500
= Total Personal Income of Residents ($000)	$830,848,000	$2,286,358,000	$4,786,293,000	$6,480,031,000	$7,811,125,000	$12,190,217,500	$19,131,257,500
Population	203,798,722	227,224,719	249,439,545	265,179,411	274,500,000	297,665,000	322,720,000
Per Capita Income	$4,077	$10,062	$19,188	$24,436	$28,456	$40,953	$59,281
Average Compound Growth Rate		9.46%	6.67%	4.11%	3.88%	3.71%	3.77%

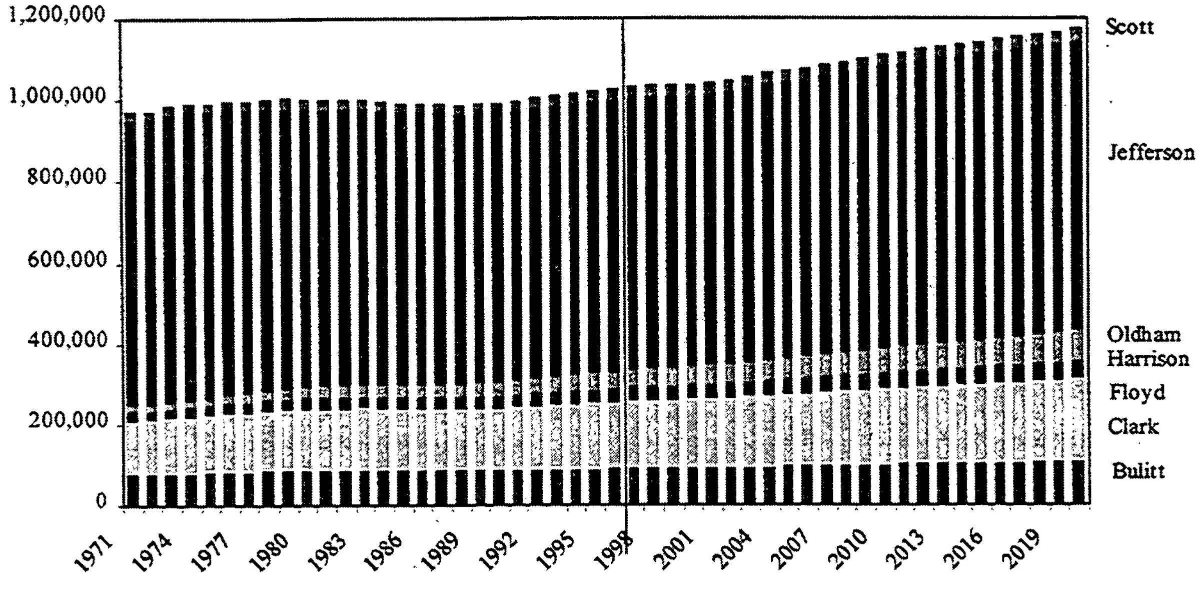
Source: Historical data from the US Bureau of Economic Analysis, "Local Area Personal Income, 1969-96", August 1998.

Forecast data for the United States from WEFA Group "U.S. Long-Term Economic Outlook", Trend Scenario, First Quarter 1999.

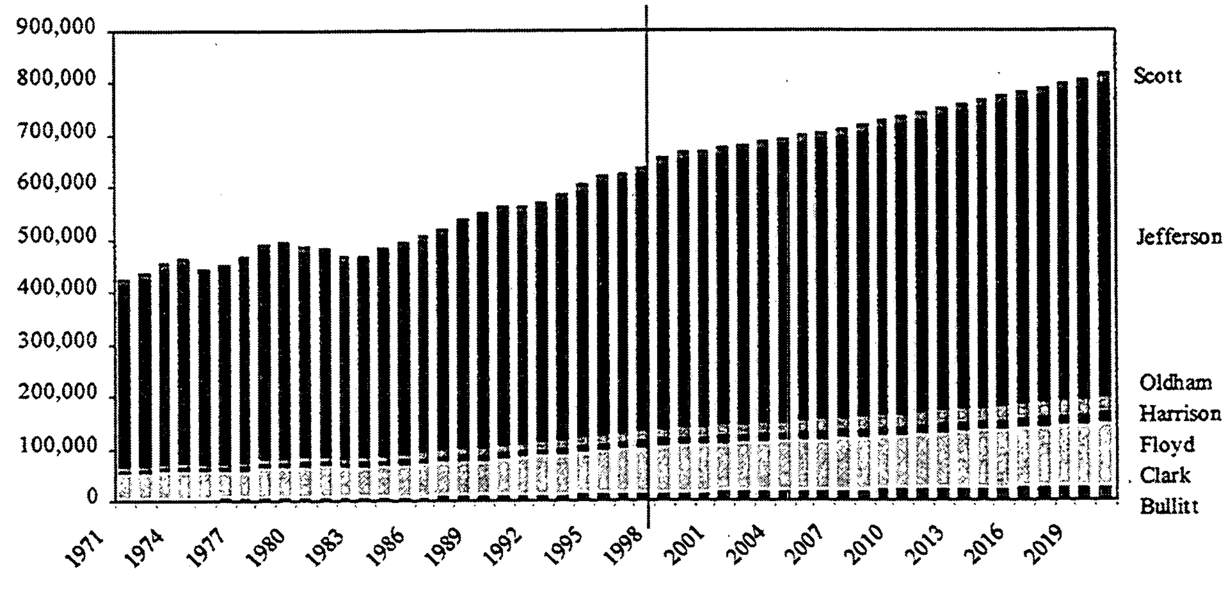
closely related to the national measures. WEFA forecasts these components and we apply these to the Louisville forecast on a per capita or per dollar basis. The result is a total personal income forecast for Louisville MSA residents. The table on page eight provides the forecast details for personal income and its components. *Excel spreadsheet name: Earnings and Income.*

County-level forecasts of population and jobs. We have produced forecasts of people and jobs for thirteen counties. Seven counties are part of the official Louisville MSA. The other six counties of interest are in Kentucky to the east, south and west of Louisville: Hardin, Henry, Meade, Nelson, Shelby, and Spencer. The population of the Louisville MSA is forecast to grow from its current level of 999,000 to 1,153,000 by the year

Total Population, Louisville MSA, by County



Total Jobs in the Louisville MSA, by County



Forecasts of Population, by County (Baseline)

	1970	1980	1990	1998	2000	2010	2020
Bullitt County, KY	26,462	43,469	47,896	59,304	60,963	74,395	88,572
Clark County, IN	76,238	89,016	87,696	93,805	94,188	101,898	109,024
Floyd County, IN	55,580	61,406	64,817	71,990	73,347	83,425	93,589
Harrison County, IN	20,512	27,404	29,937	34,730	35,225	41,231	47,434
Jefferson County, KY	696,224	684,359	665,480	672,104	669,803	696,479	715,253
Oldham County, KY	14,664	27,861	33,568	44,395	46,216	59,032	72,764
Scott County, IN	17,190	20,429	21,026	22,939	23,065	24,982	26,759
Louisville MSA	906,870	953,944	950,420	999,267	1,002,807	1,081,441	1,153,394
Hardin County, KY	78,328	88,418	89,449	91,462	90,068	94,136	96,940
Henry County, KY	10,904	12,760	12,850	14,765	15,021	16,818	18,609
Meade County, KY	18,610	22,945	24,294	28,809	28,864	32,798	36,808
Nelson County, KY	23,473	27,634	29,775	35,884	36,183	41,573	47,143
Shelby County, KY	19,012	23,379	24,976	29,583	29,698	34,181	38,822
Spencer County, KY	5,488	5,931	6,846	9,660	9,625	11,785	14,125
6 County Ring	155,815	181,067	188,190	210,163	209,458	231,290	252,446
13 County Region	1,062,685	1,135,011	1,138,610	1,209,430	1,212,265	1,312,731	1,405,840

County Shares of Total Population in the Region (Baseline)

	1970	1980	1990	1998	2000	2010	2020
Bullitt County, KY	2.9%	4.6%	5.0%	5.9%	6.1%	6.9%	7.7%
Clark County, IN	8.4%	9.3%	9.2%	9.4%	9.4%	9.4%	9.5%
Floyd County, IN	6.1%	6.4%	6.8%	7.2%	7.3%	7.7%	8.1%
Harrison County, IN	2.3%	2.9%	3.1%	3.5%	3.5%	3.8%	4.1%
Jefferson County, KY	76.8%	71.7%	70.0%	67.3%	66.8%	64.4%	62.0%
Oldham County, KY	1.6%	2.9%	3.5%	4.4%	4.6%	5.5%	6.3%
Scott County, IN	1.9%	2.1%	2.2%	2.3%	2.3%	2.3%	2.3%
Louisville MSA	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hardin County, KY	50.3%	48.8%	47.5%	43.5%	43.0%	40.7%	38.4%
Henry County, KY	7.0%	7.0%	6.8%	7.0%	7.2%	7.3%	7.4%
Meade County, KY	11.9%	12.7%	12.9%	13.7%	13.8%	14.2%	14.6%
Nelson County, KY	15.1%	15.3%	15.8%	17.1%	17.3%	18.0%	18.7%
Shelby County, KY	12.2%	12.9%	13.3%	14.1%	14.2%	14.8%	15.4%
Spencer County, KY	3.5%	3.3%	3.6%	4.6%	4.6%	5.1%	5.6%
6 County Ring	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2020. This forecast of MSA population was generated from the Cornerstone 2020 exercise in 1995. It was driven by an economic forecast, and is tracking reasonably well. (An alternative set of forecasts, developed by state demographers using no economic assumptions, is provided in Appendix B.) The six surrounding counties are forecast to grow from 210,000 to 252,000 residents over the same period. Detailed forecasts are in the tables on the following page. *Excel spreadsheet name: BEA County Data.*

Forecasts of Labor and Proprietors Jobs, by County (Baseline)

	1970	1980	1990	1996	2000	2010	2020
Bullitt County, KY	4,298	7,785	11,405	14,946	17,231	22,433	28,855
Clark County, IN	37,147	39,050	45,385	52,103	56,260	63,581	72,722
Floyd County, IN	17,993	21,493	27,378	33,432	36,206	41,204	47,437
Harrison County, IN	6,185	8,774	11,229	12,976	14,032	15,914	18,263
Jefferson County, KY	346,655	396,547	445,979	488,471	516,899	555,558	604,553
Oldham County, KY	4,693	7,432	12,534	15,699	18,088	23,521	30,227
Scott County, IN	5,338	6,036	7,213	9,101	9,978	11,685	13,806
Louisville MSA	422,309	487,117	561,123	626,728	668,694	733,896	815,862
Hardin County, KY	56,132	51,207	56,941	56,808	59,474	62,049	65,394
Henry County, KY	4,590	4,363	5,215	5,629	5,978	6,475	7,103
Meade County, KY	3,495	4,273	5,101	5,663	6,091	6,807	7,704
Nelson County, KY	8,510	10,205	14,097	16,657	18,454	22,092	26,604
Shelby County, KY	9,168	10,634	14,264	17,140	18,746	21,800	25,597
Spencer County, KY	1,988	2,125	2,342	2,741	2,971	3,383	3,897
6 County Ring	83,883	82,807	97,960	104,638	111,713	122,606	136,300
13 County Region	506,192	569,924	659,083	731,366	780,407	856,502	952,162

County Shares of Total Jobs in the Region (Baseline)

	1970	1980	1990	1996	2000	2010	2020
Bullitt County, KY	1.0%	1.6%	2.0%	2.4%	2.6%	3.1%	3.5%
Clark County, IN	8.8%	8.0%	8.1%	8.3%	8.4%	8.7%	8.9%
Floyd County, IN	4.3%	4.4%	4.9%	5.3%	5.4%	5.6%	5.8%
Harrison County, IN	1.5%	1.8%	2.0%	2.1%	2.1%	2.2%	2.2%
Jefferson County, KY	82.1%	81.4%	79.5%	77.9%	77.3%	75.7%	74.1%
Oldham County, KY	1.1%	1.5%	2.2%	2.5%	2.7%	3.2%	3.7%
Scott County, IN	1.3%	1.2%	1.3%	1.5%	1.5%	1.6%	1.7%
Louisville MSA	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hardin County, KY	66.9%	61.8%	58.1%	54.3%	53.2%	50.6%	48.0%
Henry County, KY	5.5%	5.3%	5.3%	5.4%	5.4%	5.3%	5.2%
Meade County, KY	4.2%	5.2%	5.2%	5.4%	5.5%	5.6%	5.7%
Nelson County, KY	10.1%	12.3%	14.4%	15.9%	16.5%	18.0%	19.5%
Shelby County, KY	10.9%	12.8%	14.6%	16.4%	16.8%	17.8%	18.8%
Spencer County, KY	2.4%	2.6%	2.4%	2.6%	2.7%	2.8%	2.9%
6 County Ring	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Jefferson County is expected to continue to lose population share to surrounding counties, particularly Bullitt and Oldham. We expect Jefferson County to gain around 43,000 net residents, but in percentage terms, all area counties except Hardin are expected to grow faster than Jefferson.

The thirteen county area is forecast to add on net 221,000 jobs from 1996 to 2020. Of these, 189,000 are expected to be in the seven-county Louisville MSA. While Jefferson County will lose some share to surrounding counties, we expect it to capture 53 percent of all jobs created in the area over this horizon. See details in the tables above.

Alternative Forecasts

We have used WEFA's High Growth and Low Growth forecast scenarios for the US economy to generate alternative forecasts for the Louisville area. WEFA's High and Low Growth scenarios differ from their Trend/Moderate Growth scenario in their assumptions for fertility, population growth, labor force participation, productivity, energy costs, exports, and fiscal and monetary policy. The difference among the resulting total jobs forecasts are on average about 0.2 percentage points in the annual compound growth rate. For example, under the Trend forecast, the US economy is expected to support 156 million wage and salary jobs by the year 2020; the comparable job number is 148million under the Low forecast, and 164 million under the High forecast. We mapped these alternative national scenarios to the local area economy. The results are summarized below.

Alternative Forecasts for Louisville MSA

	1996	2000	2010	2020
Population	988,802			
Low		1,000,283	1,057,262	1,108,431
Baseline		1,002,807	1,081,441	1,153,394
High		1,005,213	1,104,930	1,197,815
Jobs - Nonagricultural Wage and Salary	536,783			
Low		577,651	627,169	685,858
Baseline		579,694	643,042	717,516
High		582,872	662,313	758,557
Earnings of Labor and Proprietors	$17,812,113,000			
Low		$21,857,974,791	$33,741,899,657	$51,939,967,324
Baseline		$21,923,908,469	$34,545,260,085	$54,227,573,559
High		$22,053,717,228	$35,624,325,127	$57,497,284,289
Personal Income of Residents	$24,486,795,000			
Low		$28,836,051,146	$44,253,538,973	$67,718,825,746
Baseline		$28,860,832,153	$45,657,858,582	$72,050,664,695
High		$29,101,363,001	$46,370,833,282	$72,903,092,902
Per Capita Personal Income of Residents	$24,764			
Low		$28,828	$41,857	$61,094
Baseline		$28,780	$42,219	$62,468
High		$28,950	$41,967	$60,863

Industrial Electricity Usage

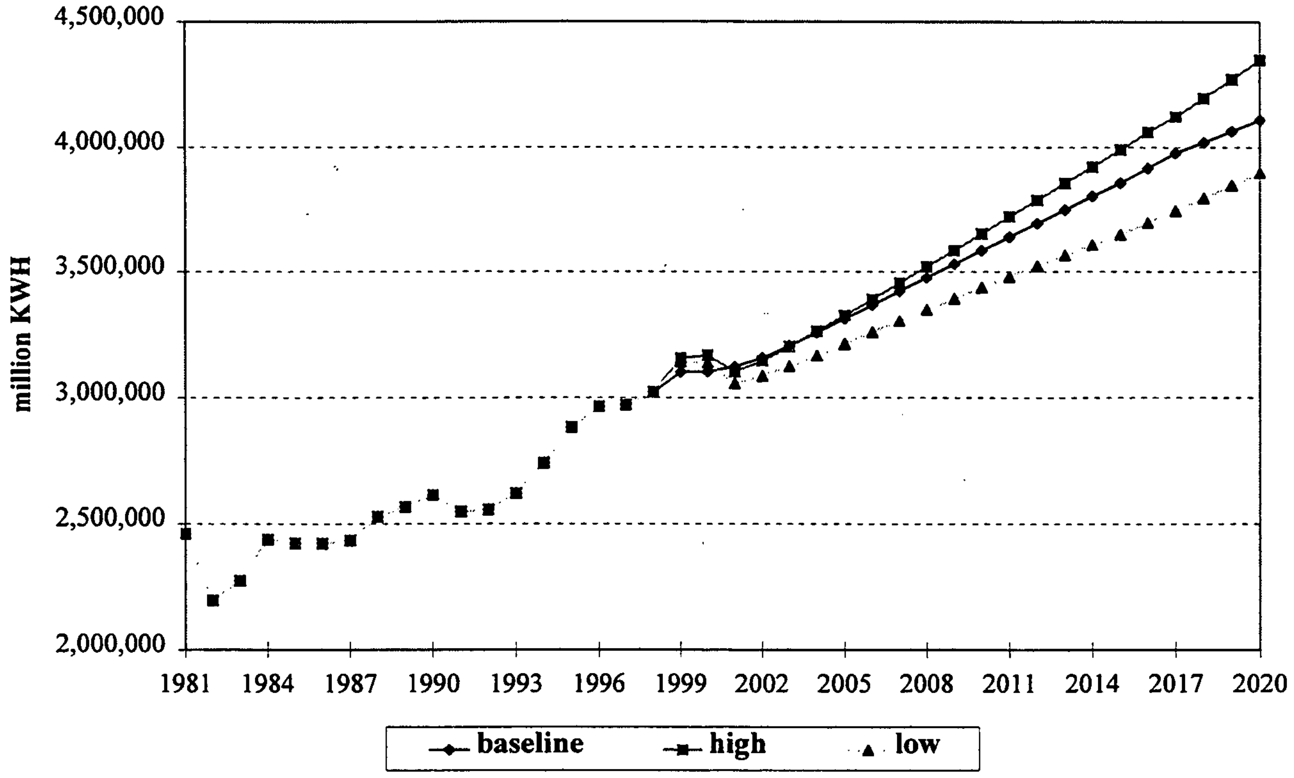
Louisville Gas & Electric Company's total industrial electricity sales amounted to 3,105,308 million KWH in 1998. The average annual growth rate for the period 1983-1998 was 2.04 percent. The percentage of total industrial electricity sales accounted for by the top 25 industrial electricity customers of LG&E has remained fairly steady over the past 16 years, on average about 72 percent.

We have made three forecasts of annual electricity sales out to the year 2020. Industrial electricity sales to large LGE customers are related to the national industrial production indexes produced by the Federal Reserve System and forecast by the WEFA Group. Alternative electricity forecasts are generated using WEFA's Low Growth, Trend/Moderate Growth, and High Growth forecast scenarios. According to our baseline long-term forecasts, LG&E's industrial electricity sales will grow to 4,108,880 million KWH in 2020. The average annual growth rate over the forecast period is 1.29 percent.

Our optimistic, high growth, long-term forecasts predict that industrial electricity sales will grow to 4,348,906 million KWH in 2020. The average annual growth rate of this scenario is 1.55 percent for the period 1998-2020.

The pessimistic, low growth, long-term forecasts predict LG&E's industrial electricity sales will grow to 3,895,514 million KWH in 2020. The average annual growth rate of this scenario is 1.04 percent for the forecast period. The significant reduction in year 2001 is due to the scheduled closing of the Phillip Morris cigarette factory at the end of year 2000.

Alternative Industrial Electricity Sales Forecasts



A Model of Local Industrial Electricity Usage

We modeled the industrial electricity usage of major LG&E customers in two steps. First, we estimated a energy-intensity trend for each of the 13 industries represented by LG&E's top 25 customers. Second, we explained historical electricity sales in each industry locally based on the national output in each industry, and the corresponding energy-intensity trend fitted from step 1. The models were then used to forecast electricity usage by industry locally, based upon WEFA forecasts of national industrial production for each sector.

Louisville Gas & Electric Company's Major Industrial Electricity Customers

SIC Code(s) Description	Local Firms
201-207 Foods	Protein Tech. (Ralston Purina), Swift & Co. (Monfort), Fischer Packing, Liqui-Dri Foods
208 Beverages	Brown Forman
21 Tobacco Products	Phillip Morris
271 Newspapers	Courier Journal
281 Basic Chemicals (Industrial Inorganic)	Carbide Graphite, Rohm & Haas, United Catalyst
282 Synthetic Materials (Plastics, Synthetic Resins, etc.)	DuPont, American Synthetic, Borden Chemical
2821 Plastic Materials, Synthetic Resins	Geon (BF Goodrich)
284 Soaps and Toiletries	Olin Mathieson
308 Plastic Products, not elsewhere classified	DJ, Inc.
32 Clay, Glass, Stone and Concrete Products	Kosmos Cement, Corhart Refractories
335 Nonferrous Mill Products	Alcan Rolled, Reynolds Metals
363 Household Appliances	General Electric
3711 Motor Vehicles and Passenger Car Bodies	Ford

Our long-term forecasts take into account not only the level of industrial production but also changing manufacturing tools and techniques by way of a trend term on the ratio of electricity consumed to industrial output. A negative trend may indicate an emphasis on conservation and energy efficiency, while a positive trend may reflect increased automation of the manufacturing process. With this method we estimated the electricity sales for each of the 13 industries which comprise the top 25 industrial customers of LG&E. The residual was estimated based only on projected industrial production.

Step 1

Over time, industries substitute among labor, capital, land, and energy inputs in response to technological change and the relative prices of inputs. Some manufacturers, like food processors, have chosen to increase the electricity intensity of their production processes; others, like household appliance producers, have decreased their electricity intensity.

To investigate the trends in the intensity of electricity usage in the production processes of the above 13 industrial sectors, we used the ratio of the quantity of electricity purchased (QELEC, thousand KWH) to the industrial production index (IPI) for that particular industry at the national level. A negative trend over time indicates decreasing electricity usage per output, and therefore greater energy efficiency and conservation. A positive trend does not signal inefficiency or a disregard for energy conservation, but may indicate increased automation of the manufacturing process or a change in the composition of the end product. We collected data on the quantity of electricity purchased and the IPI for these industrial sectors for the period 1972-1996 (the former from Annual Survey of Manufacturers and the latter from CITIBASE).

We fit a time trend for each of the 13 industries by estimating the following regression equation:

$$(QELEC_{jt} / IPI_{jt}) = a_j + b_j*t + e_{jt} ,$$

where j = 1,......13 industries; t = 1972,......1996; e = error term.

The results of these 13 regressions are shown in the table below. While some industries have experienced negative trends, others have experienced positive trends. Based on these regression results, we forecast the ratio of the quantity of electricity consumed to industrial output for each industry for each year of the period 1997-2020.

Intensity of Electricity Usage Trend Regression Results: $(QELEC_{jt}/ IPI_{jt}) = a_j + b_j*t + e_{jt}$

	Coefficients		t-statistics			Avg. Impact
Industrial Sector	**Intercept**	**Time Trend**	**Intercept**	**Time Trend**	**Adjusted R^2**	**of Trend**
Foods (201-207)	-3,423,430	1,947.71	-3.12	3.52	0.32	0.44%
Beverages (208)	758,853	-350.77	2.20	-2.02	0.11	-0.56%
Tobacco Products (21)	-404,421	210.58	-7.06	7.30	0.69	1.55%
Newspapers (271)	-1,204,042	621.20	-5.90	6.03	0.60	2.14%
Basic Chemicals (281)	9,553,437	-4,423.28	1.85	-1.70	0.07	-0.57%
Synthetic Materials (282)	5,563,018	-2,668.87	6.02	-5.73	0.57	-1.01%
Plastic Materials, Synthetic Resins (2821)	2,539,933	-1,195.92	3.38	-3.15	0.27	-0.72%
Soaps and Toiletries (284)	-912,165	473.45	-3.16	3.25	0.29	1.71%
Plastic Products, not elsewhere classified (308)	3,128,943	-1,416.51	1.36	-1.22	0.02	-0.45%
Clay, Glass, Stone and Concrete Products (32)	-1,085,096	707.47	-1.92	2.48	0.18	0.22%
Nonferrous Mill Products (335)	-1,376,278	750.95	-3.36	3.64	0.34	0.66%
Household Appliances (363)	1,413,958	-697.98	13.95	-13.66	0.89	-2.45%
Motor Vehicles and Passenger Car Bodies (3711)	-1,031,185	558.94	-2.63	2.83	0.23	0.71%

Seven of the 13 industrial sectors exhibited positive electricity intensity trends, all with significant coefficients. The sectors with positive electricity intensity trend coefficients are Foods, Tobacco, Newspapers, Soaps and Toiletries, Clay, Glass, Stone & Concrete, Nonferrous Mill Products, and Motor Vehicles. The impact of the trend on the electricity/production ratio is roughly 2 percent per year for the Newspapers sector, 1.71 percent per year for Soaps and Toiletries, 1.55 percent for Tobacco, 0.71 percent per year for Motor Vehicles, 0.66 percent per year for Nonferrous Mill Products, 0.44 percent per year for Foods, and just 0.22 percent per year for the Clay, Glass, Stone and Concrete sector.

Five of the remaining industrial sectors exhibited significant negative electricity intensity trends. These sectors are Beverages, Basic Chemicals, Synthetic Materials, Plastic Materials, and Household Appliances. The impact of the trend on the electricity/production ratio is roughly -2.45 percent per year for the Household Appliances sector, -0.56 percent per year for the Beverages, -1.01 percent per year for theSynthetic Materials sectors, and -0.57 percent per year for the Basic Chemicals, and -0.72 percent per year for Plastic Materials sectors. The Plastic Products, Not Elsewhere Classified industrial sector has a negative, but insignificant electricity intensity trend.

Step 2

To model the industrial electricity usage by LG&E's major customers, we estimate the following equation for each of the 13 industries for the period 1981-1998:

$$MWH_{jt} = a_j + b_j*IPI_{jt} + c_j*(QELEC_{jt} / IPI_{jt}) + e_{jt}.$$

For the model of residual sales (total industrial sales subtracts top 25 customers' sales) we estimated:

$$MWH_{jt} = a_j + b_j*IPI_{jt} + e_{jt}.$$

In addition to the variables above, a number of the equations included a dummy variable in order to account for some specific aspect of those particular electricity sales series. The Food sector equation includes a dummy variable to account for an unusual increase in electricity usage in 1984 and 1985. The beverages sector has a dummy to account for a jump in electricity usage since 1990. The Newspapers sector equation includes a dummy to account for the 1992 closure of one facility. The Soaps and Toiletries sector equation includes a dummy to account for an unusually large decline in 1987 and 1988. The Household Appliances sector has a dummy variable to account for an unusual decline in 1982. The Plastic Materials, Synthetic Resins sector has a dummy to account for the significant slow down since 1995. Finally, the Motor Vehicles industrial sector equation includes a dummy variable to account for a strong increase since 1994.

Electricity Sales Regression Results: $MWH_{jt} = a_j + b_j*IPI_{jt} + c_j*(QELEC_{jt} / IPI_{jt}) + e_{jt}$

	Coefficients			t-statistics			
Industrial Sector	**Intercept**	**IPI**	**QELEC/IPI**	**Intercept**	**IPI**	**QELEC/IPI**	**Adjusted R^2**
Foods (201-207)	-53,915	1,385.9		-4.55	11.46		0.8839
Beverages (208)	-370	162.8		-0.10	4.78		0.9636
Tobacco Products (21)	-99,336	191.3	10.43	-5.44	1.31	12.25	0.9023
Newspapers (271)	22,251	71.5	-0.43	5.29	2.45	-3.91	0.9672
Basic Chemicals (281)	915,739	1,272.5	-0.74	2.02	0.84	-1.59	0.2860
Synthetic Materials (282)	-244,981	2,239.4	1.01	-0.50	1.81	0.68	0.6185
Plastic Materials, Synthetic Resins (2821)	66,138	805.5		4.12	6.64		0.9045
Soaps and Toiletries (284)	73,585	618.3	-1.57	2.18	1.27	-0.62	0.7389
Plastic Products, not elsewhere classified (308)	-55,543	365.4	0.10	-0.19	1.60	0.11	0.8689
Clay, Glass, Stone and Concrete Products (32)	-1,159,178	497.2	3.88	-4.40	1.23	4.24	0.8086
Nonferrous Mill Products (335)	171,878	-6.8	-0.65	8.56	-0.06	-3.19	0.6539
Household Appliances (363)	-240,346	1,325.4	19.23	-1.48	1.75	5.51	0.8945
Motor Vehicles and Passenger Car Bodies (3711)	-1,095,660	162.2	17.06	-6.48	0.53	8.18	0.9708
residual (total U.S. industry)	161,036	5,543.7		4.78	16.99		0.9510

Because the electricity/production ratio is so unstable for the Food sector, only the industrial production index is used as an explanatory variable in that equation. Inclusion of the electricity intensity trend variable for the Beverage industrial sector does not yield a reasonable regression result, so only the industrial production index is used as an explanatory variable in that equation.

Since the Plastic Products, Not Elsewhere Classified industrial sector only emerged as a top 25 customer in 1989, we have only 10 observations for this industry. Therefore the regression results may not be as reliable as those for other industries.

Since the residual is comprised of a mix of various industries, we use the U.S. total industrial production index to account for its growth. We excluded the years 1981 and 1982 due to the marked decline in industrial electricity usage, associated with the last strong recession, in those two years. The regression, therefore, has only 16 observations.

The regression results are given in the table above.

Industrial Electricity Usage: History & Forecast

Industrial Sector	Average Annual Growth 1990-1998	Average Annual Growth 1999-2020
Foods (201-207)	3.9%	2.5%
Beverages (208)	5.0%	2.2%
Tobacco Products (21)	1.8%	0.0%
Newspapers (271)	-3.4%	-0.7%
Basic Chemicals (281)	-0.1%	0.7%
Synthetic Materials (282)	3.3%	1.4%
Plastic Materials, Synthetic Resins (2821)	4.9%	1.3%
Soaps and Toiletries (284)	3.2%	0.7%
Plastic Products, not elsewhere classified (308)	19.2%	3.3%
Clay, Glass, Stone and Concrete Products (32)	1.8%	2.0%
Nonferrous Mill Products (335)	-1.2%	-0.6%
Household Appliances (363)	-2.2%	-2.0%
Motor Vehicles and Passenger Car Bodies (3711)	7.8%	2.1%
Residual	2.2%	2.0%
Total	1.85%	1.29%

To forecast annual electricity sales for the period 1999-2020 we used the regression coefficients from the preceding table, WEFA's industrial production indexes forecasts, and our forecasted intensity of electricity usage proxy. The average annual growth rates in electricity usage for the 13 industrial sectors during the historical and forecast periods are summarized in the table above.

Five of the 13 industrial sectors are forecast to have higher annual average rates of growth in electricity consumption over the forecast period than they have had over the last eighteen years. The The Newspaper Products sector will continue to use less electricity over time, despite the impact of an increasing electricity intensity trend variable (QELEC/IPI) in our model, but the decline will be slower than in the past. The Basic Chemicals sector is forecast to experience a slow positive rate of growth of less than 1 percent.The Clay, Glass, Stone & Concrete Products is expected to continue its historically strong growth, even increasing the pace slightly. The Nonferrous Mill Products sector, despite having a positive electricity intensity trend, is forecast to decrease its electricity consumption by an average of 0.6 percent per year.The Household Appliances sector (represented by GE), which has the strongest negative electricity intensity trend (in terms of impact of overall usage), is projected to decrease its electricity consumption by an average of 2.0 percent per year.

All of the remaining industrial sectors are forecast to grow at slower rates than they did from 1990 to 1998. The Tobacco sector is scheduled to close in December, 2000. The Beverages, Plastic Materials & Synthetic Resins, and Motor Vehicles sectors are projected to have sharply reduced average annual rates of growth for the forecast period when compared to their historical average rates, though growth will remain fairly robust (in the 1.3 to 3.3 percent range). The Foods, Synthetic Materials, and Soaps & Toiletries sectors are expected to have somewhat slower rates of growth. They will all continue to increase their energy consumption at a moderate pace (0.7 to 2.5percent per year). The Plastic Products, Not Elsewhere Classified sector, which emerged as a top 25 customer in 1989, and has experienced a four-fold increase in energy consumption since then, is not expected to continue that rapid rate of growth. But it is forecast to remain the fastest growing sector, increasing its electricity usage by an average annual rate of 3.3 percent.The residual is forecast to grow at the robust average annual rate of 2.0 percent, above the overall growth rate of 1.29 percent. Factoring out the residual leaves an average annual rate of growth for the 13 industrial sectors of just 0.86 percent over the forecast period. As a result, in 2020 the residual would account for 33.4 percent of total electricity sales compared to 28.0 percent in 1998.

The various growth rates will result in a marked change in the distribution of Louisville Gas & Electric Company's industrial electricity sales among the thirteen industrial sectors. Four sectors are forecast to increase their respective shares of total industrial electricity sales by at least 0.9 percent, while another three sectors are expected to see their respective shares drop by over 1.9 percent during the period 1999-2020. The Foods, Plastic Products Not Elsewhere Classified, Clay, Glass, Stone & Concrete, and Motor Vehicles industrial sectors accounted for just 15.1 percent of LG&E's total industrial electricity sales in 1983, currently account for 21.6 percent, and are forecast to account for 26.8 percent by the year 2020. On the other hand, the Tobacco, Basic Chemicals, and Household Appliances sectors accounted for 38.7 percent of total industrial electicity sales in 1983, currently account for 28.4 percent, and are forecast to account for just 18.8 percent by the year 2020. Most of the decrease in the share of the latter group is due to the long term trends towards downsizing and increased energy conservation at the General Electric Appliance Park facility.

LG&E Electricity Sales by Industrial Sector as Percent of Total Sales

Industrial Sector	1983	1998	2020
Foods (201-207)	2.9%	3.4%	4.4%
Beverages (208)	0.3%	0.6%	0.7%
Tobacco Products (21)	2.4%	2.7%	0.0%
Newspapers (271)	1.0%	0.5%	0.3%
Basic Chemicals (281)	17.9%	15.8%	14.0%
Synthetic Materials (282)	8.5%	9.8%	9.8%
Plastic Materials, Synthetic Resins (2821)	4.3%	5.5%	5.5%
Soaps and Toiletries (284)	3.6%	3.0%	2.8%
Plastic Products, not elsewhere classified (308)	0.3%	0.7%	1.1%
Clay, Glass, Stone and Concrete Products (32)	5.5%	5.8%	6.6%
Nonferrous Mill Products (335)	3.9%	2.8%	1.8%
Household Appliances (363)	18.4%	9.9%	4.8%
Motor Vehicles and Passenger Car Bodies (3711)	6.4%	11.8%	14.7%
residual	24.9%	28.0%	33.4%

Note: The first percentage of total sales for Plastic Products, not elsewhere classified (308) is for the year 1990.

References

Barff, Richard A. and Prentice L. Knight III, "Dynamic Shift-Share Analysis," *Growth and Change*, Spring 1988, pp.1-10.

Berzeg, Korhan, "The Empirical Content of Shift-Share Analysis," *Journal of Regional Science*, 1978, vol. 18, pp.463-469.

Bjerklie, John W., "Industrial Energy Use Profile: Significance of Choice," *Gas Energy Review*, June 1995, vol. 23, pp. 8-11.

Citicorp Database Services, *CITIBASE: Citibank Economic Database*, New York, 1997.

Coomes, Paul A., Nan-Ting Chou, and Barry Kornstein, *Economic, Demographic, and Industrial Electricity Forecasts 1997 to 2020 for the Louisville Region*, June 1997.

Cornerstone 2020 Marketplace Committee, *Greater Louisville Forecasts of Jobs, Population, and Income: 1995 to 2020*, Cornerston 2020, Louisville, 1994.

Elkhafif, Mahmound, "Estimating Disaggregated Price Elasticity in Industrial Energy Demand," *Energy Journal*, 1992, vol. 13, No. 4, pp. 209-217.

Engle, Robert F., Scott J. Brown, and Gary Stern, "A Comparison of Adaptive Structural Forecasting Methods for Electricity Sales," *Journal of Forecasting*, July/September, 1988, vol. 7, pp. 149-172.

Executive Office of the President, Office of Management and Budget, *Standard Industrial Classification Manual, 1987*, Washington, D.C., 1987.

Fischler, Edward B., and Robert F. Nelson, "Integrating Time-Series and End-Use Methods to Forecast Electricity Sales," *Journal of Forecasting*, January/March 1986, vol. 5, pp. 15-30.

Halvorsen, Robert, *Econometric Models of U.S. Energy Demand*, Lexington Books, Lexington, Massachusetts, 1978.

Indiana Business Research Center, *Preliminary Population Projections for Indiana Counties: 2000-2020*, Kelley School of Business, Indiana University, Indianapolis, 1999.

Kentucky Cabinet for Economic Development, *1996 Kentucky Directory of Manufacturers*, Frankfort, 1996.

Kentucky Population Research, *How Many Kentuckians, 1999 Edition*, Kentucky State Data Center, University of Louisville, Louisville, 1999.

Kurre, J.A. and B. R. Weller, "Forecasting the Local Economy Using Time-Series ad Shift-Share Techniques," *Environment and Planning A*, 1989, vol.21, pp. 753-770.

U.S. Bureau of Economic Analysis, *Local Area Personal Income, 1969-1995*, Washington, D.C., 1997.

U.S. Bureau of Labor Statistics, *Employment and Earnings*, Washington, D.C., 1998.

U.S. Bureau of the Census, *1992 Census of Manufacturers*, Washington, D.C., 1996.

U.S. Bureau of the Census, *Annual Survey of Manufacturers*, Washington, D.C., 1970-1995.

WEFA Group, *U.S. Long-Term Economic Outlook: Fourth Quarter 1997*, Eddystone, Pennsylvania, 1997.

Yanchar, Joyce, "The U.S. Electricity Outlook," *Electrical World*, January 1995, vol. 209, No. 1, p. 28.

Appendix A

Table 1

Estimated "Competitive Component" Used in Shift-Share Forecast

				LOUISVILLE		U.S.	
	This	1998	1997	% of Total Jobs		% of Total Jobs	
Industy (SIC)	Forecast	Forecast	Forecast	1998	2020	1998	2020
Contract Construction (15 to 17)	0.0021	0.0020	0.0000	5.16%	5.60%	4.74%	4.97%
Mining (10 to 14)	0.0000	0.0013	0.0012	0.10%	0.08%	0.46%	0.39%
Total Manufacturing				15.67%	11.12%	14.88%	11.81%
Nondurable Manufacturing				6.95%	5.11%	6.06%	4.62%
Food and Kindred Products (20)	-0.0063	-0.0083	-0.0032	1.65%	0.77%	1.35%	0.76%
Tobacco Products (21)	-0.0298	-0.0247	-0.0276	0.49%	0.14%	0.03%	0.02%
Apparel and Other Finished Textile Products (23)	0.0000	0.0000	0.0165	0.35%	0.24%	0.61%	0.37%
Printing and Publishing (27)	0.0022	0.0020	0.0034	1.72%	1.67%	1.24%	1.16%
Chemicals and Allied Products (28)	-0.0228	-0.0254	-0.0192	1.01%	0.52%	0.82%	0.73%
Other Nondurables (22,26,29,30,31)	0.0155	0.0180	0.0419	1.72%	1.78%	1.99%	1.58%
Durable Manufacturing				8.72%	6.01%	8.82%	7.20%
Lumber and Wood Products (24)	-0.0076	-0.0106	-0.0128	0.70%	0.50%	0.64%	0.58%
Furniture and Fixtures (25)	0.0007	0.0006	0.0019	0.43%	0.42%	0.42%	0.39%
Stone, Clay and Glass (32)	0.0008	-0.0003	0.0056	0.40%	0.35%	0.45%	0.39%
Fabricated Metal Products (34)	-0.0150	-0.0084	-0.0135	1.31%	0.75%	1.18%	0.99%
Nonelectrical Machinery (35)	-0.0006	0.0000	0.0000	1.49%	1.15%	1.74%	1.40%
Electrical Machinery (36)	-0.0325	-0.0277	-0.0095	1.69%	0.72%	1.35%	1.13%
Transportation Equipment (37)	0.0023	0.0125	0.0133	2.06%	1.61%	1.49%	1.13%
Other Durables (33,38,39)	0.0048	0.0009	-0.0007	0.65%	0.51%	1.56%	1.18%
Transportation and Public Utilities (40 to 49)	0.0139	0.0129	0.0056	7.50%	8.73%	5.20%	4.67%
Wholesale and Retail Trade (50 to 59)	0.0004	0.0004	0.0005	24.36%	24.43%	23.29%	23.58%
Finance, Insurance and Real Estate (60 to 68)	-0.0054	-0.0050	-0.0059	5.27%	4.54%	5.83%	5.75%
Services (70 to 89)				29.55%	33.70%	29.82%	33.47%
Health Services (80)	0.0023	-0.0002	0.0000	9.11%	11.73%	7.87%	9.93%
Business Services (73)	-0.0008	0.0000	-0.0004	7.12%	9.85%	6.79%	9.47%
Other Services (70,72,75 to 79,81 to 89)	0.0010	-0.0025	0.0001	13.32%	12.12%	15.16%	14.08%
Federal Government (91)	-0.0029	-0.0145	-0.0090	1.79%	1.32%	2.13%	1.89%
State and Local Governments (92,93)	0.0009	-0.0028	-0.0042	10.60%	10.49%	13.64%	13.46%

Table 2

Wage and Salary Jobs by Industry, Louisville MSA (Baseline)

Major Industries (SIC Code)	1970	1980	1990	1998	2000	2010	2020
Mining	594	545	527	592	555	585	595
Construction	15,933	17,550	23,836	29,225	30,550	35,318	40,209
Total Manufacturing	118,658	100,333	87,736	88,817	87,265	86,397	79,783
Nondurable Manufacturing	47,057	41,742	40,864	39,408	38,388	38,881	36,651
Food and Kindred Products (20)	13,448	10,483	10,200	9,342	9,055	8,028	5,509
Tobacco Products (21)	10,292	8,367	4,400	2,783	2,479	1,518	978
Apparel and Other Finished Textile Products (23)	2,426	2,317	2,700	2,000	2,102	1,959	1,718
Printing and Publishing (27)	7,577	7,342	8,400	9,767	10,027	11,332	11,964
Chemicals and Allied Products (28)	9,609	8,825	7,400	5,742	5,354	4,557	3,737
Other Nondurables (22,26,29,30,31)	3,705	4,408	7,764	9,775	9,370	11,485	12,745
Durable Manufacturing	71,602	58,592	46,873	49,408	48,877	47,516	43,132
Lumber and Wood Products (24)	3,951	3,983	3,922	3,958	3,808	3,830	3,587
Furniture and Fixtures (25)	2,615	1,408	2,122	2,417	2,637	3,013	3,034
Stone, Clay and Glass (32)	2,542	2,625	2,122	2,292	2,323	2,508	2,529
Fabricated Metal Products (34)	9,286	9,408	7,822	7,408	6,891	6,341	5,347
Nonelectrical Machinery (35)	12,904	11,991	6,822	8,417	8,367	8,545	8,257
Electrical Machinery (36)	16,260	17,800	12,822	9,592	9,758	7,361	5,141
Transportation Equipment (37)	7,842	7,425	7,722	11,667	11,654	12,206	11,568
Other Durables (33,38,39)	16,200	3,950	3,522	3,658	3,440	3,711	3,668
Transportation and Public Utilities (40 to 49)	22,750	24,292	30,855	42,525	43,785	52,345	62,612
Wholesale and Retail Trade (50 to 59)	69,008	88,975	119,027	138,025	141,819	159,129	175,260
Finance, Insurance and Real Estate (60 to 68)	16,667	23,433	27,664	29,867	30,419	30,583	32,555
Services (70 to 89)	47,666	75,391	125,455	167,458	173,971	200,671	241,795
Health Services (80)	12,740	24,459	40,315	51,600	52,431	63,655	84,147
Business Services (73)	6,801	11,642	26,215	40,375	44,790	54,144	70,679
Other Services (70,72,75 to 79,81 to 89)	28,126	39,290	58,924	75,483	76,750	82,873	86,969
All Government	43,792	61,033	64,427	70,183	71,330	78,014	84,706
Federal Government (91)	11,861	12,437	12,464	10,133	9,166	9,081	9,470
State and Local Governments (92,93)	31,931	48,597	51,964	60,050	62,164	68,932	75,236
Total Nonagricultural Wage and Salary Jobs	335,067	391,552	479,527	566,692	579,694	643,042	717,516

Note: Historical data from the US Bureau of Labor Statistics. Estimates exclude proprietors and other self-employed persons.

Jobs are on a place of work basis and are NOT full-time equivalents; double-counting occurs for person holding two jobs. See the monthly BLS publication, "Employment and Earnings", for details.

Table 3

Labor and Proprietors Jobs by Industry, Louisville MSA (Baseline)

Major Industries (SIC Code)	1970	1980	1990	1998	2000	2010	2020
Mining	859	844	738	795	738	729	723
Construction	22,853	25,545	31,472	39,963	41,708	47,918	54,284
Total Manufacturing	122,166	104,227	89,100	90,810	89,188	88,190	81,386
Transportation and Public Utilities (40 to 49)	25,326	27,223	33,723	45,847	46,875	54,929	64,951
Wholesale and Retail Trade (50 to 59)	85,805	105,593	130,228	154,754	158,849	177,925	195,688
Finance, Insurance and Real Estate (60 to 68)	29,494	41,751	40,616	41,134	41,643	40,895	42,643
Services (70 to 89)	75,554	105,813	158,510	207,778	214,781	244,665	292,380
All Government	52,671	66,732	67,112	65,419	65,719	69,454	74,614
Federal Government (91)	11,599	12,838	12,636	9,952	8,930	8,650	8,931
State and Local Governments (92,93)	36,805	49,654	49,433	55,467	56,789	60,803	65,683
Total Nonagricultural Labor and Proprietors Jobs	414,728	477,728	551,499	646,499	659,502	724,704	806,670
+ Ag. services, forestry, fishing, and other	851	1,922	3,643	4,484	4,484	4,484	4,484
+ Farm employment	6,686	7,387	5,632	4,708	4,708	4,708	4,708
= Total Labor and Proprietors Employment (BEA)	422,309	487,117	561,123	655,691	668,694	733,896	815,862

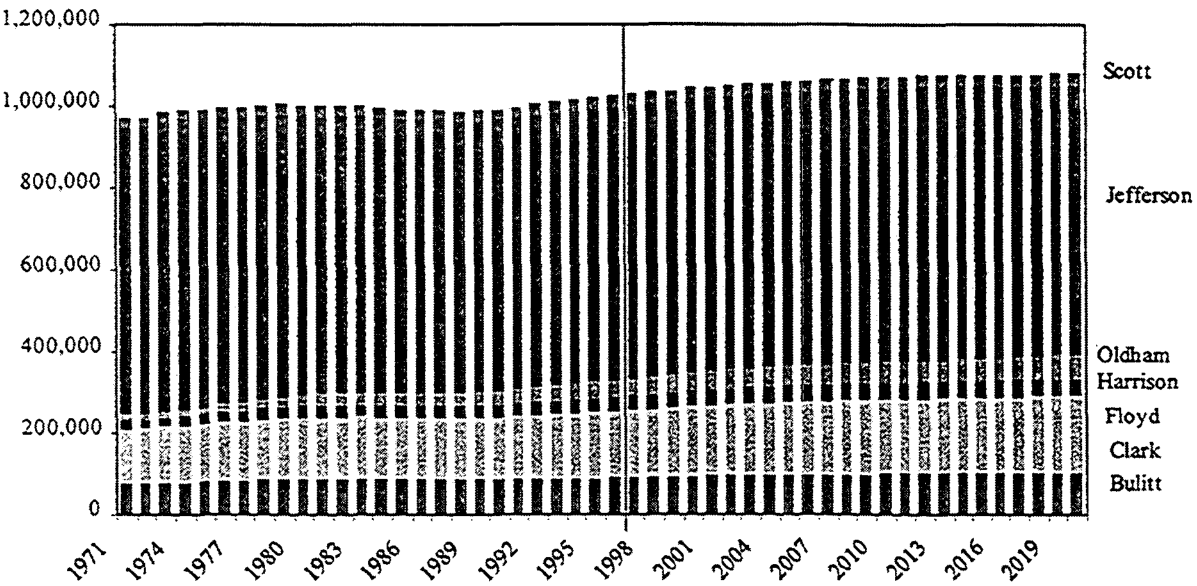
Appendix B

The forecasts presented in the body of the report are predicated upon a regional demographic forecast produced as part of the 1995 Cornerstone 2020 exercise. Those population forecasts were driven by the need to import people to support the strong job forecasts we developed for the region. We forecast then that to meet the anticipated industrial demand for labor the population of the Louisville MSA would need to grow to 1,153,000 people by the year 2020. That forecast remains our best estimate of the likely regional population given the economic outlook.

In this appendix, we provide an alternative demographic outlook by county. It is generated by the state demographers of Kentucky and Indiana, respectively. It is considerably lower than the one used in the body of this report. We believe it is inconsistent with the regional economic activity we have witnessed this decade. Nevertheless, the state demographers have good data and sound methodology, and their forecasts should be considered carefully. We carry the alternative demographic outlook through to alternative forecasts of personal income, and display these in tables, also.

At the MSA level, our population forecast and that of the state demographers differ by about 100,000 persons in the year 2020. This is a large difference. Whereas we forecast a continuation of the population growth rates we have seen througout the last decade, the demographers forecast a deceleration. Small differences in annual growth rates, compounded over twenty-five years, can have large effects on totals. Over one-half of the difference between the forecasts of the MSA population in the year 2020 is due to the very different outlooks for Jefferson County. While in the body of the report we provided forecasts showing Jefferson County continuing to modestly add population - 43,000 more people between 1998 and 2020 - the state demographers project that the County will lose 12,000 persons on net. However, most of the divergence in the two forecasts occurs during the last decade of the horizon - where uncertainty is greatest. *We have provided a duplicate set of Excel spreadsheets which incorporate these alternative demographic forecasts.*

Alternative Forecast
Total Population, Louisville MSA, by County



Components of Personal Income: Louisville MSA and United States (Baseline)

	1970	1980	1990	1996	2000	2010	2020
Louisville MSA							
Earnings by Place of Work ($000)	$3,041,131	$7,197,385	$13,003,531	$17,812,113	$21,923,908	$34,545,260	$54,227,574
- Personal Contributions for Social Insurance	$128,539	$380,998	$877,433	$1,253,933	$1,577,346	$2,614,871	$4,625,515
- Adjustment to Place of Residence Basis	$72,251	$231,960	$357,109	$466,853	$589,391	$1,055,510	$1,890,257
= Net Earnings by Place of Residence	$2,840,341	$6,584,427	$11,768,989	$16,091,327	$20,935,954	$32,985,898	$51,492,316
+ Dividends, Interest and Rent Income	$434,191	$1,323,858	$3,406,723	$4,521,851	$4,738,618	$7,114,444	$10,864,249
+ Transfer Payments	$306,190	$1,265,476	$2,558,744	$3,873,617	$4,365,043	$7,668,535	$13,474,614
= Total Personal Income of Residents ($000)	$3,580,722	$9,173,761	$17,734,456	$24,486,795	$30,039,614	$47,768,878	$75,831,179
Population	906,870	953,944	950,420	988,802	1,002,807	1,081,441	1,153,394
Per Capita Income	$3,948	$9,617	$18,660	$24,764	$29,956	$44,172	$65,746
Average Compound Growth Rate		9.31%	6.85%	4.83%	4.87%	3.96%	4.06%
United States							
Earnings by Place of Work ($000)	$657,814,000	$1,686,882,000	$3,414,296,000	$4,548,259,000	$5,644,577,500	$8,636,635,000	$13,207,742,500
- Personal Contributions for Social Insurance	$27,624,000	$88,283,000	$223,152,000	$305,842,000	$388,303,775	$626,502,000	$1,084,939,325
- Adjustment to Place of Residence Basis	$186,000	$488,000	$790,000	$3,399,000	$3,775	-500	$1,825
= Net Earnings by Place of Residence	$630,004,000	$1,598,111,000	$3,190,354,000	$4,239,018,000	$5,256,277,500	$8,010,132,500	$12,122,805,000
+ Dividends, Interest and Rent Income	$116,198,000	$366,045,000	$908,201,000	$1,173,114,000	$1,297,110,000	$1,958,240,000	$2,907,170,000
+ Transfer Payments	$84,646,000	$322,202,000	$687,738,000	$1,067,899,000	$1,257,737,500	$2,221,845,000	$3,968,632,500
= Total Personal Income of Residents ($000)	$830,848,000	$2,286,358,000	$4,786,293,000	$6,480,031,000	$7,811,125,000	$12,190,217,500	$19,131,257,500
Population	203,798,722	227,224,719	249,439,545	265,179,411	274,500,000	297,665,000	322,720,000
Per Capita Income	$4,077	$10,062	$19,188	$24,436	$28,456	$40,953	$59,281
Average Compound Growth Rate		9.46%	6.67%	4.11%	3.88%	3.71%	3.77%

Source: Historical data from the US Bureau of Economic Analysis, "Local Area Personal Income, 1969-96", August 1998.

Forecast data for the United States from .WEFA Group "U.S. Long-Term Economic Outlook", Trend Scenario, First Quarter 1999.

Alternative Forecast

Forecasts of Population, by County (Baseline)

	1970	1980	1990	1998	2000	2010	2020
Bullitt County, KY	26,462	43,469	47,896	59,304	61,858	71,401	78,280
Clark County, IN	76,238	89,016	87,696	93,805	96,748	102,115	105,311
Floyd County, IN	55,580	61,406	64,817	71,990	74,802	79,867	82,883
Harrison County, IN	20,512	27,404	29,937	34,730	36,430	40,119	42,317
Jefferson County, KY	696,224	684,359	665,480	672,104	669,722	669,421	659,860
Oldham County, KY	14,664	27,861	33,568	44,395	46,036	51,839	56,779
Scott County, IN	17,190	20,429	21,026	22,939	23,672	24,967	25,739
Louisville MSA	906,870	953,944	950,420	999,267	1,009,268	1,039,729	1,051,169
Hardin County, KY	78,328	88,418	89,449	91,462	89,816	91,322	92,708
Henry County, KY	10,904	12,760	12,850	14,765	15,480	17,227	18,419
Meade County, KY	18,610	22,945	24,294	28,809	30,780	37,507	43,064
Nelson County, KY	23,473	27,634	29,775	35,884	37,675	44,074	49,433
Shelby County, KY	19,012	23,379	24,976	29,583	30,747	35,092	38,141
Spencer County, KY	5,488	5,931	6,846	9,660	10,646	14,790	18,852
6 County Ring	155,815	181,067	188,190	210,163	215,144	240,012	260,617
13 County Region	1,062,685	1,135,011	1,138,610	1,209,430	1,224,412	1,279,741	1,311,786

Sources: Kentucky Population Research, *How Many Kentuckians, 1999 Edition*, Kentucky State Data Center, Louisville, 1999; and Indiana Business Research Center, *Preliminary Population Projections for Indiana Counties: 2000-2020*, Kelley School of Business, Indianapolis, 1999.

Alternative Forecast

County Shares of Total Population in the Region (Baseline)

	1970	1980	1990	1998	2000	2010	2020
Bullitt County, KY	2.9%	4.6%	5.0%	5.9%	6.1%	6.9%	7.4%
Clark County, IN	8.4%	9.3%	9.2%	9.4%	9.6%	9.8%	10.0%
Floyd County, IN	6.1%	6.4%	6.8%	7.2%	7.4%	7.7%	7.9%
Harrison County, IN	2.3%	2.9%	3.1%	3.5%	3.6%	3.9%	4.0%
Jefferson County, KY	76.8%	71.7%	70.0%	67.3%	66.4%	64.4%	62.8%
Oldham County, KY	1.6%	2.9%	3.5%	4.4%	4.6%	5.0%	5.4%
Scott County, IN	1.9%	2.1%	2.2%	2.3%	2.3%	2.4%	2.4%
Louisville MSA	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hardin County, KY	50.3%	48.8%	47.5%	43.5%	41.7%	38.0%	35.6%
Henry County, KY	7.0%	7.0%	6.8%	7.0%	7.2%	7.2%	7.1%
Meade County, KY	11.9%	12.7%	12.9%	13.7%	14.3%	15.6%	16.5%
Nelson County, KY	15.1%	15.3%	15.8%	17.1%	17.5%	18.4%	19.0%
Shelby County, KY	12.2%	12.9%	13.3%	14.1%	14.3%	14.6%	14.6%
Spencer County, KY	3.5%	3.3%	3.6%	4.6%	4.9%	6.2%	7.2%
6 County Ring	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Alternative Forecasts for Louisville MSA

	1996	2000	2010	2020
Population	988,802			
Low		1,003,556	1,020,867	1,019,771
Baseline		1,009,268	1,039,729	1,051,169
High		1,018,164	1,070,539	1,103,776
Jobs - Nonagricultural Wage and Salary	536,783			
Low		577,651	627,169	685,858
Baseline		579,694	643,042	717,516
High		582,872	662,313	758,557
Earnings of Labor and Proprietors	$17,812,113,000			
Low		$21,857,974,791	$33,741,899,657	$51,939,967,324
Baseline		$21,923,908,469	$34,545,260,085	$54,227,573,559
High		$22,053,717,228	$35,624,325,127	$57,497,284,289
Personal Income of Residents	$24,486,795,000			
Low		$28,829,226,975	$45,089,850,300	$70,599,523,198
Baseline		$28,919,489,036	$45,087,667,577	$69,893,515,746
High		$28,962,170,272	$46,518,886,975	$73,913,749,765
Per Capita Personal Income of Residents	$24,764			
Low		$28,727	$44,168	$69,231
Baseline		$28,654	$43,365	$66,491
High		$28,445	$43,454	$66,964

LOUISVILLE

EMPLOYMENT GROWTH

1993-98

96

1998-03

115

[illegible]

RISK-ADJUSTED RETURN, '98-03

-0.07%

COST OF DOING BUSINESS

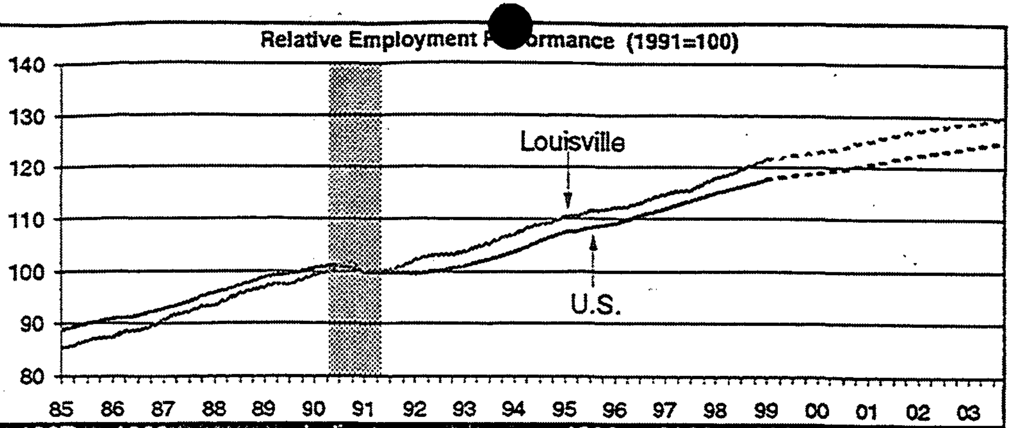
U.S.= 100%

87%

COST OF LIVING

U.S.= 100%

94%



1992	1993	1994	1995	1996	1997	1998	Indicators	1999	2000	2001	2002	2003
26.3	27.1	29.3	30.4	30.9	31.7	32.9	Gross Metro Product, C$B	33.6	34.2	35.2	36.0	36.8
1.9	*3.3*	*8.1*	*3.6*	*1.8*	*2.5*	*3.8*	*% Change*	*2.3*	*1.6*	*3.0*	*2.3*	*2.1*
488.8	499.3	515.3	527.6	536.7	549.6	566.6	Total Employment (000)	580.8	588.5	599.4	608.0	615.0
2.4	*2.2*	*3.2*	*2.4*	*1.7*	*2.4*	*3.1*	*% Change*	*2.5*	*1.3*	*1.8*	*1.4*	*1.1*
5.5	4.8	4.3	4.4	4.4	4.1	3.3	Unemployment Rate	3.0	3.3	3.5	3.6	3.7
7.2	4.7	4.9	5.3	4.8	5.4	4.8	Personal Income Growth	4.9	5.4	6.2	4.7	4.4
964.9	972.5	978.5	984.3	989.2	994.5	999.3	Population (000)	1,003.9	1,009.5	1,014.8	1,019.8	1,024.6
4,617	5,094	5,028	4,660	5,060	4,882	5,888	Single-Family Permits	4,968	3,845	3,870	3,609	3,583
887	648	1,252	970	1,437	896	1,661	Multifamily Permits	856	669	756	682	708
69.5	74.1	80.4	85.8	91.4	96.4	106.0	Existing Home Price ($Ths)	108.7	112.2	116.8	120.4	123.8
2,557	3,274	2,284	2,208	2,994	3,581	7,452	Mortgage Originations ($Mil)	5,731	4,158	3,773	3,735	3,866
2.6	3.2	2.2	1.7	0.8	1.0	0.4	Net Migration (000)	0.9	2.0	1.9	1.7	1.6
4,456	4,146	4;145	4,583	6,179	6,949	7,394	Personal Bankruptcies	6,336	6,513	6,792	6,969	7,098

STRENGTHS & WEAKNESSES

STRENGTHS

- ■ Below-average employment volatility.
- ■ Massive UPS hub acts as a magnet for relocating firms.
- ■ Very low business costs.

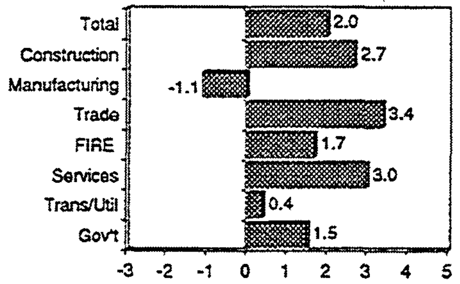
WEAKNESSES

- ght labor markets.
- vulnerable to defense cutbacks, since thousands of military personnel are based in the area.
- ■ Transportation industry is vulnerable to a downturn in the national economy.

CURRENT EMPLOYMENT TRENDS

June 1999 Employment Growth

% Change Year Ago



FORECAST RISKS

SHORT TERM ↓ LONG TERM ↑

UPSIDE

- Production of new SUV at Ford plant leads to large-scale job gains at parts suppliers.

DOWNSIDE

- Tight labor market deters corporate relocations.
- Further cuts at Phillip Morris plant.
- ew Ford SUV Excursion is scrapped due to bad press.

ANALYSIS

Recent Performance. As UPS has completed its recent round of hiring, Louisville's driving industry—transportation and distribution—is no longer expanding. This has led to an overall slowdown in the economy, and brought job growth to below the national rate for the first time in more than a year. Manufacturing industries continue to exert the largest drag on the metro area's economy, however. In particular, Phillip Morris has been making massive cuts at its LOU plant. As job growth has decelerated, LOU's labor market has been afforded some slack. Help-wanted ad volume is falling and the unemployment rate, though still low by national standards, is rising.

Auto manufacturing. LOU's manufacturing industry is proceeding with its transformation toward the production of durable goods. As the secular decline of apparel and textile manufacturing continues and cigarette production falls, durable manufacturing's share of total manufacturing employment in the metro area has increased from 51% in 1991 to 57% currently.

Auto manufacturing accounts for much of the increase in durable payrolls. LOU's Ford operations employ almost 9,000 workers, and have plans to increase production and employment over the next year. The truck plant will produce the new Ford Excursion, which will require 1,100 additional workers. LOU's shift to durable manufacturing is a good development for the metro area's economy. Though subject to downturns in the national economy and correspondingly soft auto demand, these jobs are much less vulnerable than unskilled positions in nondurable industries. Auto manufacturing is much more capital intensive and transportation costs are much higher, which reduces the incentive to locate production facilities overseas. Also, auto manufacturing industry wages are much higher than wages in nondurable goods production, providing a boost to LOU's retail, housing and service industries.

Services. Growth in LOU's services industries has decelerated sharply. As health service expansions have slowed or been cancelled altogether, particularly at Vencor, Inc., service industry employment growth has fallen by half since late last year. The outlook for LOU's service industries is bright, however, with several large expansions planned over the next few years. Most notably, Sykes Health Plan Services Inc. will invest $80 million in a new headquarters campus and hire 2,900 new workers. This expansion was predicated on $32 million in state and local incentives. In addition, Providian Financial Corp., will hire more than 1,000 workers for a new service center.

Risks. LOU's economy faces a number of downside risks. The most prominent is the metro area's tight labor market, which has already stymied expansion efforts. A second risk is a further reduction in cigarette production; Phillip Morris's LOU paper processing plant will remain at risk as long as national cigarette consumption falls. Finally, LOU's financial services industry is at risk of losing a number of headquarters jobs; Louisville-based ARM Financial Group has been rumored to be a takeover target, and if this develops payrolls would likely decline at its headquarters office.

Louisville's transportation and distribution industry will allow the economy to continue to post solid gains. However, the pace of growth will be weaker now that UPS has completed a round of hiring. A slowdown in manufacturing and construction will also curb job growth late this year and into 2000. LOU's greatest advantage remains the favorable living and business cost differential relative to midwestern metro areas, coupled with its proximity to the Midwest. However, weak population trends will limit growth potential in various local industries. LOU's advantages will outweigh disadvantages allowing its economy to expand at an above-average pace.

Ryan T. Cardwell
July 1999

Make-A-*Précis* © 1999 Dismal Sciences, Inc. • 600 Willowbrook Lane, Suite 600 • West Chester, PA 19382 • 610-696-8700 • 610-696-0875 fax • www.rfa.com

For the confidential use of subscribers. Although the information in this report has been obtained from sources that Dismal Sciences, Inc. believes to be reliable, we do not guarantee its accuracy, and such information may be incomplete or condensed.

EMPLOYM T & INDUSTRY

TOP EMPLOYERS

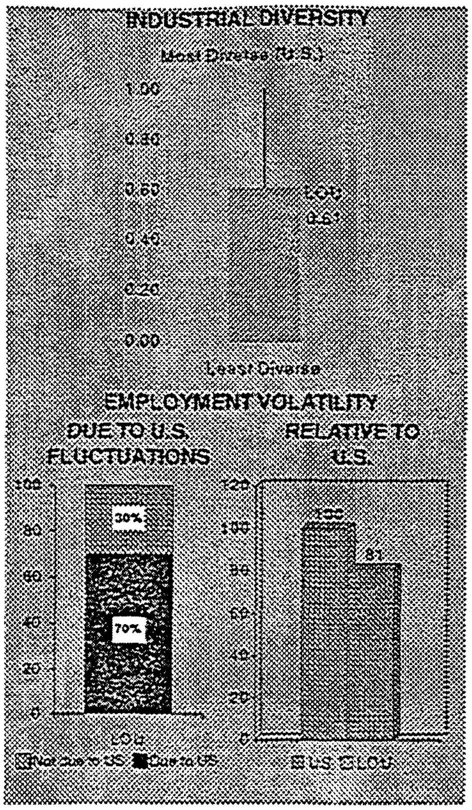
United Parcel Service, Inc.	15,339
Ford Motor Company	8,903
GE Appliances	8,290
Jewish Hospital HealthCare Services	5,138
University of Louisville	4,647
Humana, Inc.	4,523
The Kroger Company	4,430
Alliant Health System	3,911
Louisville Healthcare Network	3,500
American Commercial Lines, Inc.	2,814
LG & E Energy Corporation	2,600
Phillip Morris USA	2,400
Roman Catholic Archdiocese of Louisville	2,275
CARITAS Health Services	2,216
Baptist Hospital East	2,086
Sears, Roebuck & Company	1,985
Bank One Corporation	1,974
Vencor, Inc.	1,916
NPC (National Processing Company)	1,900
Publishers Printing Company	1,800

Source: Business First of Louisville, August 1998

Public

Federal	10,133
State	17,432
Local	42,618

1998

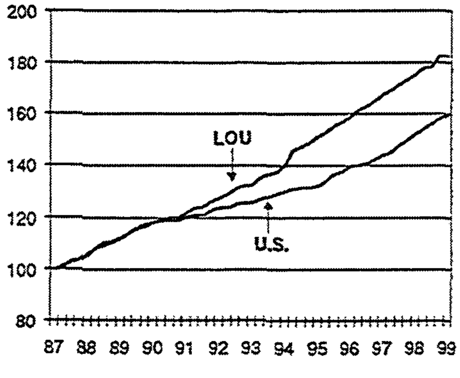


COMPARATIVE EMPLOYMENT AND INCOME

Sector	% of Total Employment LOU	KY	US	Average Annual Earnings LOU	KY	US
Mining	0.1%	1.3%	0.5%	$56,482	$50,904	$51,194
Construction	5.2%	4.8%	4.7%	$29,730	$26,902	$32,860
Manufacturing	15.7%	18.3%	14.9%	$44,205	$38,200	$44,091
Durable	*55.4%*	*58.6%*	*59.3%*	*na*	*$40,201*	*$45,979*
Nondurable	*44.6%*	*41.4%*	*40.7%*	*na*	*$35,482*	*$41,387*
Transport/Utilities	7.5%	5.8%	5.2%	$39,296	$36,740	$43,781
Wholesale Trade	5.6%	4.8%	5.4%	$39,041	$34,672	$42,575
Retail Trade	18.8%	18.9%	17.9%	$15,771	$14,831	$16,664
Finance,Ins.,Real Estate	5.3%	4.0%	5.8%	$34,151	$28,995	$34,930
Services	29.5%	25.2%	29.8%	$25,290	$22,934	$28,483
Memo: Health Services	*9.1%*	*8.7%*	*7.9%*	*na*	*$34,216*	*$36,760*
Government	12.4%	16.8%	15.8%	$29,606	$28,026	$32,829

Percent of total employment - BLS, 1998; Average annual earnings - BEA, 1997

HOUSE PRICES



Source: Freddie Mac/Fannie Mae, 1987Q1=100

CREDIT QUALITY

MOODY'S RATING	Aa3

LEADING INDUSTRIES

SIC	Industry	Employees (000)
581	Eating & drinking places	39.9
806	Hospitals	21.4
531	Department stores	15.1
421	Trucking & courier services ex air	13.3
451	Air transportation, scheduled	11.7
737	Computer and data processing	9.6
864	Civic,social, & fraternal associations	9.6
801	Offices & clinics of medical doctors	9.2
371	Motor vehicles and equipment	9.1
805	Nursing and personal care facilities	8.8
602	Commercial banks	7.5
363	Household appliances	7.5
275	Commercial printing	6.3
734	Services to buildings	5.9
171	Plumbing, heating, air-conditioning	5.6
	High-Tech Employment	13.0
	As % of Total Employment	2.3

Source: BLS, RFA, 1998

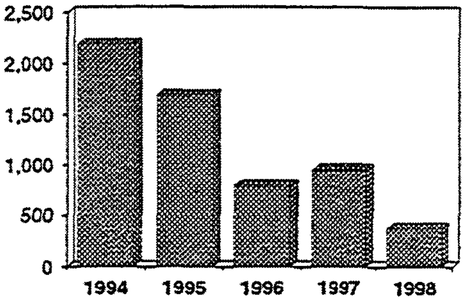
MIGRATION FLOWS

Into Louisville	Number of Migrants	Median Income
Lexington KY	1,027	19,873
Cincinnati OH	468	23,528
Chicago IL	460	34,642
Indianapolis IN	439	26,404
Nashville TN	304	25,096
Atlanta GA	304	28,983
Washington DC	222	39,421
Tampa FL	221	18,979
Evansville IN	211	20,489
St. Louis MO	197	32,372
Total All MSA's	42,913	20,802

From Louisville		
Lexington KY	881	18,608
Cincinnati OH	529	26,538
Indianapolis IN	489	23,171
Nashville TN	401	26,740
Atlanta GA	327	16,293
Tampa FL	255	17,475
Chicago IL	241	32,789
Columbus OH	217	36,733
Washington DC	185	25,501
Jacksonville FL	179	39,007
Total All MSA's	42,508	20,971

Total Net Migration	405	-169

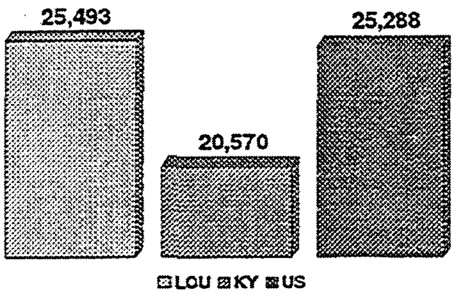
Net Migration, LOU



	Domestic	Foreign	Total
1994	1,678	518	2,196
1995	985	711	1,696
1996	77	722	799
1997	76	875	951
1998	-577	954	377

Source: IRS (top), 1997; Census Bureau, 1998

PER CAPITA INCOME



Source: Bureau of Economic Analysis, 1997

Make-A-Précis © 1999 Dismal Sciences, Inc. • 600 Willowbrook Lane, Suite 600 • West Chester, PA 19382 • 610-696-8700 • 610-696-0875 fax • www.rfa.com
For the confidential use of subscribers. Although the information in this report has been obtained from sources that Dismal Sciences, Inc. believes to be reliable, we do not guarantee its accuracy, and such information may be incomplete or condensed.

Section E

1999 IRP FORECASTING MODEL DESCRIPTIONS, EQUATIONS AND STATISTICAL TEST RESULTS

I. ENERGY SALES FORECASTING MODELS

The short-term energy sales model equations were estimated on the basis of the monthly historical data for January 1994 - December 1998. The annual data for 1981-1998 were used to estimate the long-term energy sales model equations. The estimated model equations are presented in Tables E1 and E2, with the results of the statistical tests performed on the equations. An econometric PC software package called "EVIEWS" was utilized for estimating both the short-term and the long-term model coefficients and conducting statistical robustness tests.

Residential and Small Commercial/industrial Sectors

Residential and small commercial/industrial (or general service) energy sales forecasting models were disaggregated into the equations for non-weather-sensitive (or base) energy sales and weather-sensitive energy sales. The weather-sensitive energy sales models were divided into space-heating energy usage per customer and air-conditioning energy usage per customer equations. In the long-term model, the residential and general service space-heating energy sales were further disaggregated into all-electric space-heating energy sales and regular (or non-electric furnace) space-heating energy sales. The primary use of the regular space-heating energy is for the circulating fan of gas furnaces. In the short-term model, the general service sector was divided into non-public-authority and public authority classes.

In the short-term model, monthly sales data were used to disaggregate total class sales into base usage and weather-sensitive usage. Each classes' base KWH sales, by month and year, were determined by using the load research data and ex post analysis of forecast residuals. The load research data are used to set initial values. The initial values of base loads are vigorously tested and adjusted through an iteration procedure based on regression analysis of monthly energy sales and simulation of actual sales. The iteration procedure is completed when the final estimate of base load and subsequent estimate of temperature-sensitive load yield ex post forecasts of monthly sales fairly close to the actual sales for every month.

The base usage and the separately-metered outdoor lighting and electric water heating sales were subtracted from monthly total sales. The remainder was defined as space-heating energy sales if the month is in the winter season, or air-conditioning sales if the month belongs to the summer season, or a combination of heating and cooling energy sales if the month is in the swing season. The winter season covers November through April, the summer season includes June through September and the swing seasons are May and October. Primary drivers of the short-term residential and small commercial energy sales are heating degree days (HDD), cooling degree days (CDD), monthly variation factors which allow the weather variable coefficients to change each month, and a short-term trend variable.

In the long-term model, annual residential and small commercial energy sales were broken down into base usage, space-heating usage and air-conditioning usage by assuming the minimum-usage month's sales as the base usage of the class in each month of the year. The base usage amount was then subtracted from each month's total energy sales to the class. The residential space-heating usage was further broken down into all-electric space-heating usage and non-electric-furnace space-heating energy usage. *LG&E* records the energy sales to all-electric residential customers separately from the energy sales to "other" residential customers. Therefore, application of the same "minimum-monthly-usage" approach to the all-electric customer sales yielded the estimates of all-electric space-heating usage. The same approach was followed to separate the non-electric-furnace space heating usage from the monthly total sales to "other" residential customers.

The main explanatory variables of the long-term residential energy sales model are the real price of electricity by season and the real per capita personal income, cooling and heating degree days, the composite saturation rate of air conditioners, and a long-term trend variable. The real values of price and income are in 1982-1984 dollar and 1992 dollar, respectively. The main drivers of the small commercial model are the real price of electricity by season, the service industry employment, cooling and heating degree days, and a long-term trend variable.

The estimated usage per customer model coefficients reflect a slightly increasing trend in base (non-weather-sensitive) usage of both residential and small commercial customers but a slightly declining trend in residential weather-sensitive usage. Rising penetration of new electric appliances, such as personal computers, microwave ovens and home entertainment systems, is believed to be responsible for the increasing trend. The slightly declining trend in weather-sensitive usage is actually a net effect of two phenomena happening in the energy market. The utilization rate of weather-sensitive appliances has been gradually increasing due to the stabilization of energy prices and the increase in real per capita income over the last several years. Capital investments for conservation and retrofitting of old appliances with more energy-efficient units continuously reduce residential air-conditioning and space-heating energy usage.

Large Commercial Sector

The short-term forecasting model of large commercial energy sales also consists of non-weather-sensitive (base load) energy sales, space-heating energy sales and air-conditioning energy sales equations. Similar to the case of residential and general service sales modeling, the base load for each month and year was determined by using the load research data and ex post analysis of forecast residuals. The main drivers of the large commercial sales model are annual trend variables, heating and cooling degree days, and monthly factors for weather sensitivity. Like the general service sales models, separate model equations were developed for the non-public-authority class and public authority class. Fort Knox is classified as a large commercial public authority customer under a special contract rate. Sales to Fort Knox were modeled with separate equations.

The long-term large commercial energy sales forecasting model is a single-equation model. The variables included in the model are the real price of electricity, non-manufacturing employment, cooling degree days and a long-term trend variable. A small positive coefficient estimated for the long-term trend variable implies that the net impact of the increasing trend in base load and the decreasing trend in weather-sensitive sales will be a slight increase in total usage per customer.

Large Industrial Sector

The short-term forecasting model for large industrial energy sales has the capability to individually forecast energy sales to each of the twenty-five largest LG&E customers. Energy sales to those twenty-five customers comprise about 75% of total large industrial energy sales. Sales to the top twenty-five customers were projected for the next five years by combining the individual future usage information provided by the industrial customer survey conducted through the LG&E Account Executives, with their most recent five-year (1994-1998) compound sales growth rates. The remainder of the large industrial sales was forecasted in aggregate using the annual growth rates of 1.0% for 2000, 3.5% for 2001, and 2.0% for 2002-2004. The annual growth rates projected for 2000 (1.0%) and 2001 (3.5%) reflect the slowdown of the regional economy in 2000 and the catch-up growth in 2001 predicted by the Regional Financial Associates. The annual growth rate projected for 2002-2004 (2.0%) is the average annual compound growth rate experienced during 1994-1998.

In the long-term forecasting model, the top twenty-five customers were classified by their standard industrial classification (SIC) code. Econometric analyses were performed by the University of Louisville on energy sales to each of the thirteen SIC groups for the top twenty-five customers and a separate group for the residual customers. The main drivers of the large industrial sales model are industrial productivity index by SIC, electric energy intensity by industry and trend variables. The modeling results and forecasts are provided in pp. 13-18 of the U of L's forecasting study report attached in Section D of Appendix 1.

Street Lighting Sector

The change in street lighting energy sales is a function of the change in the number of street lights, the number of retrofitted bulbs and energy efficiency improvements in new street lights. The future rate of increase in street lighting energy sales was projected by using the ratio of the street lighting energy sales growth rate to the residential customer growth rate averaged over the years of 1993-1998. Therefore, future annual growth rates for street lighting energy sales are estimated by multiplying the projected annual growth rates of residential customers by the street lighting growth ratio.

II. PEAK DEMAND FORECASTING MODEL

The 1999 peak demand model has two equations; one for summer peak load and another for winter peak load. In both of the model equations, the number of residential customers was used to reflect the growth of the demographic base. The reason for using the number of residential customers to track the service area's population growth is that historical numbers of residential customers are directly observable and readily available, while annual population figures are estimates which are reported with a one or two year time lag in the census years. Temperature-Humidity Index averaged for the twenty-four hour period prior to the time of peak demand was included to accommodate the cumulative impact of weather on summer peak load. Heating degree hours at the time of peak demand was selected for the winter peak demand equation.

III. CUSTOMER FORECASTING MODEL

Both the short-term and long-term residential and small commercial (or general service) energy sales forecasts were produced by multiplying the per customer usage forecast from the energy sales model by the number of customers forecast from the customer forecasting model.

As explained in section 7.(7)(b), the annual total number of residential customers were forecasted based on the population projections provided by the University of Kentucky and *LG&E's* projected number of persons per residential electric customer. *LG&E's* forecast of the number of persons per residential electric customer was produced by using the Gompertz-curve equation estimated in Table E2.

As shown in Table A9 of Section A, Appendix 1, the number of residential all-electric customers was fairly stable for the last several years. New residential gas service was restricted from October 1973 through August 1980. With the gas service moratorium lifted, new residential customers and also existing all-electric customers were allowed to receive gas service. As heat pumps and electric resistance heaters installed during the moratorium period have reached the end of their service lives in recent years, the residential customers' conversion to gas service has become fairly active. The number of conversions in 1998 almost canceled out the number of new all-electric customer additions. The economic advantage of natural gas as a heating fuel source over electricity is quite obvious from the current level and foreseeable prospects of the gap between LG&E's gas and electricity prices. The main reason for new all-electric customers is their inaccessability to gas mains or the high cost of gaining access to gas mains. The number of residential all-electric customers is expected to grow from 40,723 in 1998 according to the annual growth rates estimated by prorating the annual growth rates projected for total residential customers with the average of 1997 and 1998 ratios of electric space-heating customer growth rate to the total residential customer growth rate.

The number of general service customers was forecasted as a function of growth in the population base and a long-term trend. The estimated model equation for general service customers is reported in Table E2. As implied by a positive coefficient of the trend variable, per capita demand for retail trade, financial and other small commercial/industrial services would increase over time as the standard of living increases. Due to the same reasons cited for the case of all-electric residential customers, the number of general service electric space-heating customers has been declining since 1991. The declining trend of those customers is reflected in Table A9 of Section A, Appendix 1, along with the history of all-electric residential customers. The economic advantage of natural gas as a heating fuel source over electricity is assumed to continue during the forecast period. The number of general service electric space-heating customers was projected to decrease from 1,064 in 1998 at an annual rate of 1.42%. The annual rate of decrease was estimated from the average rate of decrease experienced in 1993-1998.

The short-term large commercial energy sales forecasting model is also a per customer usage model and requires customer projections to produce an energy sales forecast for the class. The annual growth rates projected for 1999-2004 were obtained by adjusting the average annual growth rate for 1993-1998 with RFA's short-term regional economic forecast.

TABLE E1

SHORT-TERM MODEL EQUATIONS FOR ENERGY SALES

I. Residential Sector

RSMWH = RSNWS + RSOLWH + RSSHS + RSACS

A. Non-Weather-Sensitive Energy Sales

RSNWS = RSNWSPC*RSCUST*BILLDAYS

RSNWSPC =20.57+0.31*(Year-1998)

B. Outdoor Lighting and Water Heating Energy Sales

Annual total sales for residential outdoor lighting and water heating in 1999-2004 were forecasted by compounding the 1998 actual energy sales with the five-year (1993-1998) average annual growth rates of 3.78% and -5.40%, respectively. Monthly sales forecasts were then generated by distributing the projected annual totals to each month on the basis of the five-year (1993-1998) average ratios of monthly sales to annual total. The five-year average monthly allocation factors are as follows:

Month	Outdoor Lighting	Water Heating
1	10.01%	10.74%
2	8.49%	10.23%
3	8.59%	9.90%
4	7.46%	9.40%
5	7.01%	8.51%
6	6.41%	7.78%
7	6.86%	7.02%
8	7.53%	6.46%
9	8.11%	6.46%
10	9.26%	6.86%
11	9.75%	7.65%

12	10.52%	8.98%
Total	100.00%	100.00%

C. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

RSSHS = RSSHSPC*RSCUST

RSSHSPC = 0.37096*(HDD)-0.02299*(D2*HDD)-0.08001*(D3*HDD)
(60.379) (-4.344) (-7.616)
-0.14629*(D4*HDD)-0.11119*(D11*HDD)
(-8.484) (-6.885)
-0.04903*(D12*HDD)-6.77033*TREND
(-2.807) (-4.267)
+60.77705*D294
(16.162)

$R^2 = 0.9889$
$S\hat{y} = 13.49892$
D.W. = 1.2435

Notes:
i) The value in the parenthesis below each of the model coefficients represents t-statistic for the corresponding variable.
ii) R^2 = The coefficient of multiple determination.
iii) $S\hat{y}$ = Standard error of the regression.
iv) D.W. = Durbin-Watson Statistic.

2) Air-conditioning energy sales, June - September

RSACS = RSACSPC*RSCUST

RSACSPC = 1.63208*(CDD)+0.18643*(D7*CDD)+0.20526*(D8*CDD)
(30.962) (3.126) (3.446)
+0.12647*(D9*CDD)
(1.999)

$R^2 = 0.9864$
$S\hat{y} = 25.05965$
D.W. = 1.4537

3) Air-conditioning and space-heating energy sales, May & October

$$RSWSS = RSWSPC * RSCUST$$

$$\begin{aligned} RSWSPC = \underset{(22.861)}{1.33651*(CDD)} + \underset{(0.328)}{0.03035*(D10*HDD)} \end{aligned}$$

$$R^2 = 0.9720$$
$$S\hat{y} = 12.86448$$

II. Small Commercial/Industrial Sector

1. Non-Public-Authority Class

$$GSMWH = GSNWS + GSOLWH + GSSHS + GSACS$$

A. Non-Weather-Sensitive Energy Sales

$$GSNWS = GSNWSPC*GSCUST*BILLDAYS$$

$$GSNWSPC = 75.8*1.012^{(year-1998)}$$

B. Outdoor Lighting and Water Heating Energy Sales

Annual General Service outdoor lighting and water heating energy sales were forecasted by compounding the 1998 actual energy sales with the five-year average annual growth rate (1993-1998) of 5.65%. Monthly sales forecasts were then generated by distributing the projected annual totals to each month on the basis of the five-year (1993-1998) average ratios of monthly sales to annual total. The five-year average monthly allocation factors are as follows:

Month	Outdoor Lighting & Water Heating
1	9.91%
2	8.40%

3	8.50%
4	7.49%
5	7.01%
6	6.45%
7	6.87%
8	7.53%
9	8.11%
10	9.33%
11	9.77%
12	10.63%
Total	100.00%

C. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

$$GSSHS = GSSHSPC * GSCUST$$

$$GSSHSPC = 0.41267*(HDD)+0.13763*(D2*HDD)-99.52534*Ln(TREND94)$$

(13.327) (3.603) (-5.751)

$$R^2 = 0.8495$$
$$S\hat{y} = 64.32425$$
$$D.W. = 1.3205$$

2) Air-conditioning energy sales, May - October

$$GSACS = GSACSPC \times GSCUST$$

$$GSACSPC = 188.0888+1.22092*(CDD)+1.29929*(D6*CDD)$$

(29.642) (2.397) (3.051)

$$+1.33745*(D7*CDD)+1.46118*(D8*CDD)$$

(2.913) (3.179)

$$+1.50596*(D9*CDD)+1.34482*(D10*CDD)$$

(3.359) (3.367)

$$-36.83847*TREND93$$

(-6.292)

$$R^2 = 0.9913$$
$$S\hat{y} = 43.68619$$
$$D.W. = 2.2622$$

2. Public Authority Class

$$GSPAMWH = GSPANWS + GSPAWHS + GSPASHS + GSPAACS$$

A. Non-Weather-Sensitive Energy Sales

$$GSPANWS = GSPANWSPC*GSCUST*BILLDAYS$$

$$GSPANWSPC = 142.6*1.012^{(year-1998)}$$

B. Water Heating Energy Sales

Annual General Service Public Authority water heating energy sales were forecasted by compounding the 1998 actual energy sales with the five-year average annual growth rate (1993-1998) of -15.36%. Monthly sales forecasts were then generated by distributing the projected annual totals to each month on the basis of the five-year (1993-1998) average ratios of monthly sales to annual total. The five-year average monthly allocation factors are as follows:

Month	Water Heating
1	10.50%
2	9.77%
3	9.20%
4	9.02%
5	9.09%
6	8.79%
7	7.02%
8	6.49%
9	6.29%
10	7.06%
11	7.80%
12	8.98%
Total	100.00%

C. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

$$GSPASHS = GSPASHSPC * GSPACUST$$

$$\begin{aligned} GSPASHSPC = {} & \underset{(11.698)}{1.00568*(HDD)} + \underset{(3.824)}{0.57421*(D2*HDD)} \\ & + \underset{(3.362)}{0.65519*(D3*HDD)} \end{aligned}$$

$$R^2 = 0.7348$$
$$S\hat{y} = 248.062$$
$$D.W. = 1.4111$$

2) Air-conditioning energy sales, May - October

$$GSPAACS = GSPAACSPC * GSPACUST$$

$$\begin{aligned} GSPAACSPC = {} & \underset{(23.409)}{3.45695*(CDD)} + \underset{(8.775)}{2.79332*(D9*CDD)} \\ & + \underset{(5.944)}{4.66833*(D10*CDD)} \end{aligned}$$

$$R^2 = 0.9039$$
$$S\hat{y} = 201.9757$$
$$D.W. = 2.3092$$

III. Large Commercial Sector

1. Non-Public-Authority Class

$$LCMWH = LCNWS + LCSHS + LCACS$$

A. Non-Weather-Sensitive Energy Sales

$$LCNWS = LCNWSPC*LCCUST*BILLDAYS$$

$$LCNWSPC = 2238.8*1.0051^{(year-1998)}$$

B. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

$$LCSHS = LCSHSPC * LCCUST$$

$$\begin{array}{llll} LCSHSPC = & 2.39023*HDD & +2.33166*(D2*HDD) & +2.94827*(D11*HDD) \\ & (4.280) & (3.368) & (2.043) \\ & +1049.0*\ln(TREND94) & & \\ & (3.234) & & \end{array}$$

$$R^2 = 0.5702$$
$$S\hat{y} = 1159.552$$
$$D.W. = 1.5241$$

3) Air-conditioning energy sales, May - October

$$LCACS = LCACSPC * LCCUST$$

$$\begin{array}{lll} LCACSPC = & 55.0792*(CDD) & +2525.367*\ln(TREND94) \\ & (26.509) & (4.734) \end{array}$$

$$R^2 = 0.9388$$
$$S\hat{y} = 2143.958$$
$$D.W. = 1.3075$$

2. Public Authority Class

$$LCPAMWH = LCPANWS + LCPASHS + LCPAACS$$

A. Non-Weather-Sensitive Energy Sales

$$LCNWS = LCNWSPC*LCCUST*BILLDAYS$$

$$LCNWSPC = 4538.2*1.0051^{(year-1998)}$$

B. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

$$\text{LCPASHS} = \text{LCPASHSPC} * \text{LCPACUST}$$

$$\begin{aligned}\text{LCPASHSPC} = {} & \underset{(2.080)}{7.33911}*\text{HDD} + \underset{(4.460)}{11.41801}*(\text{D2}*\text{HDD}) + \underset{(4.004)}{13.11805}*(\text{D3}*\text{HDD}) \\ & + \underset{(2.435)}{7.09809}*(\text{D12}*\text{HDD}) + \underset{(2.123)}{3936.172}*\ln(\text{TREND94})\end{aligned}$$

$R^2 = 0.7176$
$S\hat{y} = 4146.030$
$\text{D.W.} = 1.7869$
$\rho_1 = 0.3024$

Notes: ρ_1 = First-order autocorrelation coefficient.

3) Air-conditioning energy sales, May - October

$$\text{LCPAACS} = \text{LCPAACSPC} * \text{LCPACUST}$$

$$\begin{aligned}\text{LCACSPC} = {} & \underset{(14.774)}{179.5228}*(\text{CDD}) \underset{(-2.832)}{-127.9546}*(\text{D5}*\text{CDD}) \underset{(-4.834)}{-80.73447}*(\text{D6}*\text{CDD}) \\ & \underset{(-7.045)}{-76.35127}*(\text{D7}*\text{CDD}) \underset{(-5.831)}{-50.07364}*(\text{D8}*\text{CDD}) \\ & + \underset{(2.097)}{9636.320}*\ln(\text{TREND94})\end{aligned}$$

$R^2 = 0.9443$
$S\hat{y} = 6396.243$
$\text{D.W.} = 1.4559$
$\rho_1 = 0.7198$

3. Fort Knox

FKMWH = FKNWS + FKSHS + FKACS

A. Non-Weather-Sensitive Energy Sales

$$FKNWS = 155532*0.99^{(year-1998)}$$

B. Weather-Sensitive Energy Sales

1) Space-heating energy sales, November - April

$$\underset{(6.596)}{FKSHS = 1.18778*HDD} + \underset{(3.192)}{0.66877*(D2*HDD)} + \underset{(3.817)}{1.06851*(D3*HDD)}$$

$$R^2 = 0.6030$$
$$S\hat{y} = 366.795$$
$$D.W. = 1.8718$$
$$\rho_1 = 0.3526$$

3) Air-conditioning energy sales, May - October

$$FKACS = \underset{(16.094)}{15.00831*(CDD)} - \underset{(-2.623)}{1.79788*(D7*CDD)}$$

$$R^2 = 0.9149$$
$$S\hat{y} = 698.895$$
$$D.W. = 1.7353$$
$$\rho_1 = 0.7273$$

V. Large Industrial (or Power) Sector

Sales to the top 25 customers were projected for the next five years by combining the individual future usage information provided by the industrial customer survey conducted through LG&E Account Executives with their most recent five-year (1994-1998) compound growth rates. The remainder of the large industrial sales was forecasted by using the annual growth rate of 1.0% for 2000, 3.5% for 2001, and 2.0% for 2002-2004.

TABLE E1(continued.)

LIST OF VARIABLES FOR THE SHORT-TERM FORECASTING MODELS

	Variable Name	Description
1.	BILLDAYS	Number of days included in a given monthly bill.
2.	CDD	Monthly total cooling degree days calculated with daily average temperatures based on 24 hourly readings
3.	D2	Dummy variable for the month of February; equals one if the month is February, zero otherwise.
4.	D3	Dummy variable for the month of March; equals one if the month is March, zero otherwise.
5.	D4	Dummy variable for the month of April; equals one if the month is April, zero otherwise.
6.	D5	Dummy variable for the month of May; equals one if the month is May, zero otherwise.
7.	D6	Dummy variable for the month of June; equals one if the month is June, zero otherwise.
8.	D7	Dummy variable for the month of July; equals one if the month is July, zero otherwise.
9.	D8	Dummy variable for the month of August; equals one if the month is August, zero otherwise.
10.	D9	Dummy variable for the month of September; equals one if the month is September, zero otherwise.
11.	D10	Dummy variable for the month of October; equals one if the month is October, zero otherwise.
12.	D11	Dummy variable for the month of November; equals one if the month is November, zero otherwise.
13.	D12	Dummy variable for the month of December; equals one if the month is December, zero otherwise.

14.	GSACS	Air-conditioning energy sales to non-public-authority general service (or small commercial) customers.
15.	GSACSPC	Non-public-authority general service air-conditioning energy sales per customer.
16.	GSCUST	Total number of non-public-authority general service customers.
17.	GSMWH	Total energy sales to non-public-authority general service customers.
18.	GSNWS	Non-weather-sensitive (or base load) energy sales to non-public-authority general service customers.
19.	GSNWSPC	Non-public-authority general service non-weather-sensitive energy sales per customer.
20.	GSOLWH	Outdoor lighting and water heating energy sales to general service customers.
21.	GSPAACS	Air-conditioning energy sales to public authority general service customers.
22.	GSPAACSPC	Public authority general service air-conditioning energy sales per customer.
23.	GSPACUST	Total number of public authority general service customers.
24.	GSPAMWH	Total energy sales to public authority general service customers.
25.	GSPANWS	Non-weather-sensitive (or base load) energy sales to public authority general service customers.
26.	GSPANWSPC	Public authority general service non-weather-sensitive energy sales per customer.
27.	GSPASHS	Space heating energy sales to public authority general service customers.
28.	GSPASHSPC	Public authority general service space-heating energy sales per customer.
29.	GSPAWHS	Water heating energy sales to public authority general service

		customers
30.	GSSHS	Space heating energy sales to non-public-authority general service customers.
31.	GSSHSPC	Non-public-authority general service space-heating energy sales per customer.
32.	HDD	Monthly total heating degree days.
33.	LCACS	Air-conditioning energy sales to non-public-authority large commercial customers.
34.	LCACSPC	Non-public-authority large commercial air-conditioning energy sales per customer.
35.	LCCUST	Total number of non-public-authority large commercial customers.
36.	LCMWH	Total energy sales to non-public-authority large commercial customers.
37.	LCNWS	Non-weather-sensitive (or base load) energy sales to non-public-authority large commercial customers.
38.	LCNWSPC	Non-public-authority large commercial non-weather-sensitive energy sales per customer.
39.	LCPAACS	Air-conditioning energy sales to public authority large commercial customers.
40.	LCPAACSPC	Public-authority large commercial air-conditioning energy sales per customer.
41.	LCPACUST	Total number of public authority large commercial customers.
42.	LCPAMWH	Total energy sales to public authority large commercial customers.
43.	LCPANWS	Non-weather-sensitive (or base load) energy sales to public authority large commercial customers.
44.	LCPANWSPC	Public authority large commercial non-weather-sensitive energy sales per customer.

45.	LCPASHS	Space-heating energy sales to non-public-authority large commercial customers.
46.	LCPASHSPC	Non-public-authority large commercial space-heating energy sales per customer.
47.	LCSHS	Space-heating energy sales to non-public-authority large commercial customers.
48.	LCSHSPC	Non-public-authority large commercial space-heating energy sales per customer.
49.	RSACS	Air-conditioning energy sales to residential customers.
50.	RSACSPC	Residential air-conditioning energy sales per customer.
51.	RSCUST	Total number of residential customers.
52.	RSMWH	Total energy sales to residential customers.
53.	RSNWS	Non-weather-sensitive energy sales to residential customers.
54.	RSNWSPC	Residential non-weather-sensitive energy sales per customer.
55.	RSOLWH	Outdoor lighting and water heating energy sales to residential customers.
56.	RSSHS	Space-heating energy sales to residential customers.
57.	RSSHSPC	Residential space-heating energy sales per customer.
58.	TREND94	The current year minus 1994.
59.	YEAR	The current year.

TABLE E2

LONG-TERM MODEL EQUATIONS FOR ENERGY SALES, PEAK DEMAND AND CUSTOMER FORECASTING

I. Residential Energy Sales

$$RSMWH = RSNWS + RSACS + RSESHS + RSNESHS$$

1) Non-weather-sensitive energy sales

$$RSNWS = RSNWSPC * RSCUST$$

$$\ln(RSNWSPC) = \underset{(55.562)}{8.94749}\underset{(-1.595)}{-0.06089}*\ln(RSPRICE) \underset{(8.369)}{+0.07123}*\ln(TREND)$$

$$R^2 = 0.9374$$
$$S\hat{y} = 0.01811$$
$$D.W. = 2.2492$$

2) Air-conditioning energy sales

$$RSACS = RSACSPC * RSCUST$$

$$\ln(RSACSPC) = \underset{(-1.043)}{-0.13601}*\ln(RSSUMPR) \underset{(8.523)}{+1.14911}*\ln(CDD*ACSAT)$$
$$\underset{(0.348)}{+0.03534}*\ln(PCINC)\underset{(-3.598)}{-0.14605}*\ln(TREND)$$

$$R^2 = 0.8754$$
$$S\hat{y} = 0.07137$$
$$D.W. = 1.4953$$

$$\ln(\ln(ACSAT)) = \ln(\ln(0.7763)) + t*\ln(0.8864)$$
where $t = \text{year} - 1986$

Notes: i) The value in parenthesis below each of the model coefficients represents t-Statistic for the corresponding variable.
ii) R^2 = The coefficient of multiple determination.
iii) $S\hat{y}$ = Standard error of the regression.
iv) D.W. = Durbin-Watson Statistic.

3) Electric space-heating energy sales

RSESHS = RSESHPC * RSESHCUST

$$\ln(\mathrm{RSESHPC}) = -0.91761*\ln(\mathrm{RSWINPR}) + 1.56718*\ln(\mathrm{HDD}) - 0.45066*\ln(\mathrm{TREND})$$
$$(-2.345) \qquad\qquad (7.096) \qquad\qquad (-2.131)$$

$R^2 = 0.7993$
$S\hat{y} = 0.09663$
D.W. = 1.9845
$\rho_1 = 0.3024$

Notes: ρ_1 = First-order autocorrelation coefficient

4) Non-electric space-heating energy sales

RSNESHS = RSNESHPC * RSNESHCUST

$$\ln(\mathrm{RSNESHPC}) = -0.92036*\ln(\mathrm{RSWINPR}) + 1.11482*\ln(\mathrm{HDD})$$
$$(-4.051) \qquad\qquad (10.787)$$

$R^2 = 0.5105$
$S\hat{y} = 0.16281$
$\rho_1 = -0.6626$
D.W. = 2.7355

II. Small Commercial (or General Service) Energy Sales

GSMWH = GSNWS + GSACS + GSESHS +GSNESHS

1) Non-weather-sensitive energy sales

GSNWS = GSNWSPC * GSCUST

$$\ln(\mathrm{GSNWSPC}) = 8.51196 + 0.66663*\ln(\mathrm{SERVEMP/GSCUST})$$
$$(8.972) \qquad (1.829)$$

$R^2 = 0.9020$
$S\hat{y} = 0.02094$
D.W. = 2.1916
$\rho_1 = 0.6854$

2) Air-conditioning energy sales

GSACS = GSACSPC * GSCUST

$$\begin{array}{ll} \ln(GSACSPC) = & -0.02988*\ln(GSSUMPR)+0.67886*\ln(SERVEMP/GSCUST) \\ & (-0.239) \qquad\qquad\qquad\quad (2.317) \\ & +0.91777*\ln(CDD) \\ & \quad (9.114) \end{array}$$

$R^2 = 0.8327$
$S\hat{y} = 0.06416$
D.W. = 2.0484
$\rho_1 = 0.5136$

3) Electric space-heating energy sales

GSESHS = GSESHSPC * GSESHCUST

$$\begin{array}{ll} \ln(GSESHSPC) = & 3.22131+0.87749*\ln(HDD)-0.08226*\ln(TREND) \\ & (2.696) \quad (6.193) \qquad\qquad (-5.464) \end{array}$$

$R^2 = 0.8796$
$S\hat{y} = 0.04606$
D.W. = 1.7081

4) Non-electric space-heating energy sales

GSNESHS = GSNESHSPC * GSNESHCUST

$$\begin{array}{ll} \ln(GSNESHSPC) = & -0.85816*\ln(GSWINPR)+1.20874*\ln(HDD) \\ & \quad (-1.111) \qquad\qquad\qquad (3.404) \end{array}$$

$R^2 = 0.4937$
$S\hat{y} = 0.20255$
D.W. = 1.6653
$\rho_1 = 0.5665$

III. Large Commercial Energy Sales

$$\ln(LCMWH) = \underset{(7.198)}{12.22404} \underset{(-2.436)}{-0.11900}*\ln(LCPRICE) \underset{(5.779)}{+0.68892}*\ln(NMFGEMP) \\ \underset{(4.782)}{+0.06978}*\ln(CDD) \underset{(8.696)}{+0.08483}*\ln(TREND)$$

$$R^2 = 0.9987$$
$$S\hat{y} = 0.00756$$
$$D.W. = 2.8591$$

IV. Large Industrial (or Power) Energy Sales

Refer to pp. 13-18 of the U of L's Forecasting Study Report attached in Section D of Appendix 1.

V. Peak Demand

1) Summer (or annual) peak demand

$$\ln(SUMPIK) = \underset{(-16.156)}{-23.79561} \underset{(5.722)}{+1.53274}*\ln(THI24) \underset{(28.738)}{+1.96900}*\ln(RSCUST)$$

$$R^2 = 0.9770$$
$$S\hat{y} = 0.02155$$
$$D.W. = 2.0221$$

2) Winter peak demand

$$\ln(WINPIK) = \underset{(-9.294)}{-13.26389} \underset{(5.562)}{+0.29148}*\ln(HDH) \underset{(13.121)}{+1.54192}*\ln(RSCUST)$$

$$R^2 =0.9365$$
$$S\hat{y} = 0.02969$$
$$D.W. = 1.7630$$

VI. Number of Customers

1) Total number of residential customers

RSCUST = POP / RSSIZE

$$\ln(\ln(RSSIZE/2)) = \underset{(-15.447)}{\ln(\ln(1.69318))} + \underset{(-20.403)}{T*\ln(0.95816)}$$

$R^2 = 0.9974$
$S\hat{y} = 0.01355$
D.W. = 2.2819

2) Number of residential electric space-heating customers

RSESHCUST = will grow from 40,723 in 1998 according to the annual growth rates estimated by prorating the annual growth rates projected for total residential customers with the average of 1997 and 1998 ratios of electric space-heating customer growth rate to total residential customer growth rate.

3) Number of small commercial (or general service) customers

$$GSCUST = \underset{(42.540)}{0.03764*POP} + \underset{(10.762)}{512.1108*T}$$

$R^2 = 0.9917$
$S\hat{y} = 257.5439$
D.W. = 1.5701
$\rho_1 = 0.7049$

4) Number of small commercial electric space-heating customers

GSESHCUST = will decrease from 1,064 in 1998 at an annual rate of 1.42 %.

3) Number of large commercial customers

LCCUST = will increase at the annual growth rates projected by adjusting the average annual growth rate experienced during 1993-1998 with RFA's short-term regional economic forecast.

TABLE E2(continued.)

LIST OF VARIABLES FOR THE LONG-TERM FORECASTING MODELS

	Variable Name	Description
1.	ACSAT	Composite rate of residential air-conditioner saturation weighted by BTU capacity size of central units and window units.
2.	CDD	Monthly total cooling degree days.
3.	GSACS	Air-conditioning energy sales to general service (or small commercial/industrial) customers.
4.	GSACSPC	General service air-conditioning energy sales per customer.
5.	GSCUST	Total number of general service customers.
6.	GSESHCUST	Number of electric space-heating general service customers.
7.	GSESHS	Electric space-heating energy sales to general service customers.
8.	GSESHSPC	General service electric space-heating energy sales per customer.
9.	GSMWH	Total energy sales to general service customers in MWH.
10.	GSNESHCUST	Number of non-electric space-heating general service customers.
11.	GSNESHS	Space-heating energy sales to general service non-electric space-heating customers.
12.	GSNESHSPC	General service space-heating energy sales per non-electric space-heating customer.
13.	GSNWS	Non-weather-sensitive (or base) energy sales to general service customers.
14.	GSNWSPC	General service non-weather-sensitive energy sales per customer.
15.	GSSUMPR	Real price of electricity per MWH during the summer months for general service customers.

16.	GSWINPR	Real price of electricity per MWH during the winter months for general service customers.
17.	HDD	Monthly total heating degree days.
18.	HDH	Heating degree hour at the time of winter peak demand.
19.	LCCUST	Number of large commercial customers.
20.	LCMWH	Annual total energy sales to large commercial customers in MWH.
21.	LCPRICE	Real price of electricity per MWH for large commercial customers.
22.	NMFGEMP	Non-manufacturing employment.
23.	PCINC	Per capita personal income in real terms.
24.	POP	Population of the *LG&E* electric service area.
25.	RSACS	Air-conditioning energy sales to residential customers.
26.	RSACSPC	Residential air-conditioning energy sales per customer.
27.	RSNESHCUST	Number of electric space-heating (or all-electric) customers.
28.	RSCUST	Total number of residential customers.
29.	RSESHCUST	Number of residential electric space-heating (or all-electric) customers.
30.	RSESHS	Electric space-heating energy sales to residential customers.
31.	RSESHPC	Residential electric space-heating energy sales per all-electric customer.
32.	RSMWH	Total energy sales to residential customers in MWH.
33.	RSNESHCUST	Number of residential non-electric space-heating customers.
34.	RSNESHS	Space-heating energy sales to residential non-electric space-heating customers.

35.	RSNESHPC	Space-heating energy sales per residential non-electric space-heating customer.
36.	RSNWS	Non-weather-sensitive (or base) energy sales to residential customers.
37.	RSNWSPC	Residential non-weather-sensitive energy sales per customer.
38.	RSPRICE	Real price of residential electricity per MWH averaged for year-round.
39.	RSSIZE	Number of persons per residential electric customer.
40.	RSSUMPR	Real price of electricity per MWH during the summer months for residential customers.
41.	RSWINPR	Real price of electricity per MWH during the winter months for residential customers.
42.	SERVEMP	Service industry employment.
43.	SUMPIK	Summer (or annual) peak demand in MW.
44.	T	Time variable equal to year minus 1970.
45.	THI24	Average temperature-humidity index during the twenty-four hours prior to the time of summer peak demand.
46.	TREND	Long-term trend variable equal to year minus 1980.
47.	WINPIK	Winter peak demand in MW.

TECHNICAL APPENDIX 2

Kentucky Utilities Co.

Kentucky
Utilities
Company

A SUBSIDIARY OF
LG&E ENERGY

1999 – 2013
Energy & Demand Forecast

October 1999

With Extended Forecast to 2028

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

LIST OF GRAPHS

LIST OF GRAPHS

LIST OF GRAPHS

KENTUCKY UTILITIES COMPANY
ENERGY AND DEMAND FORECAST
1999 - 2013

EXECUTIVE SUMMARY

Kentucky Utilities Company provides electrical service to customers in seventy-seven counties throughout the Commonwealth of Kentucky and to customers in five counties in Southwestern Virginia through its Old Dominion Power operating unit. In addition, the Company sells electricity to 11 municipally owned utilities in Kentucky, Berea College (a privately owned utility), and to the municipality of Pitcairn, Pennsylvania. The Company serves such diverse classes of retail customers as: industrial, commercial, residential, coal mining, and street lighting.

Forecasting future energy and demand is essential for the planning and control of the Company's operations. The forecast becomes the basis for the decisions regarding construction of facilities, such as: power plants, transmission and distribution lines, and substations, all of which are vital to providing reliable service. The energy forecast also becomes the basis for estimating revenues, which in turn are used in the development of the annual operating budget and the five-year financial forecast.

Vital as the information is, the energy and demand forecast remains an estimate. The desired outcome of the forecasting process is a reasonable estimate upon which strategies and goals can logically be based so that the Company's mission of providing adequate and reliable electric service to its customers at the lowest reasonable cost can be attained.

The sophistication of modeling techniques is such that the energy forecast can be tailored to address the unique data characteristics and analysis needs identifiable on an individual rate class basis. These techniques focus on the use of econometrics and end-use modeling, with minimal use of trending. The major classes of the energy forecast, along with the forecasts for certain large customers, are combined with losses and converted into a forecast of peak demands using class and individual customer load research data. New forecasting approaches continue to be evaluated in order to improve all aspects of the load forecasting process. A section of this report discusses current research and development efforts.

The body of this report describes in detail the methods and assumptions used to generate a forecast of energy and demand for the 1999–2013 time period. Beyond 2013, simplified assumptions are employed starting at various points of time to extend the models to forecast the 2014-2028 time period, for a total forecast period of 30 years. While recognizing the high level of uncertainty that exists with such an extended forecast, the longer forecast period allows the Company to integrate the thirty year period into its planning process. A tabular presentation of the extended outlook, along with brief comments on its preparation is included in a section of this report.

Alternative Scenarios

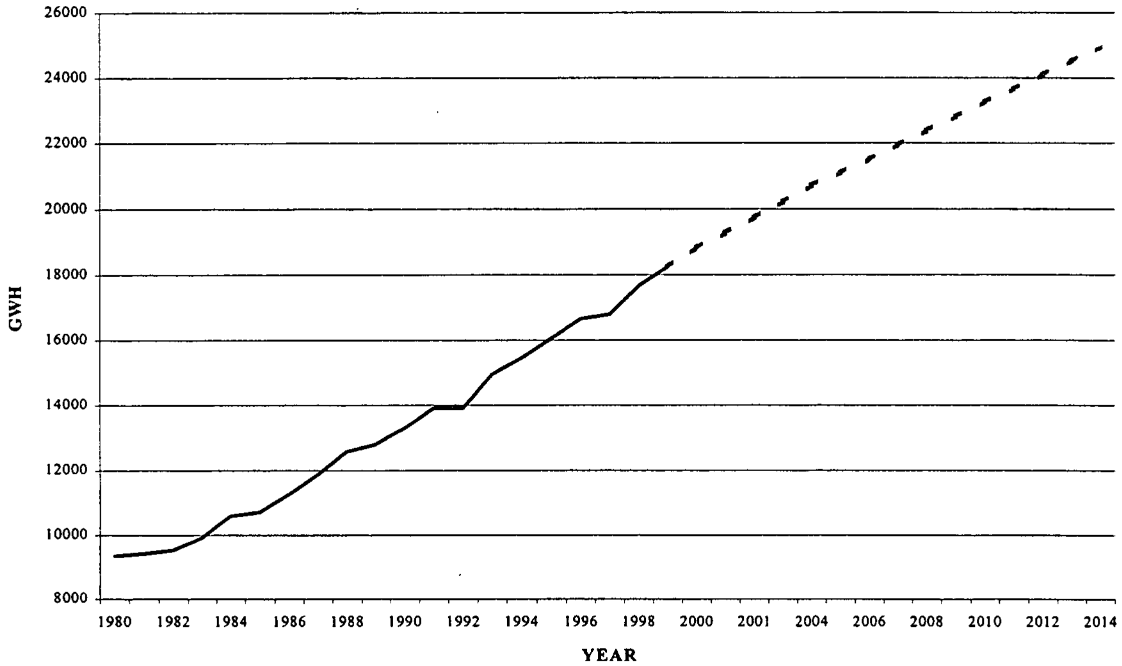
For the 1999 – 2013 Energy and Demand Forecast, uncertainty analysis has been approached from the standpoint of selecting the most important variables to the base forecast over which the forecaster has control of the predicted values. Three outlooks have been developed, coinciding with Baseline, Pessimistic, and Optimistic scenarios. Uncertainty analysis will be discussed further in a separate section of this report.

1999 – 2013 ENERGY FORECAST SUMMARY

The 1999 – 2013 Baseline Energy Forecast is developed utilizing the methodologies and assumptions that have evolved over the last several years. It is then adjusted for specific company activities including sales growth initiatives, the Curtailable Service Rider (CSR), and any Demand Side Management (DSM) adjustments. For the 1999 Forecast, no adjustment was introduced for DSM. The adjusted forecast represents the Company Energy and Demand Forecast. The Company Forecast is used by KU's Generation Services, along with the Optimistic and Pessimistic Scenarios, to develop the optimal generation expansion plan for the Company. The format of this report documents the Baseline Energy Forecast, then incorporates adjustments for the CSR and the sales initiative.

Graph KU-1 presents a visual depiction of actual sales since 1980 and the 1999-2013 Energy Forecast. Over the fifteen-year period of 1983-1998, actual sales have grown at an average annual rate of 3.9 percent, and from 1994-1998, the average growth rate was 3.4 percent. Examination of the drivers of growth in the last five years reveals that Industrial sales have been the primary driver

GRAPH KU-1
TOTAL COMPANY GWH SALES



of sales, growing at a 5.8 percent annual rate. Although KU has experienced significant growth in recent years from some of its largest industrial customers, the industrial sales growth has been relatively broad-based. Commercial sales have slightly exceeded the average, growing by 3.6 percent per year. Residential sales have lagged behind the other key retail sectors, growing 2.5 percent per year. Virginia retail sales have only averaged .3 percent growth since 1993, while Wholesale sales have been relatively healthy, growing at 3.1 percent per year.

Using a model-based estimate of expected sales for 1999 of 18,244 GWH, total KU energy sales over the first five years (1999- 2004) of the forecast are predicted to rise at a 2.4 percent average annual rate in the Baseline Forecast and 2.6 percent in the Company Forecast. Both the Baseline and Company Forecasts average 2.1 percent growth over the fifteen-year forecast horizon. The fifteen-year average annual growth rates for each class of sales and their relative share of 1999 sales for the Baseline and Company forecasts are shown below.

	Percent Annual Growth Rate 1999-2013		**Percent of 1999 Sales**[1]
Class	**Baseline**	**Company**	
RETAIL	2.0	2.1	85.1
KENTUCKY			
Residential	1.8	1.8	27.8
RS	0.8	0.8	13.6
FERS	2.7	2.7	14.3
Commercial	2.2	2.3	27.0
Industrial	2.4	2.5	27.0
Industrial SIC's	3.0	3.1	20.2
Major Industrials	0.4	0.4	6.8
Coal Mining (MP, LMP)	(2.1)	(2.1)	2.8
Lighting (C.O.L.T., St. Lt.)	0.6	0.6	0.6
VIRGINIA			
Old Dominion Power	1.9	1.9	4.8
WHOLESALE	2.5	2.5	10.1
TOTAL COMPANY	2.1	2.1	100.0

---

[1] Percentages are subject to rounding error.

Table KU-1 presents the annual Baseline Energy Forecast values for customers, sales, output and growth rate through 2013. Sales are expected to increase by 3.2 percent in 2000, assisted by a sales "adder" of 139 GWH. Without the sales adder, sales in 2000 are expected to increase 2.4 percent. In the short run, customer growth provides the major impetus to growth, while in the long-term customer growth moderates and usage per customer growth provides the greater impetus to growth.

Table KU-2 presents the KU energy forecast by component. The CSR has a small impact on energy sales as it is generally assumed that the customers who curtail load make up the production in later time periods. The sales adder of 139 GWH is fully reflected in 2000 and carries out through the forecast period.

Over the first five years of Baseline Energy Forecast, sales growth by sector are predicted to be fairly balanced. Kentucky Retail Residential sales are predicted to increase at a 2.2 percent annual rate. Residential growth comes from both customer growth and continued growth in usage per customer. The increased outlook for Residential sales comes primarily from the customer forecast for the FERS class, with approximately two-thirds of all new customers predicted to choose the all-electric rate. Baseline Kentucky Retail Commercial sales are predicted to increase at a 2.6 percent annual rate, with increases in customers and usage per customer again driving the forecast. Baseline Kentucky Retail Industrial sales are projected to average 2.7 percent growth. Concerns with minor Y2K disruptions and slower national growth expectations, along with major new customer growth settling at more normal levels lead to slower sales growth than has been experienced in recent years. The outlook for total coal production in Kentucky is rather flat, with sales under the Mine Power rate expected to decrase at an average annual rate of 0.9 percent. Virginia sales are expected to pick back up and average 2.1 percent, and Wholesale sales grow at the relatively high rate of 2.9 percent.

From 1999 to 2004, total sales are predicted to increase by 2,472 GWH, and by 6,275 GWH by 2013. Over the thirty year forecast horizon, the total KU Baseline Energy Forecast reaches 30,541 GWH. Any outlook beyond fifteen years is very tenuous and should be regarded as merely an early indicator of where the currently anticipated relationships of energy usage to demographic and economic growth will take energy sales. To achieve this level of sales, the compound growth rate needs to average 1.8 percent over the thirty years.

TABLE KU-1
TOTAL KU COMPANY CUSTOMER ,SALES, AND GENERATION FORECASTS

Year	Customers	% Growth in Customers	Company Energy Forecast (GWH)	% Growth in Energy Sales	Company Generation Forecast (GWH)	% Growth in Generation
1999	477,640	1.76%	18,240	3.31%	19,324	2.90%
2000	485,962	1.74%	18,821	3.19%	19,994	3.46%
2001	494,280	1.71%	19,269	2.38%	20,413	2.10%
2002	502,509	1.66%	19,739	2.44%	20,913	2.45%
2003	510,920	1.67%	20,208	2.37%	21,409	2.37%
2004	518,875	1.56%	20,712	2.50%	22,003	2.78%
2005	522,709	.74%	21,088	1.82%	22,341	1.54%
2006	528,214	1.05%	21,492	1.92%	22,769	1.92%
2007	533,398	.98%	21,928	2.02%	23,231	2.03%
2008	538,359	.93%	22,363	1.98%	23,760	2.28%
2009	543,229	.90%	22,800	1.95%	24,154	1.66%
2010	548,071	.89%	23,255	1.99%	24,636	1.99%
2011	552,446	.80%	23,657	1.73%	25,064	1.74%
2012	556,783	.79%	24,081	1.79%	25,583	2.07%
2013	561,051	.77%	24,515	1.80%	25,872	1.52%

TABLE KU-2
TOTAL KU ENERGY FORECAST BY COMPONENTS (GWH)

	A	B	C=A-B	D	E=C+D
Year	Unadjusted Baseline Energy Forecast	Existing Curtailable Decrease	Baseline Energy Forecast	Retail Sales Adder	Company Forecast Projected Energy
1999	18,105	4	18,101	139	18,240
2000	18,686	4	18,682	139	18,821
2001	19,134	4	19,130	139	19,269
2002	19,605	4	19,601	139	19,739
2003	20,073	4	20,069	139	20,208
2004	20,577	4	20,573	139	20,712
2005	20,953	4	20,949	139	21,088
2006	21,357	4	21,353	139	21,492
2007	21,793	4	21,789	139	21,928
2008	22,228	4	22,224	139	22,363
2009	22,665	4	22,661	139	22,800
2010	23,120	4	23,116	139	23,255
2011	23,522	4	23,518	139	23,657
2012	23,947	4	23,943	139	24,081
2013	24,380	4	24,376	139	24,515

2000 – 2013 DEMAND FORECAST SUMMARY

The 2000 – 2013 KU Baseline Demand Forecast is calculated from the class-level Baseline Energy Forecast data, class level load shapes derived from the Company's load research data , and an assumed daily weather profile. It is then adjusted for specific company activities including sales initiatives, CSR effects not already captured in the Baseline Demand Forecast, and any DSM adjustments. For the 1999 Forecast, no adjustment was introduced for DSM.

The energy, weather, and load shape information is combined and class-level demand forecasts developed using the Hourly Electric Load Model (HELM) developed by the Electric Power Research Institute (EPRI). The annual class demand profiles are summed within HELM and losses added to create the system demand forecast. The adjusted forecast represents the Company Peak Demand Forecast. The Company Peak Demand Forecast is used by Generation Planning, along with Optimistic and Pessimistic scenarios, to develop the optimal expansion plan for the Company. The format of this report documents the Baseline Demand Forecast, then incorporates adjustments for the CSR and the sales initiative.

Sales initiatives in 2000 add 27 MW to the Demand Forecast, which carry out over the forecast period. CSR reductions are contracted at 54 MW, of which 26 MW is accounted for in the load shape of two of the Company's major industrial clients and one wholesale customer. This leaves an incremental CSR reduction of 28 MW. The net effect is a Company Peak Demand Forecast that is approximately 1 to 2 MW lower each year than the Baseline Peak Demand Forecast.

Table KU-3 shows the fifteen-year winter and summer demand projections for the Company Demand Forecast. Over the forecast period KU is predicted to remain a summer peaking system, although the difference in the summer and winter peaks narrows over the forecast period.

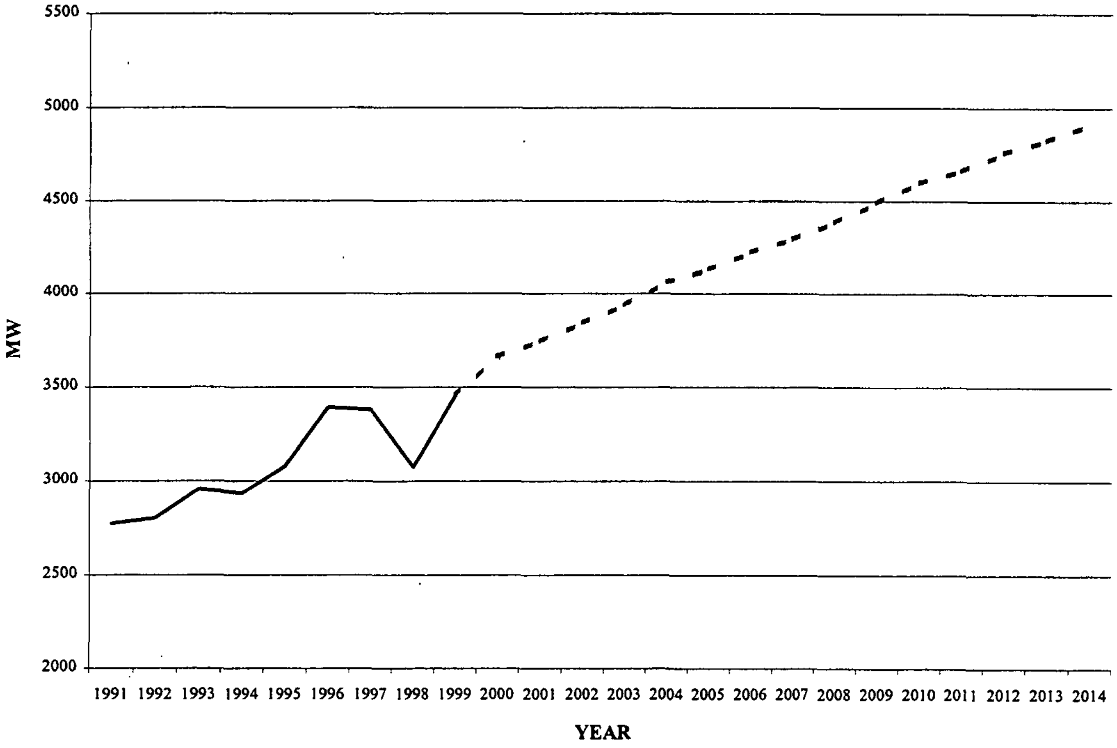
From 1993 to 1998, KU's summer peak demand grew from 3,133 MW to 3,559 MW or 426 MW, averaging 85 MW of growth per year. The compound average annual growth rate was 2.6 percent. KU's winter peak demand grew from 2,956 MW to 3,453 MW, or 497 MW over the 1993-1999 period. The average winter load growth was 99 MW, or 3.2 percent. The Baseline Peak Demand Forecast increases at an average annual rate of 2.5 percent from 1999 to 2004, and the winter season demand forecast increases 2.7 percent per year. This rate of growth adds 495 MW of peak demand over the five-year period. For the 2000 - 2013 period, the Baseline Peak Demand Forecast increases at an average annual rate of 2.1 percent average annual growth rate, and the winter season demand forecast increases at an average annual rate of 2.2 percent. From 1999 – 2013, peak demand increases by 1,244 MW. Graphs KU-2 and KU-3 visually present actual and forecasted summer and winter peak demands.

TABLE KU-3

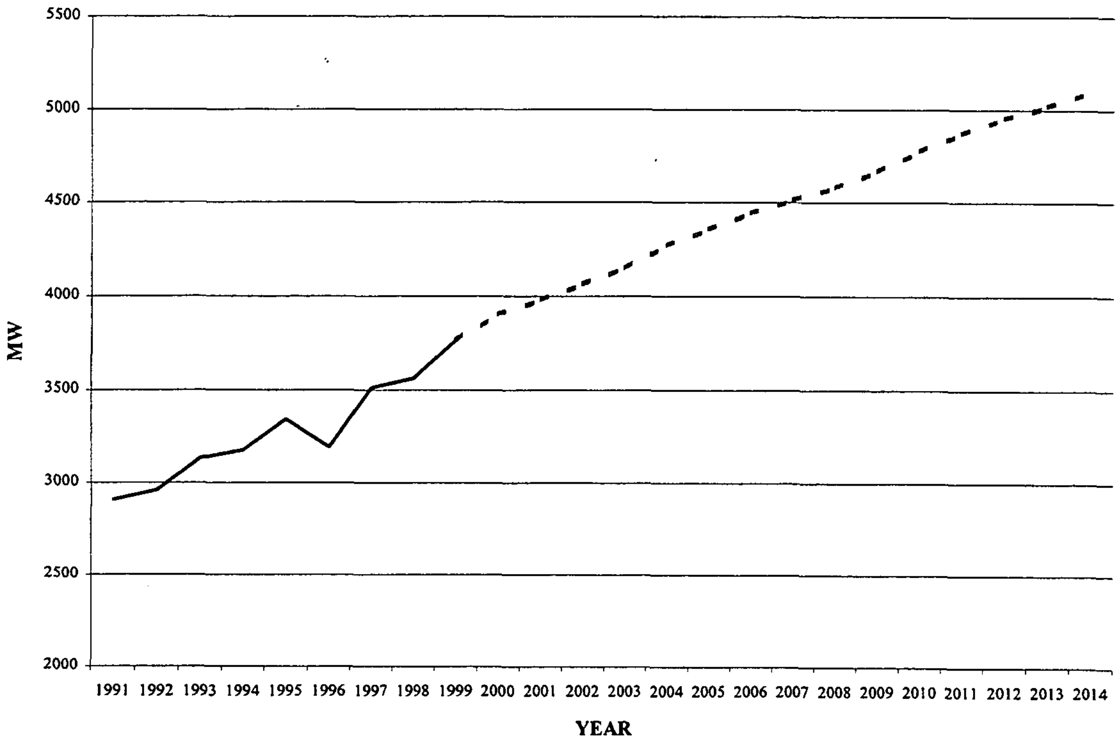
1999-2013 COMPANY SEASONAL PEAK DEMAND (MW)

SUMMER			WINTER		
YEAR	COMPANY	PCT GROWTH	YEAR	COMPANY	% GROWTH
1999	3,776	3.1%	1998/99	3,558	1.4%
2000	3,902	3.3%	1999/00	3,662	2.9%
2001	3,981	2.0%	2000/01	3,743	2.2%
2002	4,064	2.1%	2001/02	3,840	2.6%
2003	4,152	2.2%	2002/03	3,939	2.6%
2004	4,271	2.9%	2003/04	4,063	3.2%
2005	4,356	2.0%	2004/05	4,132	1.7%
2006	4,443	2.0%	2005/06	4,226	2.3%
2007	4515	1.6%	2006/07	4,296	1.7%
2008	4,581	1.5%	2007/08	4,389	2.2%
2009	4,670	1.9%	2008/09	4,493	2.4%
2010	4,779	2.3%	2009/10	4,600	2.4%
2011	4,875	2.0%	2010/11	4,664	1.4%
2012	4,955	1.6%	2011/12	4,761	2.1%
2013	5,020	1.3%	2012/13	4,828	1.4%

GRAPH KU-2
KU COMPANY WINTER DEMAND



GRAPH KU-3
KU COMPANY SUMMER DEMAND



KEY CHANGES/DRIVERS IN THE FORECAST

Changes in the Energy and Demand Forecast are typically driven by three main factors: the addition of the previous year's data to the model's inputs, changes in the weather, economic and demographic assumptions which drive the forecast, and methodological changes which reflect new methods of modeling the outlook. The 1999 Company Energy and Demand Forecast also incorporates specific estimates for sales initiatives and estimated impacts of the Curtailable Service Rate (CSR).

1998 Sales

Consolidated actual KU Retail and Wholesale energy sales before consideration of off-system sales and unbilled sales were 17,659 gWh in 1998, which normalized up by 32 gWh to 17,791 gWh. The normalized value was .7% above the budgeted sales for 1998. Updated annual sales therefore have a small upward influence on the new energy forecast.

At the time of the 1996 IRP filing, 1998 sales were predicted to be 17,208 for the Baseline Energy Forecast and 17,949 GWH for the Company Energy Forecast. Compared to the 1996 IRP Baseline Energy Forecast, 1998 actual sales were 583 GWH or 3.4 percent higher than forecast. However, compared to the 1996 Company Energy Forecast, 1998 actual sales were 158 GWH or .9 percent below forecast. A more realistic comparison is to back out the Wholesale component of the Marketing Plan as stated in the 1996 IRP. Since 1996, only the small municipality of Pitcairn, Pennsylvania has been added to KU's Wholesale customers, providing about 13 GWh of annual energy sales. In the 1996 IRP, 325 GWH were added for increased Wholesale customer sales. Adjusting for Pitcairn leaves an unrealized increase of 312 GWH. Subtracting the 312 GWH from the 1996 Company Energy Forecast for 1998 leaves an adjusted predicted value of 17,636 GWH. On this basis, 1998 sales exceeded the predicted value by 155 GWH or .9 percent. Since 1996, therefore, historical sales growth has exceeded expectations and places an upward influence on the forecast.

Changes in Weather, Economic, and Demographic Assumptions

In order to forecast electricity sales, assumptions must be made regarding the climate over the forecast horizon. KU assumes a twenty-year rolling average of heating degree days (HDD) and cooling degree days (CDD) as a reasonable representation of the likely weather conditions to be experienced on average over the forecast horizon. Lexington, Kentucky is the primary source of weather data, although KU's geographic diversity leads to the use of Bristol, Virginia and Evansville, Indiana for some portions of the forecast. For the 1999 Baseline Energy Forecast, 3,639 HDD (on a 60-degree base) have been assumed as representing normal heating weather for the Lexington data. At the time of the 1996 IRP, the normal Lexington weather assumption was 3,698 HDD. Therefore, since the 1996 IRP, KU's concept of normal HDD for Lexington has decreased by 59 HDD or 1.6 percent. For cooling, the 1999 Baseline Energy Forecast assumes 1,110 CDD (on a 65-degree base) for normal weather. At the time of the 1996 IRP, the normal Lexington weather assumption was 1,111 CDD, so that the assumed level of CDD for the forecast has remained virtually unchanged.

WEFA Macroeconomic Assumptions

National macroeconomic assumptions are among the most important in determining the path of the Energy and Demand Forecast. KU obtains a national macroeconomic forecast from WEFA Inc. This forecast is used by the Center for Business Research (CBER) at the University of Kentucky in generating a state forecast. The CBER state forecast is used by KU's service territory economic model (KUSTEM) as a key driver. Following is a brief review of the key assumptions made by WEFA in generating their trend forecast.

- In the Trend Scenario, WEFA assumes an environment free of exogenous shocks. Economic output converges towards its potential level, with all resources fully utilized.

- Growth in the economy has exceeded the long-run rate of growth in the last few years. Beginning in the year 2000, the trend forecast expects that the economy will follow a pattern of smooth growth, with actual output approximately paralleling the path of potential output. Although, growth in the year 2000 is expected to fall slightly below average long-term growth due to modest Y2K problems. Annual real U.S. GDP should average 2.0 percent over the next five years from 1999 to 2004 and 2.1 percent over the next fifteen years. Inflation over the forecast will remain moderate. Inflation will average 1.9 percent over the next five years from 1999 to 2004, and 2.1 percent over the next fifteen years.

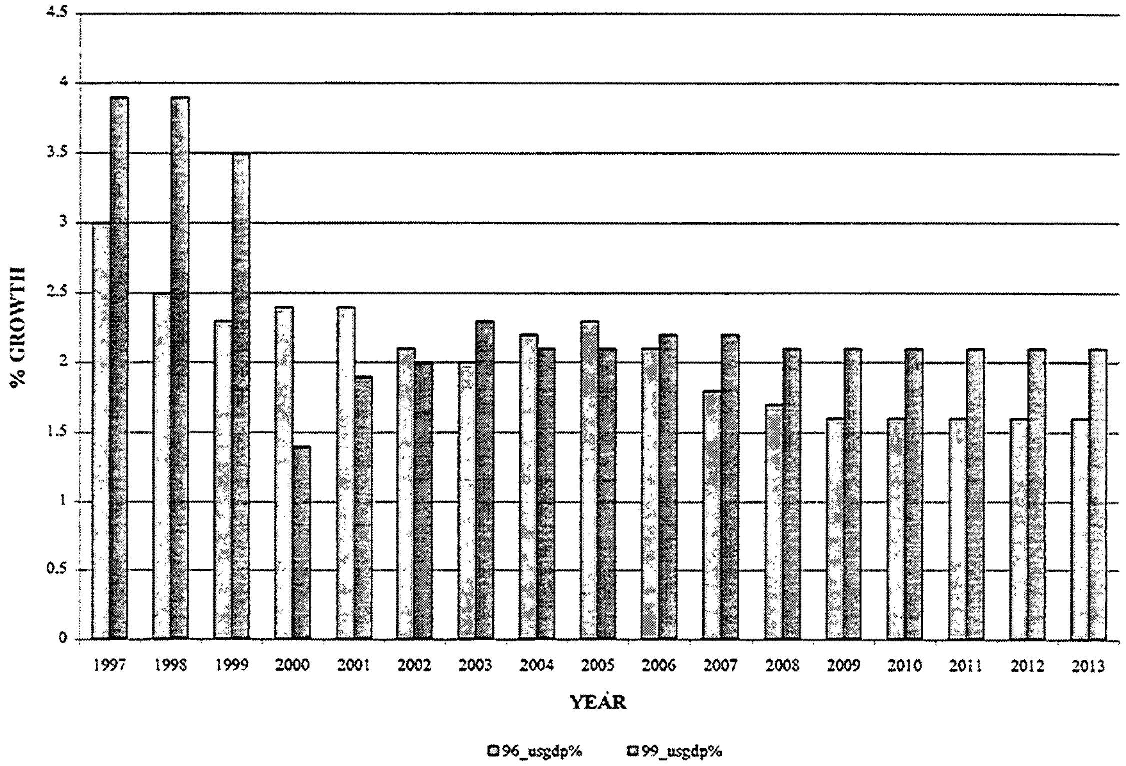
- Real interest rates are expected to remain at moderate levels as the Federal Reserve guards against inflation but does not raise rates in order to drive inflation even lower.

- The productivity performance of the U.S. economy should be fairly steady over the forecast period. Non-farm business productivity growth should average 1.1 percent per year over the long term, in line with the 1.1 percent average experienced since 1970. This productivity growth will support growth in real disposable income per capita of 1.6 percent annually over the long run.

- U.S. population is projected to expand at an annual rate of 0.8 percent over the fifteen year forecast horizon.

Graph KU-4 shows the projected growth rates for real U.S. GDP over the fifteen year forecast horizon and compares them to the annual growth rates used for the 1996 IRP. Actual growth rates in 1997 and 1998 were well above the expectation at the time of the 1996 IRP, although this experience has probably contributed to the reduced outlook in percentage growth for 2000 and 2001. Over the forecast horizon, the outlook for U.S. real GDP growth is generally higher than was expected at the time of the 1996 IRP, but the fifteen year average growth is equivalent to the fifteen year average cited in the 1996 IRP.

GRAPH KU-4
ANNUAL INCREASES IN REAL US GDP
1996 IRP VS 1999 FORECAST

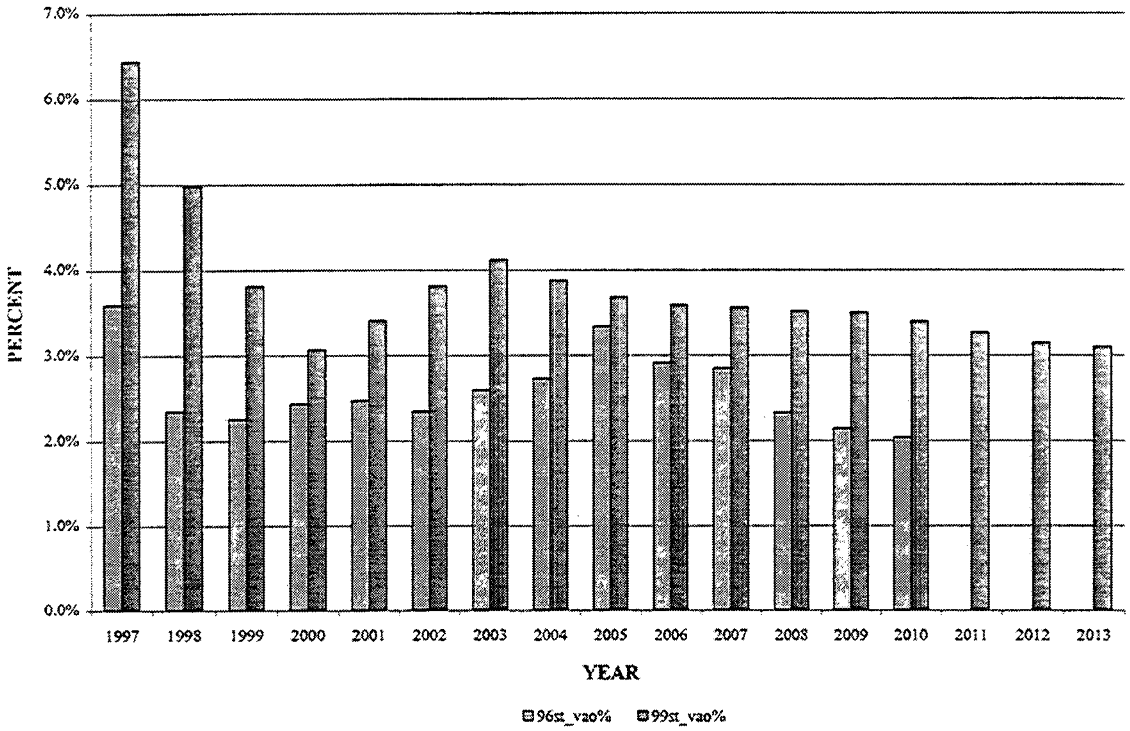


Kentucky Output

Service territory level economic and demographic forecasts are derived for KU via the KUSTEM (Kentucky Utilities Service Territory Economic Model). KUSTEM was developed by the Center for Business and Economic Research at the University of Kentucky. The KUSTEM model is an employment driven model in which forecasts of sector level value-added output, employment, income, and population are generated for five KU regions. The national forecast received from WEFA provides the inputs for CBER to generate a state forecast. This forecast in turn provides the inputs to five regional models specific to geographic areas which influence economic activity in the KU service area. These forecasts are summed to create a total KU service territory value-added output forecast. The use of KUSTEM represents a shift from the methodology employed in the 1996 IRP of using a state level output forecast from DRI, adjusted to remove the Louisville Metropolitan Statistical Area.

Graph KU-5 presents the annual percent increases assumed in the 1996 IRP versus the 1999 Energy Forecast. It is evident that as in the case of the national economy, output in KU's service territory is estimated to have grown more rapidly than was expected at the time of the 1996 IRP. For the 1999 Energy Forecast, KU service territory output is predicted to increase at a 3.7 percent annual rate for the five year period from 1999 to 2004, and average 3.5 percent growth over the fifteen-year forecast horizon. The 1996 IRP indicated an average annual growth rate of 2.5 percent over its fifteen-year horizon. At least some of this difference in outlook is attributable to the conversion to the KUSTEM model from the adjusted DRI state model. KUSTEM focuses more directly on the growth history and prospects for the economy served by KU, rather than a state-wide perspective as analyzed by the DRI state model.

GRAPH KU-5
KU SERVICE TERRITORY OUTPUT FORECASTED ANNUAL PERCENT INCREASE 1996 IRP VS 1999 FORECAST



Demographic Forecasts

Demographic forecasts of population and households are critical to the accurate forecasting of residential sales and indirectly contribute to the forecasting of commercial sales through their influence on commercial customer growth. KU utilizes the population and household forecast generated by the KUSTEM model. This is a change from the 1996 IRP, at which time KU relied on the demographic forecasts of the Center for Urban and Economic Research (CUER) at the University of Louisville (U of L).

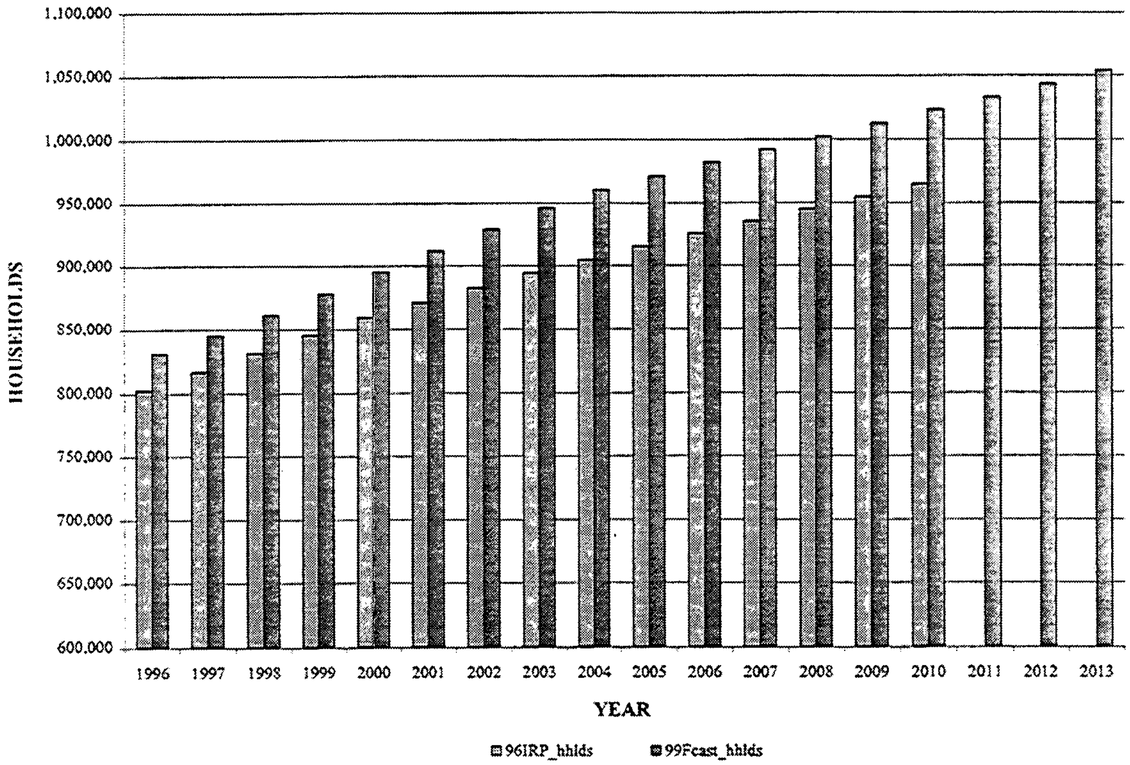
Forecasts of population in the KUSTEM model are made using a cohort-component model, the same type of model utilized in Bureau of Census (and U of L) forecasts. These models utilize birth, survival, and migration rates to forecast population. The KUSTEM model continues to use birth and survival data from the CUER. The major difference between the Bureau of Census and KUSTEM approaches is in the estimation of migration rates. Migration behavior in the Census models is based on past migration rates, while migration behavior in KUSTEM is a function of economic growth in the service territory. As a result, with a fast growing economy, it is possible that migration rates in the forecast period can exceed past rates, leading to faster growth in population. The population forecasts developed are by county, and as such are only an approximation of population specific to KU's service territory.

Population forecasts from the KUSTEM model call for a steady increase in population that closely matches the national population forecast. This is a strong performance for a state where population growth has often lagged growth rates nationally. Annual population growth is forecast to average 0.9 percent over the next five years in KU's service territory counties, and to continue to average 0.7 percent growth over the fifteen-year forecast horizon.

As nationally, the KU service territory is forecast to have an aging population. Since older persons tend to live in smaller households, this aging of the population implies fewer persons per household. This drop in household size implies that the number of households should grow even faster than the population. This is indeed the case for the 1999 Energy Forecast, with KU service territory households predicted to rise at a 1.8 percent annual rate from 1999 to 2004, and a 1.3 percent annual rate through 2013.

Graph KU-6 compares the household forecast generated by the KUSTEM model for the 1999 Baseline Energy Forecast with the household forecast provided in the 1996 IRP.

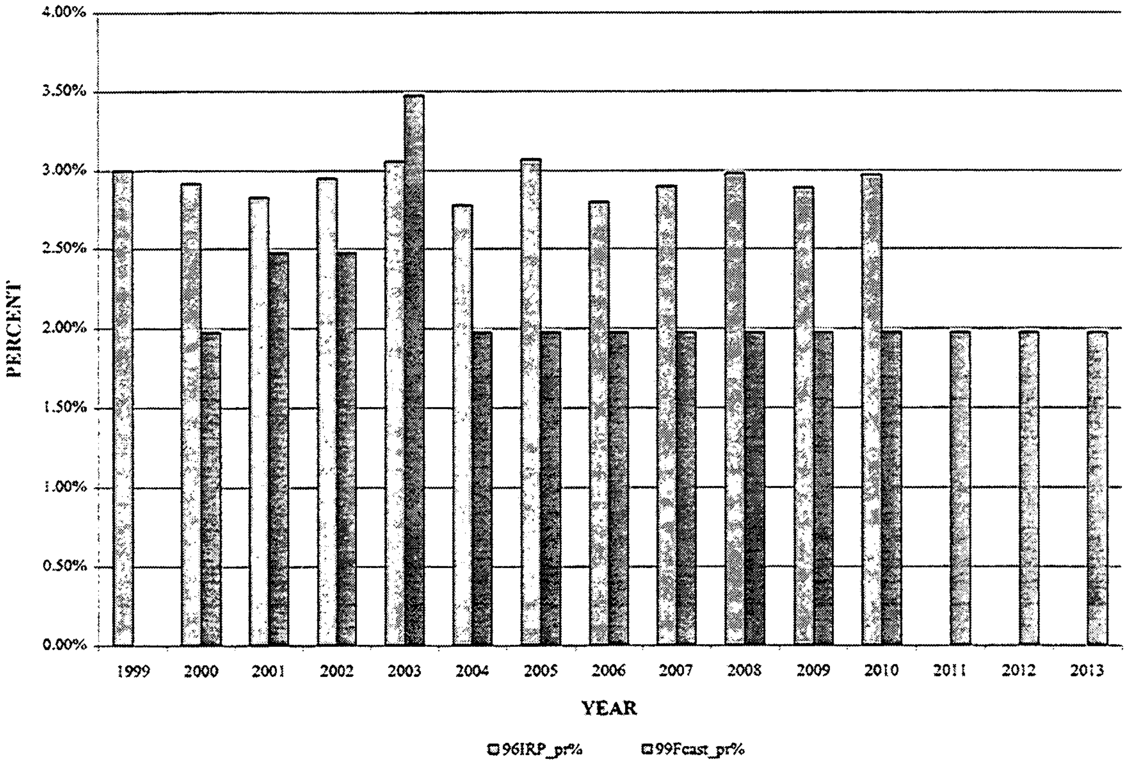
GRAPH KU-6
COMPARISON OF HOUSEHOLD FORECASTS
1996IRP VS 1999 FORECAST



Price Forecast

Many of the energy forecast class models are sensitive to price changes. The price forecast reflects the merger surcredit and a refund adjustment in 1999. Thereafter fuel expenses and environmental cost recovery drives the forecast. There are no general rate increases incorporated in the forecast and there are no assumed impacts relative to Performance Based Regulation. Graph KU-7 plots the 1999 Forecast electric price growth rates for Kentucky-Retail versus the 1996 IRP Forecast. The 1999 Forecast price outlook is for significantly lower price increases than were expected in 1996.

GRAPH KU-7
KY RETAIL PRICE FORECASTS
1996 IRP VS 1999 FORECAST



METHODOLOGICAL CHANGES

Introduction of KUSTEM

KU has found through comparison of its historical sales growth rates during various periods to that of total Kentucky electricity sales that KU has consistently outperformed the state as a whole. Further, the economy of KU's service territory has appeared to perform better that that of the nation in recent years. These observations led KU to question whether dependence on a state-level economic forecast was the best option for predicting likely growth in its territory. KU also recognizes that the future of strategic marketing in the electric utility industry lies in the knowledge of regional markets not tied to traditional service territory boundaries, and systems supportive of flexible decision analysis.

In response, KU contracted with the Center for Business and Economic Research (CBER) at the University of Kentucky to construct a regional economic and demographic database and modeling system that will enable the Company to become an independent producer of regional and service territory economic forecasts. The model has been named KUSTEM (KU Service Territory Economic Model). KUSTEM utilizes a CBER generated state-level forecast of output in conjunction with five regional models which conform to the local economies served by KU. The five regional models utilize county-level data and the state output forecast by two-digit manufacturing industry to forecast output and employment by two digit industry, commercial employment by two digit sector, personal income, and population/households. Four of the regions correspond to Kentucky and one models the Virginia jurisdiction. Quarterly forecasts are developed for the first three years and annual forecasts thereafter. Attached as Subsection 2 of Appendix 2 is documentation of the construct of the KUSTEM model.

Kentucky -Retail Commercial and Industrial Short-Run Models

Short-run Kentucky-Retail Commercial and Industrial sector sales models based on monthly data have been developed to go along with existing Residential short-run models. The monthly models use data going back to 1985 to capture near term growth better than a long-term annual model. The models capture the effects of weather on sales more effectively due to the monthly detail and the inclusion of month specific weather terms. The short-run forecasts are merged with the long run forecast from the annual models.

Municipal Models

Past forecasts have required numerous model runs in the Municipal sector as many of the Municipals provide class-level detail. For the 1999 Energy Forecast cycle, class-level forecasts will still be prepared to provide understanding of the growth prospects of each Municipal. However, for system-level forecasting, KU has migrated to a simplified four-model structure. Models have been constructed for Municipal Transmission sales, Municipal Primary sales, City of Pitcairn, Pennsylvania, and the City of Paris.

RETAIL ENERGY BASELINE FORECAST DESCRIPTION

KENTUCKY

RESIDENTIAL SUMMARY

The residential sales forecasting process embodies a combination of short-term econometric and end-use modeling methodologies. Each model is designed to contribute to a specific need of the forecasting process.

The residential sales forecast is developed in three parts: (1) a projection of customers by rate class (2) a projection of short-term (three years) monthly energy sales by class and (3) a projection of long-term annual energy sales by class.

A Customer Model is used to forecast total residential customers. This model relates increases in the number of customers to growth in the number of households for the Company's service territory. These projected customers are apportioned between the all-electric (FERS) and non all-electric rate classes (RS) through the use of a Customer Allocation Model. The rate class disaggregation accounts for differences in usage levels and revenues. In the Customer Allocation Model, a discrete choice-modeling framework is used to derive all electric households. The results are then calibrated to the actual net annual change in FERS customers. The net annual change in RS customers is calculated by subtracting the FERS customer forecast from the total residential customer forecast.

Two econometric models are developed as a means of modeling short-term monthly kWh per customer for each residential class. The purpose of these models is to improve the budget forecasting process by analyzing recent sales history. In these econometric models monthly consumption is related to weather, price and seasonal binary variables. The projections from the short-term models are merged with the long-term outlooks in a manner that creates continuity between the outlooks.

The long-term energy outlook is derived using the Residential End-Use Planning System (REEPS) model. This is an end-use forecasting model that is developed and supported by Regional Economic Research (RER) and the Electric Power Research Institute (EPRI). Company specific information is supplemented with regional and national data to develop a database for each of the two residential classes. These databases are run independently in separate REEPS models for the purpose of generating an energy forecast for each class.

The general premise of the REEPS model is to create a profile of customers in a base year, 1993. Calculated energy sales are calibrated to the total normalized energy sales for each rate class in the base year. The REEPS forecast is driven by decision equations that are used to construct multinomial share systems for each end-use. Probabilities are derived based on an end-use's economic attractiveness relative to the economic attractiveness of alternative technologies. The result is a saturation forecast by end-use and housing type. The model also projects size, use, and efficiency values for each end-use and housing type. The kWh per end-use calculation is based on the following equation:

$$\text{Sales} = \text{Households x Saturation x } \frac{\text{Size x Use}}{\text{Efficiency}}$$

Summing the sales for each appliance an annual energy forecast is derived for each rate class.

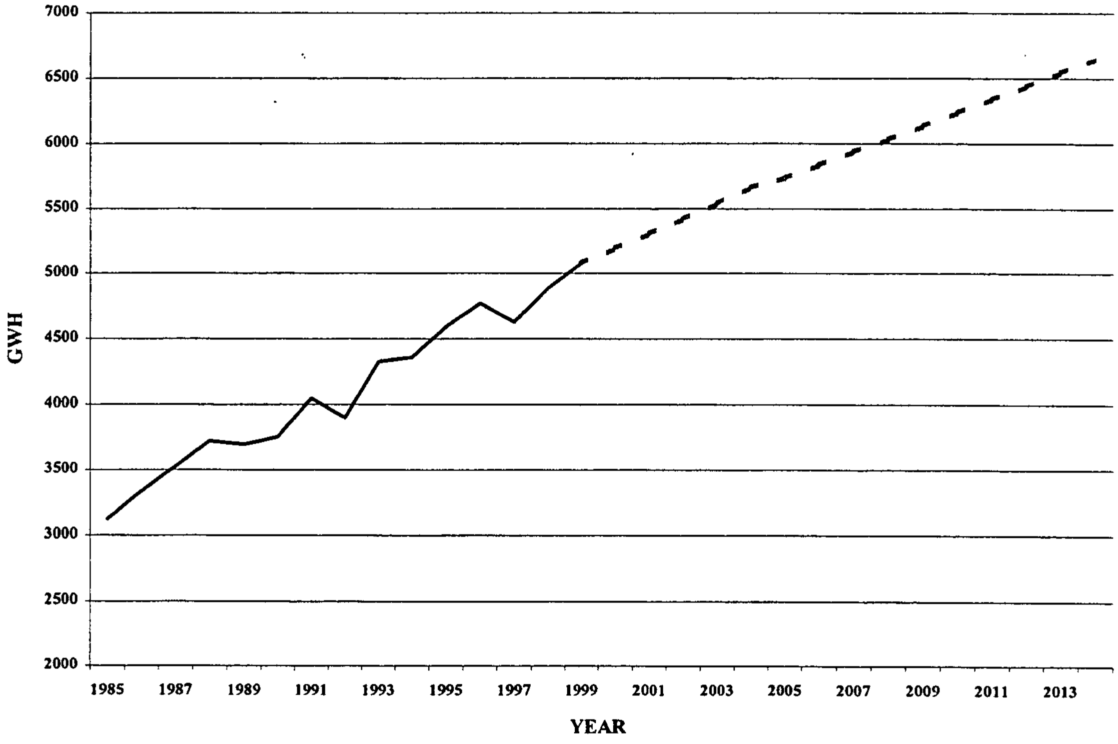
The residential energy outlook combines the short-term and long-term forecasts for the RS and FERS rate classes. The first two years of the forecast period for the RS rate class (1999 and 2000) represent the short-term model's monthly projections. 2001 represents a 50/50 split between the short-term and long-term models for the RS class. For the FERS class, 1999 represents a 75/25 split between the short-term and long-term model, respectively. The FERS class forecast for 2000 represents a 50 percent weight applied to the short-term and a 50 percent weight applied to the long-term forecasts. In year 2001, the weights for the short-term and long-term model are 25 percent and 75 percent, respectively, for the FERS class. For both classes, the remainder of the forecast is a product of the REEPS models.

The baseline forecast of residential customers, average kWh consumption per customers, and gWh sales for the total Kentucky Retail residential sector are shown in Table RES-1. Graph RES-1 shows annual historic and forecasted sales. The average annual baseline growth rate for total residential gWh sales is 2.2 percent for 1999-2004 and 1.8 percent for 1999-2013.

TABLE RES-1
TOTAL RESIDENTIAL FORECAST

YEAR	CUSTOMERS	GWH SALES	KWH/CUSTOMER
1999	373,270	5,078	13,605
2000	379,920	5,191	13,664
2001	386,590	5,305	13,723
2002	393,140	5,420	13,786
2003	399,830	5,537	13,850
2004	406,220	5,665	13,947
2005	409,062	5,734	14,018
2006	413,320	5,833	14,113
2007	417,304	5,937	14,226
2008	421,096	6,032	14,325
2009	424,807	6,134	14,440
2010	428,496	6,237	14,556
2011	432,027	6,337	14,669
2012	435,524	6,440	14,787
2013	438,963	6,545	14,911

GRAPH RES-1
TOTAL RESIDENTIAL GWH SALES



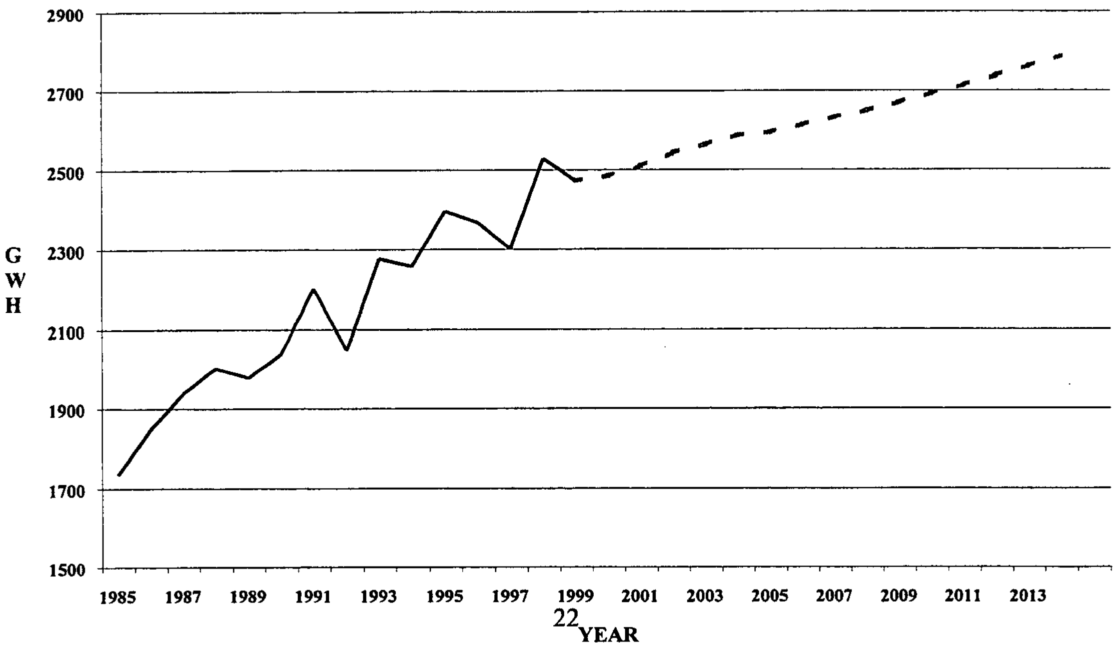
RESIDENTIAL
RS SUMMARY

A summary of the baseline forecast of customers, average kWh per customer and gWh sales for the non all-electric (RS) class is shown in table RS-1. Historical and forecasted gWh sales are shown graphically in Graph RS-1. The 1999-2004 average annual baseline growth rate for gWh sales and kWh/Customer is 0.9 percent and 0.5 percent, respectively. For 1999-2013, the annual baseline growth rate for gWh sales is 0.8 percent and the annual growth rate for kWh/Customer is 0.6 percent.

TABLE RS-1
RS FORECAST

YEAR	CUSTOMERS	GWH SALES	KWH/CUSTOMER
1999	229,550	2,472	10,770
2000	230,430	2,484	10,779
2001	231,300	2,509	10,847
2002	232,180	2,543	10,952
2003	233,250	2,563	10,989
2004	234,250	2,587	11,043
2005	234,170	2,594	11,078
2006	234,553	2,612	11,135
2007	234,863	2,632	11,205
2008	235,131	2,649	11,266
2009	235,386	2,669	11,341
2010	235,651	2,691	11,420
2011	235,888	2,713	11,499
2012	236,138	2,736	11,585
2013	236,396	2,760	11,677

GRAPH RS-1
RS GWH SALES



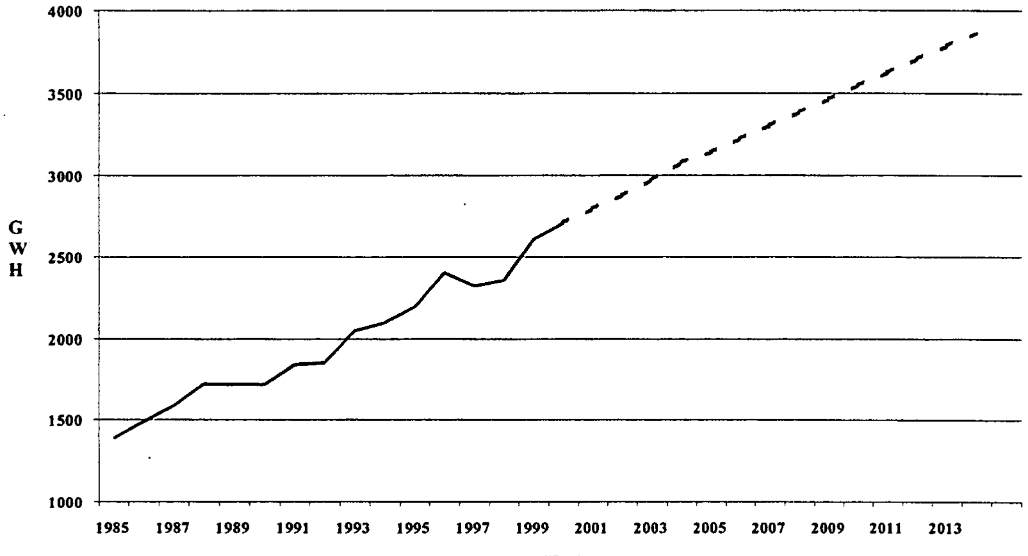
RESIDENTIAL
FERS SUMMARY

A summary of the base line forecast of customers, average kWh per customer and gWh sales for the all-electric (FERS) class is shown in Table FERS-1. Historical and forecast gWh sales are shown graphically in Graph FERS-1. The 1999-2004 average annual baseline growth rate for gWh sales and kWh/Customer is 3.4 percent and –0.3 percent, respectively. For 1999-2013, the annual baseline growth rate for gWh sales is 2.7 percent and the annual growth rate for kWh/Customer is 0.2 percent.

TABLE FERS-1
FERS FORECAST

YEAR	CUSTOMERS	GWH SALES	KWH/CUSTOMER
1999	143,720	2,606	18,133
2000	149,490	2,707	18,110
2001	155,290	2,796	18,007
2002	160,960	2,877	17,874
2003	166,580	2,974	17,855
2004	171,970	3,079	17,902
2005	174,892	3,140	17,954
2006	178,767	3,222	18,021
2007	182,441	3,305	18,116
2008	185,965	3,383	18,192
2009	189,421	3,465	18,292
2010	192,845	3,546	18,388
2011	196,139	3,625	18,481
2012	199,386	3,705	18,580
2013	202,567	3,785	18,685

GRAPH FERS-1
FERS GWH SALES



RESIDENTIAL CUSTOMER MODEL

The forecast of total residential customers begins with a county-level population forecast that is generated by the KUSTEM (Kentucky Utilities Service Territory Economic Model) model developed by the University of Kentucky Center for Business and Economic Research (CBER). The KUSTEM model utilizes birth and mortality rate data from the Center for Urban and Economic Studies (CUER) at the University of Louisville. However, the KUSTEM model generates forecasts of migration based on the model's forecast of employment growth in Kentucky counties rather than past migration trends, as is the case for CUER population forecasting models. The KUSTEM model utilizes forecasts of population growth to forecast household growth.

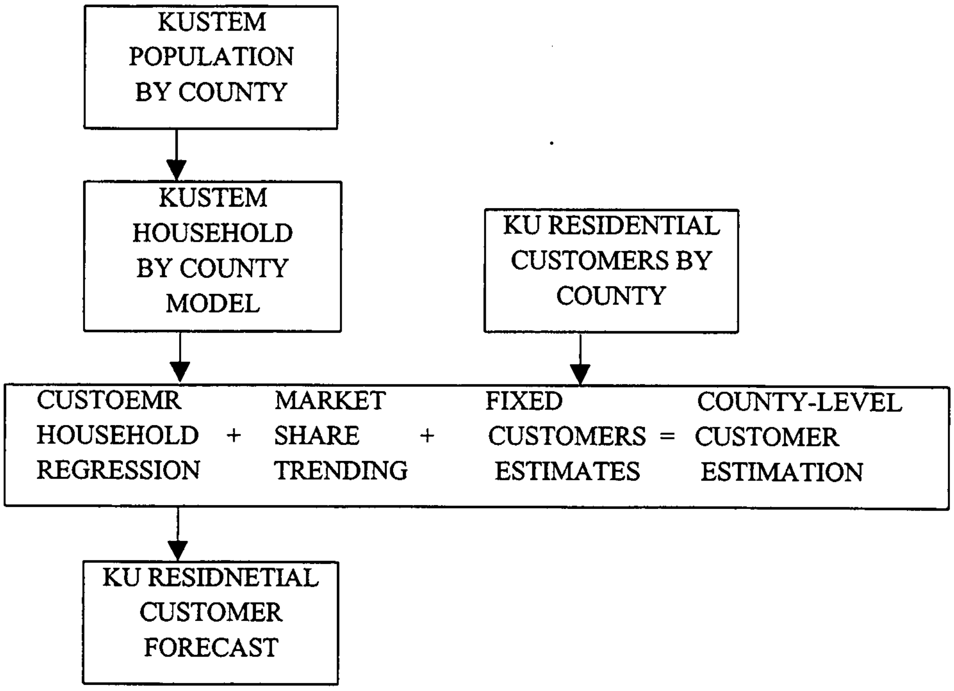
Migration is an important factor in the Kentucky population forecast. The natural population increase for Kentucky is declining because birth rates are stabilizing or declining, and death rates are increasing as the population ages. Migration has also proven more difficult to understand and forecast than the components of the natural growth rate. Historically, Kentucky has had periods of out migration of young adults as well as seen influxes of workers and families or the settling of retirees. During the 1980's, Kentucky experienced a net out migration of its population, however since 1990 the state has seen a net in migration.

The primary driver of the KU customer forecast is the county level household forecast and is derived using the county level population projection as a starting point. The KUSTEM model provided KU with this household forecast.

For counties provided residential service by KU, the forecasted growth rate in population is 0.9 percent for 1999-2004 and 0.7 for 1999-2013. The number of households in counties served by KU is projected to grow at five and fifteen year annual rates of 1.3 percent and 1.8 percent, respectively. The service territory household forecasts are able to maintain significantly higher growth rates than population due to an average population per household that is declining 0.9 percent annually over the first five years of the forecast and a decline of 0.6 percent annually over the entire forecast period. The customer growth forecast for each individual county is generated by a selection process between regressions of historical customers to households or trending of KU's market share in a county (customers/households). Acceptable statistical results were obtained for 91 percent of the customer base using the customer to household regression method, while another 4 percent of the customer base was estimated using trended county market shares. A very small number of customers were in four counties that have exhibited no growth and are fixed at their current levels. This ability to restrict household growth enables the Company to account for service territory growth constraints. To date, no such constraints have been imposed on the forecast.

Figure RC-1 illustrates the process used to forecast residential customers. Graph RC-1 shows a comparison of actual customers with the 1999 and 2000 customer forecasts. Table RC-1 shows the historical and forecasted service territory households and customers and the annual increase in customers. For the 1999-2004 period, total residential customers are forecasted to increase at a 1.7 percent annual rate, and at a 1.2 percent annual rate for the 1999-2013 period.

FIGURE RC-1
RESIDENTIAL CUSTOMER MODEL



GRAPH RC-1
RESIDENTIAL CUSTOMERS: 1998 FORECAST VS 1999 FORECAST

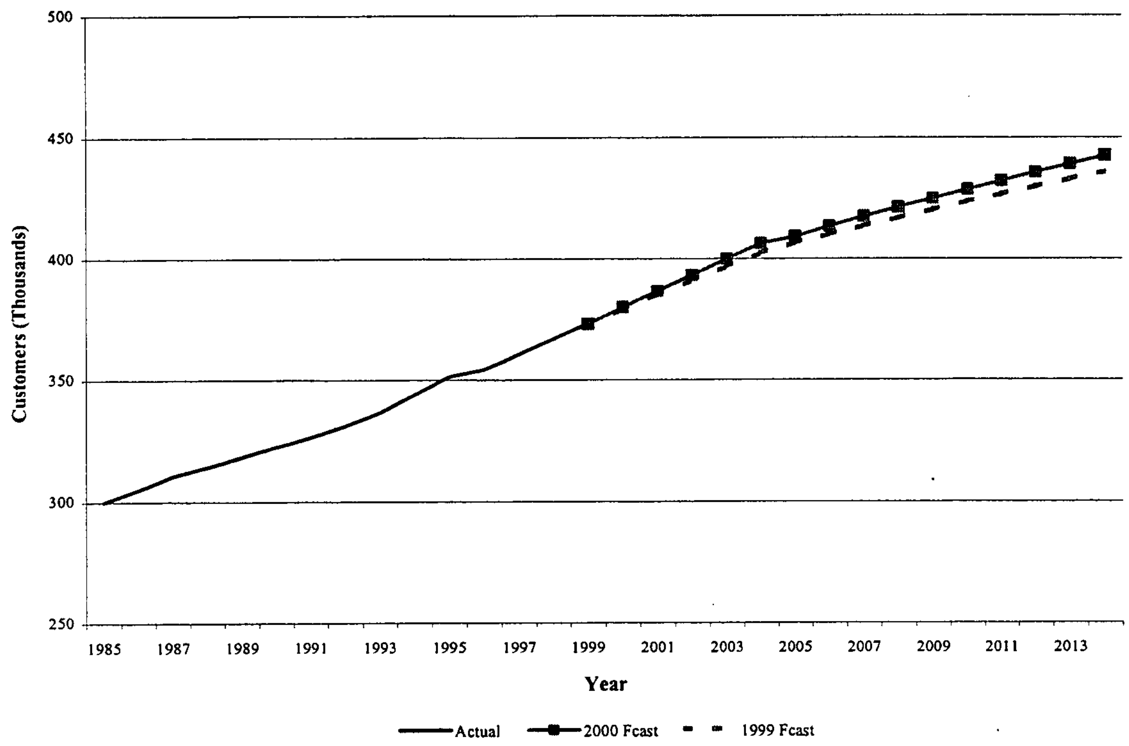


TABLE RC-1
TOTAL SERVICE TERRITORY HOUSEHOLDS AND RESIDENTIAL CUSTOMERS

YEAR	ESTIMATED HISTORIC & FORECASTED SERIVCE TERRITORY HOUSEHOLDS	HISTORIC & FORECASTED CUSTOMERS
1990	705,970	322,476
1991	719,601	326,493
1992	735,396	330,951
1993	751,880	336,497
1994	766,622	343,728
1995	782,253	351,166
1996	797,969	354,224
1997	813,519	360,375
1998	827,483	366,755
1999	842,030	373,270
2000	856,729	379,920
2001	871,290	386,590
2002	885,723	393,140
2003	900,647	399,830
2004	915,286	406,220
2005	928,520	409,062
2006	940,867	411,320
2007	952,227	417,304
2008	962,940	421,096
2009	973,349	424,807
2010	983,685	428,496
2011	993,893	432,027
2012	1003,985	435,524
2013	1013,928	438,963

RESIDENTIAL
CUSTOMER ALLOCATION BY RATE CLASS

Annual residential customer counts represent an average annual calculation. They are derived using monthly billing data. The company distinguishes between two types of residential customers, full-electric residential service (FERS) and general residential service (RS). Once the forecasted net annual change in residential customers has been derived, the forecast is then divided by rate class. The discrete choice logic embedded in EPRI's Residential End-Use Energy Planning System (REEPS) model has been used to forecast FERS customers. This discrete choice methodology specifically enables the Company to account for multiple factors such as:

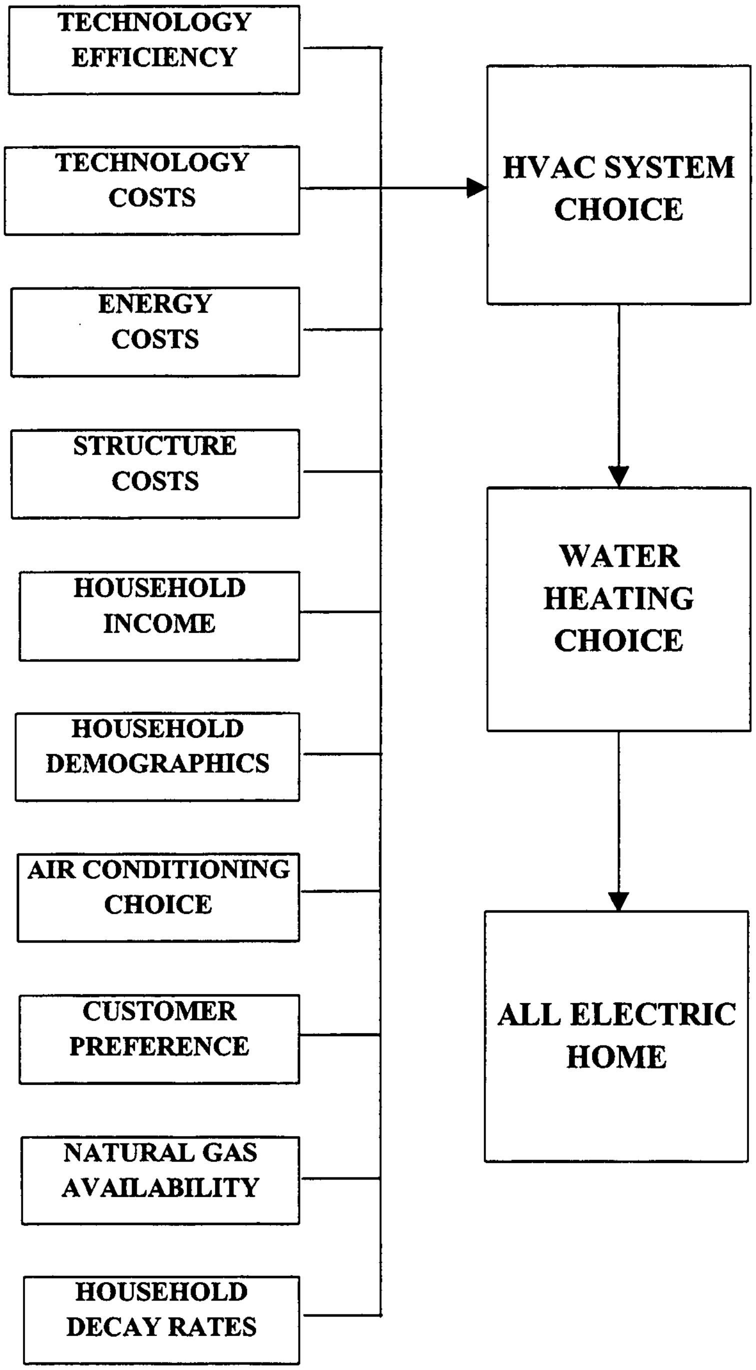
- Influence of space cooling preferences on heat equipment choice
- Impact of capital and operating costs on HVAC system choice
- Impact of changing efficiency standards
- Influence of developers on HVAC system choice
- Influence of non-economic factors (i.e. customer perceptions and attitudes)

The REEPS model contains discrete choice equations for each end-use that incorporate numerous factors including those mentioned above. Choice equations are developed for eighteen HVAC systems and eight household appliances. The choice equations are used to construct a "multinomial" share system for all end-uses. Each equation relates the market share of an end-use to its economic attractiveness relative to the economic attractiveness of alternative technologies. This reflects the notion that customer choice is dependent upon the available alternatives. These equations incorporate projected changes in energy prices, efficiency standards, equipment capital costs, structure characteristics, household income, natural gas availability, household decay rates, and other household demographics to derive the relative attractiveness of the competing end-use technologies. The equations are calibrated to known market shares for a base year and the first forecast year. Market shares are estimated using the biennial KU appliance saturation survey. A calibration term is estimated in the calibration process and represents an estimate of all the non-economic factors affecting market share of an appliance. After the first forecasted year, market share of each end-use for the three housing types, single family, multifamily, and mobile home are calculated by the discrete choice equations.

The modeling approach forecasts FERS customers using the REEPS model in an iterative process. An FERS customer is defined as a household with electric space heating and electric water heating. This definition was formulated after a review of residential survey results indicated virtually all customers with both electric space heating and electric water heating were on the FERS rate.

In the first iteration, a total residential customer REEPS model predicts the percentage of residential customers that will select electric space heating. HVAC system conversions are part of this electric space heating saturation forecast. For modeling purposes, all conversions to electric space heating are assumed to be heat pumps. It was also assumed that there would be a minimum of eight years before a household would consider converting their space heating system. Then in a spreadsheet, the REEPS forecasted percentage of electric space heating customers is multiplied times the total residential customer forecast for each housing type. The resulting customer forecast is used as an input to a second REEPS model. This REEPS model is developed based on a database of households with electric space heating and is used for the second iteration. The purpose of this model is to predict the percentage of customers with electric space heating that will also select electric water heating. In a second spreadsheet, the forecasted electric water heating saturations from the second iteration is multiplied times the electric space heating customer forecast that was calculated in the first spreadsheet. The result represents the FERS new customer forecast. RS new customers are derived by subtracting the FERS customer forecast from the total residential customer forecast. Figure RCP-1 provides an overview of the REEPS iterative process.

FIGURE RCP-1
REEPS ALL ELECTRIC CUSTOMER FORECASTING APPROACH



It should be noted that the objective of the customer forecast is to accurately predict the net annual change in customers. Therefore, the final step in this process was to calibrate results from the second iteration to the net annual change in FERS customers. Analyzing several years of customer activity for the RS and FERS rate classes revealed that the number of average annual customers who appear to go "off service" had a significant impact on the net annual change in customers for each rate class. The RS class had approximately twice as many "off service" customers as the FERS class, which is roughly proportional to its size. The effect is to increase the FERS percentage of the net annual change in residential customers. For example, in recent years a larger percent of new residential customers have gone on the FERS. In fact, since 1990 the net annual change in FERS customers has averaged between 57-86 percent of the net annual change in total residential customers. The primary factor creating the difference is the number of customers going "off service" on the RS rate relative to those going "off service" on the FERS rate. In addition, many large market share in the FERS class can be contributed to the successful marketing effort made possible by a strong commitment to sales, training, and advertising from senior management.

The term "off service" represents an average annual number and, for analysis purposes, is defined as any premise that has been removed from the billing database. Demolitions are considered part of the "off service" category. The "off service" effect could not be captured within a behaviorally based REEPS model. Therefore, it was accounted for in a spreadsheet external to the model. The REEPS generated FERS new customer forecast was calibrated to an average of the percent of the net annual change in residential customers that went on the FERS rate, approximately 75 percent. A calibration adjustment was then applied to all future years. Table RCP-1 presents this year's forecast of the percent of new FERS customers and the percent of the net annual change in total residential customers that are on the FERS rate.

TABLE RCP-1
PERCENT OF TOTAL RESIDENTIAL CUSTOMERS ON FERS RATE

	% ANNUAL CHANGE IN CUSTOMERS	% OF NEW CUSTOMERS
YEAR	1999 FORECAST	1999 FORECAST
1980	138.0	89.2
1981	118.0	85.8
1982	214.7	82.4
1983	82.9	76.0
1984	137.7	79.8
1985	98.8	84.0
1986	105.6	66.5
1987	72.9	60.9
1988	89.2	58.9
1989	57.5	62.6
1990	77.1	49.7
1991	85.8	57.0
1992	81.8	44.6
1993	70.4	46.0
1994	57.0	49.6
1995	69.4	53.4
1996	176.4	56.2
1997	91.6	60.3
1998	94.9	61.8
1999	78.6	73.0
2000	86.8	76.6
2001	87.0	77.6
2002	86.6	77.9
2003	84.0	79.3
2004	84.4	77.0
2005	102.8	52.3
2006	91.0	77.6
2007	92.2	75.0
2008	92.9	73.1
2009	93.1	72.1
2010	92.8	71.3
2011	93.3	72.1
2012	92.9	71.1
2013	92.5	70.1

Table RCP-1 shows that from 1985 through 1998 the percentage of new customers on the FERS rate range from 45 percent to 84 percent, while the percent of net additions ranges form 70 percent to over 100 percent. The 1999 Forecast is predicting the FERS percent of total residential net additions will generally rise over the forecast period to over 90 percent by 2013. It is also predicting that the percent of net additions from the FERS class will increase steadily to over 90 percent towards the end of the forecast period.

Table RCP-2 shows the residential customer forecast by rate class. RS customers are projected to increase at an average annual rate of 0.4 percent over 1999-2004 and 0.2 percent over 1999-2013. The FERS customers are forecasted to increase at an annual rate of 3.7 percent for 1999-2004 and 2.5 percent for 1999-2013.

TABLE RCP-2
FORECAST OF RESIDENTIAL CUSTOMERS BY CLASS

YEAR	FERS	RS	TOTAL
1999	143,720	229,550	373,270
2000	149,490	230,430	379,920
2001	155,290	231,300	386,590
2002	160,960	232,180	393,140
2003	166,580	233,250	399,830
2004	171,970	234,250	406,220
2005	174,892	234,170	409,062
2006	178,767	234,553	413,320
2007	182,441	234,863	417,304
2008	185,965	235,131	421,096
2009	189,421	235,386	424,807
2010	192,845	235,651	428,496
2011	196,139	235,888	432,027
2012	199,386	236,138	435,524
2013	202,567	236,396	438,963

Some of the benefits of this customer allocation forecasting methodology are that it allows for the direct consideration of a number of factors that can influence customer fuel choice. It also provides a customer forecast by housing type for each rate class, a forecast of new construction activity by housing type for each rate class, a baseline forecast for HVAC system conversion activity, and a much richer database that can be used to evaluate impacts of future marketing and DSM programs on the forecast.

RESIDENTIAL CONSUMPTION MODELS

The residential consumption models that are developed for the RS and FERS classes fall into two categories: 1) a projection of short-term energy sales and 2) a projection of long-term energy sales. This section will discuss these models for each class in detail.

SHORT-TERM ENERGY SALES

The objective of KU's short-term forecasting models is to improve the estimate of monthly energy sales used in the budgeting process and to provide a smooth transition from the short-run to a long-run sales outlook. A monthly econometric kWh per customer model using data for the period of January 1981 though March 1999 and for the period January 1990 through March 1999 is created for this purpose for the FERS and RS classes, respectively. The primary advantage of this model is its ability to capture recent cycles or trends in energy consumption and incorporate them into its projection of future energy consumption. An annual model can only capture trends over longer periods of time. Consequently, the short-term model should be a better predictor of a one to five year time horizon. Beyond this period the dynamic nature of a short-term model may distort the long-term outlook. Independent variables are tested for significance in both the RS and FERS models. Only the variables that test significant are included in a model. The number of periods a variable is lagged may also differ between models. Again, the t-test is used to determine the appropriate number of lagged periods.

RS CLASS

The dependent variable in the RS model is average monthly kWH per customer. The RS explanatory variables are real marginal price lagged one period, monthly kWh per customer lagged one period, heating degree day interaction variables for the months of January, February, March, April, November, and December, cooling degree interaction variables for the months of May, June, July, August, September, and October, and monthly kWh per customer lagged one period.

A basic assumption behind this short-term model is that much of the variation in monthly residential energy usage over short periods of time is directly related to the weather. To this end, the heating degree-day series is designed to capture an average or common effect that heating degree-days have on each month's energy consumption. The interaction variables are designed to capture the effect that cooling and heating degree-days may have on energy consumption in a particular month. The cooling and heating degree-days are calculated utilizing a ramp function to align the weather data with monthly billing cycles. Cooling degree-days are calculated using a 65-degree base and heating degree-days are calculated using a 60-degree base.

The six cooling degree day interaction variables, May, June, July, August, September, and October are all calculated in the same manner. Each series multiplies 1*CDD for the specified month and 0*CDD for all other months. The six heating degree-day interaction variables, January, February, March, April, November, and December are calculated in the same manner. Each series multiplies 1*HDD for a specified month and 0*HDD for all other months. These degree-day interaction variables capture the seasonal components of the forecast. The monthly kWh per customer term is lagged so to capture the general movements of customer consumption or, in other words, the trend components of the forecast.

The RS short-run equation is shown below (the number in parenthesis indicates the probability of that variable being insignificant).

$$
\begin{array}{ll}
\text{RS Monthly kWH} & = 913.25 - \underset{(0.0000)}{11832.07(\mathrm{RSPRICE}_{-1})} + \underset{(0.0667)}{0.10(\mathrm{KPC}_{-1})} \\
 & + \underset{(0.0000)}{0.32(\mathrm{JANHDD})} + \underset{(0.0000)}{0.22(\mathrm{FEBHDD})} + \underset{(0.0000)}{0.19(\mathrm{MARHDD})} \\
 & + \underset{(.0002)}{0.24(\mathrm{APRHDD})} + \underset{(0.0280)}{1.10(\mathrm{MAYCDD})} + \underset{(0.0000)}{1.68(\mathrm{JUNCDD})} \\
 & + \underset{(0.0000)}{1.70(\mathrm{JULCDD})} + \underset{(0.0000)}{1.85(\mathrm{AUGCDD})} + \underset{(0.0000)}{1.79(\mathrm{SEPCDD})} \\
 & + \underset{(0.0000)}{1.47(\mathrm{OCTCDD})} + \underset{(0.0120)}{0.16(\mathrm{NOVHDD})} + \underset{(0.0000)}{0.31(\mathrm{DECHDD})}
\end{array}
$$

Where:

$\mathrm{RSPRICE}_{-1}$ = Real Marginal Price of Electricity Lagged One Period
KPC_{-1} = Monthly kWh Per Customer Lagged One Period
JANHDD = January Degree Day Interaction Variable

FEDHDD = February Degree Day Interaction Variable
MARHDD = March Degree Day Interaction Variable
APRHDD = April Degree Day Interaction Variable
MAYCDD = May Degree Day Interaction Variable
JUNCDD = June Degree Day Interaction Variable
JULCDD = July Degree Day Interaction Variable
AUGCDD = August Degree Day Interaction Variable
SEPCDD = September Degree Day Interaction Variable
OCTCDD = October Degree Day Interaction Variable
NOVHDD = November Degree Day Interaction Variable
DECHDD = December Degree Day Interaction Variable

Model Statistics:
Adjusted R^2 = 0.96
F-statistic = 176.12
D-W Test = 1.54

FERS CLASS

As with the RS short-term model, the purpose of the FERS short-term model is to improve the estimate of 1999 monthly sales used in the budgeting process and to provide a smooth transition form a short-term to a long-term sales outlook. The dependent variable in the model is average monthly kWh per customer. The explanatory variables are real marginal price lagged one period, kWh per customer lagged one period, heating degree day interaction variables for the months of January, February, March, April, November, and December, a September cooling degree day interaction variable, seasonal heating degree days, seasonal cooling degree days, binary variables for February, March, and July, and monthly kWh per customer lagged one period. The cooling and heating degree days are calculated utilizing a ramp function to align the weather data with monthly billing cycles. Cooling degree-days are calculated using a 65-degree base and heating degree-days are calculated using a 60-degree base.

The six heating degree-day interaction variable terms, January, February, March, April, November, and December are calculated in the same manner. Each series multiplies 1*HDD for the specified month and 0*hdd for all other months. The one cooling degree day interaction variable, September, is calculated in the same manner. Each series multiplies 1*CDD for the specific month and 0*CDD for all other months. Other cooling degree terms were tested for May, June, July, August, and October but they did not prove to be significant. The monthly kWh per customer term is lagged so to capture the general movements of customer consumption or, in other words, the trend components of the forecast.

The FERS short-run equation is shown below (the number in parenthesis indicates the probability of that variable being insignificant).

$$\begin{aligned}
\text{RS Monthly kWH} = {} & 753.58 \underset{(0.0000)}{- 2385.50(\text{RSPRICE}_{-1})} \underset{(0.0000)}{+ 0.12(\text{KPC}_{-1})} \\
& \underset{(0.0000)}{+ 1.1(\text{JANHDD})} \underset{(0.0000)}{+ 1.45(\text{FEBHDD})} \underset{(0.0000)}{+ 1.39(\text{MARHDD})} \\
& \underset{(.0000)}{+ 0.83(\text{APRHDD})} \underset{(0.0001)}{+ 0.65(\text{NOVHDD})} \underset{(0.0000)}{+ 0.96(\text{DECHDD})} \\
& \underset{(0.0048)}{+ 0.23(\text{SEPCDD})} \underset{(0.0000)}{+ 1.46(\text{CDD})} \underset{(0.0001)}{+ 0.81(\text{HDD})} \\
& \underset{(0.0000)}{- 495.03(\text{FEB})} \underset{(0.0020)}{- 392.67(\text{MAR})} \underset{(0.0453)}{+ 41.75(\text{JUL})}
\end{aligned}$$

Where:

RSPRICE$_{-1}$ = Real Marginal Price of Electricity Lagged One Period
KPC$_{-1}$ = Monthly kWh Per Customer Lagged One Period
JANHDD = January Degree Day Interaction Variable
FEDHDD = February Degree Day Interaction Variable
MARHDD = March Degree Day Interaction Variable
APRHDD = April Degree Day Interaction Variable
NOVHDD = November Degree Day Interaction Variable
DECHDD = December Degree Day Interaction Variable
SEPCDD = September Degree Day Interaction Variable
CDD = Cooling Degree Days (65 degree base)
HDD = Heating Degree Days (60 degree base)
FEB = February Binary Variable
MAR = March Binary Variable
JUL = July Binary Variable

Model Statistics:

Adjusted R^2 = 0.98
F-statistic = 880.20
D-W Test = 1.89

LONG-TERM ENERGY SALES
RESIDENTIAL END-USE MODEL

KU's long-term forecasting models are designed to support the Company's expansion planning efforts. For the residential sector, the REEPS model is utilized. REEPS generates an annual sales forecast based on a discrete choice-modeling framework. The model utilizes choice equations to construct a "multinominal" share system for all defined end-uses. Each equation relates the market share of an end-use to its economic attractiveness relative to the economic attractiveness of alternate technologies. This results in a market share forecast. These appliance shares are multiplied times the customer forecast and then a kWh per appliance forecast to derive an energy forecast by rate class. Both appliance shares and kWh per appliance are derived within the model. Customers are derived external to the model. The model permits direct interaction with the data, model concepts, and decision equations that are developed for each defined end-use. This gives KU the flexibility to develop a model that reflects demographic and energy usage characteristics of their residential customers.

As with any detailed end-use model, REEPS requires a substantial data development effort and that the user make several assumptions regarding customer behavior and efficiency related issues. REEPS models appliance purchase decisions and energy consumption for ten end-uses plus an HVAC (heating, ventilation, and air conditioning) end-use. The FERS HVAC end-use contains eleven and the RS HVAC end-use contains nine heating and cooling appliances. The FERS class models geothermal heating and cooling due to the anticipated growth of this technology. It is not a factor for the RS class. All of the end-uses included in the models are listed below:

HVAC
- Central electric heating
- Heat pump heating
- Geothermal heat pump heating
- Room electric heating
- Secondary heating
- Ventilation
- Central air conditioning
- Heat pump cooling
- Geothermal heat pump cooling
- Room air conditioning
- Secondary cooling

WATER HEATING
DISHWASHING
CLOTHES DRYING
CLOTHES WASHING
RANGE
MICROWAVE
FIRST REFRIGERATOR
SECOND REFRIDERATOR
FREEZER
OTHER APPLIANCES

The REEPS framework for modeling these end-uses consists of a fuel price module, an exogenous variable module, a household module, a demographic segments module, an HVAC module, an appliance list module, and an appliance module. REEPS provides a default database for each of these modules that is derived using information obtained from national survey results. This information is periodically updated by Regional Economic Research Inc. (RER), a consulting group retained by the Electric Power Research Institute (EPRI). The default databases are modified to reflect updated national information, regional data, and KU specific data obtained from the Company's saturation surveys, conditional demand analysis, end-use metering results, and other internal sources. Separate REEPS databases are created for the RS and FERS rate classes.

The fuel price module consists of nominal price series for electricity, natural gas, fuel oil, and firewood as well as an implicit GDP price deflator series. The purpose of this module is to create deflated price series and convert these price series to a common unit of measurement, $/mmbtu.

The exogenous variable module includes year, average income per household, average number of people per household, heating degree days, cooling degree days, customer forecast by housing type, fuel availability, quantitative measures for appliance efficiency standards, and other demographic variables used by the model. Efficiency standards are incorporated into the model using units of measurement as they are defined in the federal legislation. In the forecast period phase in of new technologies and decay and replacement assumptions are made to derive future values of the efficiency measures.

The household module provides a framework for creating a customer forecast model. However, KU currently has a customer forecast model and the output from this model is used as an input to the REEPS model. The purpose of this module is to calculate new households for three housing types using a fixed decay rate and the exogenous customer forecast.

The demographic segment module allows for dividing the model into smaller, more homogenous groups. Currently, each REEPS model is segmented by housing type. Although the model allows for a greater degree of segmentation, the benefits received from further segmentation continue to be weighed against the availability of data and the cost of maintaining a significantly larger database.

The HVAC module consists of 20 primary system combinations plus three secondary heating systems and one secondary cooling system. The purpose of this module is to calculate saturation rates, energy consumption, appliance efficiencies, and thermal shell efficiencies for a base year and a forecast period for the HVAC systems. Variables included in this model areas follows: average and marginal saturation rates for each system; average and marginal appliance size; average and marginal appliance efficiencies;, heating and cooling degree days; capital costs; base year appliance unit energy consumption (UEC's); average and marginal thermal shell efficiency; and appliance availability for each housing type.

The appliance list module is a listing of all base or nonweather sensitive appliances defined for use in the REEPS model. Each appliance listed in this module must be defined in the appliance module.

The appliance module establishes a framework for modeling the purchase/replacement decisions, efficiency, and usage of each end-use not included in the HVAC module. Variables used in this module differ from the HVAC module in that weather and thermal shell characteristics are not specifically modeled for each of these appliances. All of the other variables mentioned before are used in the appliance module.

To begin a REEPS forecast, its computed normal energy consumption is calibrated to an estimate of normalized energy consumption for a base year. 1993 was used as the base year in this year's forecast. The forecast is calibrated by revising the "other" appliance UEC in the appliance module. The calibration process creates a base profile of each end-use and its associated parameters. The REEPS forecast is calibrated to the marginal data in the first forecasted year. The forecast is then driven by the multinominal share system, placements, household decay rates, kWh per appliance, and customer growth projections.

RESIDENTIAL
RS CONSUMPTION OUTLOOK

The long-term outlook for the RS class is for slow sales growth in the winter and summer seasons. Historically, from 1994-1998 the actual summer kWh per customer grew at an annual rate of 2.7 percent and from 1984-1998, the summer kWh per customer grew at an annual rate of 2.5 percent. Summer kWh per customer is expected to increase at an annual rate of 1.0 percent over the 1999-2004 period and 0.7 percent over the 1999-2013 period. The moderate growth reflects the effects of increasing efficiencies in air conditioning and refrigeration on energy consumption. The average efficiency for central and room air conditioning is increasing at an annual rate of 0.1 percent while the efficiency for refrigerators is increasing at an annual rate of 2.5 percent.

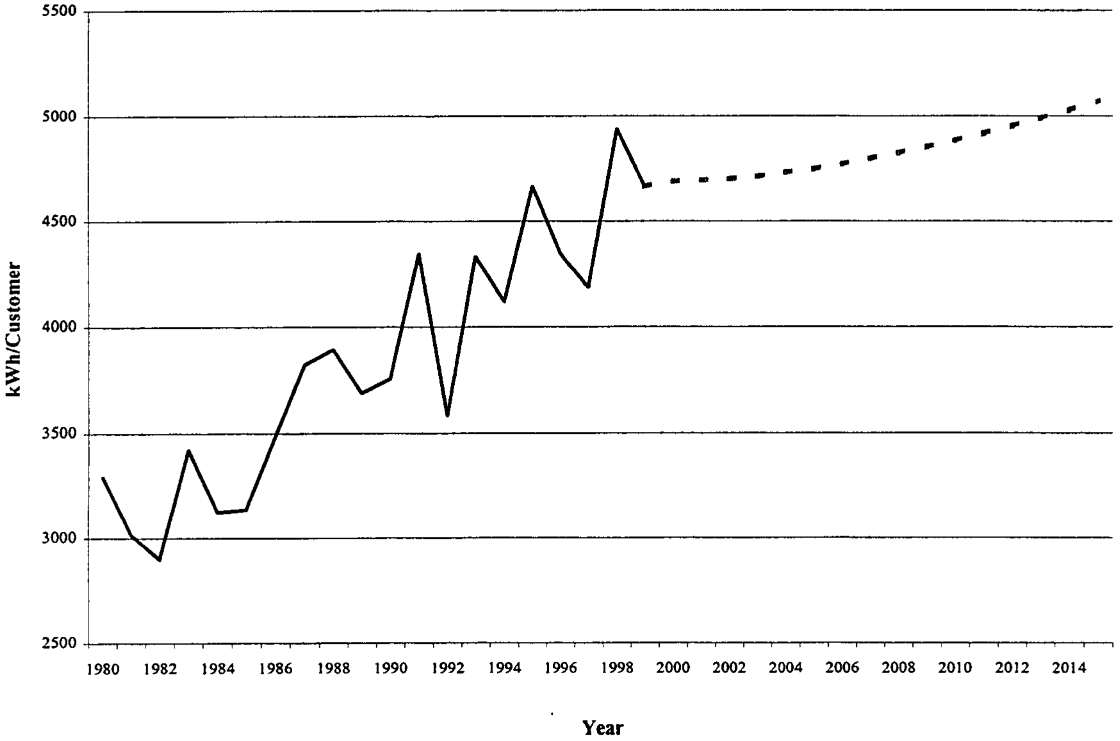
Historically from 1994-1998, the actual winter kWh per customer grew at an annual rate of 1.0 percent and from 1984-1998, the winter kWh per customer grew at an annual rate of 1.8 percent. Winter kWh per customer is projected to increase at an annual rate of 0.1 percent over the 1999-2004 period and increase at an annual rate of 0.4 percent for the 1999-2013 period.

The customer gWh sales and kWh per customer forecasts for the RS class are presented in summary annual form in Table RS-1 and Graph RS-1 (page 22). Table RS-2 presents the actual and normalized kWh per customer for the summer and winter seasons. Graphs RS-2 and RS-3 plot the actual historic data along with the predicted kWh per customer values for the summer and winter seasons.

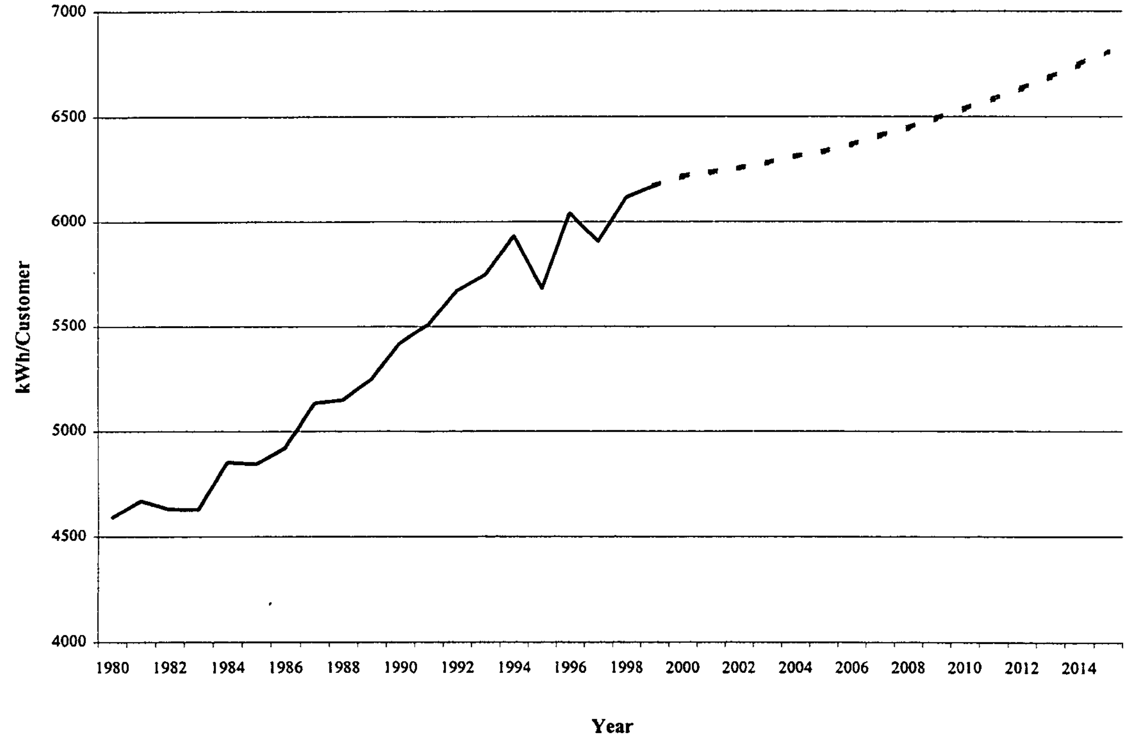
TABLE RS-2
RS CLASS
SEASONAL KWH PER CUSTOMER

YEAR	SUMMER	WINTER
1980	3,294	4,591
1981	3,017	4,671
1982	2,898	4,631
1983	3,420	4,629
1984	3,125	4,853
1985	3,136	4,844
1986	3,481	4,921
1987	3,822	5,129
1988	3,894	5,146
1989	3,691	5,245
1990	3,757	5,417
1991	4,344	5,510
1992	3,583	5,670
1993	4,333	5,746
1994	4,117	5,931
1995	4,666	5,679
1996	4,344	6,041
1997	4,186	5,816
1998	4,941	6,032
1999	4,487	6,286
2000	4,483	6,290
2001	4,577	6,280
2002	4,681	6,273
2003	4,693	6,281
2004	4,713	6,312
2005	4,727	6,337
2006	4,750	6,366
2007	4,778	6,405
2008	4,802	6,444
2009	4,832	6,486
2010	4,864	6,532
2011	4,896	6,579
2012	4,961	6,629
2013	4,968	6,682

GRAPH RS-2
RS SUMMER KWH PER CUSTOMER



GRAPH RS-3
RS WINTER KWH PER CUSTOMER



RESIDENTIAL
FERS CONSUMPTION OUTLOOK

The long-term outlook for this class is for moderate increase in kWh per customer in both the summer and winter seasons. Historically, from 1994-1998 the actual summer kWh per customer grew at an annual rate of 0.2 percent and from 1984-1998, the summer kWh per customer grew at an annual rate of 0.9 percent. Summer kWh per customer is projected to increase at an annual rate of 0.1 percent over the 1999-2004 period and increase at a rate of 0.3 percent over the 1999-2013 period. The relatively flat FERS summer season kWh per customer is due primarily to the effects of increasing efficiency standards for air conditioning and refrigerators. The average efficiency for central and room air conditioning is increasing at an annual rate of 0.1 percent, while the efficiency for refrigerators is increasing at an annual rate of 2.5 percent.

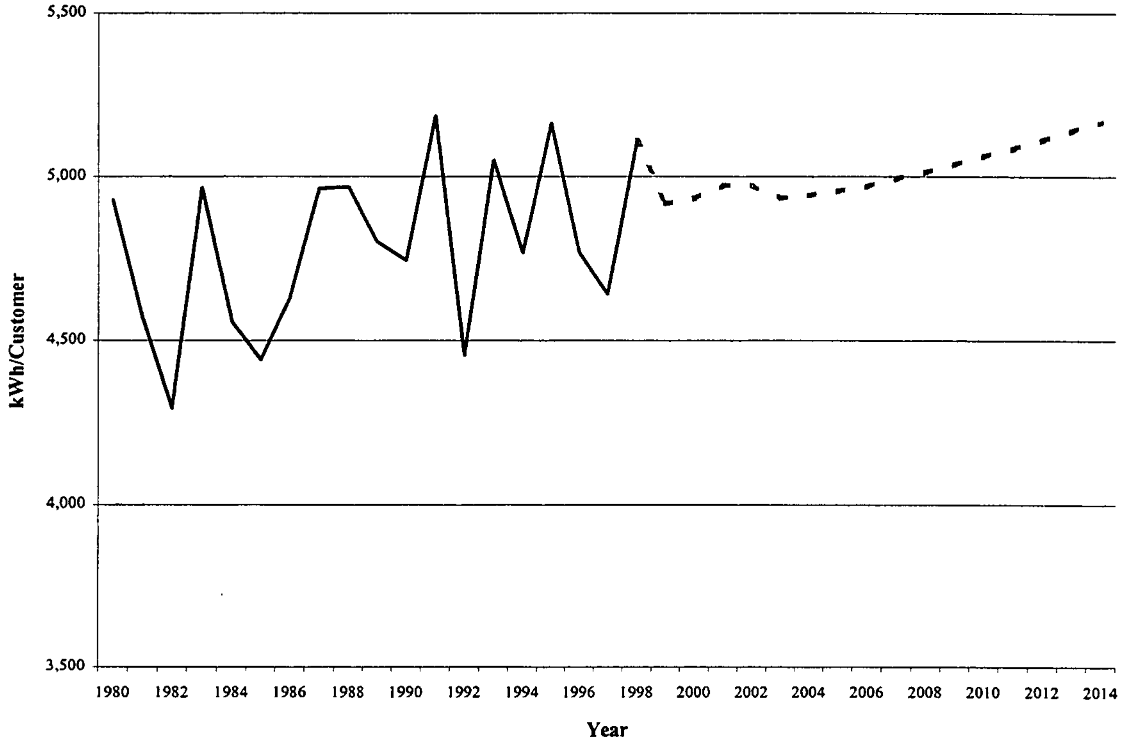
Historically from 1994-1998, the actual winter kWh per customer fell at an annual rate of 1.1 percent and from 1984-1998, the winter kWh per customer declined at an annual rate of 0.03 percent. Winter kWh per customer is projected to decline at an annual rate of 0.5percent over the 1999-2004 period and increase at a rate of 0.1 percent over the 1999-2013 period.

The customer gWh sales and kWh per customer forecasts for the FERS class are presented in annual summary form in Table FERS-1 and Graph FERS-1 (page 23). Table FERS-2 presents the actual and normalized kWh per customer for the summer and winter seasons. Graphs FERS-2 and FERS-3 plot the actual historic data along with the predicted kWh per customer values for the summer and winter seasons.

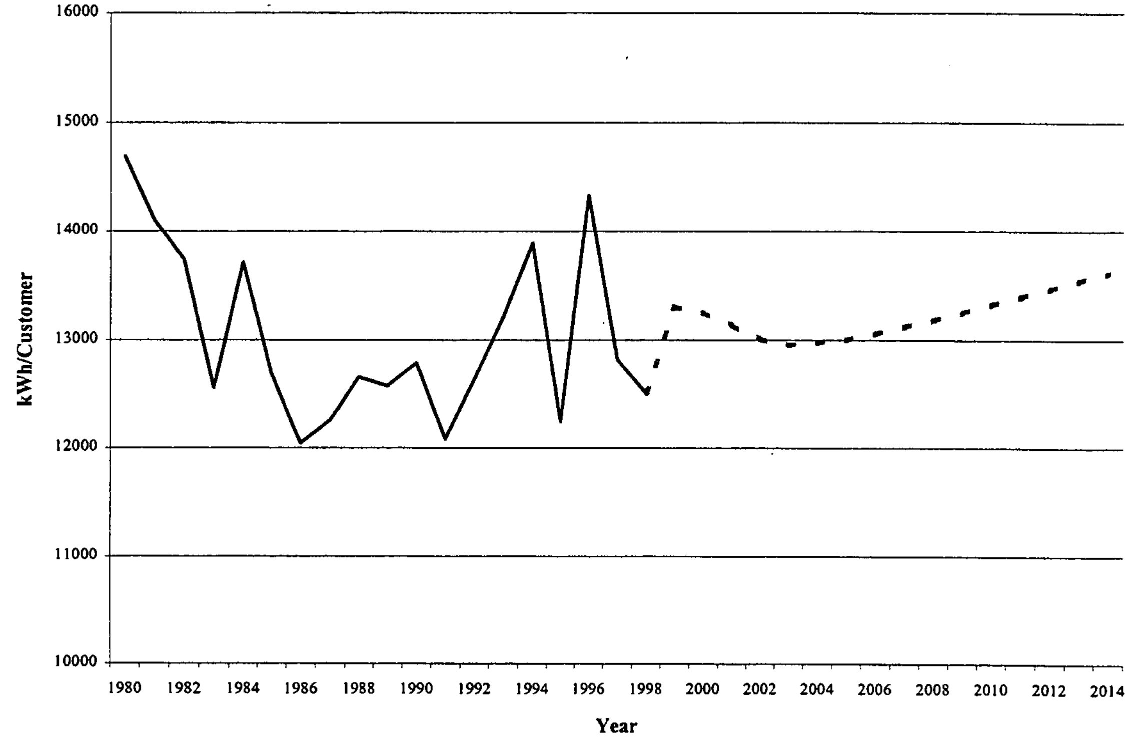
TABLE FERS-2
FERS CLASS
SEASONAL KWH PER CUSTOMER

YEAR	SUMMER	WINTER
1980	4,930	14,694
1981	4,572	14,096
1982	4,295	13,746
1983	4,967	12,557
1984	4,558	13,713
1985	4,442	12,691
1986	4,630	12,041
1987	4,964	12,256
1988	4,969	12,659
1989	4,803	12,577
1990	4,745	12,789
1991	5,185	12,081
1992	4,455	12,640
1993	5,050	13,209
1994	4,769	13,888
1995	5,163	12,243
1996	4,769	14,330
1997	4,642	12,818
1998	5,110	12,506
1999	4917	13,300
2000	4933	13,245
2001	4943	13,133
2002	4943	13,004
2003	4934	12,955
2004	4944	12,976
2005	4956	13,002
2006	4971	13,055
2007	4994	13,119
2008	5013	13,180
2009	5038	13,249
2010	5062	13,322
2011	5085	13,391
2012	5111	13,463
2013	5139	13,539

GRAPH FERS-2
FERS SUMMER KWH PER CUSTOMER



GRAPH FERS-3
FERS WINTER KWH PER CUSTOMER



KY RETAIL

COMMERCIAL

The Commercial sector is defined as an SIC code based combination of the General Service, Light and Power, All-Electric Schools, and Municipal Water Pumping rates, along with the Commercial Space Heating and Off-Peak Water Heating Riders. Together, the Kentucky Retail Commercial sector accounts for 27 percent of total KU sales expected in 1999.

Historic Commercial sector sales under these rate codes are segmented from the Industrial sector on the basis of each account's SIC code. The SIC codes that define the Industrial sector include SIC codes 20 through 39 and a general mining category that includes SIC codes 10 through 14. All accounts with other SIC codes are considered to be Commercial sector sales. Sales groups by SIC code are assumed to exhibit similar usage characteristics and to be influenced by common economic or demographic variables.

Table COMM-1 presents the forecast data for the total Commercial/Industrial class and Graph COMM-1 plots the historical and forecasted gWh sales for the total class. From 1993 to 1998, actual sales to the Commercial sector increased at an average annual rate of 3.6 percent. The predicted average growth rate for the base case forecast from 1999 – 2004 period is 2.6 percent. Increases in both the customer forecast and the usage per customer forecast contribute to the outlook for the Commercial sector. Commercial customers provide the greatest impetus to near term growth, driven by continuing residential customer growth. Commercial customers are forecast to grow at a 1.7 percent average annual rate through 2004 after growing at an average annual rate of 2.3 percent from 1993 to 1998. Usage per customer grew at a 1.2 percent annual rate from 1993 to 1998 but the rate of growth slows to 0.9 percent over the next five years. Over fifteen years, the base case forecast reflects a 2.2 percent growth rate.

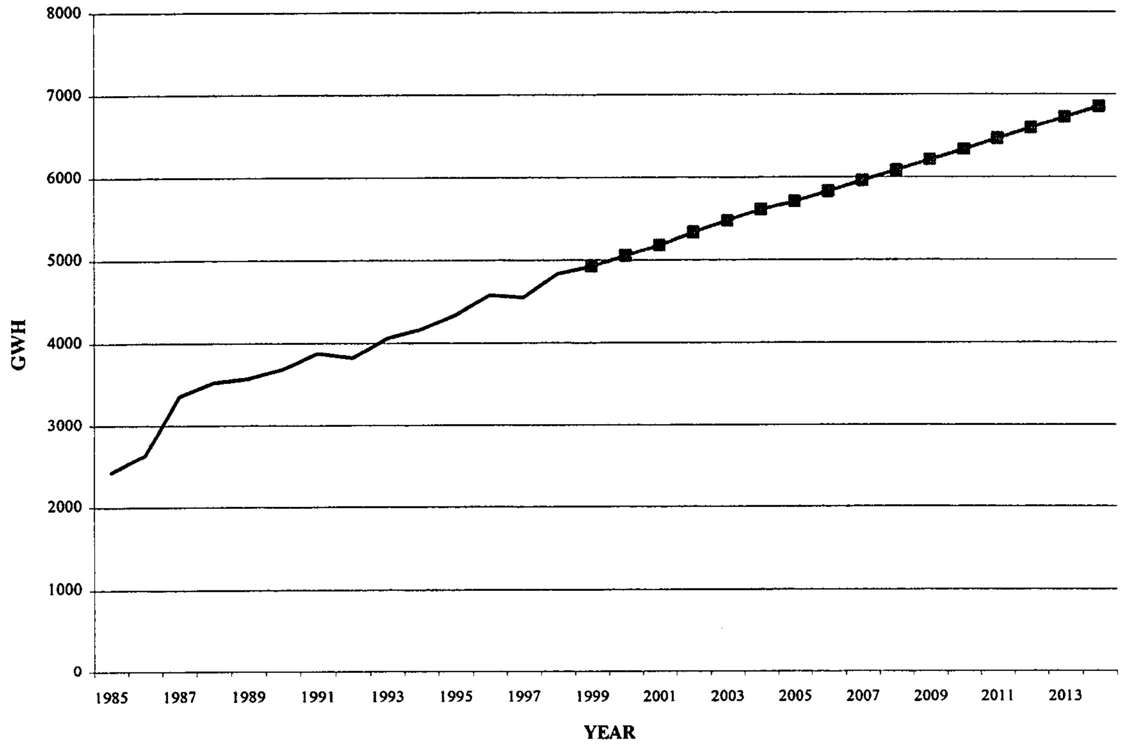
The Commercial sector sales forecasting process is a combination of short-term and long-term econometric and end-use modeling methodologies. Short-term and long-term sales are forecast as the product of customer and KWH per customer forecasts. The short-term econometric model uses monthly data from 1989 through April 1999. Two seasonal econometric models are used for the long-term forecast, one each for the cooling and heating seasons. The cooling season is May through

October and the heating season is November through April. The short-term econometric forecast predicts KWH per customer for the 1999 through 2002 period. The remainder of the outlook for KWH per customer is derived using the seasonal econometric models. Heating and cooling degree days for both the short-term and long-term models are calculated on a 65-degree base. Both use Lexington as the source of the weather data. A ramp function is utilized to align the weather data with the billing data.

TABLE COMM-1
KY-RETAIL COMMERCIAL FORECAST

YEAR	CUSTOMERS	GWH SALES	KWH/CUSTOMER
1999	71,377	4,925	69,000
2000	72,609	5,047	69,507
2001	73,900	5,172	69,988
2002	75,221	5,331	70,868
2003	76,584	5,471	71,432
2004	77,787	5,607	72,085
2005	78,417	5,703	72,728
2006	79,304	5,828	73,498
2007	80,142	5,954	74,298
2008	80,948	6,079	75,102
2009	81,743	6,206	75,926
2010	82,530	6,335	76,758
2011	83,290	6,463	77,591
2012	84,044	6,591	78,428
2013	84,786	6,721	79,267

GRAPH COMM-1
KU COMMERCIAL SALES: HISTORY AND 1999-2013 FORECAST



Commercial customers are forecast as a function of residential customers and a binary term starting in 1987 to capture the effect of a shift in historic data due to the use of SIC codes to segment commercial and industrial customers. The resulting equation for commercial customers is shown below (the number in parenthesis indicates the probability of that variable being insignificant).

$$\text{COMCUST} = -11294 + \underset{(.0001)}{.21329(\text{RESCUST})} + \underset{(.0005)}{2059.75(\text{BIN})} - .7113(\text{AR1})$$

WHERE:

COMCUST = KU Commercial Customers
BIN = Binary Variable for SIC Code Reclassification
RESCUST = Residential Customers
AR1 = Autoregressive correction term

MODEL STATISTICS:

Adj R^2 = .99
F Test = 2194
AR(1)PARM = -.71 t-test of AR(1) = -5.06

The short-term model uses monthly KWH per customer as the dependent variable. Monthly KWH per customer is forecast using KWH per customer lagged one period, commercial service territory employment, January heating degree days, February heating degree days, March heating degree days, April heating degree days, December heating degree days, June cooling degree days, July cooling degree days, August cooling degree days, and September cooling degree days. (the number in parenthesis indicates the probability of that variable being insignificant).

$$\begin{aligned}\text{Monthly KPC} = {} & 2148 + \underset{(.0001)}{.178(\text{KPC\_L1})} + \underset{(.0000)}{.003(\text{ENGO})} + \underset{(.0000)}{1.002(\text{JANHDD})} + \underset{(.0000)}{.685(\text{FEBHDD})} \\ & + \underset{(.0000)}{.45(\text{MARHDD})} + \underset{(.0012)}{.608(\text{APRHDD})} + \underset{(.0000)}{.972(\text{DECHDD})} + \underset{(.0000)}{5.90(\text{JUNCDD})} \\ & + \underset{(.0000)}{4.63(\text{JULCDD})} + \underset{(.0000)}{4.28(\text{AUGCDD})} + \underset{(.0000)}{5.52(\text{SEPTCDD})}\end{aligned}$$

Where:

KPC_L1 = Monthly KWH per Customer (lagged one period)
ENGO = Monthly Commercial Employment
JANHDD = January Heating Degree Days
FEBHDD = February Heating Degree Days
MARHDD = March Heating Degree Days
APRHDD = April Heating Degree Days
DECHDD = December Heating Degree Days
JUNCDD = June Cooling Degree Days
JULCDD = July Cooling Degree Days
AUGCDD = August Cooling Degree Days
SEPTCDD = September Cooling Degree Days

Model Statistics:

Adj R^2 = .91
F Test = 114.7
D-W Test = 2.25

The dependent variable in both seasonal models is kWh per customer. For the cooling season model, the explanatory variables are service territory commercial employment, cooling degree days, the real average commercial price of electricity, a binary variable designed to capture the effect of SIC code based segmentation beginning in 1987, and an interaction term between commercial employment and the binary variable. For the heating season model, the explanatory variables are service territory employment, heating degree days, the real average commercial price of electricity, a binary variable designed to capture the effect of SIC code based segmentation beginning in 1987, and an interaction term between commercial employment and the binary variable.

The forecast of service territory employment is obtained from the KUSTEM model. Real average commercial price is calculated from FERC Form 1 data for KU for the commercial sector, deflated by the U.S. implicit price deflator provided by WEFA.

The resulting equations are shown below (the number in parenthesis indicates the probability of that variable being insignificant). The heating degree day and real average commercial price terms in the heating season model are weakly specified, but are included for the sake of theoretical completeness and since they do have the expected signs.

COOLING SEASON:

$$\text{KWH per customer} = -3002.38 + \underset{(.0001)}{3.545(\text{CDD})} - \underset{(.0731)}{106507(\text{RACP})} + \underset{(.0001)}{.066(\text{COMEMP})} + \underset{(.0001)}{21310(\text{BIN})}$$

$$+ - \underset{(.0003)}{.038189(\text{INEMP})} - .57548(\text{AR1})$$

HEATING SEASON:

$$\text{KWH per customer} = -13777 + \underset{(.2220)}{.578(\text{HDD})} + \underset{(.0001)}{.0753(\text{COMEMP})} + \underset{(.0001)}{28237(\text{BIN})}$$

$$- \underset{(.0001)}{.050709(\text{INEMP})}$$

Where:

EMP = Service Territory Commercial Employment
CDD = Cooling Degree Days
HDD = Heating Degree Days
BIN = Binary Variable for SIC Code Reclassification in 1987
RACP = Real Average Commercial Price
INEMP = Interaction Variable (EMP * BIN)

Model Statistics:

Cooling Season:

Adj R^2 =. 995
AR(1) PARM =-.575
T-test of AR(1) =-3.31
D-W Test after AR(1) = 1.67

Heating Season:

Adj R^2 = .988
F Test = 560.7
D-W Test = 2.49

COMMERCIAL END-USE MODEL

The COMMEND model enables KU to forecast subsets of the Commercial Sector which represent classifiable commercial building sales. Commercial sales to non-building types such as pumps, billboards, phone booths, automatic tellers and sales to industrial SIC-coded accounts with a commercial revenue class are grouped and reported as >out-of-scope= sales.

The COMMEND model provides projected sales by eleven building types and nine end-uses and captures the estimated effects of appliance standards from the National Energy Policy Act of 1992 and the National Appliance Energy Conservation Act of 1987. The model is similar to REEPS in that it uses an integrated end-use econometric modeling framework which combines engineering concepts with economic relationships at the individual appliance level. Direct interaction with the data, model concepts and decision equations for each end-use gives KU the flexibility to make changes in the model that reflect the energy usage characteristics of commercial customers.

COMMEND models appliance purchase decisions and energy consumption for the nine end-uses and eleven building types listed below:

END-USES

Space heating
Space cooling
Ventilation
Water heating
Cooking
Refrigeration
Interior lighting
Office Equipment
Miscellaneous

BUILDING TYPES

Small Offices
Large Offices
Warehouses
Foodstores
Retail
Schools
Colleges
Restaurants
Health
Lodging
Miscellaneous

The COMMEND framework for modeling these building types and end-uses consists of modules for exogenous variables, floor stock, market profiles, technology data, economic data, and standards and demand-side management. COMMEND provides a default database for all parameters that has been derived from national surveys and examinations of utility data. This database is periodically updated by RER as was the case in the Residential sector. These databases have been modified to reflect available KU-specific data obtained from the 1992 KU Commercial Survey. This survey was designed as a means of populating key data inputs to the COMMEND model.

The Exogenous Variables module includes an energy price section and an "other" exogenous variable section. The energy price section consists of nominal price series for electricity, natural gas and fuel oil (treated as "other" fuels), as well as the implicit GDP price deflator series. The electricity price series is the same as used in the commercial econometric model.

The Floor Stock module serves to define market segments (building types), define historical and forecast periods, construct historical floor stock data using a base year stock value, historical scale data and survival functions, and to develop floor stock forecasts. The 1992 Base Year floor stock has been estimated from the 1992 KU Commercial Survey. Historic and forecast values are based on employment estimates and forecasts by building type and on an estimate of floor stock per employee from the commercial survey.

The Market Profiles module contains data on energy use profiles within each building type. Key parameters that are controlled here are fuel shares and energy utilization intensity (EUI) values. Average and marginal shares and EUI values are entered for each building type, end-use, and fuel choice combination. COMMEND utilizes the base year floor stock, average fuel shares and average EUI's to calculate in a spreadsheet format a total sales level for each fuel type within each building type. For electricity sales, this value can be calibrated to an estimated base year total. Average fuel shares have been estimated from the Commercial Survey. Average and marginal EUI's for small and large offices and foodstores have been estimated utilizing prototype building simulations with micro-Axcess an EPRI supported simulation model. The remaining average EUI=s are generally based on averages of South and Midwest region default data. The remaining marginal shares are estimated using adjustments to the average shares using marginal default data. Marginal EUI's are generally default data.

The Technology Data module contains information about end-use efficiencies and average equipment costs in new construction. When calculating HVAC energy usage, COMMEND recognizes a technology level distinction between heat pumps and resistance heating technologies. Direct input in this module of heat pump specific data allows the EUI value to be unbundled into the two technology components. Tradeoff elasticities between equipment costs and energy use in new construction are required. The concept behind these parameters is the existence of a technology segment representing the range of available technologies. The marginal EUI and the capital cost represent weighted averages across options on this curve. Efficiency trends are included that are considered independent of energy prices and efficiency standards. Equipment cost trends are also provided. The interaction of efficiency and cost shifts over time determine the position and shape of the technology curve. Finally, HVAC interactions with non-HVAC equipment and thermal shell characteristics are modeled through efficiency parameters. The data in this module is generally based on default values.

The Economic Data module contains information about decision makers and decision rules. Two types of decision maker data are required. The first data type is a set of discount rate distributions. Separate distributions can be entered for each building type. The second data type is a set of weights for price expectations. This allows for the introduction of distributed lags of past prices. Decision rules are modeled through the use of choice elasticities, utilization elasticities, replacement factors, penetration changes, miscellaneous equipment growth, and thermal shell parameters. Choice elasticities indicate the sensitivity of equipment decisions to life-cycle cost. Utilization elasticities indicate the sensitivity of equipment usage to energy prices or other factors. Replacement factors create a distinction between fuel share and efficiency changes in new buildings and the degree to which these changes are adopted in older buildings. They are referred to as fuel share and EUI inertia factors. Penetration factors control changes in the penetration of end uses in existing structures. The miscellaneous growth factors allow electric equipment saturations to grow independently for each building type. Separate growth profiles are entered for office equipment and miscellaneous equipment. Thermal shell parameters are used to measure the sensitivity of thermal efficiency to energy prices, and any trends in thermal efficiency that are unrelated to energy prices or efficiency standards. The data in this module is generally based on default values.

The Standards and DSM module allows the input of data related to equipment efficiency standards, thermal efficiency standards, and DSM program impacts. Equipment efficiency standards limit the range of efficiency options available in the equipment market. Standards are assigned separately to each end-use and building type. Thermal efficiency standards are not represented in COMMEND. However, the data provided give a path for thermal efficiency levels required by standards. The path is constructed from the following information:

- The timing of the standards and an assumption about compliance levels.
- The estimated impacts of standards on head loss during the heating season.
- The estimated impacts of standards on heat gain during the cooling season.

KY-RETAIL

INDUSTRIAL

The Industrial sector is an aggregation of sales under The General Service, Light & Power, Large Commercial/Industrial, and High Load Factor rate classification with SIC codes 20 through 39 plus an additional category for mining sales, including sales not covered by the Company's Mine Power rate. The Industrial sector accounts for 27 percent of total KU sales expected in 1999. The forecast for sales to the Industrial sector has been produced using a monthly econometric model and an annual econometric model along with a small number of individual customer forecasts. The results from the monthly model and the annual model are weighted so as to phase in the long-term model. The weights applied to each are illustrated in Table CI-3. After 2005, the remainder of the forecast is the prediction from the annual model.

TABLE IND-1
APPLIED WEIGHTS TO THE SHORT-TERM
AND LONG-TERM INDUSTRIAL FORECAST

Year	Short-Term Model	Long-Term Model
1999	80%	20%
2000	80%	20%
2001	65%	35%
2002	40%	60%
2003	25%	75%
2004	15%	85%
2005	10%	90%

The monthly model used monthly kWh as the dependent variable. The explanatory variables are service territory output, a seasonal binary for January, June cooling degree-days, July cooling degree-days, August cooling degree-days, and September cooling degree-days. The resulting equation is shown below (the numbers in parenthesis indicate the probability of that variable being insignificant).

$$\begin{aligned}\text{Industrial kWh} \;=\; & -29267726 + \underset{(0.0000)}{0.03(\text{RGSP})} - \underset{(0.0079)}{7764782(\text{JAN})} + \underset{(0.0000)}{240071.8(\text{JUNCDD})} \\ & + \underset{(0.0012)}{59895.82(\text{JULCDD})} + \underset{(0.0000)}{92298.31(\text{AUGCDD})} + \underset{(0.0000)}{209782.6(\text{SEPCDD})}\end{aligned}$$

Where:

RGSP = Service Territory Output
JAN = January Binary Variable
JUNCDD = June Degree Day Interaction Variable
JULCDD = July Degree Day Interaction Variable
AUGCDD = August Degree Day Interaction Variable
SEPCDD = September Degree Day Interaction Variable

Model Statistics:

Adjusted R^2 = 0.94
F-Statistic = 251.62
D-W Test = 2.07
AR(1) PARM = 0.16 t-Test of AR(1) = 1.72

Annual kWh consumption is the dependent variable in the annual model. The explanatory variables are real service territory manufacturing output, the real average industrial price of electricity, cooling degree-days using a 70-degree base, and an annual dummy variable beginning in 1985. The resulting equation is shown below (the numbers in parenthesis indicate the probability of that variable being insignificant).

$$\text{Annual Industrial kWh} = 64500983 + \underset{(0.0000)}{0.14[D(RGSPRE)]} - \underset{(0.0059)}{1.08E{+}10[D(REPRICE)]}$$

$$+ \underset{(0.0878)}{80476.22[D(CDD70)]} - \underset{(0.0000)}{6.47E{+}08[D(YRDUM)]}$$

Where:

D(RGSPRE) = First Difference of Service Territory Output
D(REPRICE) = First Difference of Real Average Industrial Price of Electricity
D(CDD70) = First Difference of Cooling Degree Days (70 Degree Base)
D(YRDUM) = First Difference of Annual Dummy Variable

Model Statistics:

Adjusted R^2 = 0.92
F-Statistic = 45.54
D-W Test = 2.11
AR(1) PARM = -0.59 t-Test of AR(1) = 3.24

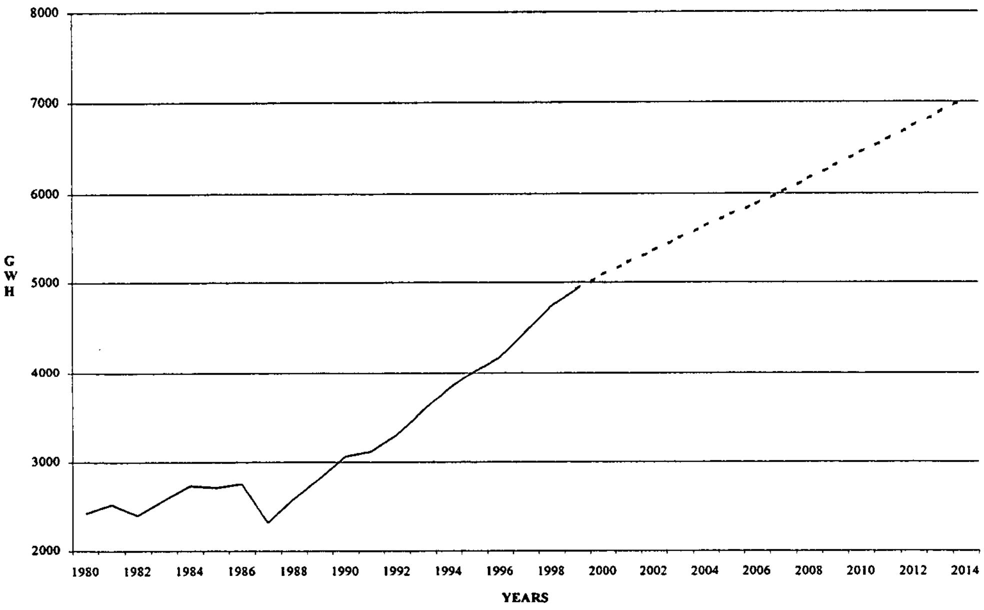
The five-year predicted growth rate for the Industrial sector is 2.7 percent. Over the fifteen year forecast horizon, the growth rate decreases slightly to 2.4 percent.

Four large industrial KU customers are individually forecasted. The forecast for these customers are developed based on recent history in sales and demand and on communications with each customer regarding its outlook for growth and expansion. In total, sales to these large customers are forecasted at 1232 gWh for 1999, rising annually at 1.2 percent to 1309 gWh in 2004, and remaining constant thereafter.

TABLE IND-2
INDUSTRIAL FORECAST

YEAR	GWH
1999	4,923
2000	5,086
2001	5,221
2002	5,353
2003	5,493
2004	5,632
2005	5,763
2006	5,876
2007	6,016
2008	6,159
2009	6,303
2010	6,448
2011	6,592
2012	6,736
2013	6,882

GRAPH IND-1
INDUSTRIAL GWH SALES



MINE POWER SERVICE (MP, LMP)

The Mine Power sales and customer forecasts reflect the dependence of this class of service on the general outlook for the state's coal industry. Table MP-1 presents Resource Data International's (RDI) outlook for coal production in Kentucky, in total and by region.

RDI predicts a general increase in total state production over the forecast period of approximately one and a half million tons from 1999 to 2004, and an average annual rate of 0.2 percent. Over the full fifteen year forecast horizon, state production is predicted to increase by approximately fourteen million tons from 1999 to 2013, an average annual growth rate of 0.6 percent. Most of the growth comes from Eastern Kentucky, which is projected to experience an increase of 4.1 million tons from 1999 to 2004 (0.6 percent average annual growth) and 13.4 million tons over the fifteen-year period (0.7 percent average annual growth) over the forecast period. Western Kentucky tonnage is projected to decline by 2.5 million tons from 1999 to 2004 (1.4 percent average annual decline) and increase by 700,000 tons (0.1 percent average annual increase) over the forecast period.

To forecast sales, the model incorporates intensity of use and market share analyses. Utilizing billing data, the RDI coal production history, Company field office knowledge, an average kWh/ton extracted on KU territory and KU's approximate share of coal production for 1997 were calculated for the Eastern and Western Kentucky regions. The analysis was based on data associated with 90 percent of total Mine Power sales. These values were then applied to KU's forecast of coal production in each region to estimate future sales for 1999 and beyond. The parameters calculated for the forecast are given in Table MP-2. A flowchart of Mine Power kWh forecast process is presented in Figure MP-1. The Mine Power customer forecast is derived from the kWh forecast by dividing forecasted gWh by 1998 average kWh per customer.

TABLE MP-1
KENTUCKY COAL PRODUCTION FORECAST (MM TONS)

YEAR	TOTAL KENTUCKY	EAST KENTUCKY	WEST KENTUCKY
1999	161.9	125.1	36.8
2000	159.4	125.0	34.4
2001	161.3	127.3	34.0
2002	161.4	127.6	33.8
2003	161.9	128.2	33.7
2004	163.5	129.2	34.3
2005	164.5	129.7	34.8
2006	164.5	130.4	34.2
2007	166.8	131.8	35.0
2008	168.9	133.4	35.5
2009	170.9	135.4	35.5
2010	174.6	137.6	37.0
2011	175.5	138.5	37.0
2012	176.5	139.5	37.0
2013	176.0	138.5	37.5

TABLE MP-2
1999 END-USE AND MARKET SHARE PARAMETERS

	EAST KENTUCKY		WEST KENTUCKY	
	AVGERAGE kWh/TON	MARKET SHARE (%)	AVERAGE kWh/TON	MARKET SHARE (%)
1999	24.9	3.90	14.9	65.71
2000	24.9	3.83	14.9	65.68
2001	24.9	4.02	14.9	64.83
2002	24.9	3.77	14.9	68.84
2003	24.9	3.44	14.9	65.56
2004	24.9	3.24	14.9	68.19
2005	24.9	2.99	14.9	69.77
2006	24.9	2.57	14.9	68.43
2007	24.9	2.19	14.9	63.97
2008	24.9	1.83	14.9	61.58
2009	24.9	1.40	14.9	59.41
2010	24.9	0.98	14.9	56.47
2011	24.9	0.76	14.9	48.79
2012	24.9	0.58	14.9	45.32
2013	24.9	0.46	14.9	42.14

RDI's coal production outlook is disaggregated by producing mine. In addition to facilitating an analysis of the Company's major Mine Power rate customers to provide the annual coal production market shares by region, the database also identifies the major customers of each mine. By analyzing the markets for the coal, KU has concluded that its major Mine Power customers in western Kentucky have relatively well protected markets due to their contracts with utilities that employ scrubbers. Therefore, there is reason to believe that KU's market share on the Mine Power rate in Western Kentucky should fluctuate in the mid-60 percent range through 2007 and decline thereafter due to new contract negotiations. For 2000, the Western Kentucky market share is projected to be 65.7 percent. From 2000 through 2005 the market share fluctuates between 65 and 69 percent. From 2006 through the end of the forecast period the market share steadily declines to 39 percent.

A summary of forecasted customers and energy sales is shown in Table MP-3. Energy sales are forecasted to show an slight decline from 502 gWh in 1999 to 479 gWh in 2004 (0.9 percent average annual decrease). Sales are anticipated to take a dip in 2007 to 466 gWh. Thereafter, the outlook is for a continued decline to a sales level of 374 in 2013 (2.0 percent average annual decline over the forecast period). Customers track the gWh forecast, declining from 50 in 1999 to 37 in 2013. Graph MP-1 plots the historical and forecasted gWh sales for the Mine Power rate class.

FIGURE MP-1
MINE POWER GWH MODEL

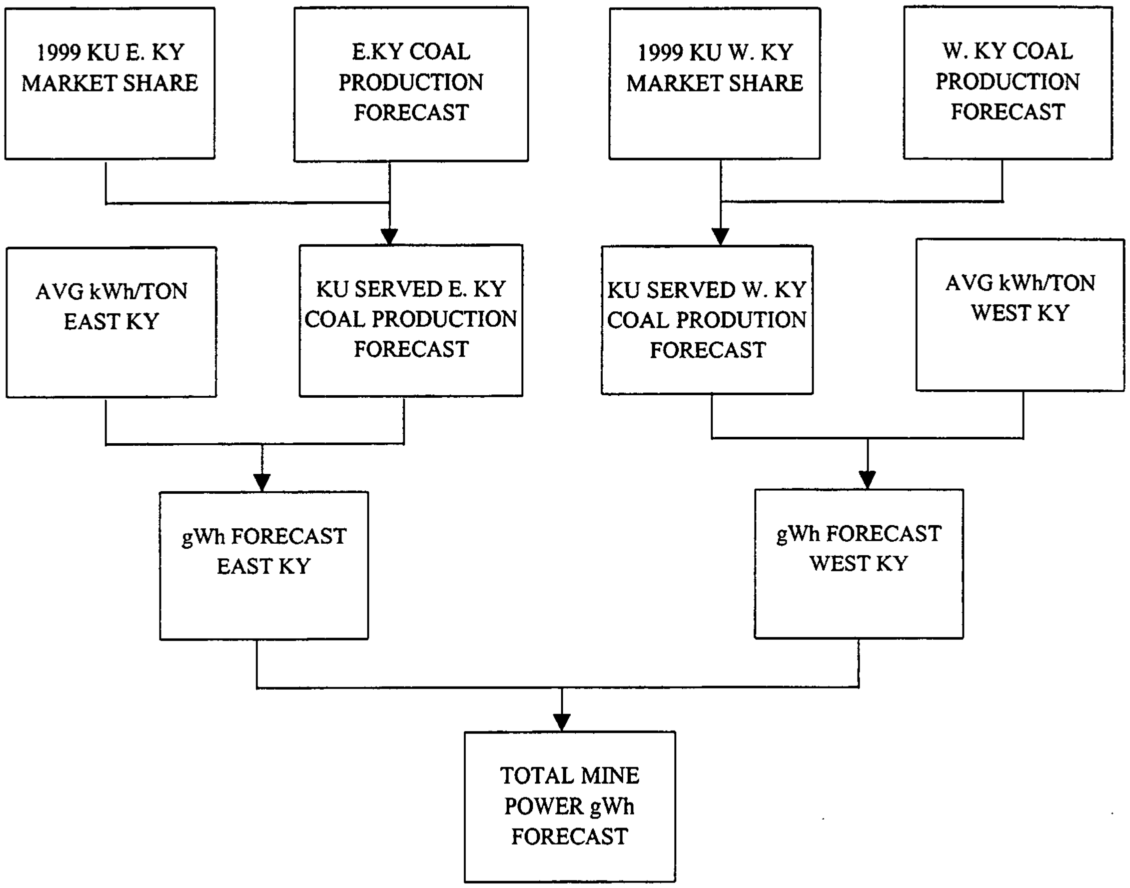
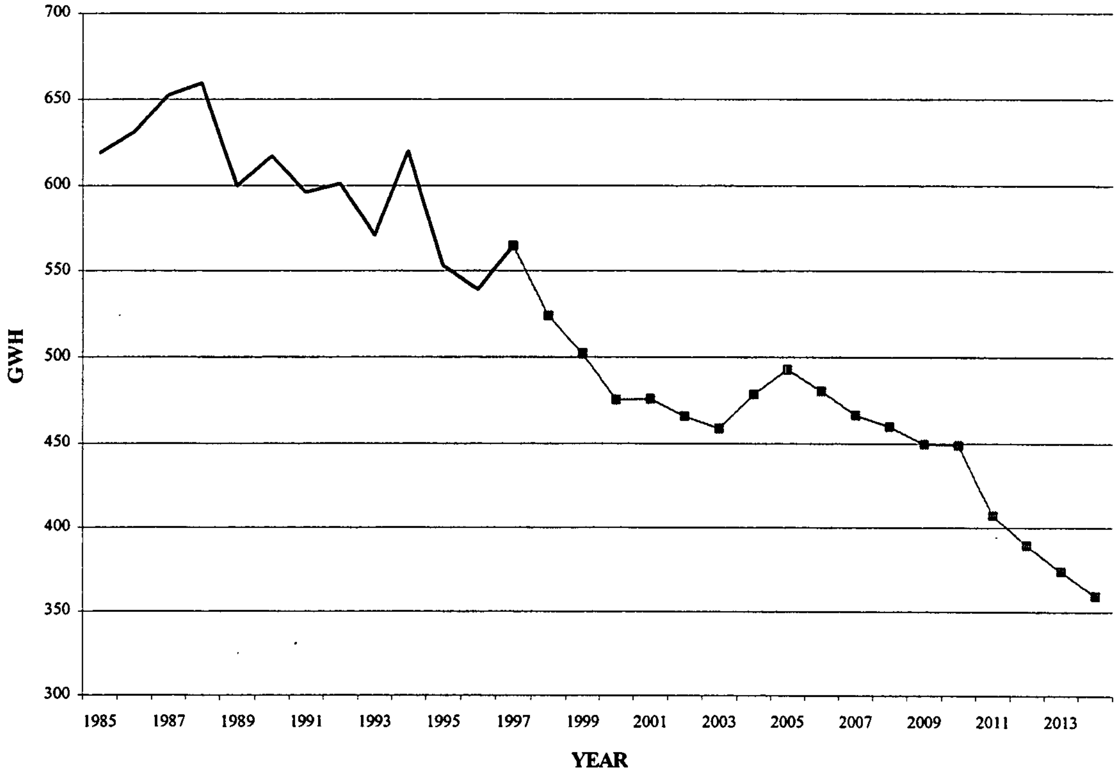


TABLE MP-3
MINE POWER FORECAST

YEAR	CUSTOMERS	GWH
1999	50	502
2000	47	475
2001	47	476
2002	46	466
2003	45	459
2004	47	479
2005	49	493
2006	47	480
2007	46	466
2008	45	460
2009	44	450
2010	44	449
2011	40	407
2012	38	389
2013	37	374

GRAPH MP-1
MINE POWER GWH SALES



LIGHTING

KU-Retail lighting sales are forecasted in two groups, outdoor area lighting and street lighting. The outdoor area lighting group is projected utilizing two regression models, one for the number of fixtures and one for the average KW rating per fixture. The fixture count times the consumption rate times hours of use determines the energy forecast. Fixtures are regressed against service territory households and a binary variable that accounts for a revision of the fixture accounting procedure in 1987. As fixtures are a physical unit, the projected fixture values are adjusted so that the last year of known values equal the predicted values. Average KW rating per light for outdoor area lighting is regressed against time and a binary variable that accounts for the impact of the fixture count revision in 1987 on average KW rating per light. The equations for fixtures and average KW rating per light are shown on the following page (the number in parenthesis indicates the probability of that variable being insignificant).

AREA LIGHTING:

$$\text{FIXTURES} = -189.9*10^3 + \underset{(.0001)}{0.705(\text{HHLDS})} - \underset{(.0520)}{2.46*10^3(\text{BIN})}$$

$$\text{AVG KW/LIGHT} = 9.83 \underset{(.0021)}{-.005(\text{YEAR})} \underset{(.897)}{-.0009(\text{BIN})}$$

Where:

HHLDS = KU Service Territory Households
BIN = Binary Variable for 1987 Redefinition
YEAR = Time

Model Statistics:

Area Lighting:		Avg kw/light:	
Adj R^2	= .99	Adj R^2	= .90

The Company provides incandescent, mercury vapor and high pressure sodium (HPS) street lighting service. Incandescent lights are not available for new installations and the price differential between mercury vapor and HPS lights effectively eliminate requests for new mercury vapor systems. The forecast assumes that all new street lights will be HPS.

The street lighting group uses the same methodology as the area lighting group for the fixture forecast. Fixtures are regressed against time and the binary variable for the 1987 revision. Following is the equation for fixtures in the street lighting group (the number in parenthesis indicates the probability of that variable being insignificant).

STREET LIGHTING:

$$\text{FIXTURES} = -203.4*10^{4} + \underset{(.0181)}{1892(\text{YEAR})} + \underset{(.0001)}{1050(\text{BIN})}$$

Where:

YEAR = Time

BIN = Binary Variable for 1987 Redefinition

Model Statistics:

Adj R^2 = .99

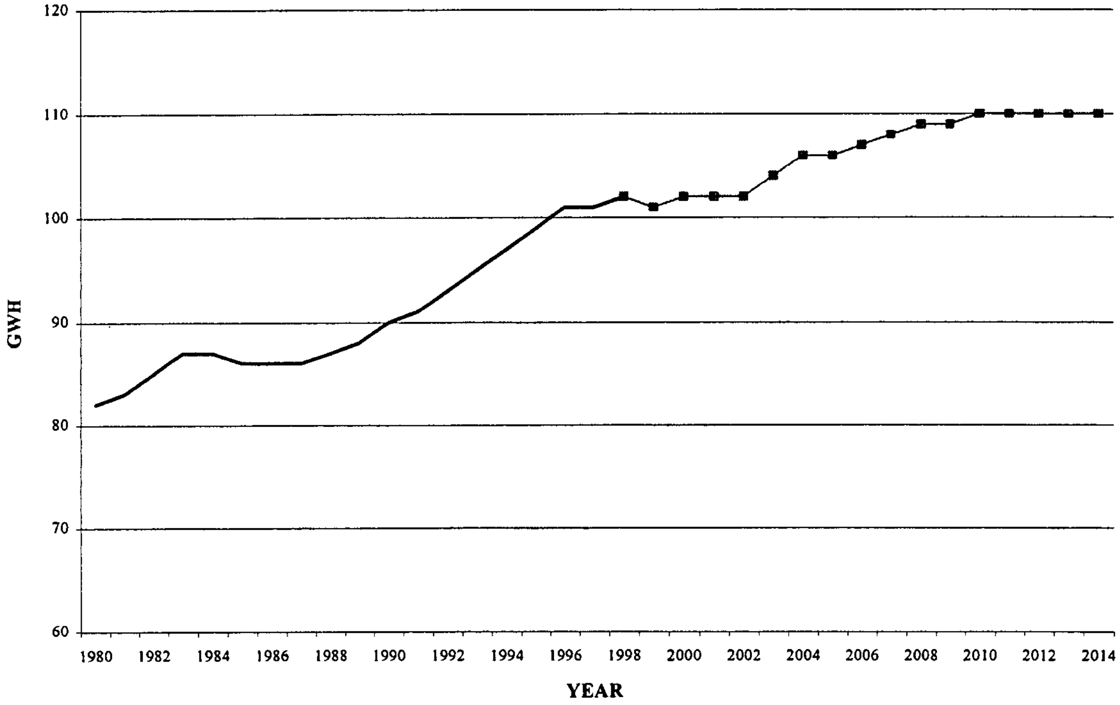
For the average KW rating per fixture, existing fixtures are grouped by type and lumen to identify HPS and Non-HPS weighted averages. The mix of HPS lighting types is then held constant over the forecast period. This establishes an average KW rating for HPS fixtures. All increases of fixtures are assumed to occur in the HPS group. The Non-HPS fixtures are retired based upon the average of the annual change in fixture count over the last five years. The Non-HPS KW per fixture used for the forecast period is based on the average over the last five years. This is the factor used in the energy calculation. The street lighting energy is calculated in the same manner as in the area lighting group and is combined to produce the energy for this group.

The forecasted gWh sales are shown in Table LT-1. A plot of the historical and forecasted lighting gWh sales are shown on Graph LT-1.

TABLE LT-1
LIGHTING FORECAST

YEAR	GWH
1999	101
2000	101
2001	102
2002	102
2003	104
2004	106
2005	106
2006	107
2007	108
2008	109
2009	109
2010	110
2011	110
2012	110
2013	110

GRAPH LT-1
LIGHTING GWH SALES



VIRGINIA

OLD DOMINION POWER

SUMMARY

The Old Dominion Power Company (ODP) operating unit of Kentucky Utilities serves five counties in southwestern Virginia. As these sales occur in the Virginia jurisdiction, they are modeled separately from other retail sales. ODP sales are disaggregated to a rate class basis. In the determination of KU system output, a two-step process of accounting for losses is employed for ODP that first brings sales up to the state line and then adjusts for the Kentucky system monthly loss factor. This forecast predicts an annual growth rate of 2.1 percent for the 1999-2004 period and 1.9 percent from 1999-2013. The forecasted growth rates by class for the 1999-2013 period are as follows:

TABLE ODP-1
FORECASTED GROWTH RATES FOR ODP

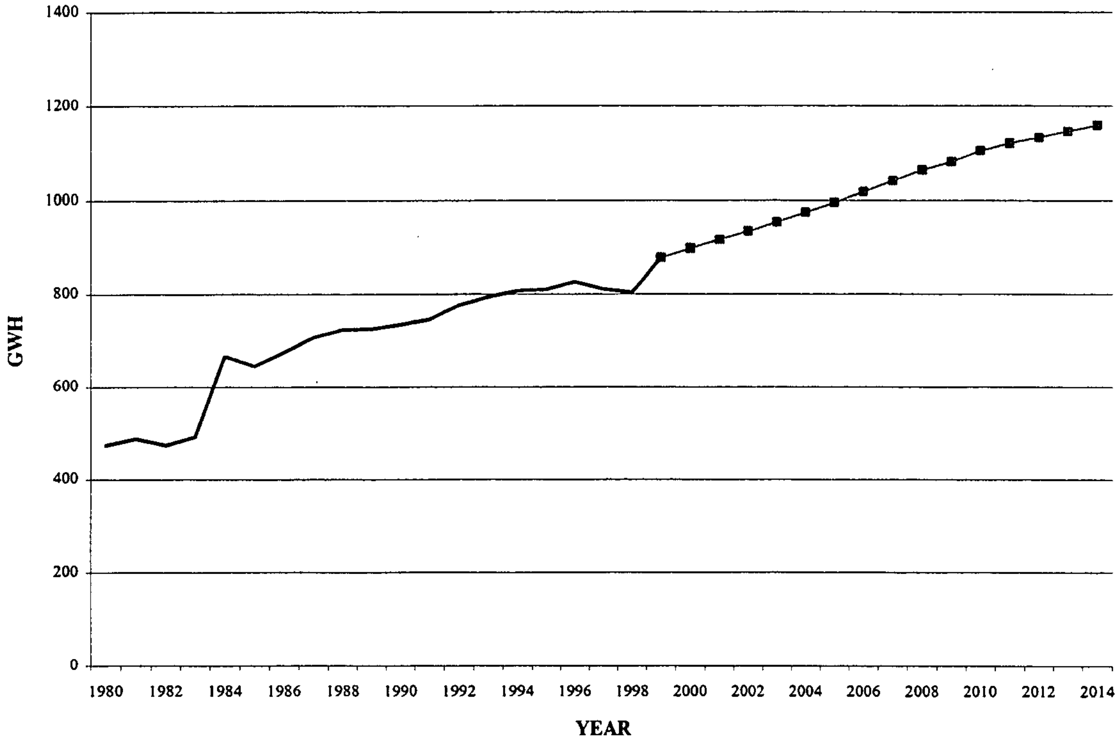
CLASS	% ANNUAL GROWTH RATE	% OF TOTAL ENERGY SALES
Residential	1.7	44
Commercial/Industrial	2.1	52
All Electric Schools	-	3
Lighting	1.9	1
TOTAL	1.9	100

Table ODP-1 is a tabulation of the forecasted gWh sales for the 15-year period. Graph ODP-1 is a plot of the historical and forecasted gWh sales.

TABLE ODP-2
TOTAL ODP FORECAST

YEAR	CUSTOMERS	GWH SALES
1999	29,322	879
2000	29,737	898
2001	30,066	916
2002	30,397	935
2003	30,728	954
2004	31,061	974
2005	31,394	996
2006	31,728	1,018
2007	32,063	1,041
2008	32,400	1,064
2009	32,737	1,082
2010	33,075	1,105
2011	33,135	1,122
2012	33,195	1,133
2013	33,256	1,146

GRAPH ODP-1
TOTAL ODP GWH SALES



OLD DOMINION POWER RESIDENTIAL

Old Dominion Power Company (ODP) has one residential rate class for both all-electric and non all-electric customers. The forecast for this class is developed in two parts: (1) a projection of customers and (2) a projection of long term energy sales. The cooling season is June through September and the heating season is October through May. Degree-day data are based on 65-degrees and derived from data from the Bristol, Tennessee weather station.

The customer forecast is initiated using a population forecast developed by the Virginia Employment Commission. A ratio of customers to population is computed by county and trended over the forecast period. Future customers are then estimated by multiplying the trended ratio of customer to population period. Future customers are then estimated by multiplying the trended ratio of customer to population by the population forecast. The most recent population forecast is through the year 2010. Therefore, the customer forecast is fixed at the 2010 level for the rest of the forecast period. Scott County, in which ODP has only 25 customers, is fixed at that value for the forecast period. The average annual service territory decline in population is projected to be 0.7 percent annually for the 1999-2004 period and 0.7 percent for the 1999-2013 period.

RESIDENTIAL END-USE MODEL

KU's long-term forecasting models are designed to support the Company's expansion planning efforts. For the residential sector, the Residential End-Use Planning System (REEPS) model is utilized. REEPS generates an annual sales forecast based on a discrete choice-modeling framework. The model utilizes choice equations to construct a "multinominal" share system for all defined end-uses. Each equation relates the market share of an end-use to its economic attractiveness relative to the economic attractiveness of alternate technologies. This results in a market share forecast. These appliance shares are multiplied times the customer forecast and then a kWh per appliance forecast to derive an energy forecast by rate class. Customers are derived external to the model. The model permits direct interaction with the data, model concepts, and decision equations that are developed for each defined end-use. This gives KU the flexibility to develop a model that reflects the demographic and energy usage characteristics of ODP residential customers.

As with any detailed end-use model, REEPS requires a substantial data development effort and that the user make several assumptions regarding customer behavior and efficiency related issues. REEPS models appliance purchase decisions and energy consumption for ten end-uses plus and HVAC (heating, ventilation, and air conditioning) end-use. The HVAC end-use contains nine heating and cooling appliances. All of the end-uses included in the models are listed below:

HVAC:
- Central electric heating
- Heat pump heating
- Room electric heating
- Secondary heating
- Central air conditioning
- Heat pump cooling
- Room air conditioning
- Secondary cooling

- WATER HEATING
- DISHWASHING
- CLOTHES DRYING
- CLOTHES WASHING
- RANGE
- MICROWAVE
- FIRST REFRIDERATOR
- SECOND REGRIDERATOR
- FREEZER
- OTHER APPLIANCES

The REEPS framework for modeling these end-uses consists of a fuel price module, an exogenous variable module, a household module, a demographic segments module, an HVAC module, an appliance list module, and an appliance module. REEPS provides a default database for each of these modules that is derived using information obtained from national survey results. This information is periodically updated by Regional Economic Research Inc. (RER), a consulting group retained by the Electric Power Research Institute (EPRI). The default databases are also modified to reflect updated saturation surveys, conditional demand analysis, end-use metering results, and other internal sources.

The fuel price module consists of nominal price series for electricity, natural gas, fuel oil, and firewood as well as an implicit GDP price deflator series. The purpose of this module is to create deflated price series and convert these price series to a common unit of measurement, \$/mmbtu.

The exogenous variable module includes year, average income per household, average number of people per household, heating degree days, cooling degree days, customer forecast by housing type, fuel availability, quantitative measures for appliance efficiency standards, and other demographic variables used by the model. Efficiency standards are incorporated into the model using units of measurement as they are defined in the federal legislation. In the forecast period phase-in of new technologies and decay and replacement assumptions are made to derive future values of the efficiency measures.

The household module provides a framework for creating a customer forecast model. However, KU currently has a customer forecast model and the output from this model is used as an input to the REEPS model. The purpose of this module is to calculate new households for three housing types using a fixed decay rate and the exogenous customer forecast.

The demographic segment module allows for dividing the model into smaller, more homogenous groups. Currently the REEEPS model is segmented by housing type. Although there are benefits associated with a greater degree of segmentation, the benefits received from further segmentation continue to be weighed against the availability of data and the cost of maintaining a significantly larger database.

The HVAC module consists of twenty primary system combinations plus three secondary heating systems and one secondary cooling system. The purpose of this module is to calculate saturation rates, energy consumption, appliance efficiencies, and thermal shell efficiencies for a base year and a forecast period for the HVAC systems. Variables included in this module are average and marginal saturation rates for each system, average and marginal appliance size, average and marginal appliance efficiencies, heating and cooling degree days, capital costs, base year appliance unit energy consumptions (UEC's), average and marginal thermal shell efficiency and appliance availability for each housing type.

The appliance module establishes a framework for modeling and purchase/replacement decisions, efficiency, and usage of each end-use not included in the HVAC module. Variables used in this module differ from the HVAC module in that weather and thermal shell characteristics are not specifically modeled for each of these appliances. All of the other variables mentioned before are used in the appliance module.

To begin a REEPS forecast, its computed normal energy consumption is calibrated to an estimate of normalized energy consumption for a base year. 1993 was used as the base year in this year's forecast. The forecast is calibrated by revising the "other" appliance UEC in the appliance module. The calibration process creates a base profile of each end-use and its associated parameters. The REEPS forecast is calibrated to the marginal data in the first forecasted year. The forecast is then driven by the multinominal share system, replacements, household decay rates, kWh per appliances, and customers growth projections.

The resultant annual forecast of total residential customers, kWh per customer and gWh sales is tabulated in Table ORES-1. Graph ORES-1 shows the annual historical and forecasted gWh sales. The forecasted seasonal consumption rates are presented on Table ORES-2. Graphs ORES-2 and ORES-3 show the forecasted seasonal consumption. Since 1984, residential energy usage per customer in ODP has increased at an average annual growth rate of 1.1 percent. It is anticipated that over the next five years there will be an increase of 0.8 percent annually and over the entire forecast period kWh per customer will grow at a 0.9 percent average annual rate. The summer consumption rate is forecasted to rise over the five year period at an annual rate of 0.98 percent and over the fifteen year period at an annual rate of 1.1 percent as air conditioning saturation levels off. The winter consumption rate is rising over the five and fifteen year forecast period at an annual rate of 0.2 and 0.1 percent, repsectively. With moderate customer growth (0.7 percent) in the ODP Service Territory projected over the forecast period, residential gWh sales are forecasted to increase at a compound annual rate of 1.9 percent per year through 2004 and at an annual rate of 1.8 percent per year through 2013.

TABLE ORES-1
ODP RESIDENTIAL FORECAST

YEAR	CUSTOMERS	KWH/CUSTOMER	GWH SALES
1999	25,157	15,571	392
2000	25,511	15,655	399
2001	25,781	15,765	406
2002	26,051	15,875	414
2003	26,322	16,010	421
2004	26,595	16,177	430
2005	26868	16,390	440
2006	27,142	16,624	451
2007	27,417	16,887	463
2008	27,693	17,130	474
2009	27,970	17189	481
2010	28,248	17,445	493
2011	28,248	17,649	499
2012	28,248	17,672	499
2013	28,248	17,762	502

GRAPH ORES-1
ODP RESIDENTIAL GWH SALES

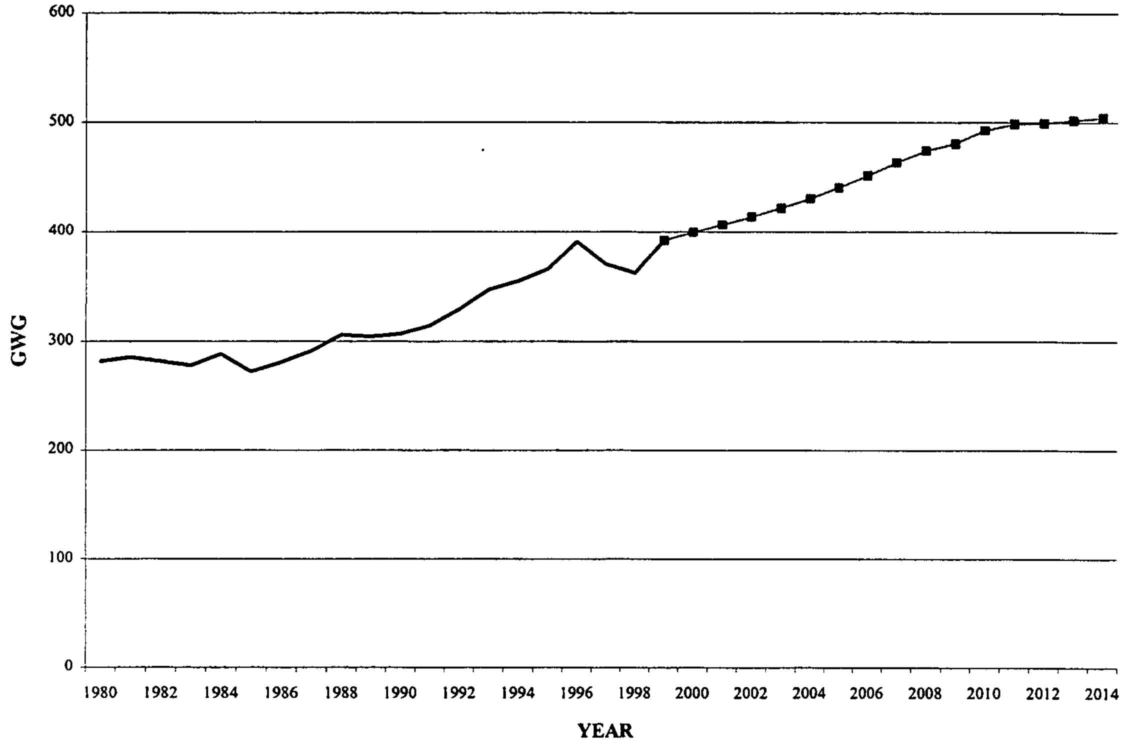
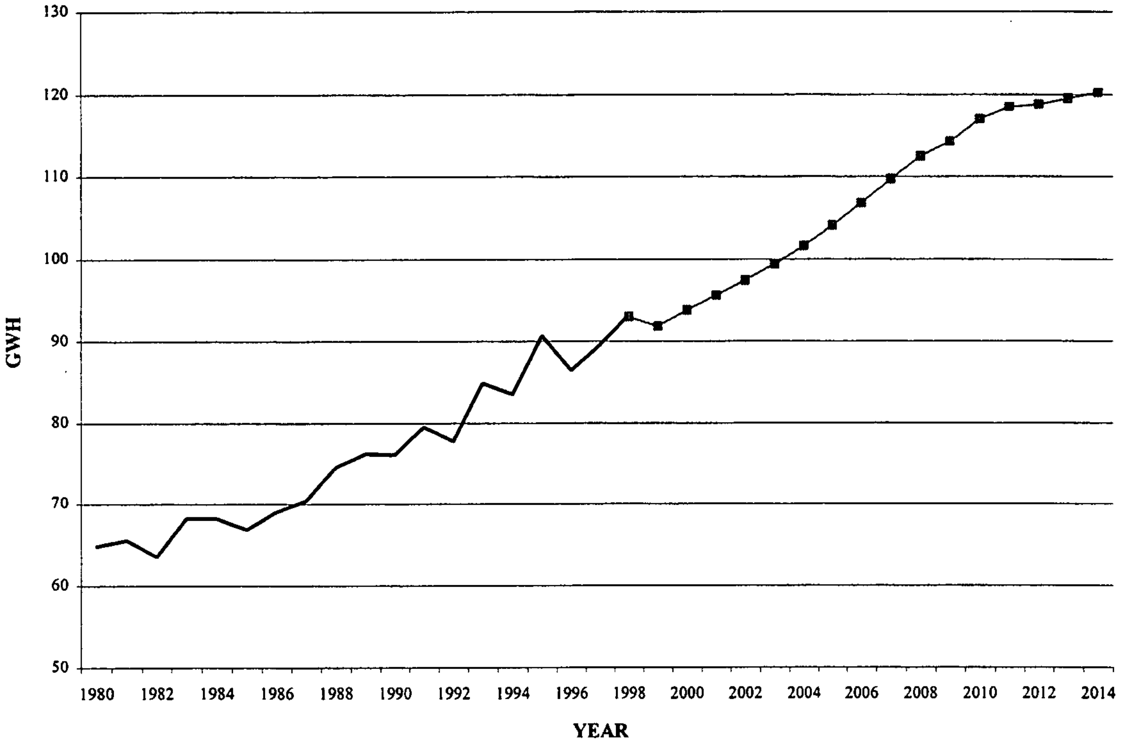


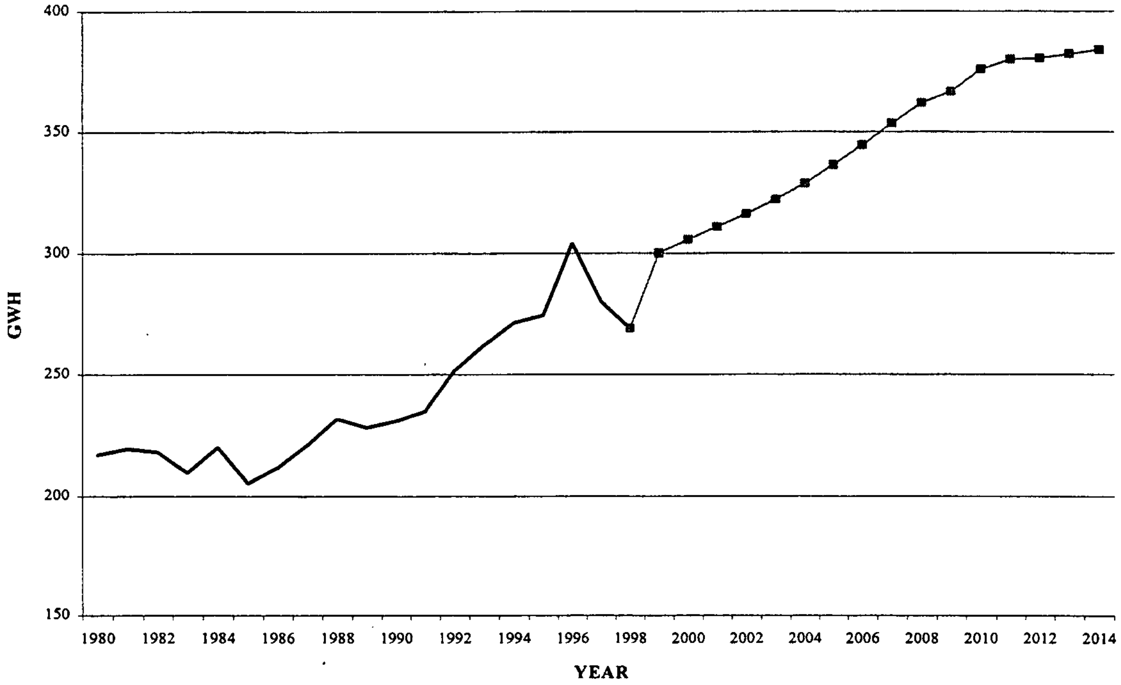
TABLE ORES-2
ODP RESIDENTIAL
SEASONAL KWH PER CUSTOMER

YEAR	SUMMER	WINTER
1980	3,023	10,133
1981	3,035	10,121
1982	2,886	9,956
1983	3,081	9,449
1984	3,062	9,871
1985	2,987	9,201
1986	3,086	9,451
1987	3,143	9,844
1988	3,318	10,302
1989	3,387	10,126
1990	3,365	10,201
1991	3,478	10,254
1992	3,358	10,864
1993	3,623	11,174
1994	3,519	11,442
1995	3,766	11,406
1996	3,571	12,534
1997	3,667	11,448
1998	3,760	10,831
1999	3,652	11,257
2000	3,678	11,279
2001	3,710	11,297
2002	3,741	11,312
2003	3,778	11,325
2004	3,822	11,336
2005	3,876	11,345
2006	3,936	11,353
2007	4,002	11,360
2008	4,064	11,365
2009	4,086	11,370
2010	4,144	11,374
2011	4,197	11,377
2012	4,208	11,380
2013	4,234	11,382

GRAPH ORES-2
ODP SUMMER RESIDENTIAL SALES



GRAPH ORES-3
ODP WINTER RESIDENTIAL SALES



OLD DOMINION POWER
COMMERCIAL/INDUSTRIAL

The LP and GS rate classes have been forecast separately to determine the customer outlook and jointly to forecast gWh sales. The customer forecasts are a function of time since 1970 for the LP class and since 1980 for the GS class. The joint approach to forecasting gWh sales utilizes a SIC code based methodology.

The gWh model disaggregates the two rate classes into three portions; Westmoreland Coal, all other SIC Code 12 (Mining) and Commercial/Industrial. For the Westmoreland Coal portion, sales were set to zero for the forecast period to reflect the closing of their operations. 27 GWH were added to reflect the new Wallings Ridge State Prison becoming fully operational. All other SIC code 12 sales were trended from 1979-1998 to best reflect recent history. The other commercial/industrial sales were modeled from 1979 utilizing Households, a time function, and a dummy variable. The equation is listed below:

$$KWH = -6{,}459*10^{6} + (3.3*10^{6})\underset{(.0070)}{(YEAR)} - \underset{(.0001)}{8192*10^{6}(BIN)} + \underset{(.0001)}{4.12*10^{6}(YEARBIN)} + \underset{(.2350)}{2110(HOUSE)}$$

Where:

YEAR = Time
BIN = Binary Variable For 1987 Revision
YEARBIN = Time Binary Variable For 1987 Revision
HOUSE = Residential Customer Forecast

Model Statistics:

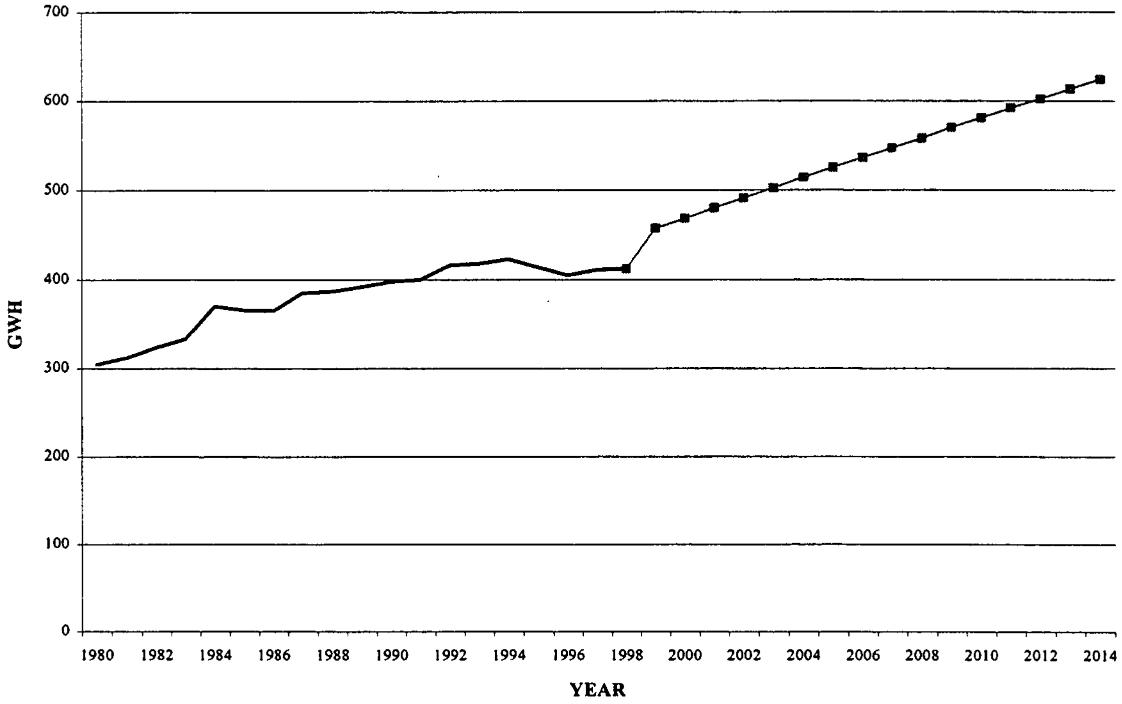
R^2 = .99
F-test = 636

Sales to the ODP Commercial/Industrial sector are predicted to increase at an average annual rate of 2.4 percent over the five year forecast horizon and 2.1 percent over the fifteen-year period. A tabulation of the forecasted customers and gWh sales for the joint LP and GS rate classes is presented in Table OLPGS-1. Graph OLPGS-1 is a plot of the historical and forecasted gWh sales. The aggregate commercial industrial amounts were disaggregated into commercial and industrial groups based upon the same criteria as the Kentucky models and the last calendar year of the actual sales.

TABLE ODPGS-1
ODP COMMERCIAL/INDUSTRIAL FORECAST

YEAR	CUSTOMERS	GWH SALES
1999	3,998	457
2000	4,058	469
2001	4,118	480
2002	4,178	491
2003	4,238	502
2004	4,298	514
2005	4,358	525
2006	4,419	536
2007	4,479	547
2008	4,539	558
2009	4,599	570
2010	4,660	581
2011	4,720	592
2012	4,780	602
2013	4,840	613

GRAPH OLPGS-1
ODP COMMERCIAL/INDUSTRIAL FORECAST

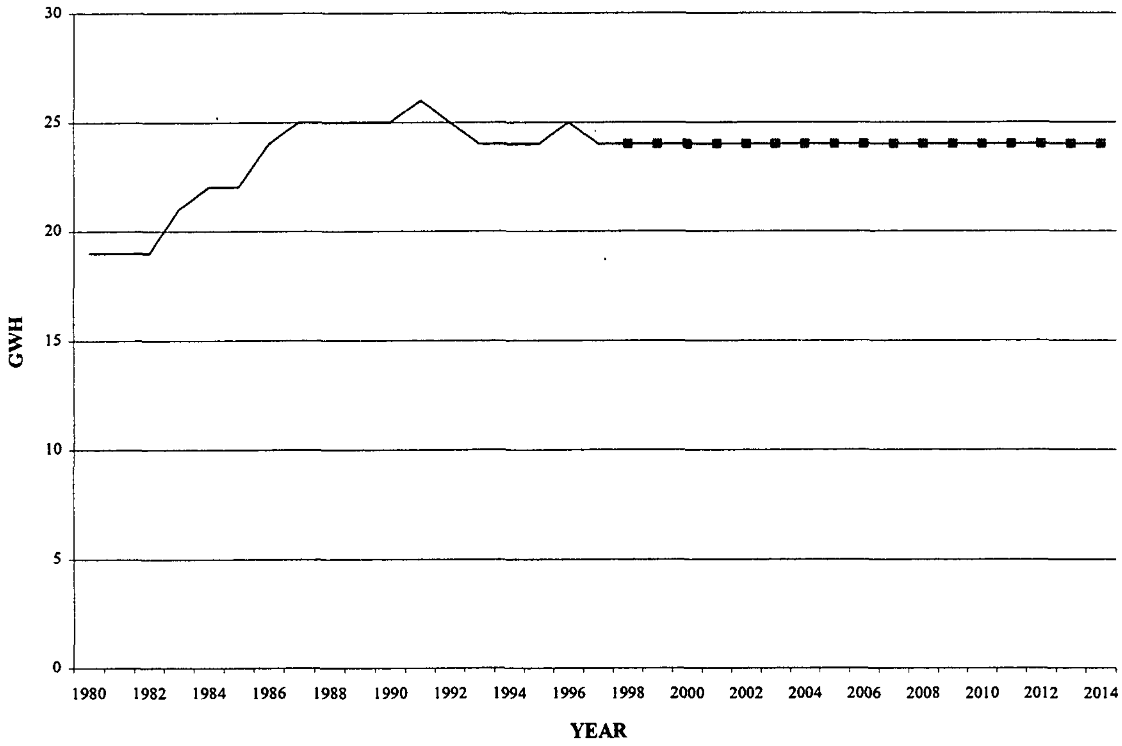


OLD DOMINION POWER

SCHOOLS

Since there has been little growth in the number of customers and a decline in usage on the school rates since 1990, sales for this class are held constant at the 1998 level. Graph OAES-E-1 shows historical and forecasted sales for the school rate classes.

GRAPH OAES-E-1
ODP ALL ELECTRIC SCHOOLS GWH SALES



OLD DOMINION POWER

LIGHTING

The forecast for outdoor area and street lighting for Old Dominion Power is developed using a process identical to that employed for KU-Retail lighting. The outdoor area group is projected utilizing a regression model, corrected for serial correlation, for the number of fixtures and a five year average of KW rating per fixture. The fixture count times the consumption rate times hours of use determines the energy forecast. Fixtures are regressed against time and residential customer forecast. As fixtures are a physical unit, the projected fixture values are adjusted so that the last year of known fixtures equal the predicted values. The equation for fixtures is shown below (the number in parenthesis indicates the probability of that variable being insignificant).

OUTDOOR AREA:

$$\text{FIXTURES} = -162.8*10^3 + \underset{(.0929)}{79.1(\text{YEAR})} + \underset{(.0979)}{0.4(\text{HOUSE})}$$

Where:

YEAR = Time
HOUSE = Residential Customer Forecast

Model Statistics:

R^2 = .99
F-test = 440
AR(1) PARM = .99 T-test of AR(1) = -2.398

The Company provides incandescent, mercury vapor and high-pressure sodium (HPS) street lighting service. Incandescent lights are not available for new installations and the price differential between mercury vapor and HPS lights effectively eliminate requests for new mercury vapor systems. The forecast assumes that all new street lights will be HPS.

The street lighting group uses similar methodology as the area lighting group for the fixture forecast. Fixtures are regressed against time and the binary variable for the 1987 revision of the fixture accounting procedure. Following is the equation for fixtures in the street lighting group (the number in parenthesis indicates the probability of that variable being insignificant).

STREET LIGHTING:

$$\text{FIXTURES} = -46.7*10^3 + \underset{(.0001)}{24.8(\text{YEAR})} + \underset{(.5718)}{12.9(\text{BIN})}$$

Where:

YEAR = Time
BIN = Binary Variable For 1987 Revision

Model Statistics:

Adj R^2 = .98
F test = 647
D-W test = 1.03

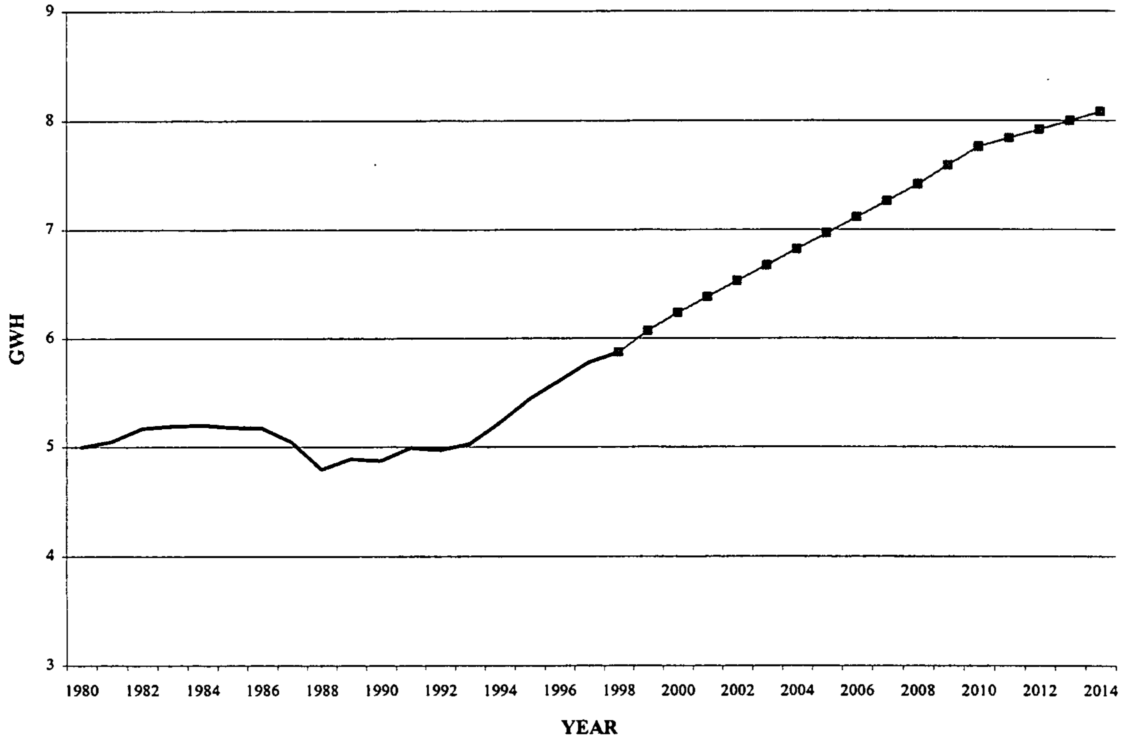
For the average KW rating per fixture, existing fixtures are grouped by type and lumen to identify HPS and Non-HPS weighted averages. The mix of HPS lighting types is then held constant over the forecast period. This establishes an average KW rating for HPS fixtures. All increases of fixtures are assumed to occur in the HPS group. The Non-HPS fixtures are retired based upon the average of the annual change in fixture count over the last five years. The Non-HPS KW per fixture used for the forecast period is based on the average over the last five years. The street lighting energy is calculated in the same manner as in the area lighting group and is combined to produce the energy for this group.

The forecasted gWh sales are shown in Table OLT-1. A plot of the historical and forecasted lighting gWh sales is shown on Graph OLT-1.

TABLE OLT-1
ODP LIGHTING FORECAST

YEAR	GWH SALES
1999	6
2000	6
2001	6
2002	7
2003	7
2004	7
2005	7
2006	7
2007	7
2008	7
2009	8
2010	8
2011	8
2012	8
2013	8

GRAPH OLT-1
ODP LIGHTING GWH SALES



WHOLESALE

MUNICIPALS

SUMMARY

The forecast of municipal purchases from KU is developed by analyzing the Company's GWH sales to Transmission customers; Primary customers; the City of Pitcairn, Pennsylvania; and the City of Paris. The sales data is evaluated to determine the time frame to be used in the models that appear to most accurately represent the latest growth patterns. Historic data back to 1980 has been graphed.

The Primary Municipal customers are Bardstown, Bardwell, Benham, Falmouth, Madisonville, and Providence. The Transmission Municipal customers are Barbourville, Berea, Corbin, Frankfort, and Nicholasville.

The dependent variable in the sales forecast equation is total gWh sales. Common explanatory variables are heating and/or cooling degree-days, county-level real industrial output, county summarized household forecast, and time. The county-level real industrial output and household forecasts are developed from the KUSTEM database using county specific information and a share-down of regional forecast data.

Municipal sales have increased at a 3.6 percent annual rate over the past fifteen years and at a 3.1 percent annual rate over the last five years. These sales are forecast to grow at a 2.9 percent annual rate over the next five years and at a 2.5 percent annual rate over the next fifteen years.

The forecasted annual growth rates and the percent contribution to the total purchases for each class of municipal customer are shown in Table MUNI-1. The forecasted purchases from KU by the Municipal Class is tabulated in Table MUNI-2 and shown graphically in Graph MUNI-1.

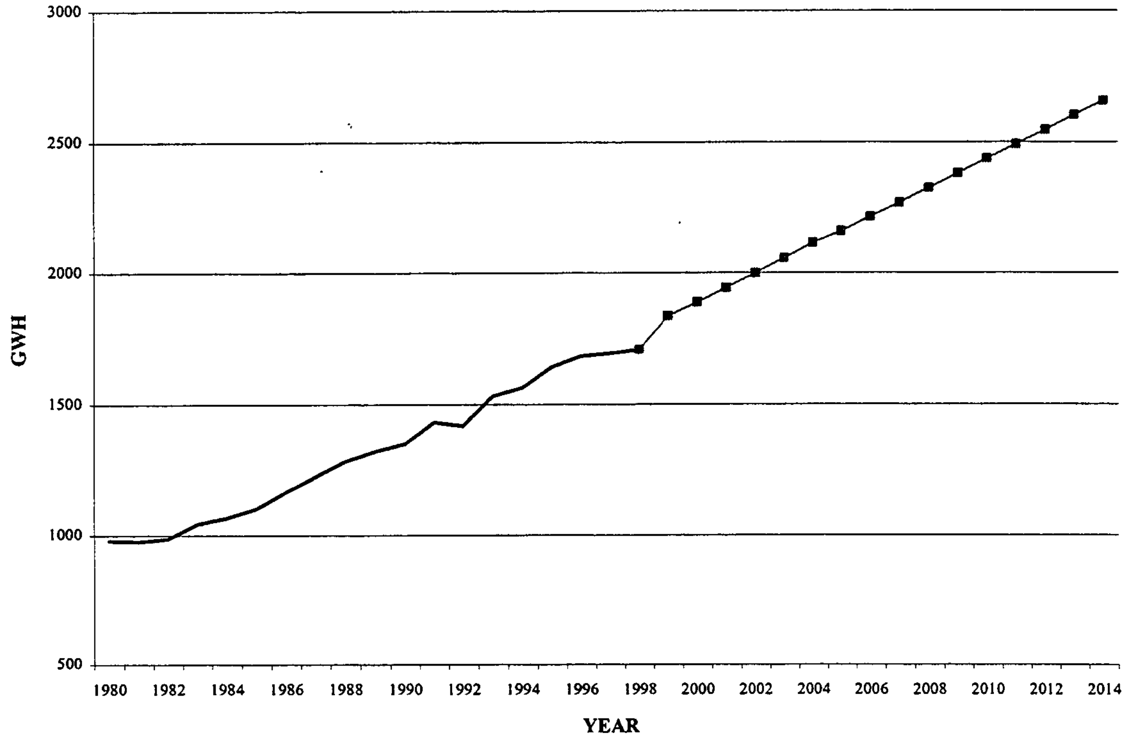
TABLE MUNI-1
MUNICIPAL SUMMARY

MUNICIPAL	% ANNUAL GROWTH RATE	% OF TOTAL PURCHASES
Primary	2.3	32
Transmission	2.7	66
Paris	1.4	2
TOTAL	2.5	100

TABLE MUNI-2
MUNICIPAL FORECAST

YEAR	GWH
1999	1,836
2000	1,888
2001	1,942
2002	1,998
2003	2,056
2004	2,114
2005	2,158
2006	2,214
2007	2,269
2008	2,325
2009	2,381
2010	2,436
2011	2,491
2012	2,546
2013	2,602

GRAPH MUNI-1
MUNICIPAL GWH SALES



PRIMARY MUNICIPAL CLASS

The forecast for the Primary class is developed in a statistical model utilizing multiple regression. The forecast of purchases utilizes historical data from 1977. The explanatory variables are cooling degree-days, heating degree-days, a combined county household forecast, and time. The cooling degree-days are derived using data from the Lexington, Kentucky weather station. A 65-degree base is used for cooling and 60-degree base is used for heating. The resulting equation is shown below (the number in parenthesis indicates the probability of that variable being insignificant).

$$\text{Primary kWh purchases} = -2.378*10^9 + \underset{(0.0001)}{11.94*10^6(\text{YEAR})} + \underset{(0.0006)}{35173(\text{ETCDD})} + \underset{(0.0480)}{11481(\text{ETHDD})} + \underset{(0.0036)}{6616(\text{HSLD})}$$

Where:

YEAR = Time function
ETCDD = Total annual Cooling Degree Days Base 65
ETHDD = Total annual heating Degree Days Base 60
HSLD = Combined county Household Forecast

Model Statistics:

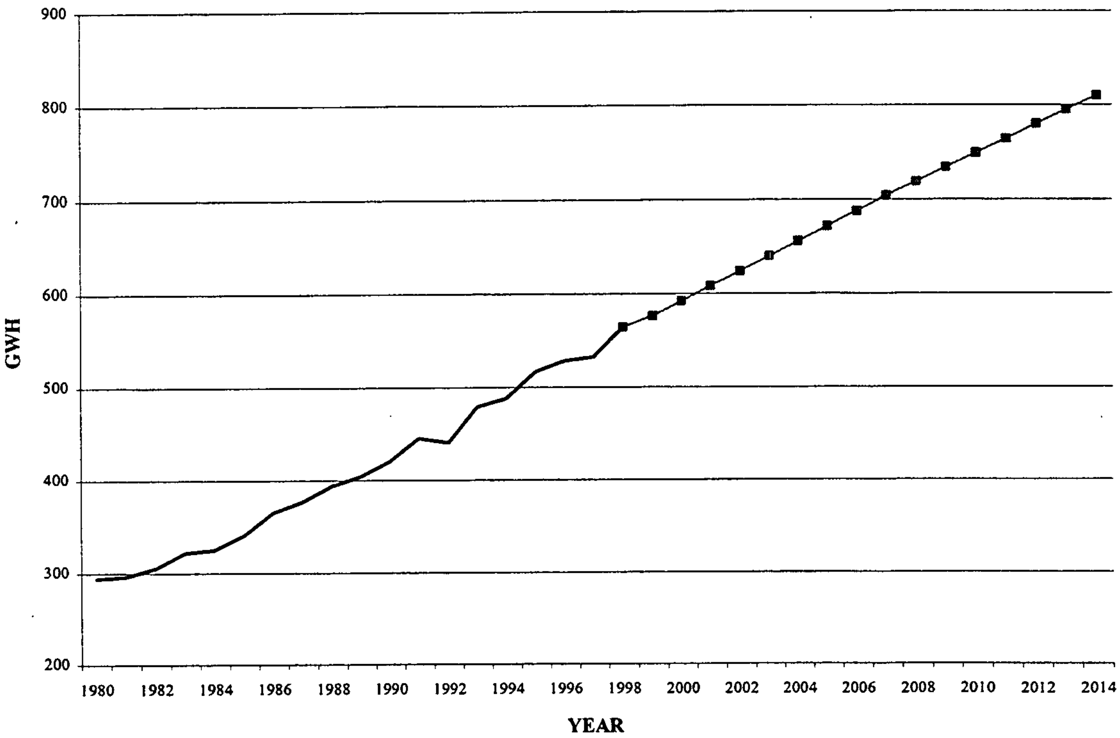
Adj R^2 = .996
F test = 1226
D-W Test = 1.02

The resultant forecast of total energy sales is tabulated in Table MUNI-3. Primary Customers' Purchases are projected to increase at an average annual rate of 2.4 percent from 1999-2013. Graph MUNI-2 shows the annual historical and forecasted gWh sales.

TABLE MUNI-3
PRIMARY MUNICIPAL FORECAST

YEAR	GWH SALES
1999	576
2000	592
2001	608
2002	624
2003	640
2004	656
2005	672
2006	688
2007	704
2008	719
2009	734
2010	749
2011	764
2012	780
2013	795

GRAPH MUNI-2
PRIMARY MUNICIPAL GWH SALES



TRANSMISSION MUNICIPAL CLASS

The forecast for the Transmission class is developed in a statistical model utilizing multiple regression. The forecast of purchases utilizes historical data from 1977. The explanatory variables are cooling degree days, heating degree days, combined county-level real industrial output, and time The cooling degree days are derived using data from the Lexington, Kentucky weather station. A 65-degree base is used for cooling and 60-degree base is used for heating. The resulting equations are shown on the following page (the number in parenthesis indicates the probability of that variable being insignificant).

$$\text{Transmission kWh purchases} = -46.69*10^9 + \underset{(0.0001)}{23.75*10^6\,(\text{YEAR})} + \underset{(0.0487)}{37642(\text{ETCDD})} +$$

$$\underset{(0.0724)}{24185(\text{ETHDD})} + \underset{(0.0036)}{0.86(\text{RGSP})}$$

Where:

YEAR = Time function
ETCDD = Total annual Cooling Degree Days Base 65
ETHDD = Total annual heating Degree Days Base 60
RGSP = Combined county Industrial output

Model Statistics:

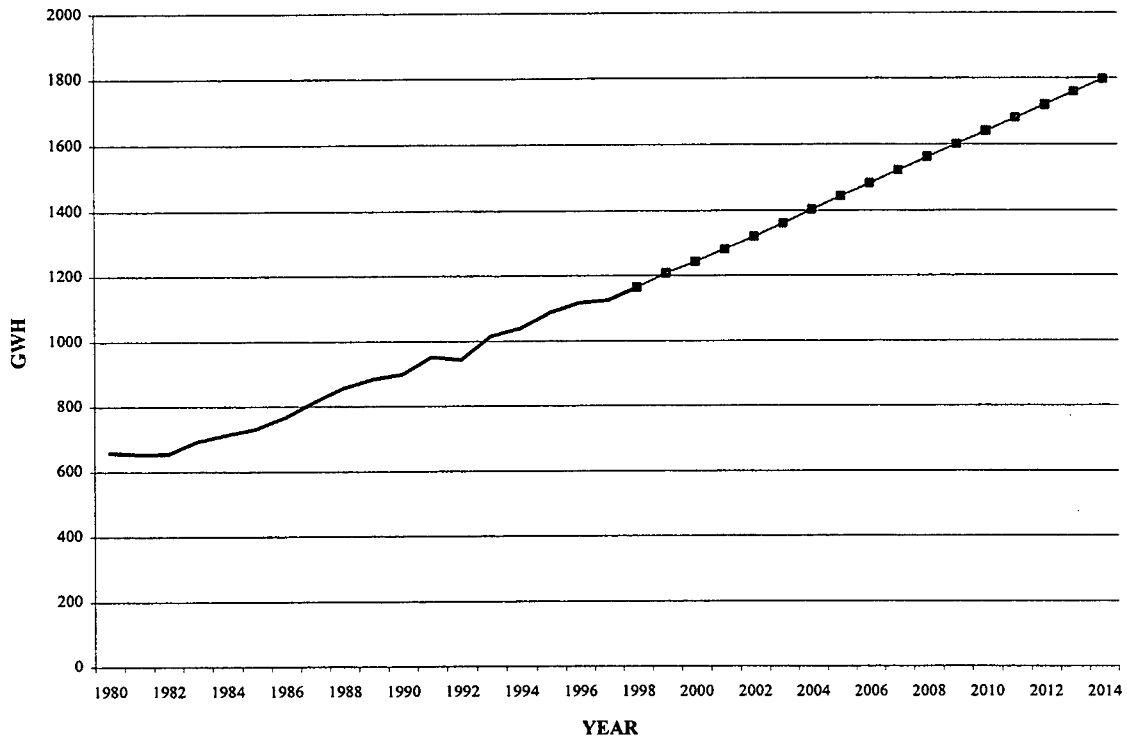
Adj R^2 = .996
F test = 1126
D-W test = 1.69

The resultant forecast of total energy sales is tabulated in Table MUNI-4. The City of Paris purchases are projected to increase at an average annual rate of 2.7 percent from 1999-2013. Graph MUNI-4 shows the annual historical and forecasted gWh sales.

TABLE MUNI-4
TRANSIMISSION MUNICIPAL FORECAST

YEAR	GWH SALES
1999	1,207
2000	1,242
2001	1,280
2002	1,319
2003	1,360
2004	1,402
2005	1,442
2006	1,481
2007	1,520
2008	1,560
2009	1,600
2010	1,639
2011	1,679
2012	1,718
2013	1,758

GRAPH MUNI-3
TRANSMISSION MUNICIPAL GWH SALES



CITY OF PARIS

The forecast for the City of Paris was developed in a statistical model utilizing multiple regression. The forecast of purchases utilizes historical data from 1977. The explanatory variables are cooling degree-days, heating degree-days, and time. The cooling and heating degree-days are derived using data from the Lexington, Kentucky weather station. A 65-degree base is used for cooling and 60-degree base is used for heating. The resulting equations are shown on the following page (the number in parenthesis indicates the probability of that variable being insignificant).

$$\text{Paris kWh purchases} = -1.25*10^9 + \underset{(.0001)}{639726\,(\text{YEAR})} + \underset{(.1014)}{876*(\text{ETHDD})} + \underset{(.0007)}{3290(\text{ETCDD})}$$

Where:

YEAR = Time function
ETCDD = Total annual Cooling Degree Days Base 65
ETHDD = Total annual heating Degree Days Base 60

Model Statistics:

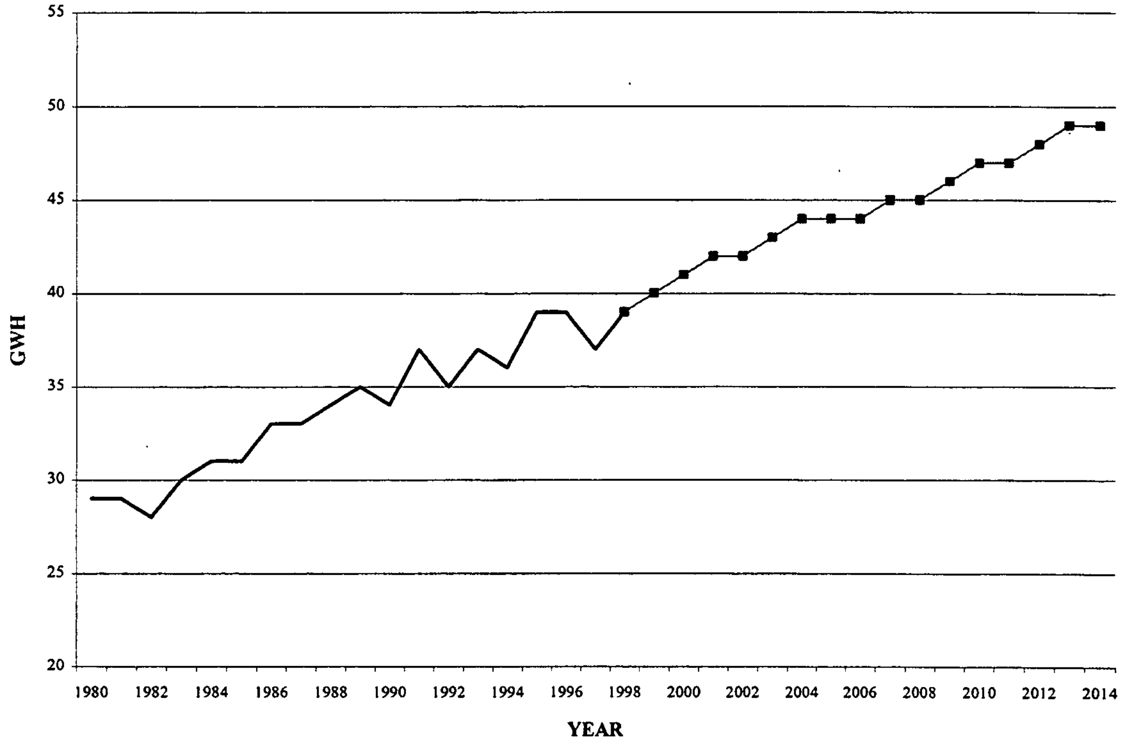
Adj R^2 = .979
F test = 286
D-W test = 1.65

The resultant forecast of total energy sales is tabulated in Table MUNI-5. Transmission Customers' Purchases are projected to increase at an average annual rate of 1.5 percent from 1999-2013. Graph MUNI-4 shows the annual historical and forecasted GWH sales.

TABLE MUNI-5
CITY OF PARIS MUNICIPAL FORECAST

YEAR	GWH SALES
1999	40
2000	41
2001	42
2002	42
2003	43
2004	43
2005	44
2006	44
2007	45
2008	45
2009	46
2010	47
2011	47
2012	48
2013	49

GRAPH MUNI-4
CITY OF PARIS GWH SALES



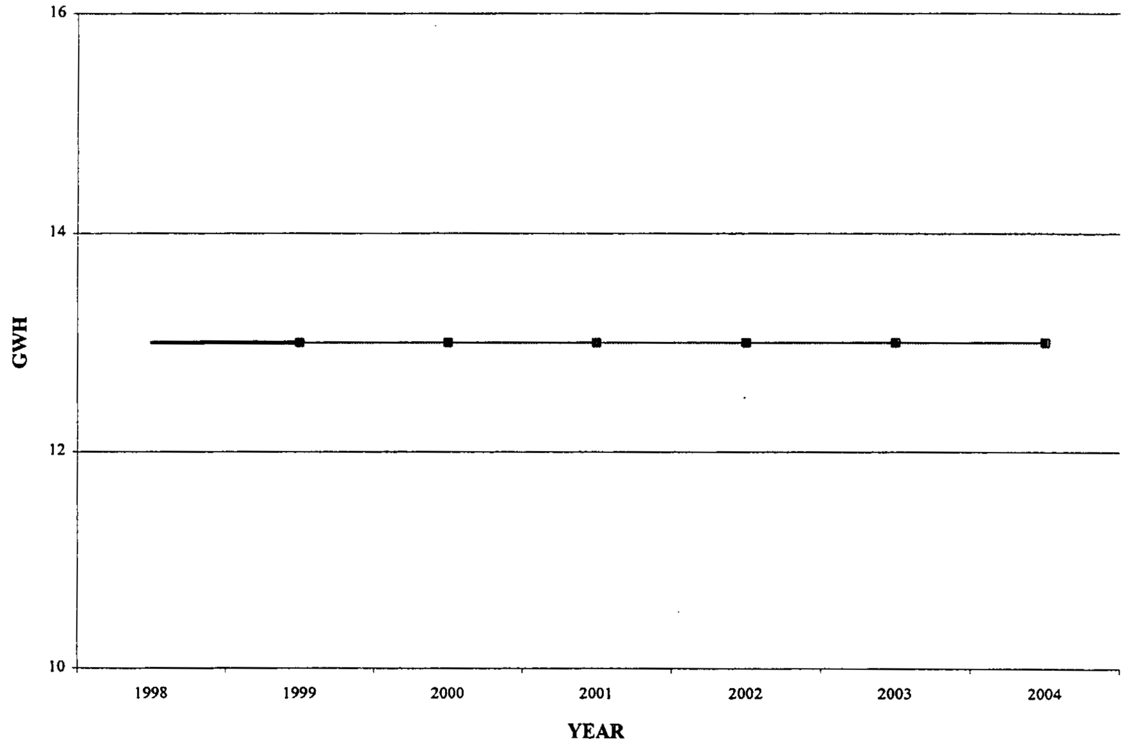
CITY OF PITCAIRN, PA

The forecast for the City of Pitcairn was fixed at the 1998 usage levels. The forecast ends in 2004 at the end of the current contract. The resultant forecast of total energy sales is tabulated in Table MUNI-6. Graph MUNI-7 shows the annual historical and forecasted gWh sales.

TABLE MUNI-6
CITY OF PITCAIRN MUNICIPAL FORECAST

YEAR	GWH SALES
1999	13
2000	13
2001	13
2002	13
2003	13
2004	13

GRAPH MUNI-5
CITY OF PITCAIRN GWH SALES



OUTPUT

Losses are added to the annual sales forecast to obtain annual output. Losses are calculated by applying class loss factors (derived from load research data) to the class forecasted energy and summing to get total system losses. Table OUTPUT-1 shows losses by rate class. Monthly and annual sales for baseline and Company forecasts are shown in Tables OUTPUT-2 and OUTPUT-3. Monthly and annual output for baseline and Company forecasts are shown in Tables OUTPUT-4 and OUTPUT-5. The adjustment to the baseline energy forecast for the sales adders and Curtailable Service Rider are shown in Table OUTPUT-6.

TABLE OUTPUT-1
LOSSES BY RATE CLASS

CLASS	% ENERGY LOSSES
RS	7.87%
FERS	7.87%
Commercial	7.07%
Industrial	5.16%
Mining Power	4.36%
Municipals	2.80%
Lighting	7.87%
Old Dominion Power	2.60%
Large Industrials	
Transmission	2.60%
Primary	3.33%

TABLE OUTPUT-2
PROJECTED BASELINE SALES (GWH)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1999	1,667	1,408	1,512	1,391	1,424	1,568	1,786	1,643	1,468	1,354	1,429	1,615	18,245
2000	1,710	1,472	1,573	1,399	1,460	1,629	1,810	1,692	1,480	1,391	1,482	1,640	18,738
2001	1,731	1,498	1,582	1,444	1,505	1,582	1,885	1,740	1,547	1,426	1,473	1,723	19,135
2002	1,782	1,535	1,614	1,482	1,540	1,630	1,939	1,767	1,589	1,461	1,511	1,757	19,606
2003	1,832	1,568	1,653	1,515	1,573	1,687	1,981	1,799	1,624	1,495	1,549	1,797	20,074
2004	1,880	1,636	1,710	1,549	1,607	1,766	2,009	1,850	1,654	1,530	1,615	1,829	20,635
2005	1,922	1,616	1,753	1,579	1,629	1,810	2,025	1,888	1,671	1,556	1,652	1,855	20,954
2006	1,926	1,678	1,776	1,614	1,683	1,759	2,086	1,950	1,731	1,591	1,630	1,935	21,358
2007	1,978	1,711	1,805	1,646	1,713	1,797	2,137	1,976	1,759	1,625	1,679	1,968	21,794
2008	2,027	1,786	1,835	1,680	1,743	1,865	2,186	1,987	1,797	1,659	1,723	2,001	22,290
2009	2,078	1,765	1,877	1,709	1,772	1,923	2,221	2,025	1,824	1,688	1,762	2,022	22,666
2010	2,124	1,793	1,922	1,739	1,803	1,978	2,245	2,072	1,854	1,719	1,815	2,057	23,121
2011	2,161	1,817	1,970	1,773	1,829	2,028	2,266	2,115	1,874	1,748	1,856	2,086	23,523
2012	2,163	1,938	1,987	1,812	1,885	1,976	2,346	2,172	1,933	1,790	1,842	2,168	24,013
2013	2,225	1,917	2,012	1,845	1,914	2,021	2,394	2,189	1,970	1,819	1,882	2,194	24,381

TABLE OUTPUT-3
PROJECTED COMPANY SALES (GWH)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1999	1,667	1,408	1,512	1,371	1,424	1,568	1,786	1,643	1,468	1,354	1,429	1,615	18,245
2000	1,772	1,483	1,584	1,410	1,472	1,641	1,823	1,705	1,492	1,402	1,494	1,651	18,878
2001	1,743	1,509	1,593	1,455	1,517	1,594	1,898	1,753	1,559	1,437	1,484	1,734	19,275
2002	1,793	1,546	1,625	1,493	1,552	1,642	1,952	1,779	1,601	1,472	1,522	1,768	19,745
2003	1,844	1,578	1,665	1,526	1,585	1,699	1,994	1,812	1,636	1,507	1,560	1,808	20,213
2004	1,891	1,647	1,721	1,560	1,619	1,779	2,022	1,863	1,666	1,541	1,626	1,841	20,774
2005	1,933	1,627	1,764	1,590	1,641	1,822	2,038	1,900	1,682	1,567	1,663	1,866	21,093
2006	1,938	1,689	1,787	1,625	1,694	1,771	2,099	1,963	1,743	1,602	1,641	1,947	21,498
2007	1,989	1,721	1,816	1,657	1,725	1,809	2,150	1,989	1,771	1,636	1,690	1,980	21,933
2008	2,039	1,797	1,846	1,691	1,754	1,877	2,199	2,002	1,809	1,670	1,734	2,012	22,429
2009	2,090	1,775	1,888	1,720	1,784	1,935	2,234	2,038	1,836	1,700	1,773	2,034	22,805
2010	2,135	1,804	1,934	1,750	1,815	1,990	2,258	2,085	1,866	1,730	1,826	2,069	23,260
2011	2,173	1,828	1,982	1,784	1,840	2,040	2,279	2,128	1,885	1,759	1,867	2,097	23,663
2012	2,175	1,949	1,999	1,823	1,897	1,988	2,359	2,185	1,945	1,801	1,853	2,180	24,153
2013	2,236	1,927	2,023	1,856	1,926	2,033	2,407	2,201	1,982	1,830	1,893	2,205	24,520

TABLE OUTPUT-4
PROJECTED BASELINE OUTPUT (GWH)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1999	1,774	1,439	1,599	1,443	1,500	1,666	1,907	1,747	1,552	1,421	1,508	1,716	19,324
2000	1,821	1,558	1,664	1,473	1,538	1,732	1,933	1,800	1,564	1,460	1,566	1,741	19,850
2001	1,842	1,589	1,672	1,521	1,586	1,676	2,016	1,852	1,637	1,496	1,553	1,832	20,270
2002	1,896	1,628	1,706	1,560	1,623	1,728	2,073	1,879	1,681	1,533	1,594	1,868	20,769
2003	1,950	1,663	1,748	1,595	1,657	1,790	2,119	1,913	1,719	1,569	1,634	1,910	21,265
2004	2,001	1,733	1,809	1,630	1,693	1,876	2,147	1,967	1,750	1,605	1,705	1,944	21,859
2005	2,046	1,713	1,854	1,663	1,716	1,923	2,163	2,007	1,766	1,632	1,745	1,970	22,198
2006	2,049	1,781	1,878	1,700	1,773	1,863	2,229	2,074	1,833	1,669	1,718	2,059	22,625
2007	2,104	1,815	1,908	1,733	1,805	1,905	2,285	2,103	1,861	1,705	1,770	2,093	23,087
2008	2,158	1,894	1,940	1,769	1,836	1,979	2,338	2,115	1,902	1,741	1,817	2,128	23,616
2009	2,213	1,871	1,984	1,799	1,866	2,041	2,374	2,153	1,930	1,771	1,860	2,150	24,011
2010	2,261	1,901	2,034	1,831	1,899	2,100	2,399	2,202	1,961	1,803	1,916	2,186	24,492
2011	2,301	1,926	2,085	1,867	1,926	2,155	2,420	2,249	1,980	1,834	1,961	2,216	24,919
2012	2,301	2,056	2,102	1,909	1,987	2,095	2,507	2,311	2,046	1,878	1,943	2,306	25,438
2013	2,368	2,034	2,127	1,943	2,017	2,142	2,560	2,327	2,084	1,909	1,985	2,333	25,829

TABLE OUTPUT-5
PROJECTED COMPANY OUTPUT (GWH)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1999	1,774	1,493	1,599	1,443	1,500	1,666	1,907	1,747	1,552	1,421	1,508	1,716	19,324
2000	1,833	1,570	1,677	1,484	1,550	1,745	1,947	1,814	1,576	1,471	1,578	1,753	19,997
2001	1,854	1,600	1,684	1,532	1,598	1,689	2,030	1,865	1,650	1,508	1,564	1,844	20,417
2002	1,908	1,640	1,718	1,572	1,635	1,741	2,088	1,892	1,694	1,544	1,605	1,880	20,916
2003	1,962	1,674	1,760	1,607	1,669	1,803	2,133	1,927	1,731	1,581	1,645	1,922	21,413
2004	2,013	1,745	1,821	1,642	1,704	1,890	2,161	1,981	1,762	1,617	1,717	1,956	22,007
2005	2,058	1,724	1,867	1,674	1,727	1,936	2,176	2,021	1,779	1,644	1,756	1,982	22,345
2006	2,061	1,792	1,890	1,711	1,785	1,876	2,243	2,089	1,844	1,681	1,730	2,071	22,773
2007	2,116	1,826	1,921	1,744	1,817	1,917	2,299	2,116	1,873	1,717	1,782	2,105	23,235
2008	2,170	1,905	1,952	1,781	1,848	1,992	2,352	2,128	1,914	1,753	1,829	2,140	23,764
2009	2,225	1,882	1,996	1,811	1,878	2,054	2,388	2,166	1,942	1,783	1,871	2,162	24,158
2010	2,274	1,912	2,045	1,842	1,911	2,114	2,412	2,216	1,973	1,815	1,928	2,198	24,640
2011	2,314	1,937	2,097	1,879	1,937	2,168	2,433	2,263	1,993	1,846	1,972	2,228	25,067
2012	2,313	2,067	2,114	1,920	1,999	2,107	2,522	2,324	2,058	1,890	1,954	2,319	25,586
2013	2,380	2,045	2,139	1,954	2,029	2,155	2,574	2,341	2,097	1,921	1,996	2,345	25,976

TABLE OUTPUT-6
2000-2013 MONTHLY OUTPUT ADJUSTMENTS* (GWH)

		SALES ADDER		
	CSR	INDUSTRIAL	COMMERCIAL	NET
JANUARY	-0.1	5.8	6.4	12.1
FEBRUARY	0.0	5.6	5.6	11.2
MARCH	0.4	5.8	6.4	12.2
APRIL	-0.4	5.7	5.4	10.7
MAY	-0.1	6.1	6.2	12.2
JUNE	-0.5	6.1	6.4	12.0
JULY	-2.0	5.9	8.3	12.2
AUGUST	-0.8	6.3	7.3	12.8
SEPTEMBER	0.0	5.8	6.8	12.6
OCTOBER	-0.1	6.1	5.8	11.8
NOVEMBER	0.1	5.7	6.9	12.7
DECEMBER	0.0	5.5	6.9	12.2

* No sales adder for 1999

KU DEMAND FORECAST

The 1999-2013 Demand Forecast for Kentucky Utilities is calculated from the class level Baseline Energy Forecast data, adjusted for existing peak demand reductions under the Curtailable Service Rider (CSR), increases due to sales adders and class-level load shapes derived from the Company's load research data. The energy and load shape information is combined and class-level demand forecasts are developed using the Hourly Electric Load Model (HELM) from EPRI. The annual class demand profiles are summed within HELM to create the system demand forecast. The existing curtailable reduction is contracted at 54 MW, of which 26 MW is accounted for in the load shape for two of the Company's major industrial clients and one wholesale customer. Table DEM-1 shows the fifteen year winter and summer demand projections and annual growth rates for the Demand Forecast. Table DEM-2 shows the monthly adjustments for the CSR, sales adders, and the breakdown of the sales adder by class, this adjustment is the same for all years except 1999 which has no sales adder. Table DEM-3 shows the monthly demands and Graphs DEM-1 and DEM-2 show the seasonal forecasts over time along with actual demand and the 1999 Demand Forecast for each season. The forecast projects KU to be a summer peaking utility.

TABLE DEM-1
1999-2013 COMPANY SEASONAL PEAK DEMAND (MW)

Year	Winter Demand	Growth Rate	Year	Summer Demand	Growth Rate
1998/99	3558.0	1.43%	1999	3776	3.06%
1999/00	3662.0	2.92%	2000	3902	3.34%
2000/01	3743.0	2.21%	2001	3981	2.02%
2001/02	3840.0	2.59%	2002	4064	2.08%
2002/03	3939.0	2.58%	2003	4152	2.17%
2003/04	4063.0	3.15%	2004	4271	2.87%
2004/05	4132.0	1.70%	2005	4356	1.99%
2005/06	4226.0	2.27%	2006	4443	2.00%
2006/07	4296.0	1.66%	2007	4515	1.62%
2007/08	4389.0	2.16%	2008	4581	1.46%
2008/09	4493.0	2.37%	2009	4670	1.94%
2009/10	4600.0	2.38%	2010	4779	2.33%
2010/11	4664.0	1.39%	2011	4875	2.01%
2011/12	4761.0	2.08%	2012	4955	1.64%
2012/13	4828.0	1.41%	2013	5020	1.31%

TABLE DEM-2
2000-2013 MONTHLY ADJUSTMENTS* (MW)

2000-2013 Monthly Demand Adjustments (MW)				Sales Adder	
	CSR	Sales Adder	Net	Industrial	Commercial
January	-28.4	22.9	-5.5	10.2	12.7
February	0.2	20.4	20.6	10.2	10.2
March	0.4	21.3	21.7	9.9	11.4
April	0.5	20.5	21.0	10.4	10.1
May	0.1	22.6	22.7	10.0	12.6
June	-28.2	24.6	-3.6	10.2	14.4
July	-28.5	26.5	-2.0	10.3	16.2
August	-28.3	26.1	-2.2	10.6	15.5
September	-0.4	23.8	23.4	10.0	13.8
October	0.5	20.1	20.6	10.1	10.0
November	-0.4	21.3	20.9	10.2	11.1
December	0.2	22.1	22.3	9.6	12.5

* No sales adder in 1999

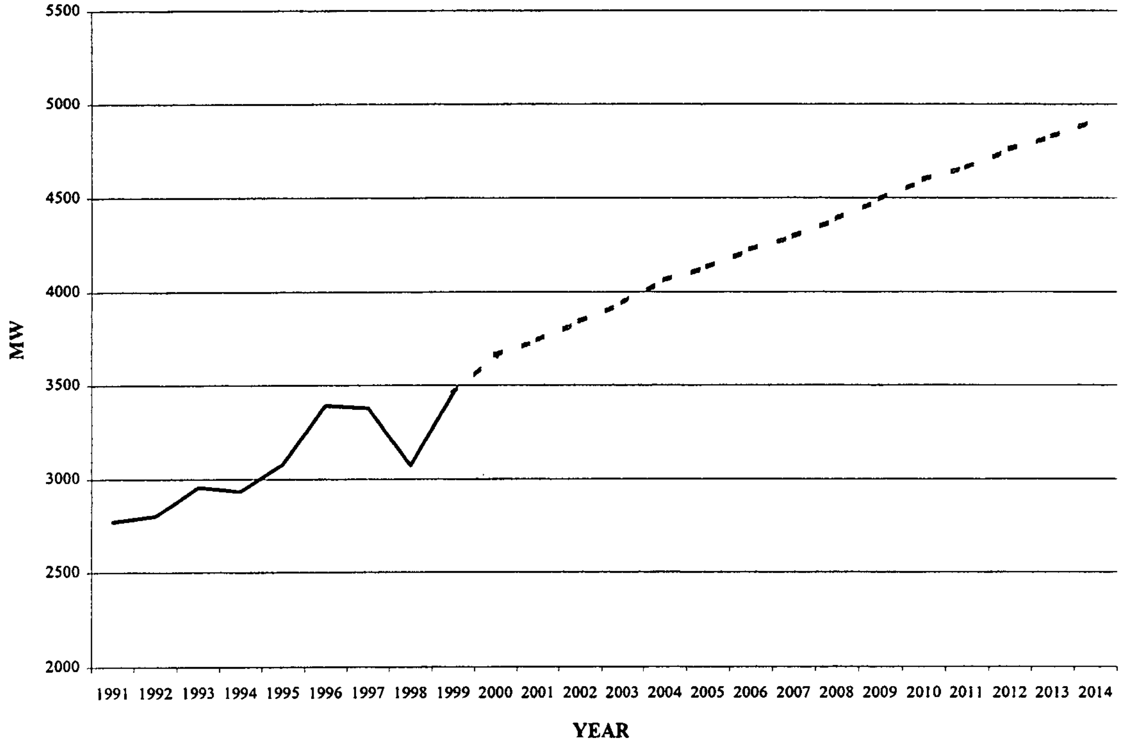
During the period of 1999 to 2004 the peak demand forecast increases at a rate of 2.5 percent and the winter season demand forecast increases 2.7 percent. This rate of growth adds 495 MW of peak demand from 19 to 2004. Over the fifteen-year period, the peak summer demand forecast increases at an average annual rate of 2.1 percent and the winter season demand forecast increases at an average annual rate of 2.2 percent. From 1999 to 20136, peak demand increases by 1244 MW.

The 1999-2013 KU Demand Forecast was developed using HELM. The HELM model develops an individual demand forecast for the following load classes; RS, FERS, Commercial, Industrial, Mine Power, Municipals, Lighting, ODP, and major industrial customers. It then combines the individual forecasts to determine the forecasted system load. HELM then applies losses using class specific loss factors and aggregates the class demand forecasts to the system. The CSR, which is designed to induce customers to reduce their load during time of high demand, is subtracted from the HELM system demand forecast to provide the final KU demand forecast.

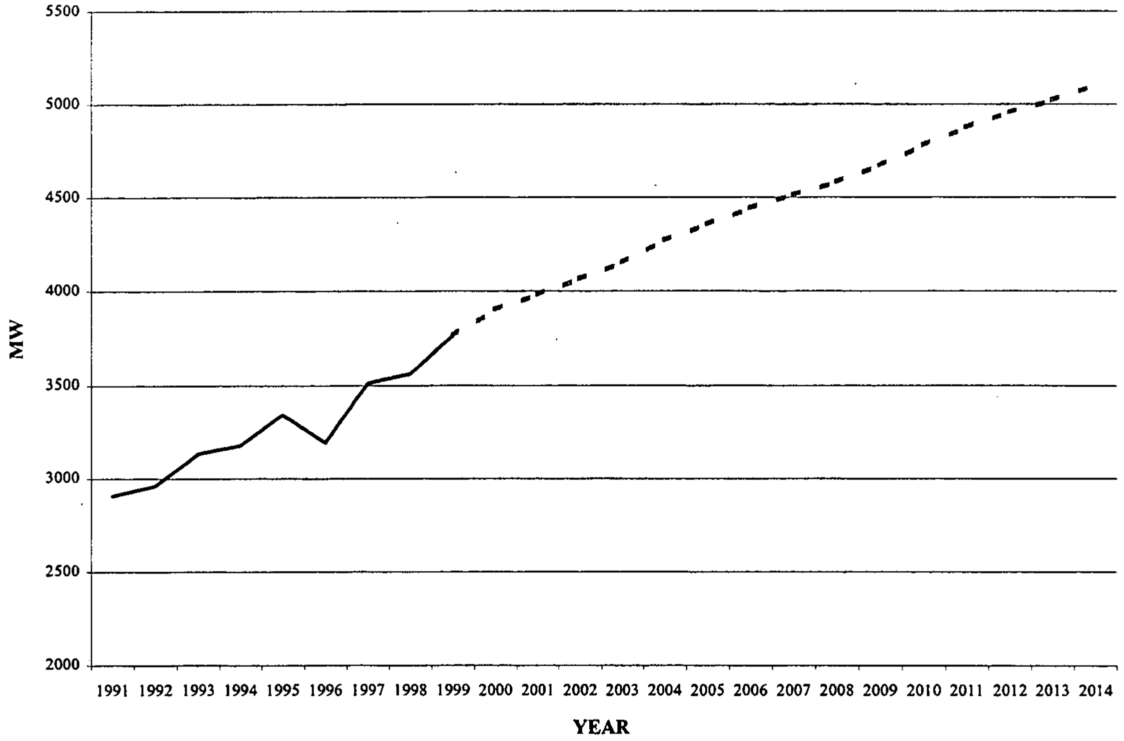
TABLE DEM-3
SYSTEM PEAK FORECAST (MW)

Year	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept**	**Oct**	**Nov**	**Dec**	**Winter**	**Summer**
1999	3558	2988	3164	2837	2896	3480	3776	3578	3281	2603	2848	3298	3558.0	3776.0
2000	3662	3051	3267	2955	2963	3585	3902	3673	3389	2682	2956	3415	3662.0	3902.0
2001	3743	3162	3339	3018	3028	3676	3981	3759	3478	2733	3030	3474	3743.0	3981.0
2002	3840	3241	3456	3080	3102	3780	4064	3862	3556	2801	3100	3552	3840.0	4064.0
2003	3939	3322	3542	3156	3183	3860	4152	3965	3624	2870	3188	3656	3939.0	4152.0
2004	4063	3392	3618	3249	3280	3948	4271	4056	3715	2973	3250	3771	4063.0	4271.0
2005	4132	3474	3677	3315	3321	4002	4356	4104	3772	3024	3303	3829	4132.0	4356.0
2006	4226	3548	3739	3400	3371	4083	4443	4186	3858	3077	3373	3898	4226.0	4443.0
2007	4296	3620	3826	3458	3434	4171	4515	4267	3944	3125	3463	3980	4296.0	4515.0
2008	4389	3656	3940	3513	3514	4261	4581	4378	3999	3190	3541	4037	4389.0	4581.0
2009	4493	3773	4010	3586	3597	4330	4670	4462	4073	3266	3600	4121	4493.0	4670.0
2010	4600	3850	4076	3663	3668	4407	4779	4536	4152	3347	3657	4219	4600.0	4779.0
2011	4664	3916	4143	3740	3715	4480	4875	4596	4220	3404	3717	4286	4664.0	4875.0
2012	4761	3950	4220	3819	3769	4579	4955	4686	4328	3446	3795	4390	4761.0	4955.0
2013	4828	4063	4328	3867	3831	4671	5020	4777	4391	3503	3872	4455	4828.0	5020.0
Five Year Growth Rate	2.69%	2.57%	2.72%	2.75%	2.52%	2.56%	2.50%	2.54%	2.52%	2.70%	2.68%	2.72%	2.69%	2.50%
Fifteen Year Growth Rate	2.20%	2.22%	2.26%	2.24%	2.02%	2.12%	2.05%	2.72%	2.10%	2.14%	2.22%	2.17%	2.20%	2.05%

GRAPH DEM-1
WINTER DEMAND



GRAPH DEM-2
SUMMER DEMAND



The use of the HELM model allows the demand forecast to be examined at the class level. Tables DEM-4A and DEM-4B show the class summer and winter coincident peaks. Graphs DEM-3 and DEM-4 show how the class contributions to system peak change over the forecast. Table DEM-4A indicates that the most rapid growth in peak demand over the next five years will come from the Industrial class at an average annual growth rate of 3.6 percent. Above average growth also is expected from the FERS class at 3.4 percent, the Commercial class at 2.9 percent and the Municipals at 2.9 percent. The five-year winter growth rates are 3.3 percent, 3.4, 2.9 percent and 2.9 percent. The fifteen-year peak growth rates for the Industrial, FERS, Commercial, and Municipal classes are 3.0 percent, 2.7 percent, 2.3 percent, and 2.5 percent, respectively, as shown in Table DEM-4B. The RS coincident demands will grow at a rate of 0.9 percent over the next five years and an average of 0.8 percent from 1999-2013. ODP coincident demands are expected to rise 2.1 percent over the next five years and 1.9 percent from 1999-2013. Mine Power will experience reduced sales during the forecast period.

Graph DEM-3 demonstrates that the Commercial sector makes up 27 percent of the total summer peak demand forecast for 1999. This share is predicted to increase to 28 percent over the forecast period. The Industrial and FERS sectors make up 14 and 13 percent respectively with the Industrial sector increasing to 16 percent while FERS increases to 14 percent. Municipals increase from 10 percent to 11 percent, while Large Industrials drop from 5 percent to 4 percent and the RS class drops from 18 percent to 15 percent. The Commercial Sector contributes the largest component of peak demand growth, representing 383.97 MW of the 1,244 MW increase in peak demand from 1999 to 2013. The Industrial sector is next with 262.9 MW. Graph DEM-4 demonstrates that the FERS class constitutes the largest portion of the total winter peak demand at 25 percent, with this share predicted to increase to 26 percent over the forecast period.

TABLE DEM 4A
CLASS SUMMER COINCIDENT PEAK (MW)

Year	RS	FERS	Commercial	Industrial	MP	Municipals	Lighting	ODP	Large Industrials	T&D Losses	CSR*	Total
1999	703.80	490.90	1015.00	516.40	68.70	395.90	0.00	129.40	174.20	310	-28.0	3776.0
2000	706.60	508.20	1055.70	551.80	67.00	407.30	0.00	132.00	182.20	319	-28.0	3902.0
2001	714.80	525.60	1079.90	561.90	65.70	419.20	0.00	134.80	180.80	326	-28.0	3981.0
2002	723.70	540.80	1112.70	571.10	62.80	431.20	0.00	137.60	179.90	332	-28.0	4064.0
2003	729.10	558.90	1141.40	586.40	61.70	443.50	0.00	140.40	179.20	339	-28.0	4152.0
2004	737.00	580.20	1170.80	615.70	65.60	456.00	0.00	143.40	181.20	349	-28.0	4271.0
2005	738.00	590.00	1189.70	641.20	69.10	465.50	0.00	146.50	188.50	356	-28.0	4356.0
2006	744.90	606.90	1215.70	656.20	67.50	478.70	0.00	150.10	188.70	362	-28.0	4443.0
2007	749.80	621.20	1241.00	668.80	64.40	490.00	0.00	153.20	186.10	369	-28.0	4515.0
2008	753.70	635.00	1266.70	678.30	62.10	501.50	0.00	156.40	181.40	374	-28.0	4581.0
2009	759.80	652.80	1293.20	698.70	60.50	513.50	0.00	159.40	178.80	381	-28.0	4670.0
2010	766.10	667.90	1320.40	728.30	61.40	525.30	0.00	162.70	185.70	389	-28.0	4779.0
2011	771.70	681.00	1346.20	758.90	57.10	537.40	0.00	165.00	188.50	397	-28.0	4875.0
2012	779.90	696.90	1373.20	771.80	53.90	550.20	0.00	166.90	186.50	404	-28.0	4955.0
2013	785.60	711.40	1398.90	779.30	50.40	561.50	0.00	168.80	183.30	409	-28.0	5020.0
Five Year Growth Rate	0.93%	3.40%	2.90%	3.58%	-0.92%	2.87%	0.00%	2.08%	0.79%	2.40%	0.00%	2.49%
Fifteen Year Growth Rate	0.79%	2.69%	2.32%	2.98%	-2.19%	2.53%	0.00%	1.92%	0.36%	2.00%	0.00%	2.05%

TABLE DEM-4B
CLASS WINTER COINCIDENT PEAK (MW)

Year	RS	FERS	Commercial	Industrial	MP	Municipals	Lighting	ODP	Large Industrials	T&D Losses	CSR*	Total
1999	299.70	893.90	804.80	524.90	93.40	395.90	0.00	232.20	173.90	167	-28.0	3558.0
2000	300.90	925.40	837.10	547.70	87.00	407.30	0.00	237.00	177.10	171	-28.0	3662.0
2001	304.40	957.10	856.30	557.50	85.70	419.20	0.00	242.00	174.90	174	-28.0	3743.0
2002	308.20	984.80	882.30	574.40	83.90	431.20	0.00	247.00	177.80	178	-28.0	3840.0
2003	310.50	1017.80	905.10	592.50	82.60	443.50	0.00	252.10	179.80	183	-28.0	3939.0
2004	313.80	1056.70	928.30	617.30	87.40	456.00	0.00	257.50	183.70	190	-28.0	4063.0
2005	314.30	1074.40	943.30	635.40	89.90	465.50	0.00	262.90	182.50	192	-28.0	4132.0
2006	317.20	1105.20	964.00	653.10	88.30	478.70	0.00	269.40	182.30	196	-28.0	4226.0
2007	319.30	1131.20	984.00	663.60	84.00	490.00	0.00	275.00	179.20	198	-28.0	4296.0
2008	321.00	1156.40	1004.40	685.20	83.00	501.50	0.00	280.80	181.30	203	-28.0	4389.0
2009	323.60	1188.90	1025.40	709.80	81.90	513.50	0.00	286.10	183.20	209	-28.0	4493.0
2010	326.30	1216.30	1047.00	740.30	83.50	525.30	0.00	292.10	184.20	213	-28.0	4600.0
2011	328.60	1240.20	1067.40	752.00	74.30	537.40	0.00	296.20	182.50	213	-28.0	4664.0
2012	332.10	1269.20	1088.90	776.50	71.80	550.20	0.00	299.60	182.60	218	-28.0	4761.0
2013	334.50	1295.60	1109.30	783.80	67.30	561.50	0.00	302.90	180.80	220	-28.0	4828.0
Five Year Growth Rate	0.92%	3.40%	2.90%	3.30%	-1.32%	2.87%	0.00%	2.09%	1.10%	2.61%	0.00%	2.69%
Fifteen Year Growth Rate	0.79%	2.29%	2.32%	2.91%	-2.31%	2.53%	0.00%	1.92%	0.28%	1.99%	0.00%	2.20%

By forecasting each class individually we are able to see how the system load factor will change as KU's energy mix changes. Table DEM-5A shows that the system load factor is improving over time. This improvement is attributed to the varying load factors and energy growth rates in the different classes. Table DEM-5B shows the coincident load factors for the individual classes. Graphs DEM-5 through DEM-8 show the system peak load shape with class contributions for summer and winter in 1999 and 2013. In the residential sector the energy growth rate is greatest for FERS, which has a coincident load factor of 60.8 percent. While RS, which has a coincident load factor of 40.01 percent, is growing at a relatively slow rate. Also, energy growth in lighting is contributing to the improved load factor since lighting is off peak. The improvement in load factor is slowed somewhat by the negative growth in mining, which uses less energy in summer months giving it a high coincident load factor.

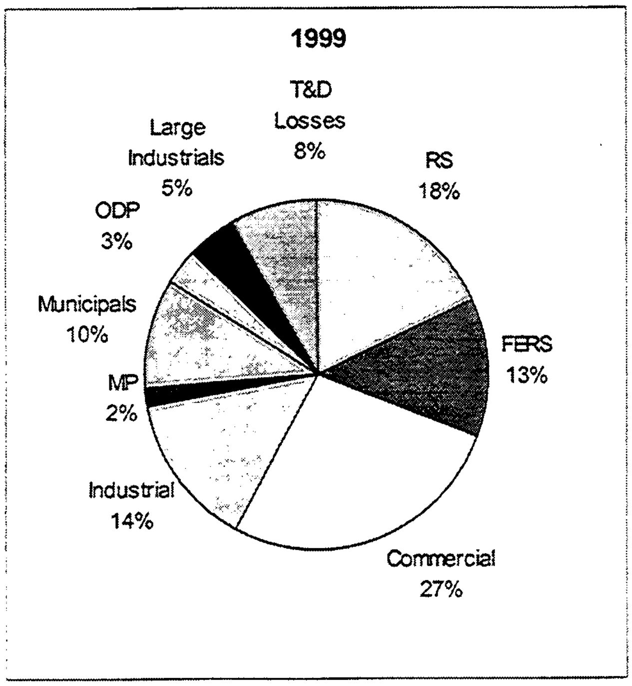
TABLE DEM-5A
SYSTEM LOAD FACTORS

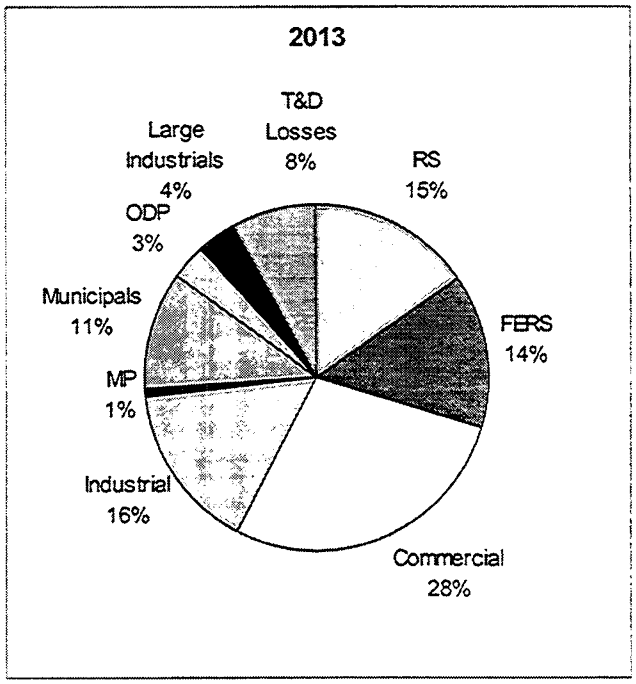
YEAR	LOAD FACTOR
2000	58.30%
2005	58.50%
2010	58.80%
2015	59.10%

TABLE DEM-5B
COINCIDENT LOAD FACTOR BY CLASS

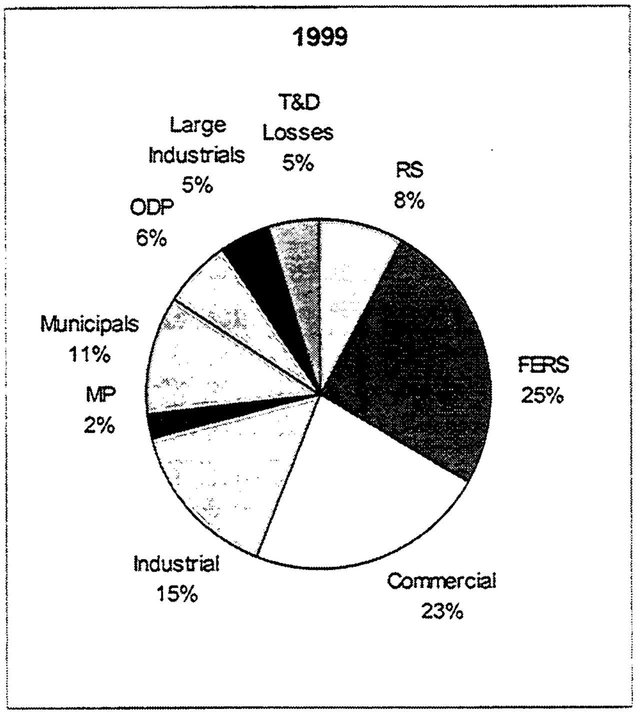
CLASS	LOAD FACTOR
RS	40.01%
FERS	60.80%
Commercial	55.40%
Industrial	80.40%
Mine Power	81.00%
Municipals	52.90%
Old Dominion	77.60%

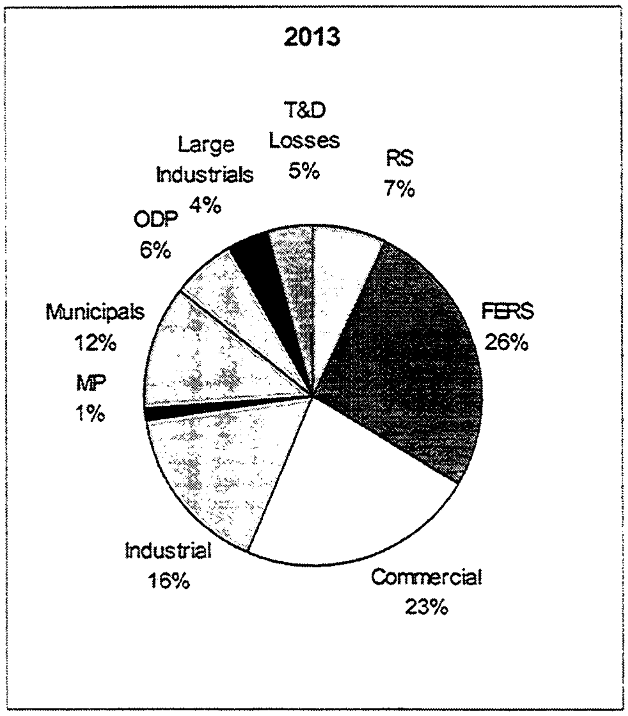
GRAPH DEM- 3
CLASS CONTRIBUTION TO SUMMER PEAK



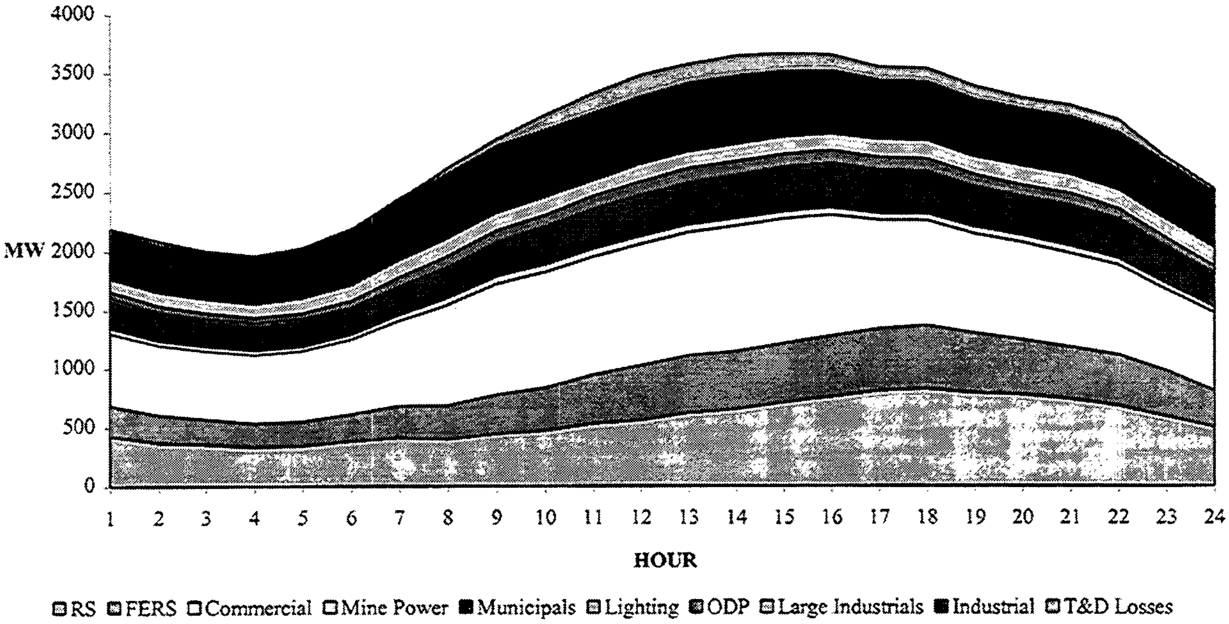


GRAPH DEM-4
CLASS CONTRIBUTION TO WINTER PEAK

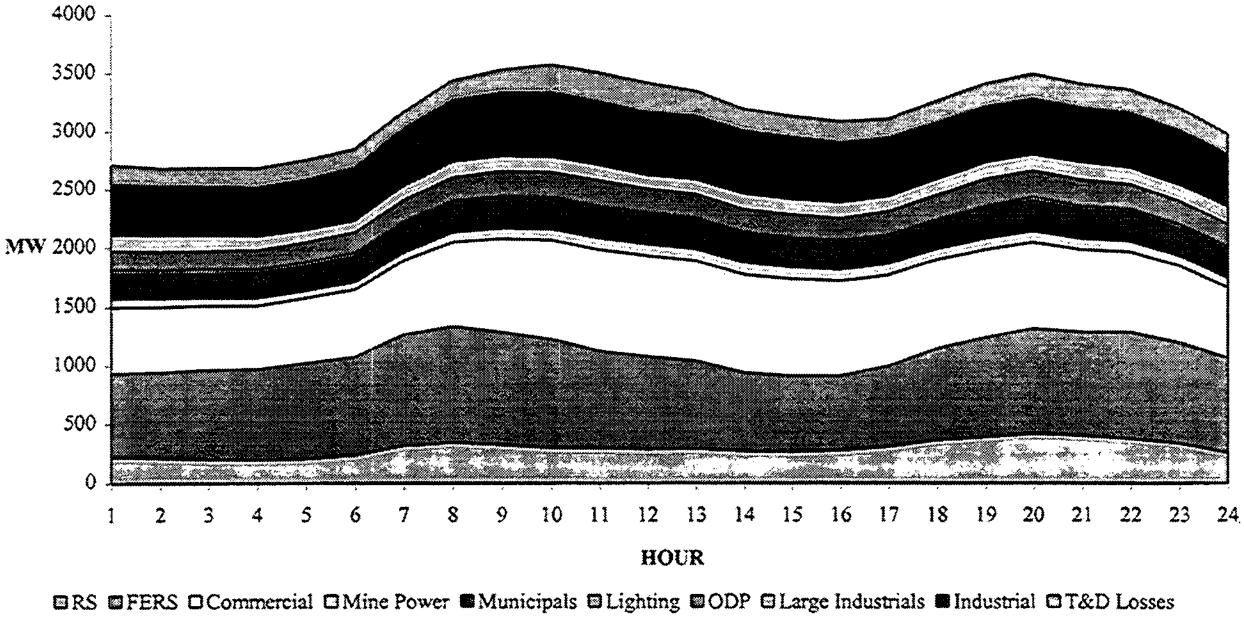




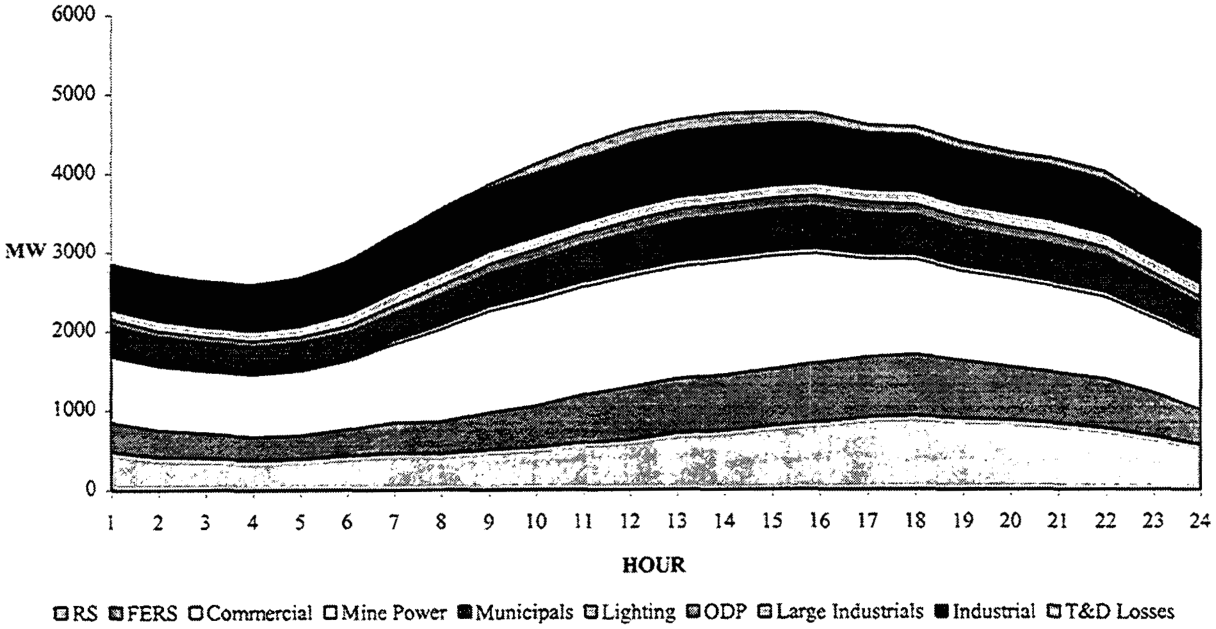
GRAPH DEM-5
1999 KU SYSTEM SUMMER PEAK DAY LOAD SHAPE BY CLASS



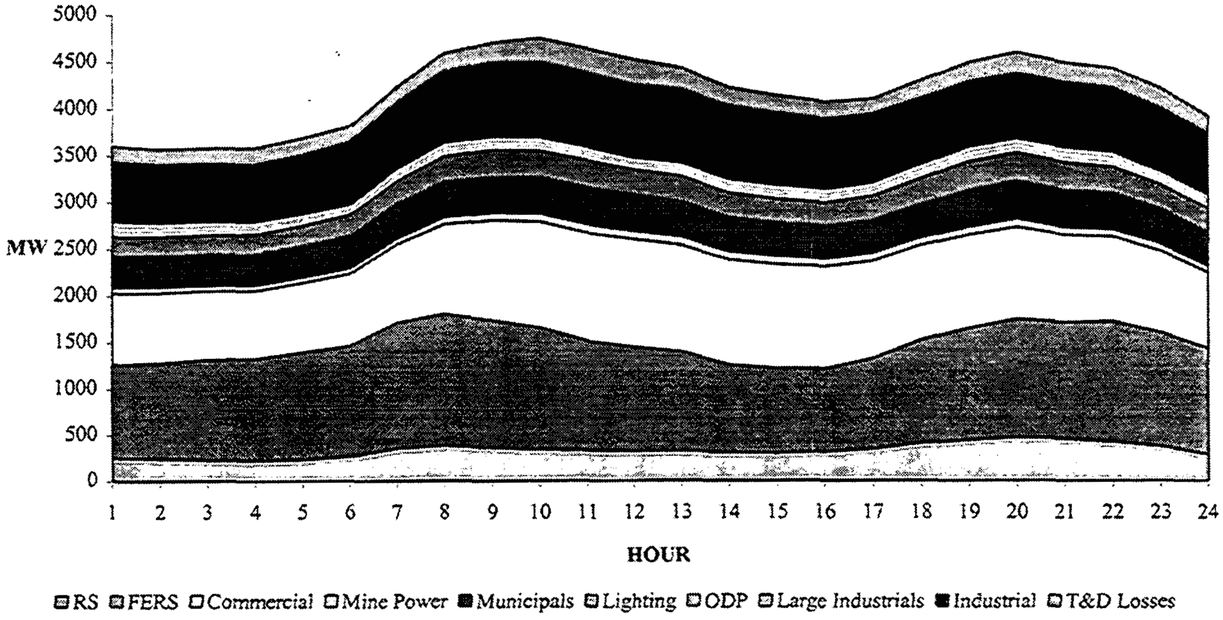
GRAPH DEM-6
1999 KU SYSTEM WINTER PEAK DAY LOAD SHAPE BY CLASS



GRAPH DEM-7
2013 KU SYSTEM SUMMER PEAK DAY LOAD SHAPE BY CLASS



GRAPH DEM-8
2013 KU SYSTEM WINTER PEAK DAY LOAD SHAPE BY CLASS



HELM develops an 8760 hourly load forecast for each class, by allocating forecasted sales to each day of the year and assigning daily load shapes to each day, and adds up the class loads to determine the forecasted system demand. HELM creates a library of load shapes that vary by season, groups of months that exhibit similar characteristics, day-type, such as week-day or week-end, and weather. Load shapes are then estimated from load research data. Finally, HELM adds losses to the class level demand and sums the class forecasts to give the system demand forecast.

The following section describes in detail the process HELM uses to accomplish these tasks.

Allocation of Sales

Annual sales are forecasted for each class and allocated to each day in the year by one of two methods. First, if the energy for a given class is sensitive to weather then normal weather is used to allocate sales to the days of the year. If the sales for a particular class are not affected by the weather then annual sales are simply allocated based on the mix of days in the year.

For weather sensitive classes HELM distributes annual forecasted sales to the days of the year by means of daily allocation factors. HELM estimates daily sales for the forecast period. These values of sales are only used for calculating the allocation factors and are not the official forecasted sales. The HELM forecasted daily sales are estimated using normal weather and are divided by the annual sales to provide the allocation factor.

Sales are forecasted by HELM for each day of the year by use of a Weather Response Function (WRF). The WRF shows the relationship between daily weather and sales. It is calculated by regressing the average daily dry-bulb temperature on daily sales. Any non-linearity that exists is captured by using a spline function. The spline function separates the relationship into segments. For example, there is a segment for all average temperatures between the range of -20 and 0 degrees, another segment for 0 to 25 degrees, and so on throughout the relevant temperature range. Segments are chosen to isolate near linear sections of the relationship. The spline function then estimates a linear relationship within each of these segments. The combination of the segments fully describes the daily sales and weather relationship for all temperatures. Separate WRF's are calculated for each class and can be further separated into WRF's for each season and day-type combination.

HELM then uses forecasted weather files for each year in the forecast period which contain temperature values for each day of the year. The forecasted weather observations are based on 20 years of historical weather data. The maximum average temperatures for all twenty years are averaged and then assigned to the hottest day of the mapping year. The mapping year is any year of daily weather patterns and is chosen to best represent historical patterns. The same procedure is carried out for the next hottest day and so on for each day in the year. The assignment of temperatures to days is done in a way that maintains weather patterns. That is, if the hottest day of the year falls in July then the hottest day is always assigned to a day in July.

The forecasted weather values are plugged into the regression equation providing predicted sales for each day. The predicted value is then divided by the sum of the predicted values for the year to provide the percent of total sales that each day uses. These percentages are then applied to the official forecasted annual sales to determine the amount of sales to be allocated to each day.

For classes that are not weather sensitive the allocation factor is still calculated by dividing estimated daily load by estimated annual load. However, the estimate for daily load is simply the average historical load for all days that fall into the season, day-type combination. For example, average sales will be calculated for winter, week-days. All winter, week-days in the forecast period will be assigned that average daily sales. Again, annual sales is the sum of the daily sales. Once the allocation factors are determined they are applied to the annual sales forecast in the same manner as the weather sensitive allocation factors.

Load Shapes Development

HELM maintains a library of load shapes, consisting of load shapes that vary by season, day-type, and weather bin. Weather bins are temperature ranges for which loads in the bin have similar shapes. If the average temperature for a day falls into the specified range, that day is assigned to the corresponding weather bin. Unique load shapes are estimated for each weather range to reflect the differences in load shapes as weather changes. Typical weather bins may be -20 to 20 degrees, 20 to 35, and so on.

The load shape for a given season, day-type, and weather bin is derived by calculating the average daily load duration curve and the average daily load shape. The average daily load duration curve sorts the hourly load in each day from the highest load to the lowest and averages the hour with the highest load, then the next highest, and so on. These averages are then mapped to the average load shape. The highest average from the average load duration curve is assigned to the hour with the highest load in the average load shape. This process is done for each hour to develop a "typical" load shape.

Forecast

HELM forecasts class load by determining the amount of sales for each day and the appropriate load shape. By doing this for each day of the year HELM is able to create an 8760 hour demand forecast based on sales for each class. Transmission and distribution losses are then applied to each hour of the class forecast to determine the demand associated with output. Summing the class level demands yields an 8760 hour system forecast. An adjustment was made to the January load to help the winter peak better reflect its expected relationship with historical weather normalized winter demand. The ratio of historical weather normalized winter peak load to historical weather normalized January peak load was applied at an exponentially decreasing rate to the forecasted January peak demand.

The CSR constrains certain customers to reduce their load to specified levels when requested by KU. The constraint is typically imposed when demand is high. Curtailable load is accounted for by two methods in the forecast. First, a portion of curtailable load contracted with the large industrials is accounted for within their individual load shape. The remaining curtailable load is subtracted from the HELM forecast. It is assumed that the contracted load is for 150 hours of curtailment. The curtailable load is subtracted from the HELM forecast by finding the hours of the 150 highest peaks and subtracting the contracted amount from the load for those hours.

UNCERTAINTY ANALYSIS

For the 1999 Energy Demand Forecast, uncertainty analysis has been approached from the standpoint of selecting the most important variables to the forecast over which the forecaster has control of the predicted values. Table UNC-2 shows that for the chosen variables three alternative outlooks have been developed, coinciding with Baseline, Pessimistic, and Optimistic growth scenarios. For each case, a scenario was either available from the vendor of the exogenously provided forecast variable or a scenario was created utilizing information provided by the vendor.

Quantitative assessment of the likelihood of the variables following their alternative paths depends on the individual vendors. WEFA states in its documentation that it believes there is a 70 percent probability that the economy will most closely resemble the trend, a 15 percent chance that it will resemble the optimistic scenario, and a 15 percent chance that it will resemble the pessimistic case. The CUER at the University of Louisville offers no assessment of the likelihood of households growing at a high versus a moderate rate. KU has defined a mid-path between the two that it considers the base outlook that accounts for recent customer growth rates in its territory. Price is internally modeled using WEFA assumptions regarding interest rates.

The scenarios as constructed do not directly reflect the inherent degree of uncertainty that electricity usage will have regardless of the path of the economic and demographic drivers. In other words, the variance in sales is due solely to changes in the economic drivers and customer assumptions. However, probabilities of occurrence of each forecast path can be constructed by fitting a probability distribution to the forecast. The forecast is assumed to follow a normal distribution with the Baseline Forecast as the mean. The variance is estimated from historical sales. Ranges defined for each scenario are as follows:

Pessimistic – 0 to the mid-point of the Pessimistic and Base forecast
Baseline - Mid-point between Pessimistic and Baseline forecast to the mid-point between the Baseline and Optimistic Forecast
Optimistic - From the mid-point of the Baseline and Optimistic forecasts and beyond

The probabilities for each forecast scenario are determined by calculating the cumulative probability of sales falling within the specified range given a normal distribution with mean and variance above. The probabilities of occurrence are calculated in five, ten, and fifteen-year increments. Each increment is the probability that the total sales will fall within the range of the pessimistic, optimistic, and baseline forecast and is illustrated in Table UNC-1.

TABLE UNC-1
PROBABILITY OF FORECAST OCCURRING

	5-YEAR	10-YEAR	15-YEAR
BASELINE	62.63	78.85	85.87
OPTIMISTIC	4.43	2.33	1.55
PESSIMISTIC	32.94	18.82	12.57

It should be noted that in calculating the cumulative probabilities, the variances are associated with the long run growth trend of the Company. It should also be noted that by becoming directly involved in marketing efforts to achieve the Bulk Power initiatives, and because of the unique load requirements that might be associated with an individual customer, the probability of the Optimistic Forecast occurring may be understated. Although the remaining portions of the Retail Marketing initiatives were not considered fully independent of the Optimistic sales outlook without initiatives, clearly these efforts increase the probability that the sales outlook of KU will track with the Optimistic scenario. If they are successful in addition to the occurrence of optimistic economic and demographic conditions, sales could track well above the Optimistic scenario.

TABLE UNC-2
UNCERTAINTY ANALYSIS STUDY VARIABLES

VARIABLES	GROWTH SCENARIOS	
	LOW	HIGH
REAL GROSS DOMESTIC PRODUCT	KUSTEM Low	KUSTEM High
INCOME	KUSTEM Low	KUSTEM High
KY OUTPUT	KUSTEM Low	KUSTEM High
RESIDENTIAL CUSTOMERS	1999 Forecast	KUSTEM
ELECTRIC PRICE	KUSTEM Low	KUSTEM High

WEFA Optimistic/pessimistic Assumptions

Macroeconomic assumptions regarding Optimistic and Pessimistic scenarios are provided by WEFA Group in their report "U.S. Long-Term Economic Outlook", third quarter, 1999. Key WEFA assumptions relative to the Baseline Energy forecast were presented in the Executive Summary/Overview section of this report. Following is a brief review of the key assumptions made by WEFA in generating their Optimistic and Pessimistic forecasts.

WEFA Optimistic Forecast

- Characterized by high growth and low inflation. Read GDP increases at a 2.5 percent annual rate over the forecast period.

- Despite the higher GDP growth rate, the GDP deflator averages only 1.9 percent increase over the forecast.
- Population growth averages 1.0 percent

WEFA Pessimistic Forecast

- Characterized by low growth and high inflation. Real GDP increases at a 1.7 percent rate over the forecast period.
- The GDP Inflator averages 2.3 percent over the forecast period.
- Population growth is below the trend due to lower net immigration.
- Productivity growth averages .6 percent.

1999-2013 Energy Demand Forecast Comparisons

Graph UNC-1 illustrates the relative bandwidth created by the three scenarios for total KU energy sales. The Baseline Energy Forecast increases at an average annual rate of 2.4 percent (assuming normalized actual sales of 18,244 gWh in 1999) over the first five years and 2.1 percent over the fifteen-year horizon. The Optimistic scenario increases at an average annual rate of 2.8 percent over the first five years and 2.4 percent over the fifteen-year horizon. The pessimistic scenario increases at an average annual rate of 2.3 percent over the first five years and 1.9 percent over the fifteen-year period.

The Baseline Energy Forecast is 413 gWh lower than the Optimistic scenario in 2004. For the year 2013, the Base line Energy Forecast is 704 gWh higher than the Pessimistic scenario and 990 gWh lower than the Optimistic scenario. The commercial and industrial sectors account for most of the variance between the Baseline Forecast and Optimistic scenario, while the commercial, industrial, and residential sectors account for the variance between the Baseline Energy Forecast and the Pessimistic Scenario. Table UNC-3 presents the annual forecast values for the Baseline Energy Forecast and each scenario.

GRAPH UNC-1
BASELINE/SCENARIO SALES COMPARISON

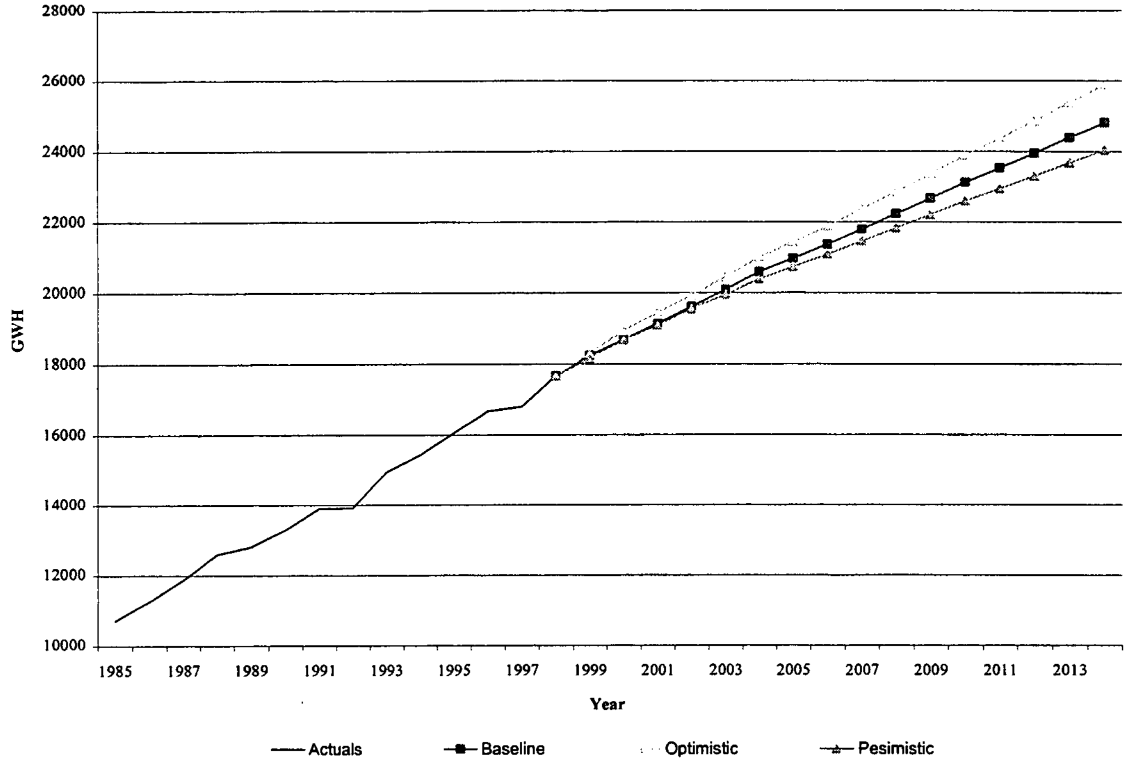


TABLE UNC-3
BASELINE/SCENARIOS SALES COMPARISON
(GWH)

Year	1999 Baseline	1999 Optimistic	1999 Pessimistic
1999	18,244	18,300	18,152
2000	18,686	18,939	18,680
2001	19,134	19,440	19,083
2002	19,605	19,932	19,546
2003	20,073	20,442	19,948
2004	20,577	20,990	20,372
2005	20,953	21,418	20,723
2006	21,357	21,875	21,074
2007	21,793	22,368	21,449
2008	22,228	22,862	21,827
2009	22,665	23,361	22,204
2010	23,120	23,886	22,605
2011	23,522	24,360	22,944
2012	23,947	24,857	23,304
2013	24,380	25,370	23,676

Graph UNC-2 illustrates the relative bandwidth associated with peak demand forecasts generated using the three energy scenarios above. The baseline Demand Forecast increases at an average annual rate of 2.5 percent from 1999 through 2004 and 2.1 percent over the fifteen-year horizon. The Optimistic scenario increases at an average annual rate of 2.7 percent over the first five years and 2.3 percent over the fifteen-year horizon. The Pessimistic scenario increases at an average annual rate of 2.2 percent over the first five years and 1.8 percent over the fifteen-year horizon.

The Baseline Demand forecast is 67 MW higher than the Pessimistic scenario in 2004 and 69 MW lower than the Optimistic scenario. For the year 2013, the Baseline demand Forecast is 174 MW higher than the Pessimistic scenario and 186 MW lower than the Optimistic scenario. Table UNC-4 presents the annual forecast values for the Baseline Demand Forecast and each scenario.

GRAPH UNC-2
BASELINE/SCENARIOS PEAK DEMAND COMPARISON

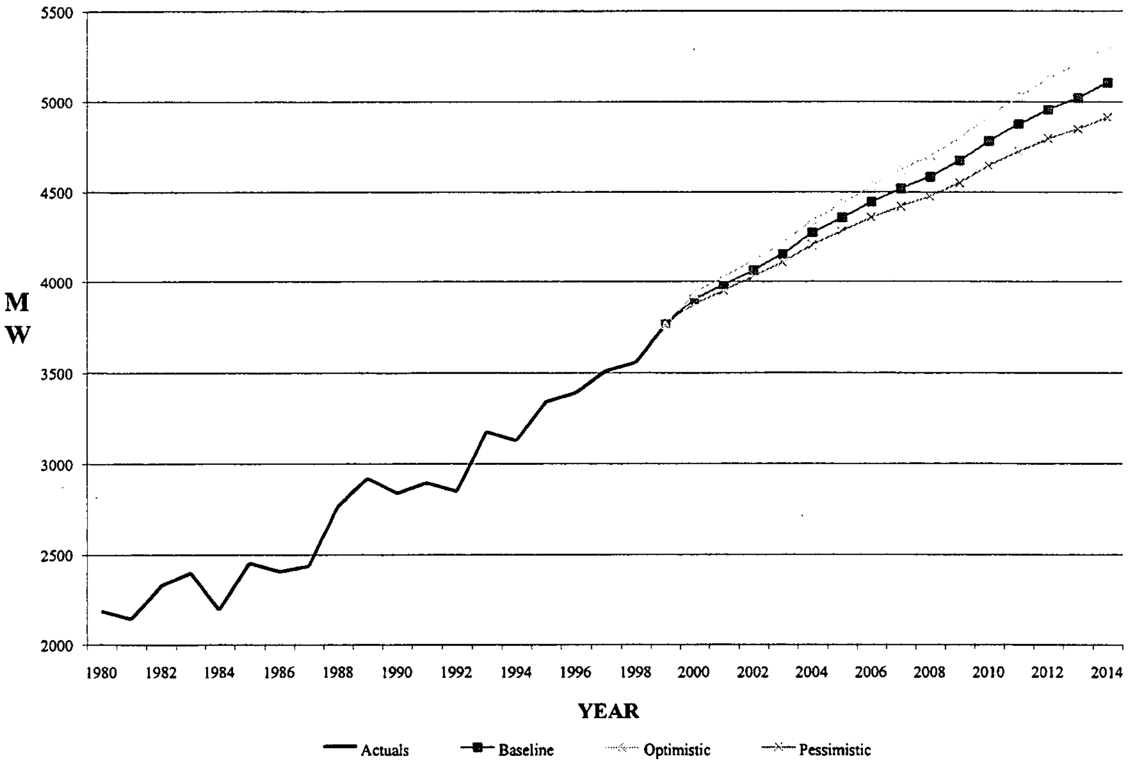


TABLE UNC-4
BASELINE/SCENARIOS PEAK DEMAND COMPARISON
(MW)

YEAR	1999 Baseline	1999 Optimistic	1999 Pessimistic
1999	3776	3796	3763
2000	3902	3934	3878
2001	3981	4026	3948
2002	4064	4116	4031
2003	4152	4214	4106
2004	4271	4340	4204
2005	4356	4432	4282
2006	4443	4532	4357
2007	4515	4617	4417
2008	4581	4696	4473
2009	4670	4796	4548
2010	4779	4918	4644
2011	4875	5027	4724
2012	4955	5123	4792
2013	5020	5206	4846

TABLE EXT-1
EXTENDED ENERGY AND DEMAND FORECAST
2014-2028

	2014	2018	2023	2028
ENERGY FORECAST (GWH)				
RESIDENTIAL				
RS	2,786	2,897	3,027	3,094
FERS	3,864	4,169	4,538	4,834
TOTAL	6,651	7,066	7,565	7,928
COMMERCIAL/INDUSTRIAL				
COMMERCIAL	6,849	7,460	7,940	8,465
INDUSTRIAL	7,027	7,604	8,236	8,798
TOTAL	13,876	15,064	16,176	17,263
MINE POWER	3,592	3,447	3,516	3,584
LIGHTING	110	108	103	96
TOTAL KU RETAIL	2,100	2,246	2,419	2,565
MUNICIPALS	2,657	2,877	3,134	3,397
OLD DOMINION	1,160	1,213	1,284	1,360
TOTAL ENERGY SALES	24,813	26,552	28,613	30,402
TOTAL ENERGY OUTPUT	26,431	28,275	30,460	32,442
DEMAND FORECAST (MW)				
SUMMER	5,101	5,478	5,918	6,275
WINTER	4,916	5,265	5,712	6,071

KEYASSUMPTIONS FOR EXTENDED FORECAST PERIOD (2014-2028)

ENERGY FORECAST

RESIDENTIAL

- The KUSTEM county level population forecast drives KU's customer forecast.
- KU's market share of households that are customers in a county is not allowed to rise above 100 percent or fall lower than 0.0 percent.
- Customer Allocation Model assumptions are unchanged after 2010.
- Gas price increase at an average annual rate of [redacted] through 2020. Thereafter, gas price increase at [redacted] per year.
- Electric price increases are internally generated.
- Personal income increases follows CBER's projections and service territory weighting procedures through 2028.
- Normalized degree-days are unchanged.
- Appliance UEC and saturation assumptions change in response to the forecast drivers.

COMMERCIAL/INDUSTRIAL

- Nominal GDP increases follow WEFA projections through 2028.
- The GDP implicit price deflator follows WEFA projections through 2028.

MINE POWER

- East and West Kentucky coal production follows the RDI forecast through 2028.
- Market share for West Kentucky remains fixed for the 2014-2028 period.
- Market share for East Kentucky remains fixed at the 2003 level for 2003-2028.

LIGHTING

- No change in assumptions.

MUNICIPALS

- Industrial output series are derived from the KUSTEM database.
- Cooling and heating degree-days are fixed at the 1979-1998 20-year average.
- Household estimates are derived from the KUSTEM database.

OLD DOMINION POWER

- Old Dominion population estimates is held at the 2010 level.
- Westmoreland Coal's usage is zeroed because of closing of operations.
- No change in assumptions made for other mining and the GS-LP-HLF group to generate the 2014-2028 forecast.

DEMAND FORECAST

- Monthly peak demands for the 2014-2028 forecast period are determined using the 2014-2028 energy forecast and class level load shapes. While the underlying energy changes over time, the class level load shapes are assumed constant over the forecast period.

RESEARCH AND DEVELOPMENT

Research and development efforts in the immediate future will concentrate on identifying "best practices" between the LG&E and KU forecasting systems with the objective of standardizing as many processes as possible. With this approach, the companies can continue to look ahead to enhancements to the forecasting process while maximizing consistency and efficiency.

While the separate tariff structures of KU and LG&E will make complete standardization impractical for the present, the companies are working to develop a common segmentation scheme. While final decisions have not been made, consideration is being given to introducing SIC-code based segmentation to the LG&E data. While useful in developing a more customer focused approach to forecasting, it may require some additional years of history before time dependent regression methods will be able to utilize the data.

In the coming year, the companies will evaluate the methodological differences in the modeling of customers and sales, with the goal of settling on a common approach for as many classes as possible. The final approach may not be identical to either company's methodology before consolidation if enhancements are identified. In particular, KU's experience with the end-use models suggests that innovative thinking needs to be applied to achieve a proper balance between complexity and efficiency in system level energy forecasting. The companies envision a hybrid of econometric and end-use modeling, similar to KU's modeling of the Commercial sector, that attempts to capture factors not present in the historic data while providing statistical rigor for the model diagnostics.

With respect to data, the KUSTEM model utilized by KU has been expanded to include LG&E's service territory. Future forecasts will be more reliant on a common source of local economic outlook information. However, additional information sources may continue to be evaluated in order to provide a comprehensive perspective.

In demand forecasting, the companies intend to emulate the KU use of HELM to generate a class-level demand forecast for LG&E. In addition, the companies intend to thoroughly evaluate the value of a hybrid approach of mixing econometric techniques with the HELM process to capture benefits from each method.

Subsection 1

KU Service Territory Economic and Demographic Forecast Report

Report on the 2000 Economic and Demographic Forecast for the Kentucky Utilities Service Territory
May 7, 1999

Introduction

The following document presents the 2000 economic and demographic forecast for the Kentucky Utilities Service Territory made using the Kentucky Utilities Service Territory Econometric Model (KUSTEM). Forecasts are presented for aggregate variables and by detailed industry and demographic group. Forecasts are presented for the entire Kentucky Utilities Service Territory and for key sub-areas such as the Kentucky Retail Service Territory, the Virginia Service Territory, and municipal customers. Throughout, forecast growth rates from the 2000 forecast are compared to those from the 1999 forecast.

As in the previous years, the 2000 long-term economic forecast for the Kentucky Utilities Service Territory calls for a rapid rate of growth. The area's economy is forecast to outperform the national economy. Growth in industrial value added in particular is forecast to be strong.

Over the next 5 years, from 2000 through 2004, industrial value added in the Kentucky Utilities Service Territory is forecast to grow by 3.5% annually.[1] Commercial employment, which is employment in retail, trucking, wholesale, services, government, and finance, insurance, and real estate is forecast to grow at 2.1% per year.[2] Nationally, commercial employment is forecast to grow by 0.9% annually. Real total personal income in the Kentucky Utilities Service Territory is forecast to grow by 2.7% on average each year compared to 2.4% nationally.

The rate of population growth in the service territory is forecast to match population forecasts for the United States over the next five years. This is a strong performance for a state where population growth has often lagged growth rates nationally. Annual population growth is forecast to average 0.8% over the next five years in the Kentucky Utilities Service Territory, and 0.8% nationally. The number of households is forecast to increase by 1.6% per year in the Kentucky Utilities Service Territory.

These rapid rates of growth over the next 5 years are forecast to moderate slightly further in the future. This can be seen by comparing forecast annual growth rates over the next 5 years with the annual average forecasts for the entire 15 year period from 2000 to 2014. Forecast annual growth rates for industrial value-added are expected to average 3.4% annually from 2000 through 2014 compared to 3.5% annually from 2000 through 2004. Commercial employment is forecast to grow by 2.0% each year for 2000 through 2014 compared to 2.1% each year from 2000 through 2004. Households are forecast to grow by 1.3% per year from 2000 through 2014 compared to 1.6% per year from 2000 through 2004.

Results for the Kentucky Utilities Service Territory

The entire Kentucky Utilities Service Territory includes 82 counties, including 77 counties in Kentucky and 5 counties in southwest Virginia. Forecasts for the entire Kentucky Utilities Service Territory are presented below. Forecasts for aggregate growth measures are presented first followed by forecasts for detailed industrial and demographic categories. The results for this entire service territory should be representative of results for important sub-regions such as the Kentucky Retail Service Territory, and municipal customers.

Output

---

[1] The industrial sector is defined to include all mining industries (SIC 12-14) and all manufacturing industries (SIC 20-39).

[2] The commercial sector is defined to include all construction industries (SIC 15-17), all transportation, communications, and public utility industries (SIC 41-49), all wholesale trade industries (SIC 50-51), all retail trade industries (SIC 52-59), all finance, insurance, and real estate industries (SIC 60-67), all services industries (SIC 70-89), and all government industries (SIC 90-99).

Output growth includes the growth in value-added in manufacturing and mining sectors. As seen in Figure 1, the current 1999 forecast calls for output to grow strongly throughout the next 15 years, though the rate of growth is expected to decline over time. Output is forecast to grow on average by 3.5% per year for the 5 year period of 2000 through 2004, and average 3.4% over the entire 15 year period from 2000 to 2014. These growth rates represent a slight slowdown relative to 1999 forecasts for the period 2000 to 2004, but more rapid overall growth for the entire 2000 to 2014 period. The 1999 forecasts called for 3.8% growth in industrial value-added over the 2000 through 2004 period and 3.0% annual growth over the 2000 through 2014 period. For the entire 30 year period, industrial value-added for the Kentucky Utilities Service Territory is forecast to grow by 2.7% annually, which is 0.4% higher than the growth rate in the 1999 forecast. These changes from the 1999 to 2000 forecast reflect changes to the national forecast between the two years. Relative to last year, the current national forecast has slower growth in industrial production in the next five years, but faster growth from 6 to 30 years into the future. This issue is discussed in more detail in the section at the end of this report entitled "WEFA Macroeconomic Assumptions."

Commercial Employment

Commercial employment growth encompasses growth in the wholesale trade, retail trade, trucking, finance, insurance, and real estate, and services industry employment, as well as government employment. Growth in commercial employment in the Kentucky Utilities Service Territory is forecast to grow steadily over the next 15 years. Commercial employment is forecast to grow by 2.1% annually from 2000 through 2004, and average 2.0% annual growth over the entire 2000 to 2014 period. As seen in Figure 2, these growth rates are slightly higher than the 1999 forecasts of 2.0% average annual growth from 2000 through 2004, and 1.8% annual growth from 2000 to 2014.

Population and Households

Forecasts of population in the KUSTEM model are made using a cohort-component model, the same type of model utilized in Bureau of Census forecasts. These models utilize birth, survival, and migration rates to forecast population. The major difference between the Bureau of Census and KUSTEM approach is in the estimation of migration rates. Migration behavior in Census models is based on past migration rates, while migration behavior in the KUSTEM model is a function of economic growth in the service territory. As a result, with a fast growing economy, it is possible that migration rates in the forecast period can exceed past rates, leading to faster growth in population.

Population forecasts from the KUSTEM model call for a steady increase in population in the Kentucky Utilities Service Territory over the forecast period. Population is forecast to increase by 0.7% per year over the entire 2000 to 2014 period, and at a slightly faster 0.8% annual rate for 2000 through 2004. As nationally, the Kentucky Utilities service territory is forecast to have an aging population. Since older persons tend to live in smaller household, this aging of the population implies fewer persons per household. This drop in household size implies that the number of households should grow even faster than the population.

The growth rate for households over the 2000 to 2014 is indeed faster, averaging 1.3% per year. This is slightly faster than the annual household increase forecast for the same period in the 1999 Forecast. Households are forecast to increase by 1.6% per year from 2000 to 2004.

Forecast Detail

Widely varying growth rates in individual industries and age groups underlie these aggregate results. To examine these differences, more disaggregate forecasts are presented below.

Output

Industry value-added growth rates indicate that selected durable goods industries appear to be the impetus for rapid value-added growth in the Kentucky Utilities Service Territory. The most rapidly growing industries were transportation equipment and industrial machinery, which includes the very rapidly growing computer equipment and parts manufacturing industry. As seen in Table 1, the forecasts call for continued success in Kentucky in growth in the transportation equipment industry, and participation in the nationwide trend for rapid value-added growth in computers and other industrial machinery.

There is also expected to be one rapidly growing non-durable goods industry over the next 5 years: wood products. Value-added in wood products is expected to grow at an average annual rate of 5.9% from 2000 to 2004, though the industry is expected to have more moderate growth thereafter. In the next few years, this industry is expected to benefit from the continued realignment of the industry from the western United States to the southeast. The growth rate in many other non-durable goods manufacturing industries, however, is expected to be more moderate, and quite slow in some cases. One moderately growing non-durable goods industries is chemical products, which is forecast to grow at just above 3.0% per year.

Non-durable goods industries experiencing very slow growth include the food processing industry, which is expected to average just over 0.6% growth annually over the next 5 years. Coal mining is expected to be another weak industry in terms of value-added growth. The industry is forecast to experience a decline in value-added over each of the next 5 years.

Commercial Employment

Forecasts for growth in commercial employment are illustrated in Table 2. Figures in that table indicate broad-based growth. Each of the commercial industries presented in Table 2 is expected to add employment over the next fifteen years.

Despite restructuring, the health care industry is still expected to be among the fastest growing commercial industry over the next 15 years. On average, its growth rate is expected to exceed the overall growth rate of commercial employment by 0.5% from 2000 through 2014. In the next five years, however, the rate of employment growth in the health care industry is expected to be very similar to overall growth in commercial employment. Several services industries forecast to grow quickly are personal services, education and other retail trade also are forecast to grow quickly. The slower growing commercial industries are expected to be wholesale trade, finance, insurance, and real estate, and government.

Demographic Change

National trends towards an older age distribution are clearly evident in forecasts for the Kentucky Utilities Service Territory. Table 3 shows this aging process by presenting forecast population growth rates for selected age groups. For both men and women, it is evident that the growth in the population age 15 to 34 will be limited over the next 15 years. Moderate growth is forecast among 25 to 29 and 30 to 34 year olds, but population is expected to decline among 15 to 19 and 20 to 24 year olds. At the same time, population is forecast to grow rapidly among many older age cohorts.

Rapid growth among persons age 55 through 69 reflect the aging of the baby boom generation. The number of persons age 55 to 59 and 60 to 64 are forecast to grow by more than 3% annually over the next 5 years. The growth rate of persons 65 to 69 is forecast to be most rapid later in the 2000 to 2014 time period.

The growth rate of persons over age 85 is also rapid throughout the period. This does not reflect the aging of the baby boom population since baby-boomers will not have reached that age as of yet. Instead, the growth reflects the rising life expectancy of Kentuckians and people throughout the United States.

The Kentucky Retail Area

The Kentucky Retail Service Territory includes parts of 77 Kentucky counties, but excludes Kentucky Utilities' twelve municipal customers in Kentucky. The Kentucky Retail Service Territory makes up a large portion of the entire Kentucky Utilities Service Territory. Thus it is not surprising that the results for the Kentucky Retail Service Territory are quite similar to those for the entire Kentucky Utilities Service Territory.

Value-added output in the Kentucky Retail Service Territory is forecast to grow at an annual rate of 3.7% per year from 2000 to 2004, and 3.5% per year over the entire 15 year 2000 to 2014 period. These growth rates represent a slight slowdown relative to 1999 forecasts for the period 2000 to 2004, but more rapid overall growth for the entire 2000 to 2014 period. The 1999 forecasts called for 3.9% growth in industrial value-added over the 2000 through 2004 period and 3.1% annual growth over the 2000 through 2014 period.

The forecast for commercial employment growth in the Kentucky Retail Service Territory is a 2.1% growth rate each year from 2000 to 2004. The 15 year forecast calls for a 2.0% average annual growth from 2000 to 2014. These growth rates match the 1999 forecasts of 2.1% average annual growth from 2000 through 2004, and exceed the 1999 forecast of 1.8% annual growth from 2000 to 2014.

The forecast for population in the Kentucky Retail Service Territory is 0.8% each year from 2000 to 2004, and an average growth of 0.8% annually from 2000 to 2014. The forecast for household growth is 1.7% annually from 2000 to 2004, and 1.3% on average from 2000 to 2014.

The Virginia Area

The rate of growth in the Virginia Service Territory is somewhat slower than the rate of growth in the Kentucky Retail Service Territory. This is because the Virginia Service Territory has a larger concentration of two industries that are forecast to grow quite slowly: coal mining and apparel.

Total value-added is forecast to drop at an annual rate of 0.5% from 2000 through 2004, but grow 1.5% annually on average from 2000 to 2014. The results reflect a slower growth forecast for value-added output among mining industries, including a forecast drop in mining output from 2000 through 2004. In the current forecast, mining value-added is forecast to grow by less than 0.4% per year on average over the 15 year period. Manufacturing output is forecast to grow by 4.1% on average from 2000 through 2004, and average 4.3% growth each year from 2000 through 2014.

The forecast for commercial employment growth in the Virginia Service Territory is a 1.5% growth rate each year from 2000 to 2004. The 15 year forecast calls for a 1.6% average annual growth from 2000 to 2014. These forecast annual growth rates are just above those called for in the 1999 forecast. Households in the Virginia Service Territory are forecast to grow by 0.9% per year from 2000 through 2004, and 0.7% per year over the entire 15 year period from 2000 through 2014.

Municipals

Kentucky Utilities serves 12 municipal customers. Each of these municipalities has a unique growth forecast. However, in the interest of brevity, an aggregate forecast for all 12 municipal customers is presented here. While the forecasts for individual municipal customers will differ, the forecast for this aggregate of all twelve municipals is quite similar to the forecast for the Kentucky Retail Service Territory. Although, the forecast rate of growth for value-added is higher for the municipals in aggregate.

Aggregate value-added output for the twelve municipals is forecast to grow at an annual rate of 4.1% per year from 2000 to 2004, and 3.6% per year over the entire 15 year period from 2000 to 2014. Commercial employment is forecast to grow by 2.0% per year from 2000 to 2004, and 2.1% annually from 2000 to 2014. Aggregate households for the twelve municipals is forecast to grow by 1.5% annually from 2000 to 2004, and by 1.2% each year on average form 2000 to 2014.

Summary

Economic growth in the Kentucky Utilities Service Territory is forecast to proceed at a rapid rate over the next 15 years. Growth in industrial value-added in particular is expected to be strong, though the growth in commercial employment and households is also expected to be brisk. These 2000 forecasts from the KUSTEM model are similar to those produced in the 1999 forecasts. In general, the 2000 forecast shows slightly slower growth from 2000 through 2004, but faster growth from 2005-2014.

WEFA Macroeconomic Assumptions

The Center for Business and Economic Research develops an economic forecast for the Commonwealth of Kentucky in order to drive its forecast for the Kentucky Utilities Service Territory. In turn, this economic forecast for Kentucky is developed using variables from a national economic forecast developed by WEFA. Thus, the national economic forecast from WEFA has an important influence on the economic, and therefore, the Energy and Demand Forecast, for the Kentucky Utilities Service Territory.

The current forecast from WEFA (the year 2000 forecast) calls for slower growth in the next five years, and particularly the next few years, than was called for in last year's national forecast (the year 1999 forecast). The two forecasts are illustrated in Figure 3, which illustrates forecast growth rates of gross domestic product (GDP) in the current year WEFA forecast and last year's forecast. GDP is the most comprehensive measure available of national output, and is a measure that is correlated with national industrial output. Note that much slower growth is forecast for the years 2000 and 2002 in the current year forecast. Note also that forecast rates of GDP growth in the current WEFA forecast are higher in most years after 2005, particularly after 2010. This pattern of slower growth forecast from 2000 through 2004 relative to last year's forecast, and faster growth after 2005 is also reflected in forecasts for the Kentucky Utilities Service Territory.

As mentioned above, the current year forecast from WEFA calls for slower growth from 2000 through 2004 than last year's forecast, particularly in 2000 and 2002. The source for last year's national economic forecast was DRI/McGraw-Hill. One natural question is: how have DRI's forecasts for 2000 and the next few years changed between this year's forecast and last year's forecast? Has there also been a slowdown in DRI's forecasts? These questions are answered in Figure 3A, which shows forecasts for the years 2000 through 2003 based on DRI's current year forecast (the year 2000 forecast) and last year's forecast (the year 1999 forecast). The 2000 forecast does call for slower growth than the 1999 forecast for the 2000 through 2003 period, and there is a sharp slowdown in the year 2000 and the year 2002. Both the DRI and WEFA sources for national macroeconomic forecasts call for a slowdown in growth relative to last year's forecast.

Some of the key assumptions behind WEFA's First-Quarter 1999 Trend/Moderate Growth Scenario national forecast are presented below.

- Growth in the economy has exceeded the long-run rate of growth in the last few years. Beginning in the year 2000, the trend forecast expects that the economy will follow a pattern of smooth growth, with actual output approximately paralleling the path of potential output. Although, growth in the year 2000 is expected to fall slightly below average long-term growth due to modest Y2K problems. Annual real U.S. GDP growth should average 2.0% over the next 5 years from 2000 through 2004 and 2.1% over the next 15 years.

- Inflation over the forecast will remain moderate. Inflation will average 1.9% over the next 5 years from 2000 through 2004, of the forecast, and 2.1% over the next 15 years.

- Real interest rates are expected to remain at moderate levels as the Federal Reserve guards against inflation but does not raise rates in order to drive inflation even lower.

Figure 1
Growth Rates in Real Industrial Value Added for KU Service Territory
2000 Forecast versus 1999 Forecast

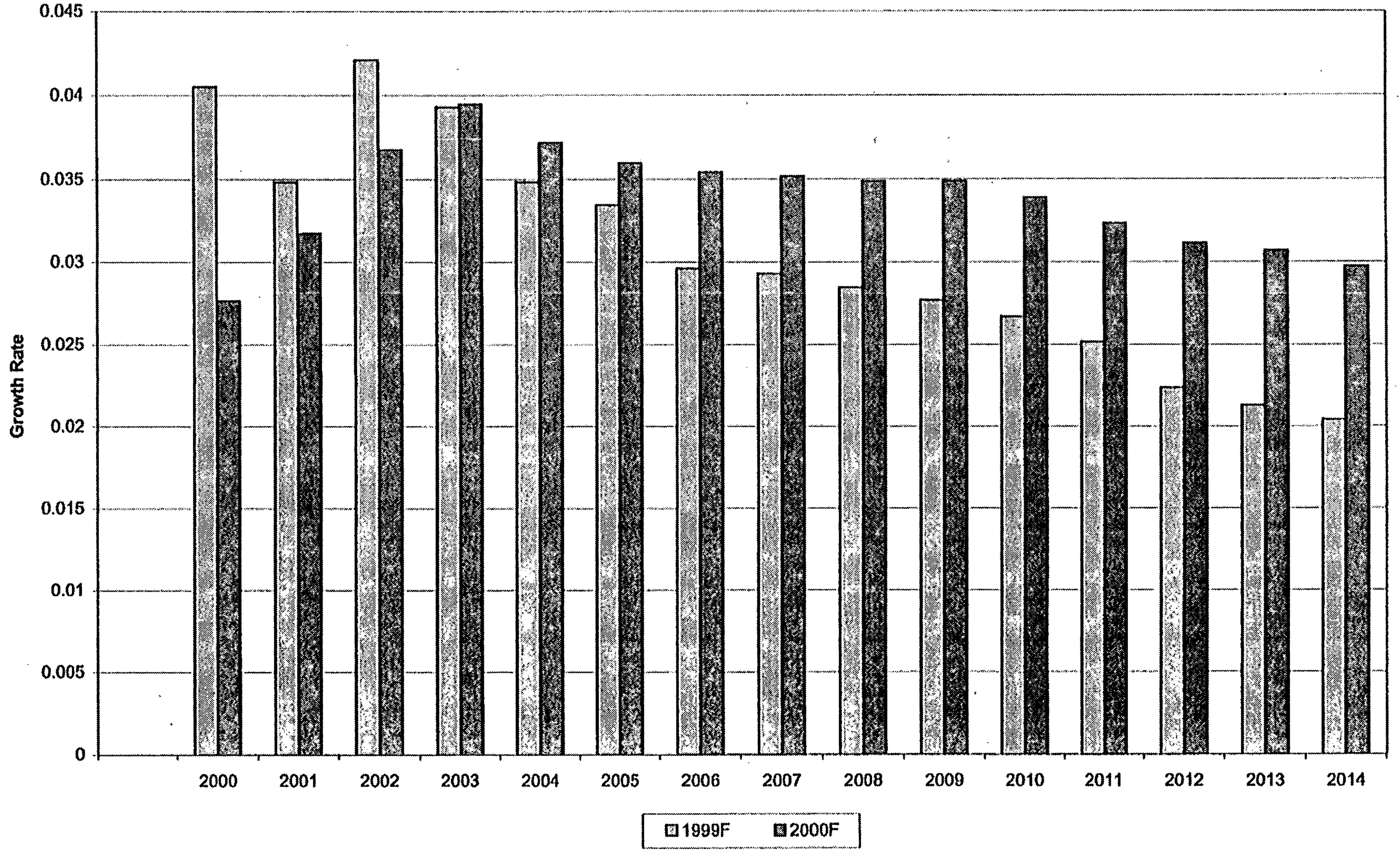


Figure 1-RTL
Growth Rates in Real Industrial Value Added for Kentucky Retail Customers
2000 Forecast versus 1999 Forecast

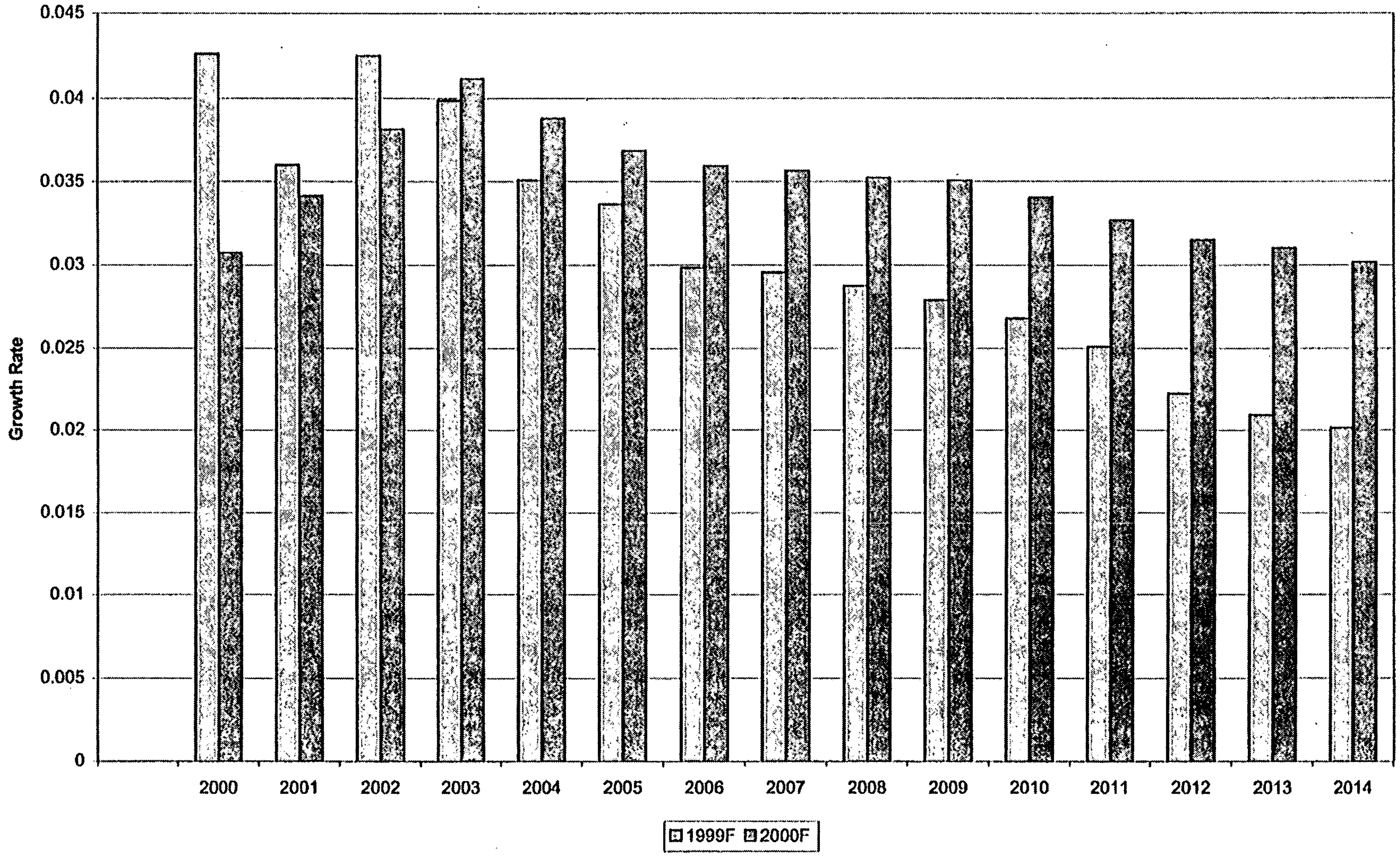


Figure 1 -Va
Growth Rates in Real Industrial Value Added for Old Dominion Power Service Territory
2000 Forecast versus 1999 Forecast

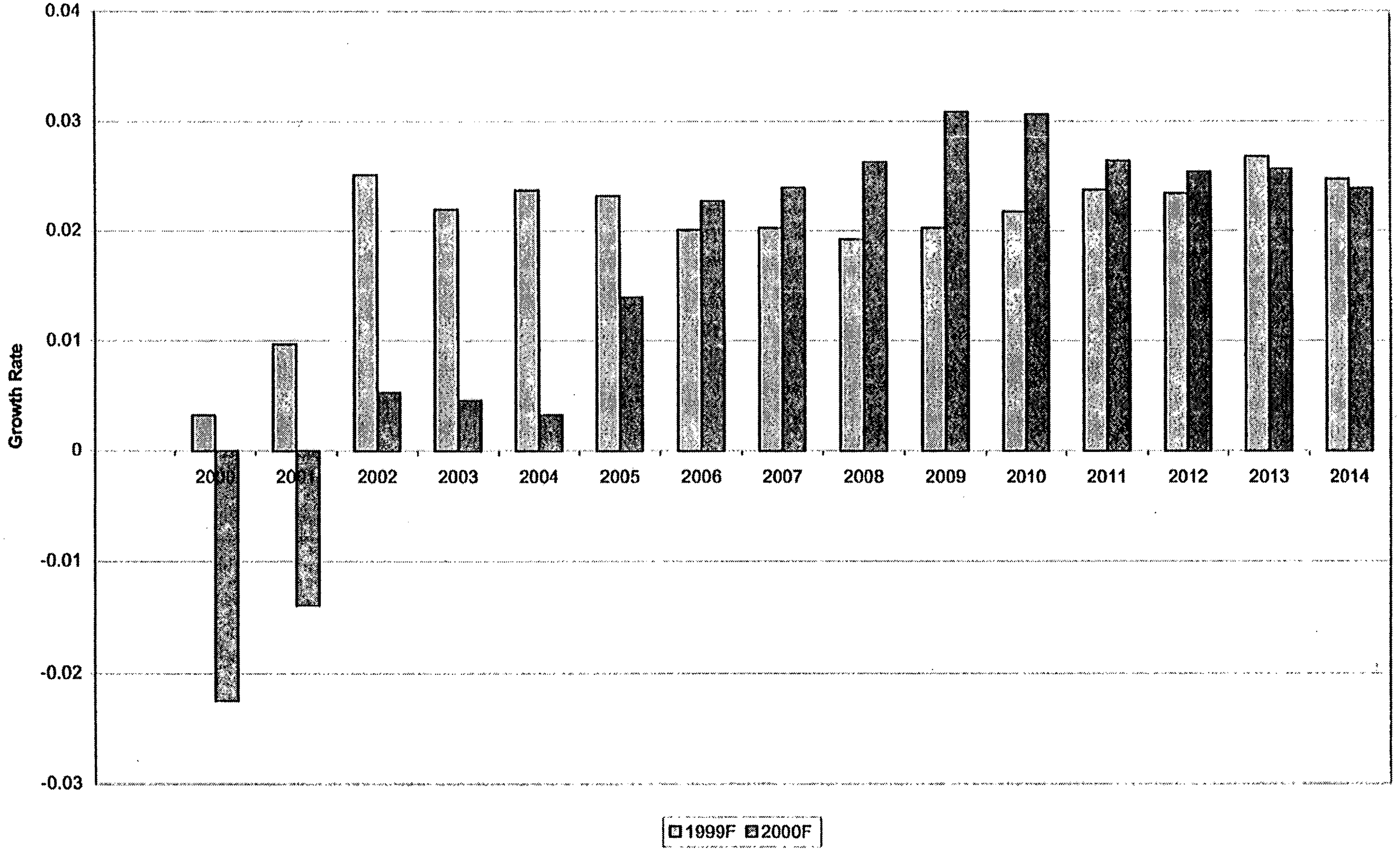


Figure 1- Whl
Growth Rates In Real Industrial Value Added for KU Wholesale Customers
2000 Forecast versus 1999 Forecast

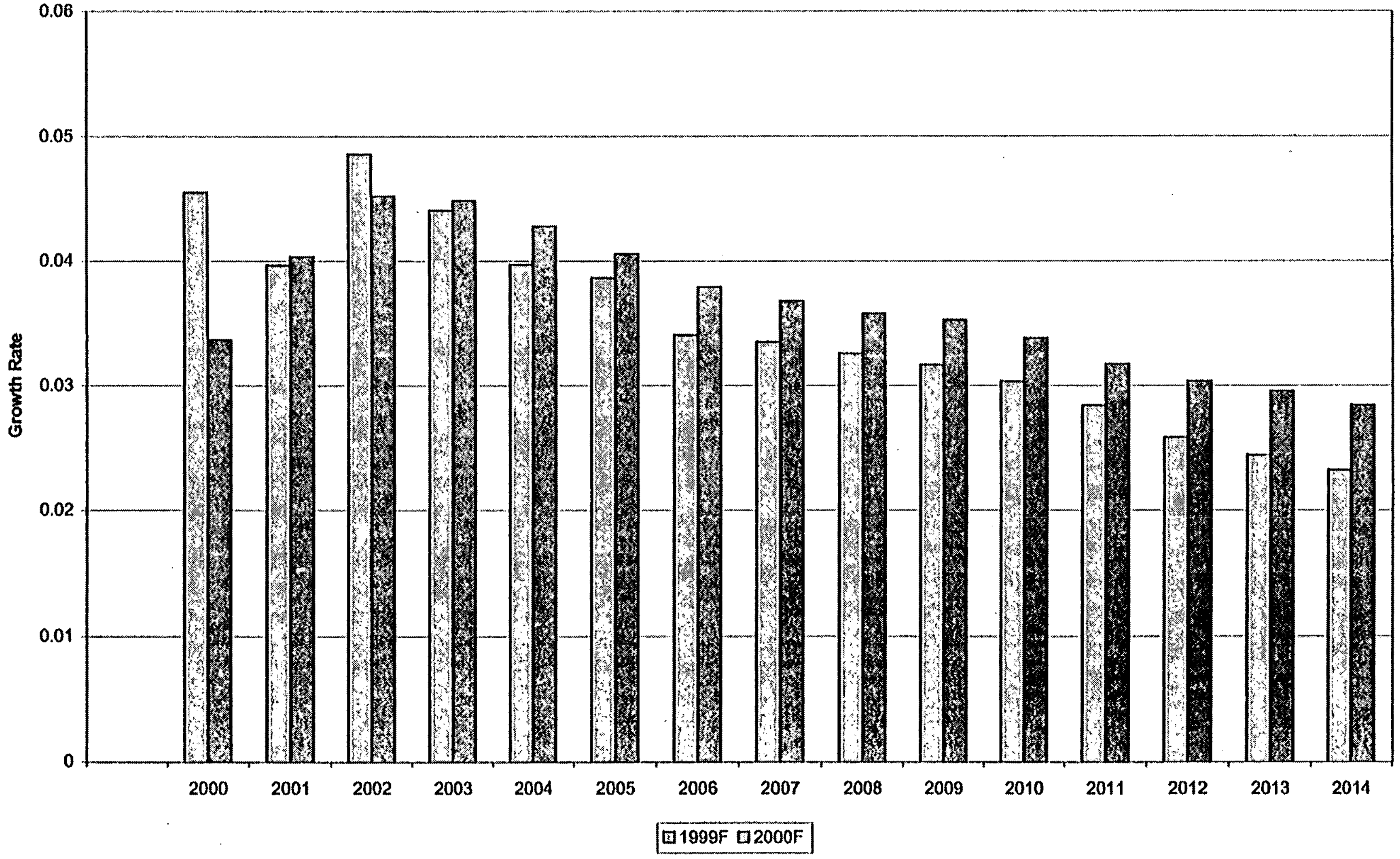


Figure 2
Growth Rate In Commercial Employment
2000 Forecast versus 1999 Forecast

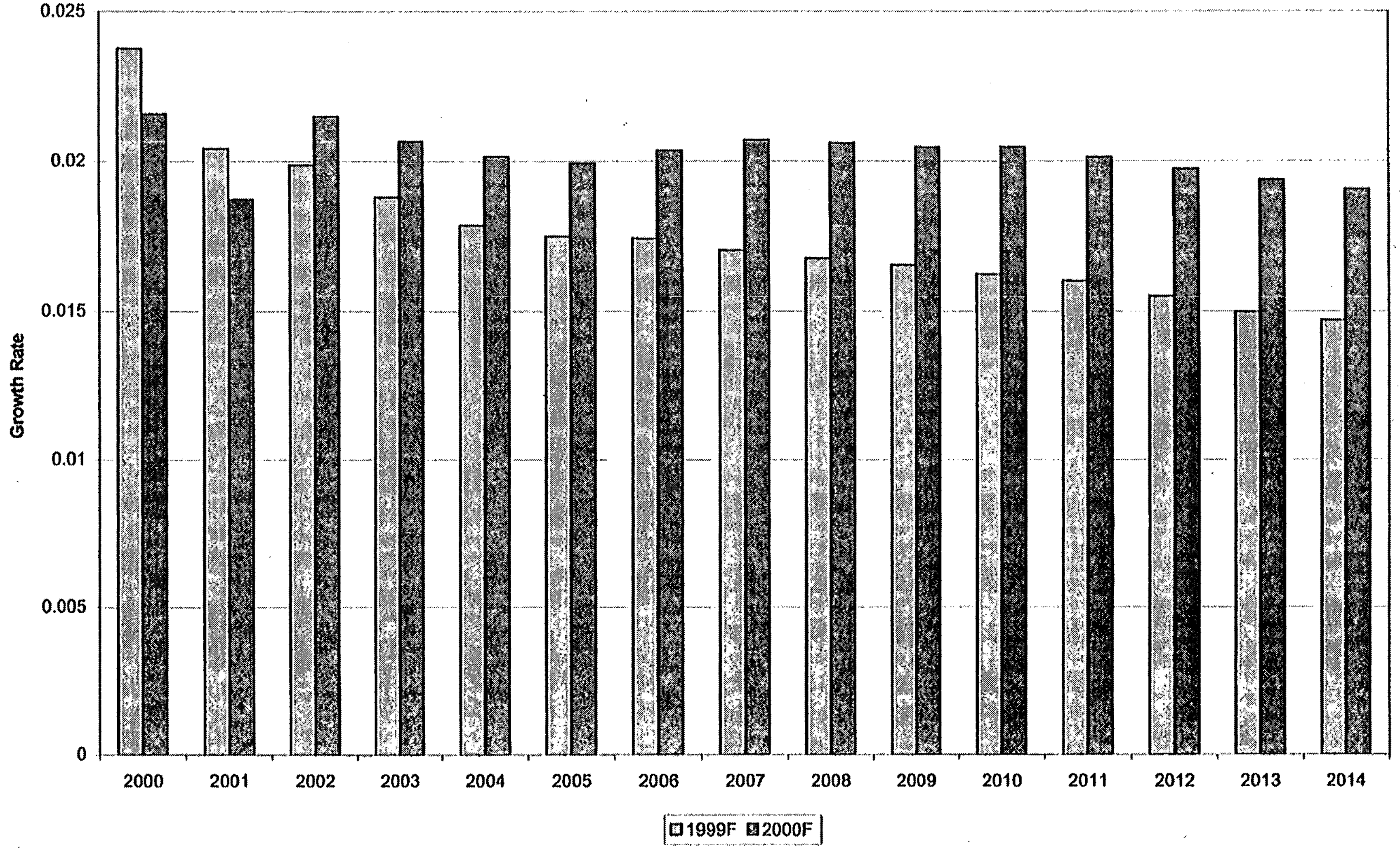


Figure 2-Rtl
Growth Rate in Commercial Employment for Kentucky Retail Customers
2000 Forecast versus 1999 Forecast

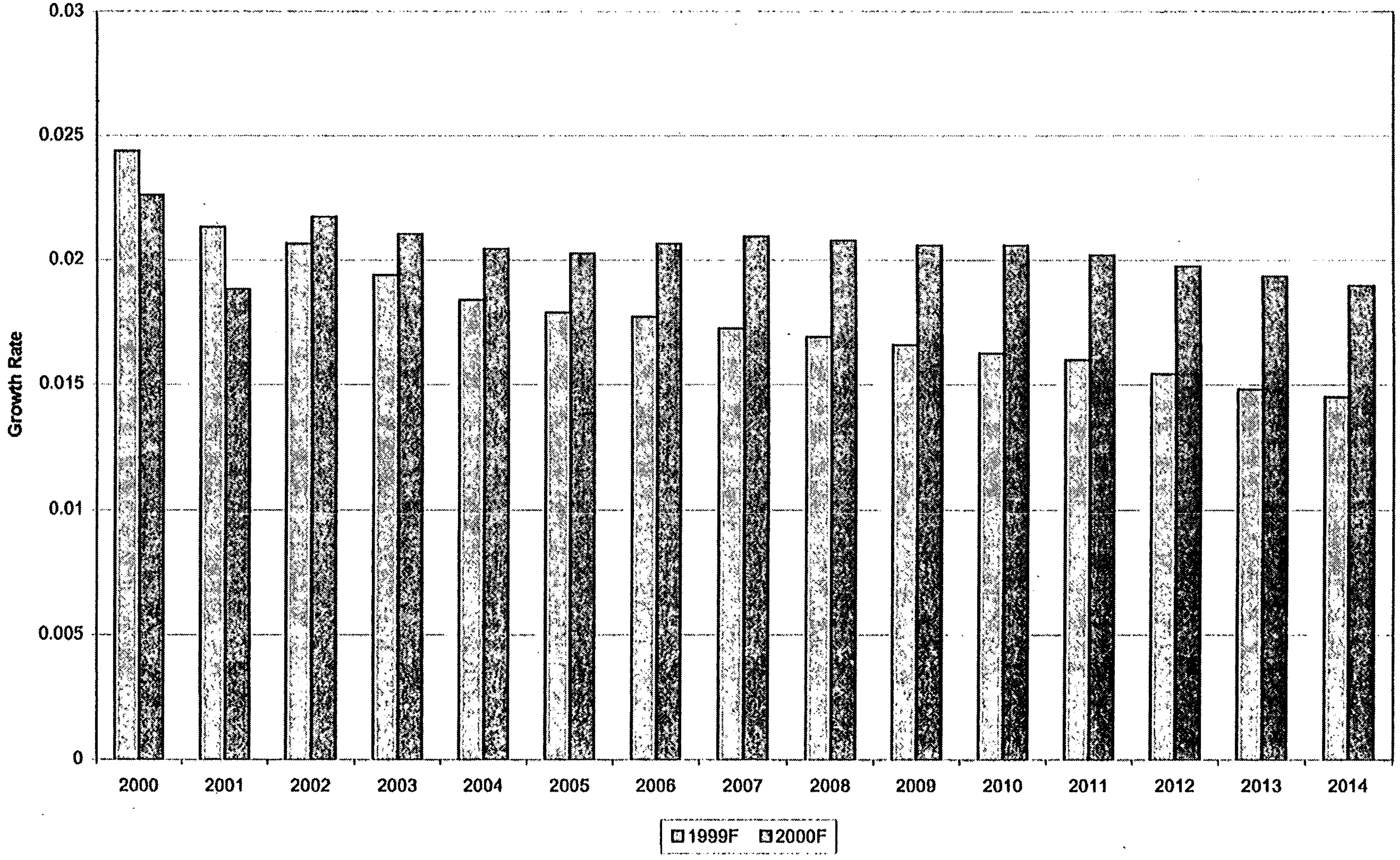


Figure 2-Va

Growth Rate in Commercial Employment in the Old Dominion Power Service Territory

2000 Forecast versus 1999 Forecast

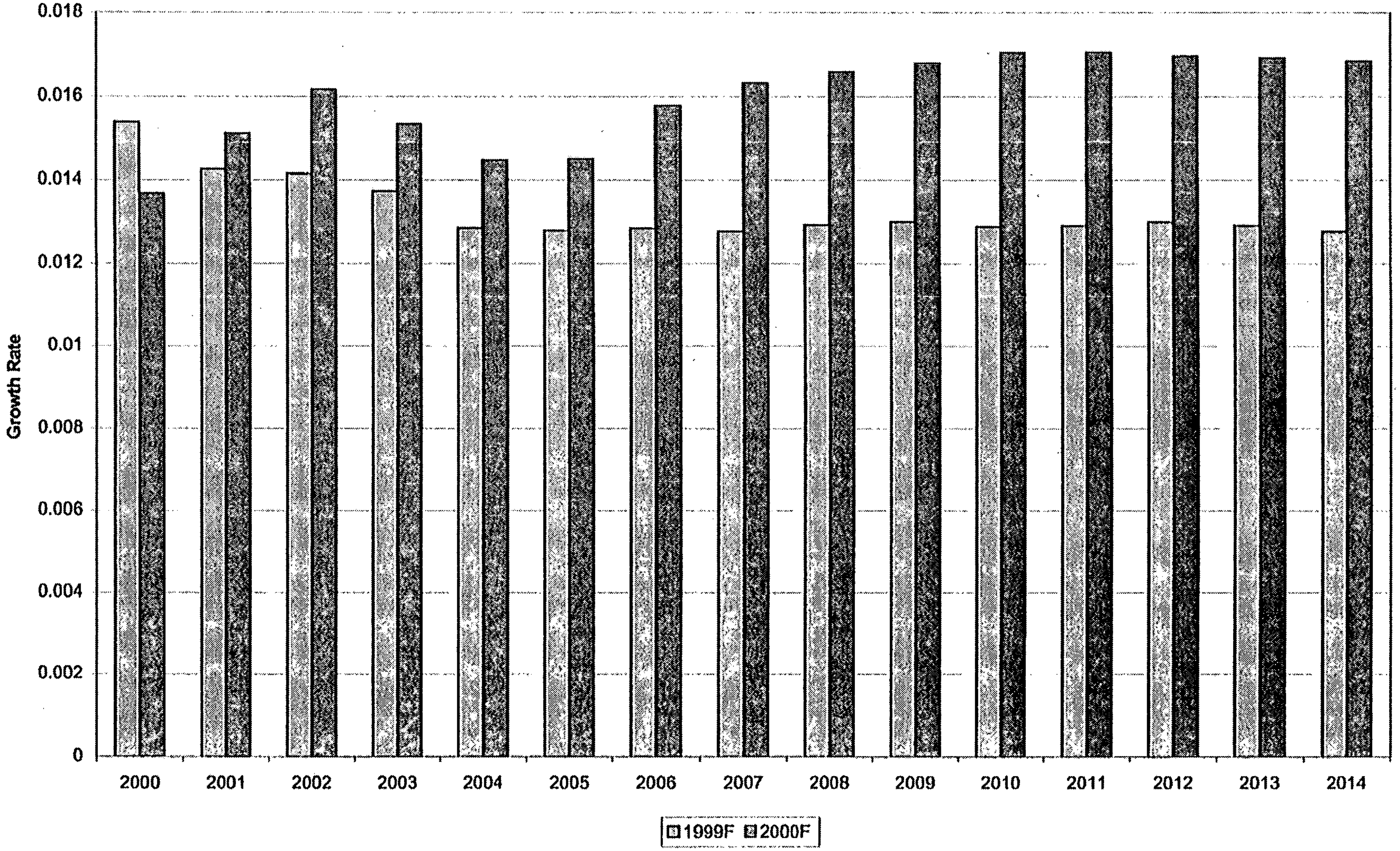


Figure 2 -Whl

Growth Rate In Commercial Employment for KU Wholesale Customers
2000 Forecast versus 1999 Forecast

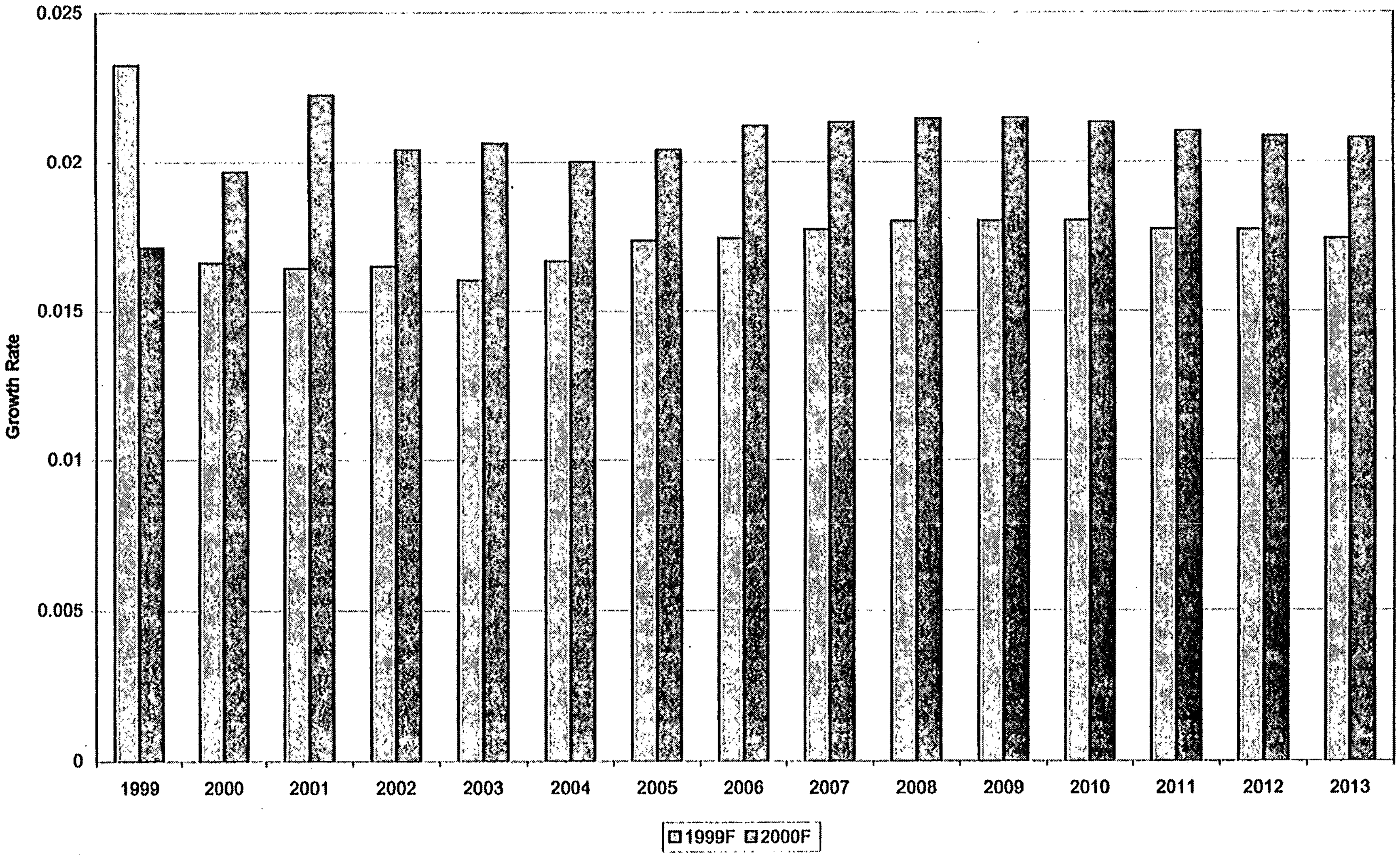


Figure 3
Forecast for the Growth Rate in U.S. Real GDP
WEFA 2000 Forrecast versus
DRI/McGraw Hill 1999 Forecast

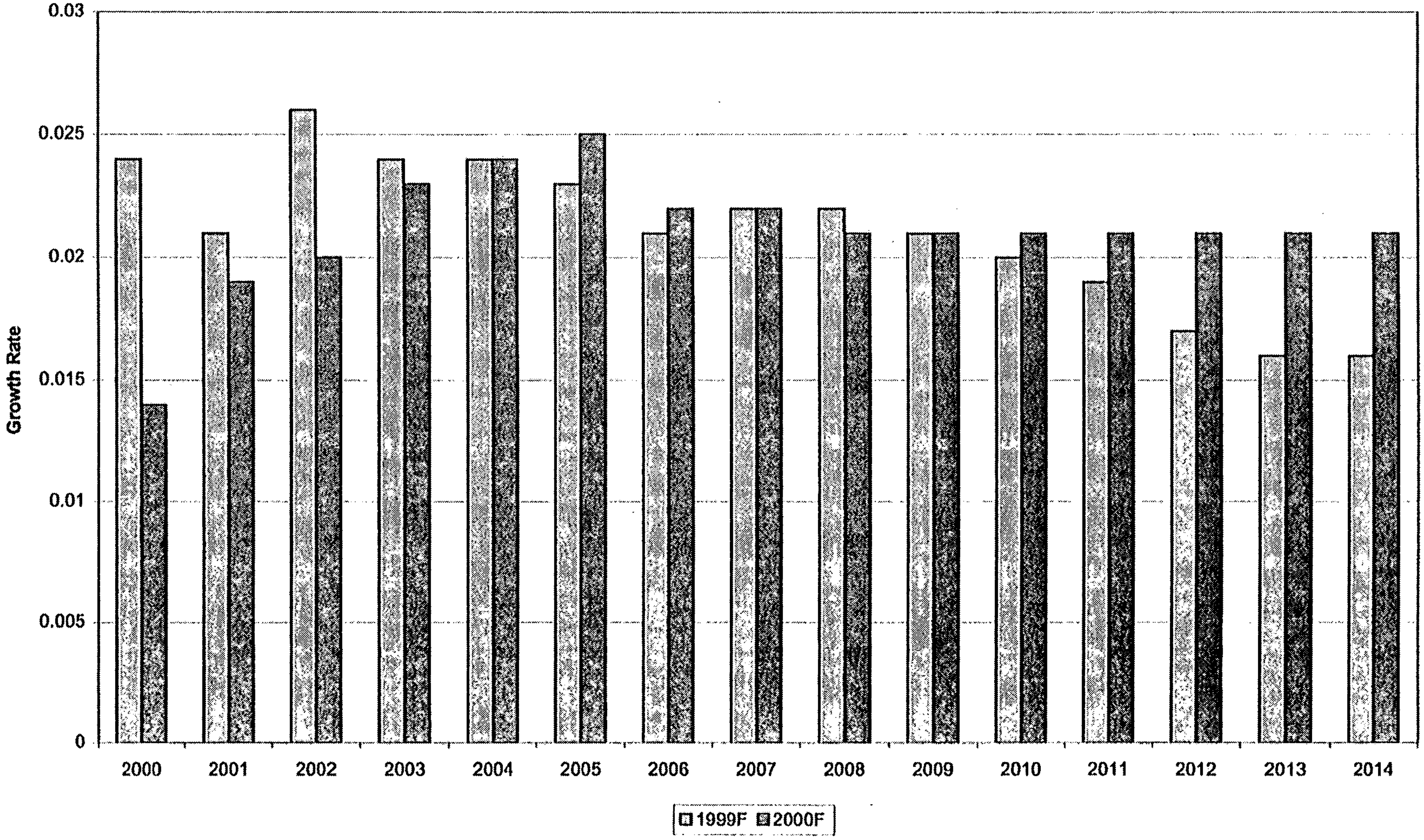


Figure 3A
Forecast for the Growth Rate in U.S. Real GDP
DRI/McGraw Hill 2000 Forrecast versus
DRI/McGraw Hill 1999 Forecast

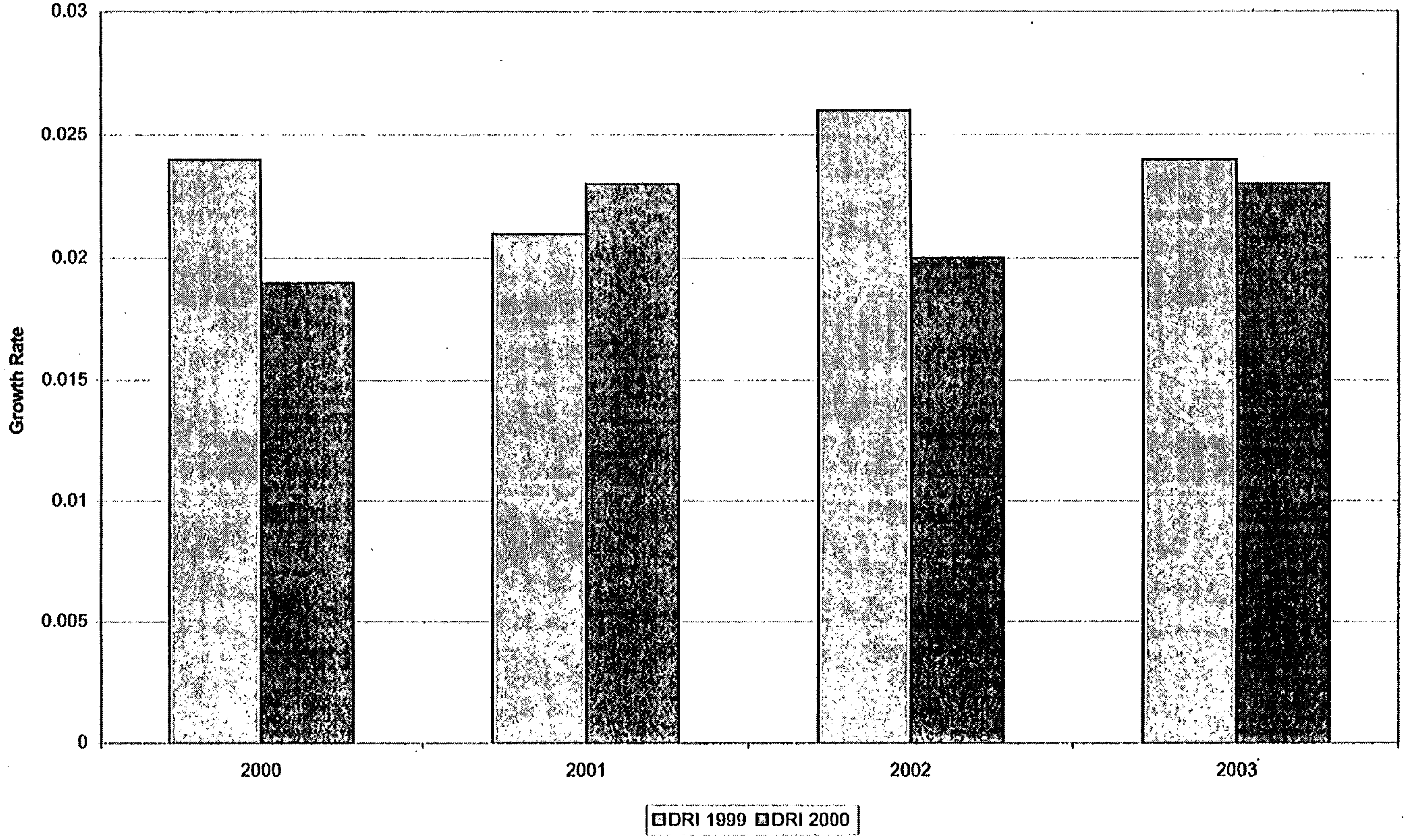


Figure 4
Growth Rate in Real Total Personal Income
2000 Forecast versus 1999 Forecast

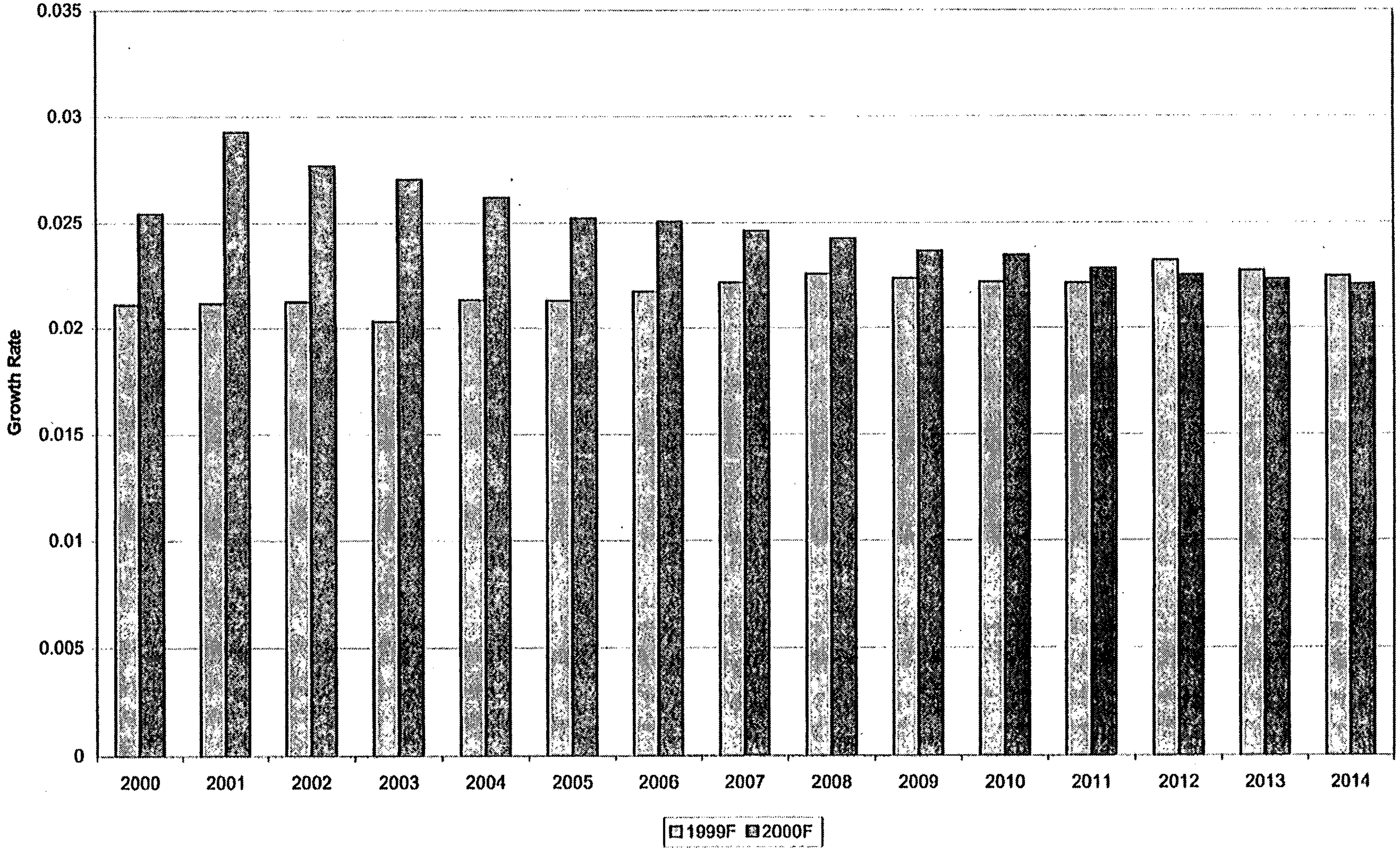


Figure 4 -Rtl
Growth Rate in Real Total Personal Income for Kentucky Retail Customers
2000 Forecast versus 1999 Forecast

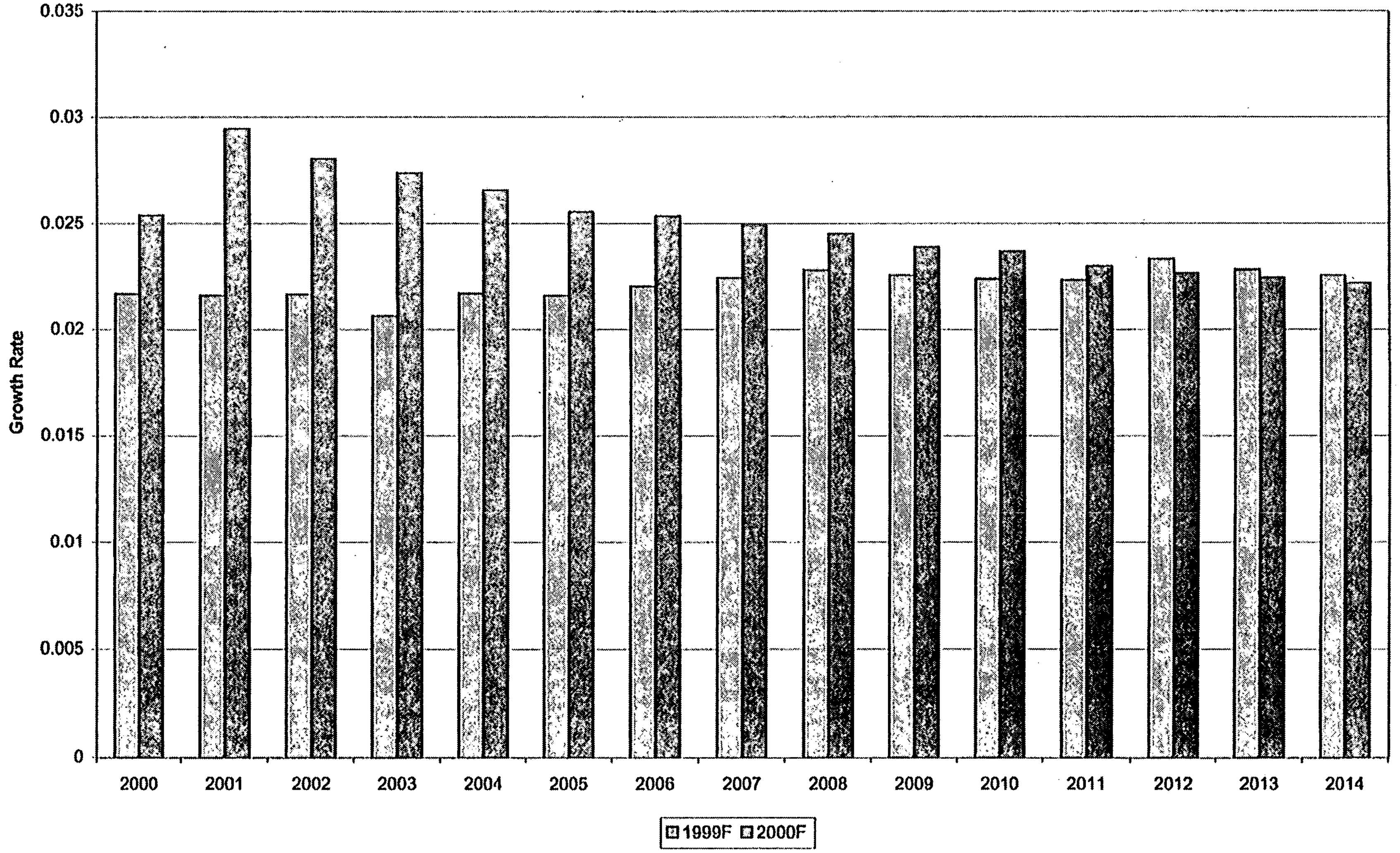


Figure 4 -Va
Growth Rate in Real Total Personal Income in the Old Dominion Power Service Territory
2000 Forecast versus 1999 Forecast

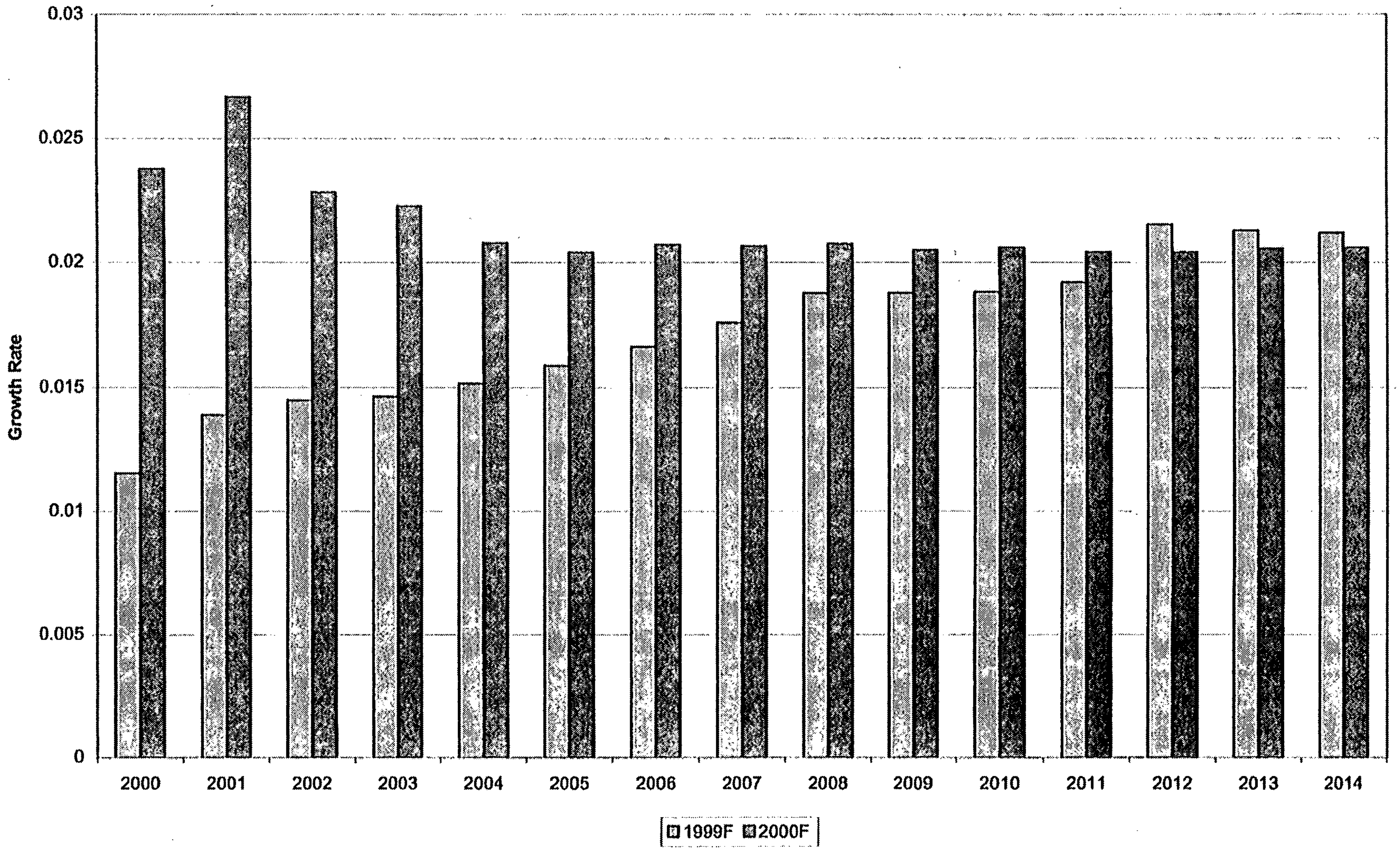


Table 1
Growth in Industrial Value Added by Detailed Industry
2000-2014

	Annual Growth Rate					Average Annual Growth Rate	
Industry	**2000**	**2001**	**2002**	**2003**	**2004**	**2000-2004**	**2000-2014**
Total Industrial Value Added	2.8%	3.2%	3.7%	3.9%	3.7%	3.5%	3.4%
Coal Mining	-2.9%	-1.6%	0.1%	-0.5%	-0.8%	-1.2%	1.0%
Manufacturing	3.6%	3.9%	4.2%	4.6%	4.3%	4.1%	3.5%
Food Processing	-0.4%	0.3%	0.8%	1.1%	1.4%	0.6%	1.8%
Wood Products	5.4%	6.5%	6.3%	6.0%	5.5%	5.9%	4.9%
Chemicals Products	3.1%	2.9%	3.1%	3.2%	2.8%	3.0%	2.5%
Plastic Products	2.1%	2.8%	3.3%	4.0%	4.7%	3.4%	3.2%
Primary Metals	4.4%	3.9%	4.6%	4.6%	4.0%	4.3%	2.7%
Industrial Machinery	8.6%	8.2%	7.6%	7.9%	7.0%	7.9%	5.9%
Transportation Equipment	6.2%	5.9%	6.0%	5.6%	4.8%	5.7%	4.0%

Table 2
Growth in Commercial Employment by Detailed Industry
2000-2014

	Annual Growth Rate					Average Annual Growth Rate	
Industry	**2000**	**2001**	**2002**	**2003**	**2004**	**2000-2004**	**2000-2014**
Total Commercial Employment	2.2%	1.9%	2.1%	2.1%	2.0%	2.1%	2.0%
Wholesale Trade	0.4%	0.3%	0.5%	0.7%	0.7%	0.5%	0.5%
Eating and Drinking Places	3.0%	2.4%	2.3%	2.1%	2.2%	2.4%	2.3%
Other Retail	2.7%	2.6%	2.8%	2.7%	2.6%	2.7%	2.4%
Finance, Insurance, and Real Estate	0.5%	0.3%	0.5%	0.6%	0.6%	0.5%	0.8%
Personal Services	3.1%	2.8%	3.0%	3.1%	2.9%	3.0%	2.8%
Health Care	2.6%	1.7%	2.0%	2.0%	1.7%	2.0%	2.5%
Education	3.1%	2.8%	2.6%	2.4%	2.4%	2.7%	2.4%
Miscellaneous Services	2.7%	2.4%	2.4%	2.3%	2.2%	2.4%	2.2%
Government	0.7%	1.1%	1.4%	1.3%	1.4%	1.2%	1.4%

Table 3
Growth in Population by Age and Gender Cohort
2000-2014

	Annual Growth Rate					Average Annual Growth Rate	
Industry	**2000**	**2001**	**2002**	**2003**	**2004**	**2000-2004**	**2000-2014**
Total Population	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.7%
Males							
Age 15-19	-1.6%	-1.3%	-1.0%	-0.7%	-0.5%	-1.0%	-0.3%
Age 20-24	0.3%	0.0%	-0.2%	-0.2%	-0.2%	0.0%	-0.1%
Age 25-29	2.1%	1.7%	1.4%	1.2%	1.0%	1.5%	0.6%
Age 30-34	0.9%	1.1%	1.2%	1.3%	1.3%	1.2%	0.8%
Age 55-59	3.6%	3.4%	3.2%	3.0%	2.7%	3.2%	2.1%
Age 60-64	2.8%	3.0%	3.1%	3.2%	3.1%	3.1%	2.5%
Age 65-69	1.2%	1.6%	2.0%	2.3%	2.5%	1.9%	2.4%
Above age 85	5.5%	4.6%	3.9%	3.3%	2.9%	4.1%	2.8%
Females							
Age 15-19	-1.1%	-0.9%	-0.7%	-0.5%	-0.3%	-0.7%	-0.2%
Age 20-24	0.4%	0.2%	0.0%	0.1%	0.0%	0.2%	0.0%
Age 25-29	1.0%	0.9%	0.8%	0.7%	0.6%	0.8%	0.4%
Age 30-34	0.3%	0.4%	0.5%	0.6%	0.7%	0.5%	0.4%
Age 55-59	3.7%	3.5%	3.2%	3.0%	2.7%	3.2%	2.1%
Age 60-64	2.9%	3.1%	3.1%	3.2%	3.1%	3.1%	2.5%
Age 65-69	1.2%	1.6%	1.9%	2.2%	2.4%	1.8%	2.3%
Above age 85	4.0%	3.5%	3.1%	2.7%	2.4%	3.1%	2.3%

Subsection 2

KU Service Territory Data Base and Modeling System Documentation

CENTER FOR BUSINESS AND ECONOMIC RESEARCH

THE KENTUCKY UTILITIES SERVICE TERRITORY DATA BASE AND MODELING SYSTEM

University of Kentucky
Gatton College of Business and Economics
Lexington, KY 40506-0034

(606) 257-7675
(606) 257-7671 (FAX)
http://gatton.gws.uky.edu/cber/cber.htm

UK UNIVERSITY OF KENTUCKY
CAROL MARTIN GATTON
COLLEGE of BUSINESS and ECONOMICS

Documentation for
The Kentucky Utilities Service Territory Data Base and Modeling System

Center for Business and Economic Research
University of Kentucky
Lexington, KY 40506-0034
(606) 257-7675

Mark C. Berger, Director

November, 1996

Introduction

THE CBER KU Service Territory Model consists of 8 EVIEWS programs. Five of the programs are used to produce value-added output, employment, and demographic forecasts in each of five groupings of counties within Kentucky Utilities' service territory. The sixth program is used both to control and operate the five regional programs and to specify simulations made with the CBER KU model. The seventh program aggregates forecasts produced in each region to produce both annual and monthly summary forecasts for KU's entire service territory, and separately for its retail and wholesale territories. The eighth program simulates economic growth in additional counties outside of the current KU service territory. Forecasts also are produced for each of the 82 KU service territory counties. The control program can be used to produce forecasts under baseline, optimistic, and pessimistic scenarios.

The five county groupings or regions within the KU service territory are listed in Table 1. Region 1 consists of counties from the Bluegrass and northern Kentucky. Region 2 consists of coal counties in southeastern Kentucky and southwestern Virginia. Region 3 consists of counties with substantial employment in apparel and textiles in the southern and southeastern portion of Kentucky. Region 4 contains counties on the highway corridors from Cincinnati, Ohio to Memphis, Tennessee. Region 5 contains counties in KU's service territory in the western part of Kentucky.

The Control Program for the CBER KU Model

The model control program both regulates the forecasts carried out using each of the five regional programs and is used to run simulations using the CBER KU model. The control program is called **"control.prg"**. The majority of the program is used for the purpose of running simulations. The portion of the program which is involved with getting each of the five regional programs to execute is located in the bottom portion of the program. The command which begins with "run" tells EVIEWS to run the program for Region 1. The control program does not directly instruct EVIEWS to run the other regional programs, but a line of text is included on the bottom of the program for Region 1 which instructs EVIEWS to run the program for Region 2. A line on the bottom of the program for Region 2 gets EVIEWS to execute the program for Region 3, and so on, until all five programs are run. In this way, the control program sets off a chain of events to execute all regional programs. A line at the bottom of the fifth regional program then tells EVIEWS to execute the seventh program, which sums the forecasts produced in each of the regional models to produce forecasts for the entire KU service territory, and for the KU retail and wholesale territories.

The bulk of text in the control program is devoted to running simulations with the CBER KU model. The first simulation is related to running baseline optimistic or pessimistic scenarios using the CBER KU model. One part of such scenarios is to assume Kentucky Utilities, through its industrial recruitment efforts, is able to attract a larger (or smaller) than predicted share of new industrial plants in Kentucky. This can be done by using the line of text which defines the variable "recruit". Simply type in a number indicating the extra percentage of new plant employment which KU recruitment efforts are able to capture (or manage to lose) for its service territory. For example, typing .05 would assume that KU is able to capture an extra 5% of the new plant employment for Kentucky, while typing -.05 would assume that KU fails to capture 5% of the new plant employment that it should capture given the area's growth. Typing .05 is a possible part of an optimistic scenario, while typing -.05 is a possible part of a pessimistic scenario. Typing .00 is part of a baseline scenario. Running an optimistic scenario also involves using the optimistic statewide forecast for Kentucky in spreadsheet **"Kentucko.xls"** in the model. Running a pessimistic scenario also involves using the pessimistic statewide forecast for Kentucky in spreadsheet **"Kentuckp.xls"**. Running a baseline scenario also involves using the baseline statewide forecast for Kentucky in spreadsheet **"Kentuckx.xls"**.

Just above the line of text used to select a value for the variable recruit is a line that solves the EVIEWS modelfile **"control.dbl"**. This modelfile not only creates the default value for the variable "recruit" (zero), it also creates a large group of 1,722 variables (also with default value zero) which can be used to simulate an employment shock from the location of a new plant in any of the 82 KU service territory counties in coal mining or any of the twenty manufacturing industries.

The selection of the shock to simulate is carried out in the next set of lines. First, the time period for the shock is selected. To do this, it is necessary to type in the time period in which the shock is expected to take place. For example, if a 1,000 worker car plant is expected to open in December 1997, then the time period selected should be the fourth quarter of 1997 (type smpl 1997:4 1997:4). Then it is necessary to indicate the county and industry in which the shock will take place. This is done using the name of the variable entitled "shoc??XX," ,where ?? refers to the 2-digit SIC code for the industry (see Table 3), and XX refers to the two letter abbreviation for the county (see Table 2). Simply insert the 2-digit SIC code for the correct manufacturing industry or coal mining for ??, and the two letter abbreviation for the county for XX. As for the number of jobs in the new plant, simply insert that number to the right of the equal sign. So, for example, to simulate the shock of a 1,000 worker car assembly plant in Adair County, Kentucky, type shoc37ad=1000.

Another part of simulating the shock is to estimate the multiplier effect within the same two digit industry. In our example, there would likely be some growth in existing and/or new auto parts producers in or near Adair County, Kentucky. This part of the shock is simulated by multiplying the original shock by a coefficient which would yield the multiplier effect within the same 2-digit industry. The coefficients would simply indicate the number of additional jobs which would be created in the same 2-digit industry for each job generated in the shock. A coefficient of .1 would indicate one additional job in the same 2-digit industry for each 10 jobs created in the simulated new plant.

The appropriate coefficients for each 2-digit manufacturing industry and coal mining in each of the 5 KU regions were calculated for these groupings of counties using the IMPLAN model. Those coefficients were then placed in the spreadsheet **"inoutput.xls"**. This spreadsheet of coefficients is then imported into the control program (with the line which begins with read(e,b2)). In the EVIEWS modelfile **"control2.dbl"**, the multiplier for the same 2-digit industry resulting from the shock is calculated. Aggregate shocks and multiplier effects for each industry in each region also are calculated. The regional and county shocks for each industry and county are then written to spreadsheets for use when the programs to produce forecasts for each of the 5 KU regions are executed. These spreadsheets are entitled **"contrrRa.xls,"** **"contrrRb.xls,"** and in the case of region 1, **"contrrRc.xls."** The "R" in each of these spreadsheet names, as always, refers to the region number.

By importing these spreadsheets, the shock is then introduced into the forecast for the relevant region in which the shock takes place. The shock may have further impacts on other manufacturing industries through inter-industry linkages, and will have an impact on commercial industry employment as well as earnings, income, and population. These results of the shock are simulated within the models contained in each of the 5 regional forecasting programs.

The spreadsheets, of course, contain mostly zeros since only one or a few shocks are used in any particular simulation. To simulate more than one shock, it is simply necessary to introduce additional sets of commands which select a time period for a shock, and the county, industry, and employment level. So, for example, to also simulate a shock for the opening of a 300 job apparel plant in Webster County, Kentucky in July 1996, simply type two additional lines, the first being "smpl 1996:3 1996:3." and the second being "shoc23we=300".

Once any simulations are introduced, it is simply necessary to push the RUN button in EVIEWS and the model will run. Of course, it is possible to run the model without any simulations using the baseline Kentucky forecast by using **"Kentuckx.xls,"** and by typing .00 when defining the variable recruit, and by setting the shoc??XX variable equal to 0.

The Summing Program for the CBER KU Model

The EVIEWS program **"sumthem.prg"** totals the results of output, employment, population, and income forecasts from each of the five KU regions. These totals are produced at the same high level of disaggregation as for counties, with 32 value-added output variables, 47 employment variables, 5 income variables, and 38 population variables. Results are aggregated in several ways which are of interest to Kentucky Utilities. First, results are totaled for all 82 KU service territory counties. Second, results are totaled only for the 77 Kentucky counties in the KU service territory. Third, results are totaled for the retail service territory for Kentucky. Lastly, forecast results are totaled for the 5 Virginia counties. Totals are converted into annual and monthly forecasts. Annual forecasts are for 30 years into the future and monthly forecasts for 8 years into the future. The difference between the current forecast and the baseline forecast also is calculated. Annual forecasts are output into the EXCEL spreadsheets entitled: **"totalku.xls"** for the entire KU service territory forecast, **"totalky.xls"** for the Kentucky portions of the KU service territory, **"totalre.xls"** for the retail portions of the Kentucky counties, and **"totalva.xls"** for the Virginia counties in the KU service territory. The difference between current and baseline annual forecasts are output to EXCEL spreadsheets entitled: **"changeku.xls," "changeky.xls," "changere.xls,"** and **"changeva.xls."** Monthly forecasts are output to EXCEL spreadsheets entitled: **"totalkum.xls," "totalkym.xls," "totalrem.xls,"** and **"totalvam.xls."**

The New County Simulation Program for the CBER KU Model

The program **"newcounR.prg"** is used to forecast output, employment, population, and income in counties outside of the existing KU service territory. This program is set-up to run automatically after the **"sumthem.prg"** program. The program is currently set to the unnecessary case of trying to simulate adding Adair County, Kentucky as a new county in the KU service territory. To simulate a true new county for the service territory, it is necessary to take two steps. First, it is necessary to gather demographic, income, employment, and value-added output data for the new county. Succinctly, it is necessary to gather the same data which is contained in each of the spreadsheets for the 82 service territory counties. Second, it is necessary to decide which existing service territory county is the best "twin" for the new county to be modeled, and then to enter the existing county's single county modelfile into the **"newcounR.prg"**. This model already developed for the twin county will be used to produce the forecast for the new county (the new county's data spreadsheet should contain the same column names as the twin county's data spreadsheet). To get EVIEWS to properly run this simulation, it is first necessary to select the proper **"newcounR.prg"** program. Choose the program for the region of which the twin county is a part. Type the name of the spreadsheet with data for the new county in the second line of text (which begins with read(e,b2)). In the line near the end of the file just before the "write(e)" command, type the two letter abbreviation for the twin county into the modelfile name "**modsimXX.dbl**". This ensures that the correct singe county modelfile is used. Lastly, write the first five letters of new county's name into the "write(e)" command to have the forecasts for the new county written to an EXCEL spreadsheet.

Five Regional Models

The proceeding text described how to use the **control.prg** program to run alternative simulations with the CBER KU model, and how the **sumthem** would sum results to create annual and monthly forecasts. These two programs control the operation or summarize the results of the 5 regional forecasting programs. These five regional programs contain the economic forecasting models for five groupings of KU's 82 service territory counties. The structure of a regional forecasting program is discussed in detail below.

The Regional Forecasting Program

Each regional forecasting program contains a number of commands to input and manipulate data and produce forecasts. As pictured in Figure 2, these programs can be considered to have several stages. The first is the data input stage in which the necessary data are input into an EVIEWS modelfile. The second stage is the data transformation stage in which the variables which have been loaded are logged or manipulated in some other way to prepare the variables for use in the model. The third stage is the data update stage in which variables which are not as current are updated through estimation so that all variables are current to the same time period. The fourth stage is the forecasting stage in which variables are forecast on a quarterly basis 30 years into the future. The final stage is the data output stage in which forecasts data are output into EXCEL files. Each of these stages is described in detail below. The description of the forecasting stage includes an explanation of the equations included in the model.

Data Input Stage

The first step in the operation of the CBER model is to import historic and forecast data into an EVIEWS workfile for each region. This data is housed in EXCEL spreadsheets. Depending on the region, there will be from 11 to 24 spreadsheet files which contain both historic and forecast data for each county **"countynameXXx.xls"**. In addition, each region will have a spreadsheet file which contains historic data on relative wages in the region in manufacturing industries and coal mining **"wagratrR.xls"**. Each region also will have a spreadsheet which contains a forecast for the Kentucky economy **"kentucky.xls"**. This spreadsheet is the source for statewide exogenous data for the CBER model. Finally, each region will have a spreadsheet which contains information on any employment shocks which may be introduced to coal mining or manufacturing industries in any county by the operator of the model. These spreadsheets will contain zeroes for most industries since shocks would be introduced to few if any counties and industries at any one time. These shock spreadsheets (**"contrrR1.xls,"** and **"contrrR2.xls,"** (and **"contrrR3.xls"** in region 1)) are generated in the control program which guides the overall model. These data will be combined into a single EVIEWS modelfile which covers the years 1989 to 2025. An "R" in the above spreadsheet names stands for region 1 through 5, while an "XX" stands for a 2 letter abbreviation for a particular county name.

The county data spreadsheet files imported into the EVIEWS workfile **"regRpx.wf1"** contain both historic and forecast county-specific data. The historic data include county value-added output and employment data by industry, county nominal total income and nominal income by source, and population by gender and five year age group. With the exception of the population data, the historic quarterly data begin in the first quarter of 1989 and run through the most recent quarter for data which is available. The forecast data include the birth rates, survival rates, and household headship rates which are used to forecast population growth and the change in the number of households in counties. These forecast data extend from the most recently available quarter through the fourth quarter of 2025.

The source for employment data is ES202 data. The value-added output data is estimated using county employment and earnings data from ES202 and statewide value-added output data. The source for the statewide value added output data is the United States Department of Commerce, Bureau of Economic Analysis' **Regional Economic Information System**. The **Regional Economic Information System** is also the source for nominal income data. The source for the historic population data for counties by gender and five year age cohort is the United States Bureau of Census (through the University of Louisville). Data on birth rates, survival rates, and household headship rates also come from the United States Bureau of Census (also through the University of Louisville). Each county has a unique set of headship rates for each age and gender cohort. The birth rates for women age 14 to 49 are unique for larger counties, but are an average rate for smaller rural counties, which account for most of the counties in the KU service territory. The survival rates are state averages. Forecast values for birth rates, survival rates, and household headship rates are generated by taking current values and growing or shrinking them at the same rate as they are forecast to change in (moderate) national demographic forecasts by the United States Bureau of Census.

The spreadsheet containing relative wage data contains data for the 20 manufacturing industries and coal mining. The relative wage data for each industry is average annual wages per job in the region divided by average annual wages per job in the state. Thus, the relative wage data reflect whether wages per job are higher or lower in the region than in the state. A lower relative wage can reflect a comparative advantage for a region. The source for the regional and statewide average annual wage data is the ES202 employment data set. This is also the source for the regional employment data.

The file containing state forecast data contains statewide value-added output, employment, and income forecasts as well as national forecasts for total employment and selected industrial production indexes. This forecast data will embody the baseline, optimistic, or pessimistic forecast for the Kentucky economy depending on whether the objective is to produce a baseline, optimistic, or pessimistic forecasts for the KU regions. The source for these Kentucky forecast data is the University of Kentucky Center for Business and Economic Research's **University of Kentucky State Econometric Model**. The UKSEM utilizes national forecast data from ~~DRI/McGraw-Hill~~ WEFA Group, Inc and produces output forecasts for over 30 industries and employment forecasts for nearly 70 industries. Income is forecast for 7 sources of income and population for 36 age and gender cohorts. The model has been operated by the Center for Economic Research since 1995.

Data Transformation Stage

Some of the raw imported data must be transformed before it is utilized in the UK CBER forecasting model. Such transformations are made to statewide forecast data using the EVIEWS modelfile entitled **"makeexo.xls."** Transformations are made to county variables in the EVIEWS modelfiles entitled **"makendrR.xls"**, **"artpirR.xls"**, and **"mak2ndrR.xls"**, where R refers to KU regions 1 through 5. The relative wage data do not need to be transformed.

Two types of transformations are made to the imported statewide data using the modelfile **"makeexo.dbl"** First, state employment variables in 2-digit manufacturing industries are transformed using the natural logarithm to create log of state employment variables. Similarly, statewide average productivity variables for 2-digit manufacturing industries are created by dividing statewide value-added output in each industry by statewide employment. Both sets of transformed variables are utilized in the regional modelfiles **"modmrRp9.dbl"** for forecasting industrial value-added output and employment, and manufacturing wages. These transformations are made for the entire historic and forecast period for the model, from first quarter, 1989 through fourth quarter, 2025.

Multiple transformations are made to the county data which is imported. County data from the years 1989 to 1993 is transformed in numerous ways in the EVIEWS modelfile **"makendrR.dbl"** First, regional aggregates are created in the data for value-added output and employment. Regional output aggregates are created for all 32 industrial sectors, and regional employment aggregates are created for all 47 industrial and commercial sectors. Then, both regional and county employment data are aggregated into various totals which are important for evaluating model forecasts. County or regional employment data are totaled into manufacturing employment (eman_XX), industrial employment (ego_XX), and commercial employment (engo_XX). County or regional employment data also are totaled into the high wage (ehiw_XX), medium wage (emedw_XX), and low wage (eloww_XX) employment data which are utilized for forecasting county earnings growth by place of residence.

The next transformation made in modelfile **"makendrR.dbl"** is that regional employment data for coal mining, manufacturing industries, and non-trucking transportation, communications, and utilities are seasonally adjusted and logged. This transformed data is utilized in the regional value-added output, employment, and relative wage forecasting modelfiles **"modmrRp9.dbl"**. Finally, nominal income data is transformed into real income data using the consumer price index, and real farm and military income is logged.

The modelfile **"artpirR.dbl"** is used on 1989 to 1993 county income data in order to create a variable which is a four quarter moving average of real total personal income in each county. Each of these income variables is utilized in forecasting employment growth in commercial sectors in the CBER KU model.

Lastly, a modified version of the modelfile **"makendrR.dbl"** is utilized to transform 1994 quarterly data. This modelfile is called **"mak2ndrR.dbl"** This model makes all the transformations of employment and value-added output data which were described above. But, it does not make the transformations of income data which were described above. This is because the historic income data are available only through fourth quarter, 1993. Thus the model **"mak2ndrR.dbl"** essentially completes all of the transformations made in **"makendrR.dbl"** for every variable for which 1994 data is available- i.e., the employment and value-added output data.

Data Update Stage

The release of historic income and population data lags the release of historic employment and earnings data. Income data typically lags employment and earnings data by a full year while the lag for population is less than a year. These longer lags for income and population data are a problem because all historic data must be updated to the same quarter for the forecast to begin. It is necessary to estimate these lagging historic variables in order to update them to the quarter in which employment and earnings data are available. In the current CBER model, data must be estimated through the fourth quarter of 1994, the last quarter for which employment and earnings data are available. This implies that income data, which are available through the fourth quarter of 1993, must be updated for four quarters, while population data, which are available through the third quarter of 1994, must be updated one quarter.

In order to run the cohort-component population forecasting model, it is necessary to have an estimate of net migration to a county in the previous quarter. As a consequence, before utilizing the cohort-component model to estimate county population in the fourth quarter of 1994, it is necessary to estimate net migration to all counties in the third quarter of 1994. This is accomplished through the EVIEWS modelfile **"modmigrR.dbl,"** which contains all of the migrations equations for each county in the region. The modelfile is run for only the third quarter of 1994.

Once the lagged net migration is calculated, it is possible to run the cohort-component population forecasting models for the fourth quarter of 1994. These models are quite large so that only about 8 county population forecasting models can be held in one EVIEWS modelfile. As a result, from two to three modelfiles entitled **"moderRp1.dbl,"** **"moderRp2.dbl,"** or **"moderRp3.dbl"** are run in order to estimate population data for the fourth quarter of 1994. Essentially, the cohort-component model looks at all the ways in which population flows in or out of each five year age and gender population cohort. Population flows in as persons "age in" from the previous cohort and as persons in the cohort migrate into the county. Population flows out of each cohort as persons "age out" into the next cohort, as persons in the cohort migrate to another county, or as persons die. Population flows into the age 0-4 male and female cohorts through births. A more complete description of the cohort-component model is given below.

County population growth, along with county or area employment growth, is one of the key factors influencing income growth in counties. That is why it is necessary to update population growth before updating income growth. But, once population has been updated, it is possible to use the income growth portions of the CBER KU service territory model for each county to update income variables from the first quarter of 1994 through the fourth quarter of 1994. This is done by gathering the income equations for each county in a region into a single EVIEWS modelfile entitled **"modelrRy.dbl"** and running it for all four quarters of 1994. Once this is done, all model historic data have been updated to the fourth quarter of 1994, and forecasts can begin starting with the first quarter of 1995. The income equations in the CBER KU forecasting model are described below.

The Forecasting Stage

Given the industry and county detail used in the CBER KU model, its was not possible to fit all model equations for a given region into a single KU model file. As a result, data were organized into a set of model files. One model file, entitled (**"modmrRp9.dbl"**) contains all variables which are forecast on a regional basis. These variables include industrial sector value-added output, employment, and wages. Additional modelfiles contain forecasting equations for variables forecast at the county level, including income, commercial employment, and population. The modelfiles also contain equations to share-down regional industrial sector employment and value-added forecasts to the county level. These model files are of the form (**"modelXXx.dbl"**), where XX refers to the two-digit abbreviation for one of the counties in the modelfile (see Table 2). Each modelfile contains equations for 2 or 3 counties. There are from 4 to 8 such county model files in each region, depending on the number of counties. A final modelfile, entitled (**"modsrRp2.dbl"**), summarizes data forecast only at the county level (commercial sector employment, population, income) to produce regional level forecasts.

For the first forecast period, these modelfiles are imported into the EVIEWS workfile and executed to produce forecasts for the first quarter. For later periods, a "do loop" is used to instruct EVIEWS to execute each of the modelfiles in each of succeeding periods. Finally, forecasts are made for any wholesale areas that are found in each region using a program entitled (**"modtowrR.dbl"**). The equations included in each of the model forecasting files are discussed below. Employment, and value-added output forecasts are discussed first, followed with a discussion of income, population, and household forecasts.

Region-Wide Equations

The EVIEWS modelfile **"modmrRp9.dbl"** contains equations for forecasting regional employment, as well as regional value-added output for manufacturing, mining, and non-trucking transportation industries. The modelfile also has equations for forecasting relative wages for coal mining and manufacturing industries. These regional level equations are discussed below.

The CBER KU model is an employment driven model, so that regional forecasts of employment growth are a key driver of regional economic growth. An example of an equation for manufacturing employment growth is illustrated below (Equation 1). This equation shows the group of variables which each industry equation might have for manufacturing sectors, although each equation does not have each of the type of explanatory variable discussed below. Employment (as well as wage) equations were estimated using pooled data for each of the 5 regions in order to increase the sample size.

In all industry equations, statewide growth in output and average product are key explanatory variables for regional employment growth. These variables are chosen because statewide trends are expected to better explain growth in the KU service territory than national industry variables. This is true because southern states like Kentucky have outperformed the nation in manufacturing growth, particularly in heavy industries such as transportation equipment. It is also true because Kentucky's industrial specialty within each 2-digit industry is more likely to mirror the specialty in each KU region than the national industrial mix (which would underlie national industry variables). It should be noted that for the estimation period in most industry equations, predicted values for value-added output and average product (predicted using the statewide forecasting model) were substituted for actual values in order to address simultaneity bias.

(1) $d(E_{i,r,q}) = b_0 + b_1 * d(O_{i,s,q}) + b2 * d(AP_{i,s,q}) + b3 * d(RW_{i,r,q-x}) + b4 * d(E_{j,r,q}) + b5 * d(T_{i,u,q})$

where $E_{i,r,q}$ is quarterly employment in industry i in region r.
$O_{i,s,q}$ is quarterly value-added output in industry i in the state.
$AP_{i,s,q}$ is quarterly average productivity in industry i in the state.
$RW_{i,r,q-x}$ is relative wages in industry i in region r in previous quarter q-x.
$E_{j,r,q}$ is quarterly employment in consumer industry j in region r.
$T_{i,u,q}$ is quarterly employment in 3-digit industry i in the United States.

A relative wage variable also was part of equations for most manufacturing industries. Relative wages refers to the average annual wages in an industry in a region divided by the average annual wages in that industry for the state. Relative wages are an aspect of the relative cost of production in the region compared to the state as a whole. Regions of the state with lower wages in past periods can experience more investment or faster expansion of firms leading to greater employment growth. When estimating equation 1, the lag length for $RW_{,i,r,q-x}$ was chosen which had the most significant negative value.

Inter-industry linkage and national industrial production index variables also are included in forecasting equations for some industries. In the case of industries influenced by inter-industry linkages, growth in these industries benefit from growth of nearby firms which are major customers. For these industries, growth in major customer industries increases their own growth potential, and thus, growth in customer industries is included as an additional explanatory variable.

The customer industries which are used as explanatory variables were selected using national input-output tables and econometric testing. The national input-output model was consulted in order to identify potential major customer industries in Kentucky regions. Any manufacturing industry which nationally purchased 5% of its inputs from a particular industry was a major customer industry. Since spending patterns of business are often very dispersed, this 5% threshold was not crossed frequently. There were in total 54 cases where one manufacturing industry was identified as a major customer industry for another. These 54 cases were then tested in econometric equations such as equation 1 to determine when growth in the customer industry had a significant effect on employment growth. There were 7 cases in which the customer industry growth variable had the expected sign and was significant at least at the 20% confidence level. In these cases, employment growth in the customer industry is included in Equation 1. These 7 cases were all in durable goods industries.

There also were cases in which a national production index was included as an explanatory variable in a manufacturing equation. Those cases occurred when an industry had a unique industrial specialty in at least one region. The. indexes were used to account for the fact that within some 2-digit manufacturing industries, a region will have a narrow specialization in a particular 3-digit industry. That narrow specialization can mean that Kentucky forecasts for the 2-digit industry may not be an appropriate driver for industry growth in the region. This is particular true where patterns of employment growth for the 3-digit industry differ dramatically from the growth of the 2-digit industry of which it is a part.

In these cases, a national industrial production index for the particular 3-digit industry can be added to Equation 1. This is done in all cases where a region is specialized in a particular 3-digit industry (which is not a specialty of the state economy), and when the coefficient on the production index variable is significant when it is included in Equation 1. Cases when a region specialized in a particular 3-digit industry were identified by comparing the shares of each 2-digit industry's employment located in its 3-digit industries for each KU region and the state. This was done using ES202 data. When a specialization was identified, it was tested in estimation of Equation 1 to determine if it should be included in the equation. There were 2 cases in which an national industrial production index was used.

There were four manufacturing industries where employment growth was not estimated using pooled data, as described above. Pooled data also was not used for coal mining equations. A KU service territory equation is estimated for these four manufacturing industries, meaning that data for the entire KU service territory is aggregated together for estimation. This is done because most of the employment in these industries is in one or two of the five KU regions. This implies that there is very little employment in these industries in other regions, often fewer than 100 jobs. Estimating industry equations with these region's data pooled with data from regions with more employment could lead to unreliable results for the larger regions where most of the employment is located. Thus, it is preferable to aggregate data from all the regions together and estimate an equation on data for the entire KU service territory. This yields an estimate based on fewer data points, but on data that represent the growth and decline of a large number of jobs and firms. Service territory forecasts can then be allocated to each of the five regions proportionally, that is, by assigning each region the same share of service territory employment it held in the previous quarter. The four effected industries are tobacco products (SIC 21), petroleum products (SIC 29), leather products (SIC 31), and instruments (SIC 38). Such aggregation is also carried out to a limited degree for coal mining. Data for coal mining in Regions 1, 3, and 4 are aggregated together and estimated in a single equation. The eastern and western coal fields are not located in either of these three regions.

There were five other industries which were estimated using employment data aggregated for the entire KU service territory. These industries were oil and gas extraction (SIC 13), nonmetallic minerals (SIC 14), water transportation (SIC 44), air transportation (SIC 45), and pipelines (SIC 46). Employment change in the KU service territory for water transportation and pipelines was estimated as a function of the statewide employment change in these industries. Service territory employment change in air transportation was estimated as a function of total employment change. Employment change in oil and gas extraction was estimated as a function of a national industrial production index. Employment change in nonmetallic minerals was estimated as a function of the employment change in construction industries.

Output

The CBER model is an employment driven model in which forecasts of output are driven by forecasts of employment. For the construction, transportation, communications, public utilities. oil and gas extraction, and nonmetallic minerals industries, employment forecasts are multiplied by average productivity measures in order to yield value-added output for each region. Statewide gross state product per job is used as the measure of average productivity.

Relative annual wages is an additional factor in equations estimating value-added output in all manufacturing industries and in coal mining. Earnings are the largest component of value-added output, so regions with higher levels of wage and salary earnings per job also are likely to have greater value-added output per job. As a consequence, statewide average value-added per job for these industries is multiplied by relative wages in each region to derive a unique measure of value-added output per job for each of the 5 KU regions. These unique value-added output per job measures are then multiplied by regional employment levels to yield value-added output for each region in each industry. This approach reflects that value added per job will be greater in those regions that pay wages above the state average.

Wages

A difference in relative wage rates is one factor which may account for the difference between the relative growth of an industry in a KU region versus Kentucky as a whole. Relative wages in a region is also an important factor in determining value-added output in a particular region. For these reasons, relative annual wages in each manufacturing industry and coal mining are forecast in the CBER KU model. The equations which forecast relative wages are also part of the EVIEWS modelfile **"modmrRp9.dbl"**. The equation for forecasting the change in wage rates is a reduced form equation which reflects the change in the supply of population (a proxy for labor force) in the region and the state, as well as the change in employment growth in the industry in the region versus the state. Population and industry employment variables are logged so that changes reflect change rates. These variable also are lagged one period. The equation was estimated by pooling the data from all industries and regions together in order to estimate a single equation.

Sharing-Down Output and Employment

Regional forecasts for employment and output need to be shared down to the county level to determine the influence of manufacturing growth on each county's economy. In the CBER KU model, regional forecasts of employment and output are shared down proportionately to produce county forecasts. Proportional shares simply mean that a county's share of current regional employment and output in a manufacturing industry is equal to its share in the previous quarter. The assumption is that counties will share in forecast changes in employment or output in a 2-digit manufacturing industry or coal mining to the same extent that they have shared in employment in that industry in the past.

County-level Equations

County level equations are used to forecast commercial employment, income, population, and households. Equations are included in the county modelfiles named **"modelXXx.dbl"**. These county level equations are described below.

Commercial Employment

Equations for forecasting commercial employment were developed at the county rather than regional level. Furthermore, county data were pooled in order to increase sample size and reliability of estimates. Data were pooled within KU regions in some cases and for all KU counties in others. When data were pooled across all KU regions, counties in each region in some cases shared a region-specific intercept. Counties of different size also in some cases shared a county size-specific intercept. In these cases, counties were divided into those with fewer than 20,000 residents, those with more than 20,000 but few than 50,000 residents, and those with more than 50,000 residents, according to the 1990 Census.

The basic form of county employment equations is for employment to be a function of both county income multiplied by a statewide employment to income ratio, and seasonal dummy variables. The statewide ratio is the statewide ratio of employment in an industry to statewide real total personal income. This ratio introduces statewide and national patterns of employment growth in these industries into the county equations. The ratio does this by reflecting the statewide (and therefore national) tendency for income to be spent on a particular commercial industry. Seasonal dummies are multiplied by county real total personal income. This is done to model the larger seasonal effects in larger counties through the estimation of a single seasonal coefficient. A typical equation is pictured below in Equation 2. Note that a moving average of county real total personal income over the last four quarters is used rather than county total personal income in the current quarter.

$$d(E_{i,c,q}) = b_0 + b_1 * d(-4)(artpy_{c,q} \cdot ER_{i,s,q}) + b_3 * Q1 * artpy_{c,q} + b_4 * Q2 * artpy_{c,q} + b_5 * Q3 * artpy_{c,q} \quad (2)$$

where $E_{i,c,q}$ is quarterly employment in industry i in county c,
$artpy_{c,q}$ is the moving average of quarterly real total personal income in county c,
$ER_{i,s,q}$ is the quarterly statewide ratio of employment to statewide real total personal income,
Q1 is a dummy variable for the first quarter,
Q2 is a dummy variable for the second quarter, and
Q3 is a dummy variable for the third quarter.

This approach implies that real income growth over the previous 12 months influences the propensity for spending in various commercial industries in the county, which leads to employment in those industries. It also means that the coefficient $b_1$does not reflect spurious correlation resulting because quarters with higher employment are also quarters with higher personal income. Dummy variables capture the seasonal fluctuations in commercial industries.

For some sectors, county employment is substituted for county real total personal income. This is done for industries with a large share of business as well as household customers. The effected industries include hotels and other lodging places (SIC 70). They also include the six industrial sectors which were modeled in the same way as the commercial sectors: general construction (SIC 15), heavy construction (SIC 16), specialty construction (SIC 17), transportation services (SIC 47), communications (SIC 48).and public utilities (SIC 49).

Population and Household Block

Unlike other blocks of the CBER KU model, the population and household block of the model is not based on econometric estimation. Instead, the CBER KU model utilizes a cohort component approach to model population growth. Population growth in each county is modeled in five year age and gender cohorts. The model functions by aging one twentieth of each cohort's population into the next older cohort in each quarter. The appropriate Kentucky death rate is applied then to each age and gender cohort, which reduces population in each cohort. Population then is added or lost from cohorts depending on net migration for each county. County-specific or rural county birth rates are applied to female cohorts of childbearing age to calculate births into the male and female age 0 to 4 cohorts.

Net migration is forecast using econometric equations for both inmigration and outmigration. In each equation, the migration variable is a function of county employment growth relative to national employment growth. These two equations are shown below.

$$\begin{aligned} (3) \quad INR_{c,y} = {} & b_{0c} + b_1{*}(EGR_{c,y} - EGR_{u,y}) + b_s{*}(EGR_{c,y-1} - EGR_{u,y-1}) \\ & + b_3{*}(EGR_{c,y-2} - EGR_{u,y-2}) + b_4{*}(EGR_{c,y-3} - EGR_{u,y-3}) \\ & + b_5{*}(EGR_{c,y-4} - EGR_{u,y-4}) + b_6{*}(EGR_{c,y-5} - EGR_{u,y-5}) \end{aligned}$$

$$\begin{aligned} (4) \quad ONR_{c,y} = {} & b_{0c} + b_1{*}(EGR_{c,y} - EGR_{u,y}) + b_s{*}(EGR_{c,y-1} - EGR_{u,y-1}) \\ & + b_3{*}(EGR_{c,y-2} - EGR_{u,y-2}) + b_4{*}(EGR_{c,y-3} - EGR_{u,y-3}) \end{aligned}$$

where $INR_{c,y}$ is the annual inmigration rate for county c in the current year,
$ONR_{c,y}$ is the annual outmigration rate for county c in the current year,
b_{0c} is the county-specific intercept for county c,
$EGR_{c,y-x}$ is the annual growth rate for county employment in the current or lagged year, and
$EGR_{u,y-x}$ is the annual growth rate for national employment in the current or lagged year.

Four years of lagged relative employment growth data are utilized in the outmigration equation, while six years of lagged data are utilized in the inmigration equation. The equation produces annual forecasts for county inmigration and outmigration. One quarter of the forecast for the current year is taken as the forecast for inmigration or outmigration in the current quarter. Net migration is taken by subtracting outmigration from inmigration

Population forecasts are the cornerstone of household forecasts in the CBER KU model. Household headship rates for each age and gender cohort are used to convert forecasts of population by cohort into forecasts of the number of households headed by people in each age and gender cohort. The number of households headed by persons in each cohort are then added to yield a forecast of the total number of households in each county. The household headship rate for each Kentucky and Virginia County are available from the 1990 census for the 15-19, 20-24, 25-34, 44-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84 age cohorts for both men and women.

Headship rates for future years are assumed to be the same as in the 1990 Census for each age and gender cohort in each county. Future birth rates for Kentucky counties by age cohort also are held constant. This is done because the vast majority of Kentucky's population is white, and the birth rates for white females are held constant through 2050 in national Bureau of Census forecasts. This is done because the Bureau of Census has noted that birth rates within age cohorts in most racial groups have remained quite steady throughout recent history, and are expected to remain steady in the future.

Future values for Kentucky survival rates in each age and gender cohort are developed by assuming the same percentage change in Kentucky survival rates as are forecast for national survival rates by the United States Bureau of Census. The percentage change in survival rates forecast for the nation are applied to Kentucky-specific rates. If survival rates for the nation are expected to increase by 1 percentage point over ten years, then the Kentucky survival rate is also forecast to rise by 1 percentage point. This method is used to obtain annual survival rates, which are then multiplied to the fourth power to obtain quarterly survival rates. Annual birth rates are divided by four to obtain quarterly birth rates.

Incomes

The UK CBER model forecasts the components of real personal income for each county. These five components are: real earnings by place of residents; real dividend, interest and rent (DIR) income; real transfer income; real farm earnings; and real military earnings.

The principal source for historic county income data for these income components is the United States Departments of Commerce Economics and Statistics Administration's **Regional Economic Information System**. This source contains annual data in nominal dollars. Annual values for real earnings by place of residents were converted to quarterly values using the quarterly fluctuations in wage and salary earnings which occurred in each county in each year. The source for these quarterly wage and salary earnings data was ES202 data. Annual county data for dividends interest and rent income, transfer income, farm earnings, and military earnings was converted to quarterly county data using the quarterly statewide fluctuations which occurred in these variables in each year. Statewide fluctuations were used because no county information is available on which to base quarterly fluctuations. The source for these quarterly statewide values was the **Regional Economic Information System**. Nominal values for the five components were converted into real values using the consumer price index. Income variables are not seasonally adjusted.

Earnings by place of residence for each county is forecast as a function of employment growth. The measure of employment growth used depends on the commuting patterns for each county. Commuting data are available in the 1990 Census. If almost all of the workforce that lives in a county also works in that county, then only employment growth in that county influences earnings growth. But, if a substantial share of the workforce works in adjacent counties, then employment growth in these adjacent counties also influences earnings growth. In particular, if more than 10% of a county's workforce works in an adjacent county, then that adjacent county's employment growth is included in the earnings equation.

The form of the real earnings by place of residence equation is shown below. Data were pooled for the counties in each of the five KU regions.

(5)
$$\begin{aligned} d(YE_{c,q}) = b_{0,c} &+ b_1 * rwgjob_{s,q} * d\,(HE_{c,q} + HE_{a,q}) \\ &+ b_2 * rwgjob_{s,q} * d\,(ME_{c,q} + ME_{a,q}) \\ &+ b_3 * rwgjob_{s,q} * d\,(LE_{c,q} + LE_{a,q}) \end{aligned}$$

where $YE_{c,q}$ is real earnings by place of residence in county c in quarter q,
$b_{0,c}$ is the county-specific intercept for each county.
$rwgjob_{s,q}$ is the statewide average wage and salary earnings per job in quarter q,
$HE_{c,q}$, $ME_{c,q}$ and $LE_{c,q}$ are jobs in high wage industries, medium wage industries, and low wage industries, respectively in the county, and
$HE_{a,q}$, $ME_{a,q}$ and $LE_{a,q}$ are jobs in high wage industries, medium wage industries, and low wage industries, respectively, in the adjacent commuting county.

In the equations, the change in earnings growth in each county is not simply a function of total employment growth in all appropriate counties. Employment growth is multiplied by the statewide average wage and salary earnings per job. This causes the county earnings forecasts to reflect whether wage growth is strong or weak in the economy. In addition, employment growth is broken into three industry categories: high wage, medium wage, and low wage industries. This approach makes the earnings growth equation responsive to whether growth occurs in manufacturing or other high wage sectors, or occurs primarily in low wage sectors, which is the case in some rural counties. In particular, earnings growth would be increased more by job growth in high and medium wage industries than growth in low wage industries. The high wage industries (those paying on average over $14/hr) were: coal mining (SIC 12), heavy construction (SIC 16), special trade construction (SIC 17), primary metal industries (SIC 33), transportation equipment (SIC 37), tobacco products (SIC 21), chemicals and allied products (SIC 28), petroleum and coal products (SIC 29), water transportation (SIC 44), pipelines (SIC 46), communications (SIC 48), and utilities (SIC 49). The medium wage industries (those paying on average between $10/hr and $14/hr) were: oil and gas extraction (SIC 13), nonmetallic minerals (SIC 14), general building construction (SIC 15), food and kindred products (SIC 20), paper products (SIC 26), printing and publishing (SIC 27), rubber and miscellaneous plastic products (SIC 30), stone, clay and glass products (SIC 32), fabricated metal products (SIC 34), industrial machinery (SIC 35), electronic equipment (SIC 36), instruments (SIC 38), transportation (SICs 40-42), transportation by air (SIC 45), transportation services (SIC 47), wholesale trade (SICs 50-51), finance, insurance, and real estate (SIC 60-67), health care (SIC 80), business and professional services (SICs 73, 81, 87). The low wage industries (those paying on average less than $10/hr) were: textile mill products (SIC 22), apparel products (SIC 23), lumber and wood products (SIC 24), furniture and fixtures (SIC 25), food stores (SIC 54), eating and drinking places (SIC 58), other retail trade (SICs 52,53,55,56,57,59), agricultural services (SIC 7), hotels and motels (SIC 70), and other services (SIC 83, 84, 86, 88, 89), and miscellaneous manufacturing (SIC 39).

County values for dividends interest and rent income, transfer income, farm earnings, and military earnings are estimated using both county and state data and equations. Statewide rather than county specific information is used because the quarterly fluctuations for historic county data were taken from statewide fluctuations. Any attempt to estimate county equations would simply mimic statewide equations since most quarter-to-quarter variation would be the same. For farm and military earnings, the statewide equations for these variables are used to yield the percentage growth in the income or earnings in each county. As a consequence, farm and military earnings in each county are forecast to grow at the same percentage as statewide.

Statewide growth in transfer income and dividend, interest, and rent income also determines county growth in these variables, although not as directly. Instead of assuming that county growth rates equal statewide growth rates, a method is introduced to allocate statewide growth in transfer income and dividend, interest, and rent income to KU service territory counties. These allocation equations take the following form:

$$d(tran_{c,q}) = d(tran_{s,q})*(pop_{c,q}/pop_{s,q})*reltran \tag{6}$$

$$d(dir_{c,q}) = d(dir_{s,q})*(pop_{c,q}/pop_{s,q})*reldir \tag{7}$$

where $d(tran_{c,q})$ and $d(tran_{s,q})$ refers to the change in county or state transfer income in quarter q,
$d(dir_{c,q})$ and $d(dir_{s,q})$ refers to the change in county or state DIR income in quarter q,
$pop_{c,q}$ and $pop_{s,q}$ refers to county or state population in quarter q,
reltran is county transfer income per person divided by state transfer income per person, and
reldir is county DIR income per person divided by state DIR income per person.

In these equations, a county's share of forecast statewide transfer and DIR income growth depends on its share of state population and on its historic propensity to receive transfer or DIR income (i.e., reltran or reldir). This form for the allocation equation implies that a county's share of transfer and DIR income growth increases if its population grows faster than the state and decreases if its population grows slower. The allocation equation also recognizes that some counties have a historic propensity to receive transfer income due to factors like higher levels of disability and poverty, just as some counties have a higher propensity to receive dividend, interest, and rent income due to higher levels of wealth. The values for reltran and reldir come from **Regional Economic Information System** data from 1990 through 1993.

Wholesale and Retail Data

Separate forecasts are required for twelve municipalities inside the KU service territory. These municipalities are wholesale customers of Kentucky Utilities. Thus, forecasts for these wholesale municipalities must be separated from the remainder of the KU service territory. The KU service territory without these twelve municipalities is referred to as the retail territory.

The forecasts for municipalities are generated by sharing down the forecasts for the counties in which the municipalities are located. A percentage of sector employment or value-added, county population, or county income is attributed to the municipality and the remained is attributed to the balance of the county. The shares are determined using census data, but can be supplemented based on knowledge of each area. Regional commercial territory forecasts are obtained by subtracting out municipal values from the regional totals, once municipal employment, value-added output, income, population, and household data are calculated. These calculations are carried out in the EVIEWS modelfile **"modtowrR.dbl"**

The key issue in this process is what percentage of a particular economic activity to attribute to the municipality versus the rest of its county. When no data is available regarding the distribution of a particular economic variable within a county, the percentage used is the share of the population located in the municipality versus the share located in the balance of the county according to the 1990 Census. When available, other data or knowledge is substituted for this percentage.

For some variables, using the percentage of population inside and outside of the municipality is clearly an appropriate manner in which to divide municipal versus balance of county forecasts. In particular, this is true for population, income, and household data. These variables pertain to population, and should track the population variable. However, use of the percent of population may be less appropriate when assigning a share of employment or value-added output to the municipality or the balance of the county. Commercial or industrial districts would not necessarily be located closely to residential districts. Typically, a much larger share of commercial activity is located within municipalities rather than rural countyside, even relative to the distribution of population. Industrial districts could be located either within or outside of the municipality.

Censuses of services, retail trade, and wholesale trade from 1992 for Kentucky were used as a resource to attribute commercial employment to a municipality or the balance of the county. Census data list the number of establishments and retail sales located inside municipalities and in the balance of counties. Data was available for 2-digit industries or groupings of 2-digit industries within wholesale and retail trade and services. These data were aggregated up to the commercial categories utilized in the UK CBER model. When not suppressed, sales in commercial industries inside of the county and in the balance of the county were used to split county employment between the municipality and the rest of the county. When sales data were suppressed, the number of establishments inside and outside of the municipality was used. Aggregate shares for services were assumed to hold for government employment and for finance, insurance, and real estate.

Local knowledge about the location of various factories, mines, or construction companies within the county would be the best way to attribute industrial employment and value-added output to the municipality within 2-digit manufacturing industries. There are likely to be few factories within a given 2-digit SIC grouping in each county, and persons familiar with the county could be consulted in order to attribute this activity to the municipality or balance of the county. This has not been done as of yet, so 2-digit manufacturing activity was attributed according to the share of population inside and outside of the municipality.

The Data Output Stage

After forecasts have been made, several types of forecast data are output to EXCEL spreadsheets. Variable totals for all counties in a region are output in a file named (**"resulrR.xls"**). Variable totals for the retail portions of each region, and aggregate industrial value-added, total employment, and household forecasts for wholesale areas in each region are output in a file named (**"resrerR.xls"**). Variable values for each county in a region are output in a file named (**"Countynamef.xls"**). In region 2, variable totals for all Virginia counties in the region are output in a file name (**"virginia.xls"**).

Appendix I

Backcasts

In addition to developing a quarterly data set back to 1990, CBER gathered or backcast annual data for the value-added output, employment, income, population, and household data forecast in the CBER model. These historic annual data were developed back to 1970. By combining this historic data with CBER forecasts, it is possible to obtain annual values for county data for the period from 1970 to 2025.

CBER obtained historic employment data for all KU counties from 1970 to 1989 from the firm Regional Financial Associates, hereafter referred to as RFA. The historic data provided by RFA was at the 2-digit SIC level. The RFA data is based on the Bureau of Labor Statistics 790 series which is consistent with state ES202 data and has more complete employment information for social services (part of the other services sector in the KU county data base provided by CBER). Social services is the one sector which ES202 data underestimates. As a consequence, ES202 data from the early 1990s was inflated to keep it consistent with the historic RFA data series for 1970 through 1989.

The historic employment series, along with ES202 earnings data, was used to generate a historic value-added output series by industry for KU counties. Statewide ratios for value-added output per job were multiplied by the number of jobs in each county and the relative wages per job in each county to yield value-added output in each county in historic years. This process is similar to the process used to convert employment forecasts for KU regions into value-added output forecasts. 1989 values for the relative wages per job in each county were used from 1970 to 1989 because 1989 is the first year for which this data is available.

Backcasts did not need to be made for: real earnings by place of residents; real dividend, interest and rent income; real transfer income; real farm earnings; and real military earnings. Nominal values for these data were available in the United States Department of Commerce's **Regional Economic Information System**. Nominal values for these annual data were converted to real annual values using the consumer price index.

Historic population data for 1970 through 1989 by age and gender cohort were estimated using information available on the number of births in each county in each year and the number of deaths in each age and gender cohort in each county in each year. Data also were available on the net number of new migrants in each county. Net migration was estimated using Equations (3) and (4) for the years in the 1970s for which migration data were not available. Once birth, death, and net migration data were collected, population backcasts for 1971-1979, and 1981-1989 were made using the cohort-component approach. Census data were used for 1970, 1980, and 1990 population by age and gender cohort. Weighted headship rate data from the three census years were applied to age and gender cohort population in order to backcast households for each county.

Table 1
Counties Contained in Each KU Region

Region 1	Region 2	Region 3	Region 4	Region 5
Anderson	Bell	Adair	Barren	Ballard
Bath	Clay	Boyle	Bullitt	Caldwell
Bourbon	Harlan	Casey	Carroll	Carlisle
Bracken	Knox	Garrard	Edmonson	Christainson
Campbell	Laurel	Green	Gallatin	Crittendon
Clark	Whitley	Lincoln	Grayson	Daviess
Estill	Dickenson, VA	McCreary	Hardin	Fulton
Fayette	Lee, VA	Marion	Hart	Henderson
Fleming	Russell, VA	Mercer	Henry	Hickman
Franklin	Scott, VA	Pulaski	Larue	Hopkins
Grant	Wise, VA	Rockcastle	Nelson	Livingston
Harrison		Russell	Oldham	Lyon
Jessamine		Taylor	Shelby	McCracken
Lee		Washington	Spencer	McLean
Madison			Trimble	Muhlenburg
Mason				Ohio
Montgomery				Union
Nicholas				Webster
Owen				
Pendleton				
Robertson				
Rowan				
Scott				
Woodford				

Table 2
Two Letter Abbreviation for Each County Name

County Name	Two Letter Abbreviation
Adair	ad
Anderson	an
Ballard	bl
Barren	ba
Bath	bt
Bell	be
Bourbon	bu
Boyle	by
Bracken	br
Bullitt	bi
Campbell	cm
Cardwell	ca
Carlisle	cs
Carroll	cr
Casey	cy
Christainson	ch
Clark	ck
Clay	cl
Crittenden	cd
Daviess	da
Edmonson	ed
Estill	es
Fayette	fa
Fleming	fl
Franklin	fr
Fulton	fu
Gallatin	ga
Garrard	gd
Grant	gr
Grayson	gy
Green	gn
Hardin	hr
Harlan	hl
Harrison	hs
Hart	ht
Henderson	he
Henry	hn
Hickman	hi
Hopkins	ho
Jessamine	je
Knox	kx
Larue	la
Laurel	lu
Lee	le
Lincoln	li
Livingston	lv
Lyon	ly

Table 2 (Continued)
Two Letter Abbreviation for Each County Name

County Name	Two Letter Abbreviation
McCreary	my
McCracken	mc
McLean	ml
Madison	md
Marion	ma
Mason	ms
Mercer	mr
Montgomery	mm
Muhlenburg	mu
Nelson	ne
Nicholas	ni
Ohio	oh
Oldham	od
Owen	on
Pendleton	pe
Pulaski	pu
Robertson	ro
Rockcastle	rk
Rowan	rw
Russell	ru
Scott	sc
Shelby	sh
Spencer	sp
Taylor	ta
Trimble	tr
Union	un
Washington	ws
Webster	we
Whitley	wh
Woodford	wd
Dickenson. VA	vd
Lee, VA	vl
Russell, VA	vr
Scott, VA	vs
Wise, VA	vw

Table 3
State and County Variables

(County, regional or service territory summary variables end in XX, state variables do not. The XX is for the county abbreviation in Table 2, for the region number of "ku" for the entire service territory, "ky" for Kentucky service territory counties, "re" for retail portions of the Kentucky service territory, or "va" for the Virginia counties of the service territory.)
(All variables ending in "s" are seasonally adjusted.)
(All variables beginning with "l" are log of the variable.)

mwinXX= county nominal military earnings in 1982-84 dollars.
fwinXX= county nominal farm earnings in 1982-84 dollars.
nwinXX= county nominal nonfarm (and nonmilitary) earnings in 1982-84 dollars.
dirXX= county nominal dividend, interest, and rent income in 1982-84 dollars.
tranXX= county nominal transfer income in 1982-84 dollars.
tpiXX= county nominal total personal income in 1982-84 dollars.
rmwinXX= county real military earnings in 1982-84 dollars.
rfwinXX= county real farm earnings in 1982-84 dollars.
rnwinXX= county real nonfarm (and nonmilitary) earnings in 1982-84 dollars.
rdirXX= county real dividend, interest, and rent income in 1982-84 dollars.
rtranXX= county real transfer income in 1982-84 dollars.
rtpiXX= county real total personal income in 1982-84 dollars.
artpiXX= a four quarter moving average of county real total personal income in 1982-84 dollars.
rwgslky= real wage and salary income in the state in millions of 1982-84 dollars.
rwgslrat=real wage and salary income per job in the state in millions of 1982-84 dollars.
rtranky= real transfer income in the state in millions of 1982-84dollars.
rdirky= real dividend, interest, and rent income in the state in millions of 1982-84 dollars.

popXX = total county population.
male??XX= males in age group ?? in county (04 to 84 in five year intervals and 85+).
female??XX= females in age group ?? in county (04 to 84 in five year intervals and 85+).
birthXX= number of births in county.
brat??XX= birth rate for women in age group ?? in county (age 14 to 49 in five year intervals).
svrtma??XX= survival rate for males age in age group ?? in county (04 to 84 in five year intervals and 85+).
svrtfe??XX= survival rate for females age in age group ?? in county(04 to 84 in five year intervals and 85+).
InmigrXX= inmigration rate in county.
outmigrXX= outmigration rate in county.
InmigXX= county inmigration.
outmigXX= county outmigration.
nmigXX= net county migration.
Hdrma??XX= household headship rate for males in age group ?? in county (04 to 84 in five year intervals and 85+).
Hdrfe??XX= household headship rate for females in age group ?? in county (04 to 84 in five year intervals and 85+).
Hdma??XX= households headed by males in age group ?? in county (04 to 84 in five year intervals and 85+).
Hdfe??XX= households headed by females in age group ?? in county (04 to 84 in five year intervals and 85+).
HdXX= in county households.

DUMMY1= dummy variable for first quarter.
DUMMY2= dummy variable for second quarter.

DUMMY3= dummy variable for third quarter.

e7rat=statewide ratio of employment in agricultural services to real total personal income.
e15rate=statewide ratio of employment in general contractor construction to total employment.
e16rate=statewide ratio of employment in heavy construction to total employment.
e17rate=statewide ratio of employment in specialty construction to total employment.
e42rate=statewide ratio of employment in trucking to total employment (SIC 40,41,42).
e47rate=statewide ratio of employment in transportation services to total employment.
e48rate=statewide ratio of employment in communications to total employment.
e49rate=statewide ratio of employment in public utilities to total employment.
e51rat=statewide ratio of employment in wholesale trade to real total personal income (SIC 50,51).
e54rat=statewide ratio of employment in food stores to real total personal income.
e58rat=statewide ratio of employment in eating and drinking places to real total personal income.
e59rat=statewide ratio of employment in other retail to real total personal income (SIC 52,53,55,56,57,59).
e67rat=statewide ratio of employment in other finance, insurance and real estate to real total personal income (SIC 60-67).
e70rate= statewide ratio of employment in hotels and motels to total employment.
e79rat=statewide ratio of employment in personal services to real total personal income (SIC 72,75,76,78,79).
e80rat= statewide ratio of employment in health services to real total personal income.
e82rat= statewide ratio of employment in educational services to real total personal income.
e87rat= statewide ratio of employment in business and professional services to real total personal income (SIC 73,81,87).
e89rat= statewide ratio of employment in other services to real total personal income (SIC 83,84,86,88,89).
e99rat= statewide ratio of employment in other services to real total personal income (SIC 91-99).

e7_XX= county employment in agricultural services.
e12_XX= county employment in coal mining.
e13_XX= county employment in oil and natural gas.
e14_XX= county employment in other mining.
e15_XX= county employment in general contractor construction.
e16_XX= county employment in heavy construction.
e17_XX= county employment in specialty construction.
e20_XX= county employment in food products.
e21_XX= county employment in tobacco products.
e22_XX= county employment in textile products.
e23_XX= county employment in apparel products.
e24_XX= county employment in lumber and wood products.
e25_XX= county employment in furniture and fixtures.
e26_XX= county employment in paper products.
e27_XX= county employment in printing.
e28_XX= county employment in chemical products.
e29_XX= county employment in petroleum products.
e30_XX= county employment in plastics products.
e31_XX= county employment in leather products.
e32_XX= county employment in stone, clay, and glass products.
e33_XX= county employment in primary metals.
e34_XX= county employment in fabricated metal products.
e35_XX= county employment in industrial machinery.
e36_XX= county employment in electronics and electrical equipment.
e37_XX= county employment in transportation equipment.
e38_XX= county employment in instruments.
e39_XX= county employment in miscellaneous manufacturers.
e42_XX= county employment in trucking (SIC 40,41,42).

e44_XX= county employment in water transportation.
e45_XX= county employment in air transportation.
e46_XX= county employment in pipeline transportation.
e47_XX= county employment in transportation services.
e48_XX= county employment in communications.
e49_XX= county employment in public utilities.
e51_XX= county employment in wholesale trade (SIC 50,51).
e54_XX= county employment in food stores.
e58_XX= county employment in eating and drinking places.
e59_XX= county employment in other retail (SIC 52,53,55,56,57,59).
e67_XX= county employment in other finance, insurance and real estate (SIC 60-67).
e70_XX= county employment in hotels and motels.
e79_XX= county employment in personal services (SIC 72,75,76,78,79).
e80_XX= county employment in health services.
e82_XX= county employment in educational services.
e87_XX= county employment in business and professional services (SIC 73,81,87).
e89_XX= county employment in other services (SIC 83,84,86,88,89).
e99_XX= county employment in other services (SIC 91-99).
eman_XX = county employment in manufacturing (SIC 20-39).
ego_XX = county employment in industrial sector (SIC 12-39, 44-49).
engo_XX = county employment in commercial sector (SIC 40-42,50-99).
ehiw_XX = county employment in high wage industries.
emedw_XX = county employment in medium wage industries.
eloww_XX = county employment in low wage industries.

w12_XX= real gross county product in coal mining in 1987 dollars.
w13_XX= real gross county product in oil and natural gas in 1987 dollars.
w14_XX= real gross county product in other mining in 1987 dollars.
w15_XX= real gross county product in general contractor construction in 1987 dollars.
w16_XX= real gross county product in heavy construction in 1987 dollars.
w17_XX= real gross county product in specialty construction in 1987 dollars.
w20_XX= real gross county product in food products in 1987 dollars.
w21_XX= real gross county product in tobacco products in 1987 dollars.
w22_XX= real gross county product in textile products in 1987 dollars.
w23_XX= real gross county product in apparel products in 1987 dollars.
w24_XX= real gross county product in lumber and wood products in 1987 dollars.
w25_XX= real gross county product in furniture and fixtures in 1987 dollars.
w26_XX= real gross county product in paper products in 1987 dollars.
w27_XX= real gross county product in printing in 1987 dollars.
w28_XX= real gross county product in chemical products in 1987 dollars.
w29_XX= real gross county product in petroleum products in 1987 dollars.
w30_XX= real gross county product in plastics products in 1987 dollars.
w31_XX= real gross county product in leather products in 1987 dollars.
w32_XX= real gross county product in stone, clay, and glass products in 1987 dollars.
w33_XX= real gross county product in primary metals in 1987 dollars.
w34_XX= real gross county product in fabricated metal products in 1987 dollars.
w35_XX= real gross county product in industrial machinery in 1987 dollars.
w36_XX= real gross county product in electronics and electrical equipment in 1987 dollars.
w37_XX= real gross county product in transportation equipment in 1987 dollars.
w38_XX= real gross county product in instruments in 1987 dollars.
w39_XX= real gross county product in miscellaneous manufacturers in 1987 dollars.
w44_XX= real gross county product in water transportation in 1987 dollars.
w45_XX= real gross county product in air transportation in 1987 dollars.
w46_XX= real gross county product in pipeline transportation in 1987 dollars.

w47_XX= real gross county product in transportation services in 1987 dollars.
w48_XX= real gross county product in communications in 1987 dollars.
w49_XX= real gross county product in public utilities in 1987 dollars.
(rgsp is substituted for w when variable is for regional (or total KU) gross product in an industry).

rgspman_XX= real gross county or regional product in manufacturing in 1987 dollars (SIC 20-39).
rgspgo_XX=real gross county or regional product in the industrial sector in 1987 dollars (SIC 12-39, 44-49).

wrat12rR=quarterly wages in coal mining in region relative to the state.
wrat20rR=quarterly wages in food products in region relative to the state.
wrat21rR=quarterly wages in tobacco products in region relative to the state.
wrat22rR=quarterly wages in textiles in region relative to the state.
wrat23rR=quarterly wages in apparel in region relative to the state.
wrat24rR=quarterly wages in lumber and wood products in region relative to the state.
wrat25rR=quarterly wages in furniture and fixtures in region relative to the state.
wrat26rR=quarterly wages in paper products in region relative to the state.
wrat27rR=quarterly wages in printing and publishing in region relative to the state.
wrat28rR=quarterly wages in chemical products in region relative to the state.
wrat29rR=quarterly wages in petroleum products in region relative to the state.
wrat30rR=quarterly wages in plastic products in region relative to the state.
wrat31rR=quarterly wages in leather products in region relative to the state.
wrat32rR=quarterly wages in stone, clay, and glass products in region relative to the state.
wrat33rR=quarterly wages in primary metals in region relative to the state.
wrat34rR=quarterly wages in fabricated metal products in region relative to the state.
wrat35rR=quarterly wages in industrial machinery in region relative to the state.
wrat36rR=quarterly wages in electrical machinery in region relative to the state.
wrat37rR=quarterly wages in transportation equipment in region relative to the state.
wrat38rR=quarterly wages in instruments in region relative to the state.
wrat39rR=quarterly wages in miscellaneous manufacturers in region relative to the state.

rgspb12s=real gross state product in coal mining in millions of 1987 dollars.
rgspb20s=real gross state product in food products in millions of 1987 dollars.
rgspb21s=real gross state product in tobacco products in millions of 1987 dollars.
rgspb22s=real gross state product in textiles in millions of 1987 dollars.
rgspb23s=real gross state product in apparel in millions of 1987 dollars.
rgspb24s=real gross state product in lumber and wood products in millions of 1987 dollars.
rgspb25s=real gross state product in furniture and fixtures in millions of 1987 dollars.
rgspb26s=real gross state product in paper products in millions of 1987 dollars.
rgspb27s=real gross state product in printing and publishing in millions of 1987 dollars.
rgspb28s=real gross state product in chemical products in millions of 1987 dollars.
rgspb29s=real gross state product in petroleum products in millions of 1987 dollars.
rgspb30s=real gross state product in plastic products in millions of 1987 dollars.
rgspb31s=real gross state product in leather products in millions of 1987 dollars.
rgspb32s=real gross state product in stone, clay, and glass products in millions of 1987 dollars.
rgspb33s=real gross state product in primary metals in millions of 1987 dollars.
rgspb34s=real gross state product in fabricated metal products in millions of 1987 dollars.
rgspb35s=real gross state product in industrial machinery in millions of 1987 dollars.
rgspb36s=real gross state product in electronic and electrical equipment in millions of 1987 dollars.
rgspb37s=real gross state product in transportation equipment in millions of 1987 dollars.
rgspb38s=real gross state product in instruments in millions of 1987 dollars.
rgspb39s=real gross state product in miscellaneous manufacturers in millions of 1987 dollars.

s112002s=state employment in coal mining in thousands of jobs.
s420002s=state employment in food products in thousands of jobs.
s421002s= state employment in tobacco products in thousands of jobs.
s422002s= state employment in textiles in thousands of jobs.
s423002s= state employment in apparel in thousands of jobs.
s324002s= state employment in lumber and wood products in thousands of jobs.
s325002s= state employment in furniture and fixtures in thousands of jobs.
s426002s= state employment in paper products in thousands of jobs.
s427002s= state employment in printing and publishing in thousands of jobs.
s428002s= state employment in chemical products in thousands of jobs.
s429002s= state employment in petroleum products in thousands of jobs.
s430002s= state employment in plastic products in thousands of jobs.
s431002s= state employment in leather products in thousands of jobs.
s332002s= state employment in stone, clay, and glass products in thousands of jobs.
s333002s= state employment in primary metals in thousands of jobs.
s334002s= state employment in fabricated metal products in thousands of jobs.
s335002s= state employment in industrial machinery in thousands of jobs.
s336002s= state employment in electronic and electrical equipment in thousands of jobs.
s337002s= state employment in transportation equipment in thousands of jobs.
s338002s= state employment in instruments in thousands of jobs.
s339002s= state employment in miscellaneous manufacturers in thousands of jobs.

(productivity refers to real gross state product per employee).
prod12=state productivity in coal mining in 1987 dollars per jobs.
prod13=state productivity in natural gas production in 1987 dollars per jobs.
prod14=state productivity in other mining (mining besides coal mining and natural gas production) in 1987 dollars per jobs.
prod20=state productivity in food products in 1987 dollars per jobs.
prod21= state productivity in tobacco products in 1987 dollars per jobs.
prod22= state productivity in textiles in 1987 dollars per jobs.
prod23= state productivity in apparel in 1987 dollars per jobs.
prod24= state productivity in lumber and wood products in 1987 dollars per jobs.
prod25= state productivity in furniture and fixtures in 1987 dollars per jobs.
prod26= state productivity in paper products in 1987 dollars per jobs.
prod27= state productivity in printing and publishing in 1987 dollars per jobs.
prod28= state productivity in chemical products in 1987 dollars per jobs.
prod29= state productivity in petroleum products in 1987 dollars per jobs.
prod30= state productivity in plastic products in 1987 dollars per jobs.
prod31= state productivity in leather products in 1987 dollars per jobs.
prod32= state productivity in stone, clay, and glass products in 1987 dollars per jobs.
prod33= state productivity in primary metals in 1987 dollars per jobs.
prod34= state productivity in fabricated metal products in 1987 dollars per jobs.
prod35= state productivity in industrial machinery in 1987 dollars per jobs.
prod36= state productivity in electronic and electrical equipment in 1987 dollars per jobs.
prod37= state productivity in transportation equipment in 1987 dollars per jobs.
prod38= state productivity in instruments in 1987 dollars per jobs.
prod39= state productivity in miscellaneous manufacturers in 1987 dollars per jobs.
prod44= state productivity in water transportation in 1987 dollars per jobs.
prod45= state productivity in air transportation in 1987 dollars per jobs.
prod46= state productivity in pipeline transportation in 1987 dollars per jobs.
prod47= state productivity in transportation services in 1987 dollars per jobs.
prod48= state productivity in communications services in 1987 dollars per jobs.
prod49= state productivity in utility services in 1987 dollars per jobs.

prod12rR=regional productivity in coal mining in region R in 1987 dollars per jobs.
prod20rR= regional productivity in food products in region R in 1987 dollars per jobs.
prod21rR= regional productivity in tobacco products in region R in 1987 dollars per jobs.
prod22rR= regional productivity in textiles in region R in 1987 dollars per jobs.
prod23rR= regional productivity in apparel in region R in 1987 dollars per jobs.
prod24rR= regional productivity in lumber and wood products in region R in 1987 dollars per jobs.
prod25rR= regional productivity in furniture and fixtures in region R in 1987 dollars per jobs.
prod26rR= regional productivity in paper products in region R in 1987 dollars per jobs.
prod27rR= regional productivity in printing and publishing in region R in 1987 dollars per jobs.
prod28rR= regional productivity in chemical products in region R in 1987 dollars per jobs.
prod29rR= regional productivity in petroleum products in region R in 1987 dollars per jobs.
prod30rR= regional productivity in plastic products in region R in 1987 dollars per jobs.
prod31rR= regional productivity in leather products in region R in 1987 dollars per jobs.
prod32rR= regional productivity in stone, clay, and glass products in region R in 1987 dollars per jobs.
prod33rR= regional productivity in primary metals in region R in 1987 dollars per jobs.
prod34rR= regional productivity in fabricated metal products in region R in 1987 dollars per jobs.
prod35rR= regional productivity in industrial machinery in region R in 1987 dollars per jobs.
prod36rR= regional productivity in electronic and electrical equipment in region R in 1987 dollars per jobs.
prod37rR= regional productivity in transportation equipment in region R in 1987 dollars per jobs.
prod38rR= regional productivity in instruments in region R in 1987 dollars per jobs.
prod39rR= regional productivity in miscellaneous manufacturers in region R in 1987 dollars per jobs.

recruit = relative success of KU industrial recruiting efforts.
shoc12XX=exogenous shock to coal mining employment in county or region.
shoc20XX=exogenous shock to food processing employment in county or region.
shoc21XX=exogenous shock to tobacco products employment in county or region.
shoc22XX=exogenous shock to apparel products employment in county or region.
shoc23XX=exogenous shock to textiles employment in county or region.
shoc24XX=exogenous shock to wood processing employment in county or region.
shoc25XX=exogenous shock to furniture and fixtures employment in county or region.
shoc26XX=exogenous shock to paper products employment in county or region.
shoc27XX=exogenous shock to printing and publishing employment in county or region.
shoc28XX=exogenous shock to chemical products employment in county or region.
shoc29XX=exogenous shock to petroleum products employment in county or region.
shoc30XX=exogenous shock to plastic products employment in county or region.
shoc31XX=exogenous shock to leather products employment in county or region.
shoc32XX=exogenous shock to stone, clay, and glass products employment in county or region.
shoc33XX=exogenous shock to primary metals employment in county or region.
shoc34XX=exogenous shock to fabricated metals employment in county or region.
shoc35XX=exogenous shock to industrial machinery employment in county or region.
shoc36XX=exogenous shock to electronic and electrical equipment employment in county or region.
shoc37XX=exogenous shock to transportation equipment employment in county or region.
shoc38XX=exogenous shock to instruments employment in county or region.
shoc39XX=exogenous shock to miscellaneous employment in county or region.

mult12rR=within industry multiplier for exogenous shock in coal mining in the region.
mult20rR=within industry multiplier for exogenous shock in food processing in the region.
mult21rR=within industry multiplier for exogenous shock in tobacco products in the region.
mult22rR=within industry multiplier for exogenous shock in apparel products in the region.
mult23rR=within industry multiplier for exogenous shock in textiles in the region.
mult24rR=within industry multiplier for exogenous shock in wood products in the region.
mult25rR=within industry multiplier for exogenous shock in furniture and fixtures in the region.

mult26rR=within industry multiplier for exogenous shock in paper products in the region.
mult27rR=within industry multiplier for exogenous shock in printing and publishing in the region.
mult28rR=within industry multiplier for exogenous shock in chemical products in the region.
mult29rR=within industry multiplier for exogenous shock in petroleum products in the region.
mult30rR=within industry multiplier for exogenous shock in plastic products in the region.
mult31rR=within industry multiplier for exogenous shock in leather products in the region.
mult32rR=within industry multiplier for exogenous shock in stone, clay, and glass products in the region.
mult33rR=within industry multiplier for exogenous shock in primary metals in the region.
mult34rR=within industry multiplier for exogenous shock in fabricated metals in the region.
mult35rR=within industry multiplier for exogenous shock in industrial machinery in the region.
mult36rR=within industry multiplier for exogenous shock in electronic and electrical equipment in the region.
mult37rR=within industry multiplier for exogenous shock in transportation equipment in the region.
mult38rR=within industry multiplier for exogenous shock in instruments in the region.
mult39rR=within industry multiplier for exogenous shock in miscellaneous manufacturers in the region.

e44kys=state employment in water transportation.
e46kys= state employment in pipeline transportation.

ggncmq= national compensation of military employees.
gprof=farm proprietor's income.
ip357= national industrial production index for computers and office machines.
ip131= national industrial production index for oil and gas extraction.

Subsection 3

Data Series

KENTUCKY UTILITIES COMPANY
1999 FORECAST
MONTHLY MODEL

Rate Class	Series		Source	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
RS	kWh/Customer														
	January		Internal	805.57	764.52	792.36	807.22	922.81	833.16	909.47	877.73	844.65	922.31	914.80	914.94
	February		Internal	669.86	718.33	745.23	771.94	832.07	813.09	836.82	824.06	800.84	800.26	855.91	854.88
	March		Internal	629.96	666.44	673.11	740.79	734.73	718.18	751.31	747.91	749.15	776.62	765.79	764.58
	April		Internal	616.38	607.73	669.83	682.47	678.40	661.08	722.29	713.62	706.81	729.88	727.45	726.24
	May		Internal	572.49	621.17	633.26	635.88	633.45	631.31	670.95	625.57	672.98	691.22	690.03	689.10
	June		Internal	725.23	975.06	726.37	795.49	890.99	843.37	829.02	703.97	935.59	896.35	895.26	894.34
	July		Internal	1046.14	1174.68	1000.12	1238.14	1228.72	1113.91	1099.41	1075.34	1184.58	1182.94	1181.91	1181.03
	August		Internal	1051.74	1240.96	1037.99	1298.03	1175.14	1434.95	1113.76	1241.62	1282.64	1298.95	1298.44	1297.79
	September		Internal	1047.93	1107.99	920.85	1149.34	979.10	1215.72	1021.94	987.76	1254.53	1118.76	1118.30	1117.67
	October		Internal	677.74	727.91	675.33	703.43	698.57	720.54	701.09	766.56	922.77	790.97	790.52	789.90
	November		Internal	595.95	633.31	632.66	658.02	631.55	661.78	674.86	701.54	715.38	709.86	709.94	709.46
	December		Internal	679.74	715.96	767.15	760.48	729.35	807.40	815.95	823.29	761.32	822.18	822.31	821.82
	Elec. $/kWh														
	January		Internal	0.0364	0.0362	0.0339	0.0321	0.0313	0.0315	0.0307	0.0292	0.0290	[redacted]	[redacted]	[redacted]
	March		Internal	0.0378	0.0362	0.0342	0.0329	0.0322	0.0323	0.0315	0.0305	0.0295	[redacted]	[redacted]	[redacted]
	April		Internal	0.0370	0.0363	0.0340	0.0327	0.0321	0.0324	0.0311	0.0309	0.0298	[redacted]	[redacted]	[redacted]
	May		Internal	0.0373	0.0359	0.0342	0.0330	0.0326	0.0328	0.0315	0.0307	0.0297	[redacted]	[redacted]	[redacted]
	June		Internal	0.0373	0.0340	0.0339	0.0324	0.0314	0.0315	0.0301	0.0303	0.0283	[redacted]	[redacted]	[redacted]
	July		Internal	0.0353	0.0334	0.0328	0.0299	0.0300	0.0299	0.0291	0.0286	0.0276	[redacted]	[redacted]	[redacted]
	August		Internal	0.0352	0.0335	0.0322	0.0299	0.0302	0.0299	0.0291	0.0284	0.0279	[redacted]	[redacted]	[redacted]
	September		Internal	0.0355	0.0335	0.0328	0.0311	0.0312	0.0307	0.0296	0.0290	0.0274	[redacted]	[redacted]	[redacted]
	October		Internal	0.0364	0.0344	0.0333	0.0323	0.0322	0.0326	0.0308	0.0303	0.0283	[redacted]	[redacted]	[redacted]
	November		Internal	0.0369	0.0353	0.0337	0.0328	0.0328	0.0324	0.0305	0.0297	0.0292	[redacted]	[redacted]	[redacted]
	December		Internal	0.0370	0.0346	0.0326	0.0322	0.0320	0.0312	0.0295	0.0294	0.0287	[redacted]	[redacted]	[redacted]
	Interaction Weather Variables														
	January		Internal	846	701	688	642	996	716	901	735	624	819	819	819
	January	(HDD)	Internal	846	701	688	642	996	716	901	735	624	862	802	802
	February	(HDD)	Internal	490	719	709	722	906	869	900	774	674	551	815	815
	March	(HDD)	Internal	477	568	453	754	586	541	645	473	562	668	588	588
	April	(HDD)	Internal	374	241	399	363	311	251	455	370	290	330	330	330
	May	(CDD)	Internal	33	70	51	38	30	32	49	6	38	40	40	40
	June	(CDD)	Internal	117	253	92	125	179	152	132	55	183	155	155	155
	July	(CDD)	Internal	296	334	245	371	353	289	271	266	303	301	301	301
	August	(CDD)	Internal	244	327	223	332	267	413	235	302	312	318	318	318
	September	(CDD)	Internal	250	262	160	258	172	288	192	161	305	225	225	225
	October	(CDD)	Internal	55	69	40	30	39	34	25	67	142	58	58	58
	November	(HDD)	Internal	290	345	297	363	190	398	360	449	291	305	305	305
	December	(HDD)	Internal	466	511	613	549	459	686	638	623	395	576	576	576

HDD - Heating Degree Days
CDD - Cooling Degree Days

G:\FCAST00\1999 FCST WRITEUP\DATASERIES

CONFIDENTIAL INFORMATION REDACTED

KENTUCKY UTILITIES COMPANY
1999 FORECAST
MONTHLY MODEL
HISTORICAL/FORECAST

Rate Class	Series	Source	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
FERS	kWh/Customer																						
	January	Internal	2732.65	2622.58	2132.85	2854.34	2204.96	2565.37	2381.21	2502.72	2146.85	2555.14	2213.19	2204.30	2140.67	2807.92	2248.83	2656.58	2331.69	2118.25	2526.36	2449.50	2449.32
	February	Internal	2444.75	2508.36	2176.57	2303.00	2937.90	2090.99	2275.20	2281.96	1966.07	1591.78	2073.19	2054.22	2076.98	2576.68	2425.36	2545.84	2227.84	1973.05	1744.01	2332.32	2332.10
	March	Internal	1878.21	1748.08	1592.36	1906.08	1832.23	1850.21	1730.47	1981.26	1940.77	1529.19	1781.40	1529.83	2198.90	1888.64	1771.63	2016.72	1601.78	1774.36	1979.92	1873.07	1872.86
	April	Internal	1305.65	1419.61	1533.62	1543.57	1324.54	1257.75	1443.17	1343.65	1460.57	1484.51	1292.61	1537.74	1541.45	1430.38	1320.89	1676.34	1487.16	1408.53	1464.62	1466.61	1466.44
	May	Internal	910.18	959.29	960.28	979.42	896.66	982.93	977.04	962.80	1026.93	995.09	976.93	1042.26	990.26	970.93	972.91	1064.16	1042.46	987.54	1013.59	1013.64	1013.47
	June	Internal	1002.53	932.55	897.33	1073.29	951.42	1045.74	1163.74	1062.33	1017.93	972.09	1163.06	962.95	992.49	1073.60	1022.78	1014.43	917.49	1077.79	1049.16	1048.99	1048.82
	July	Internal	1241.90	1119.59	1300.10	1225.19	1134.77	1324.10	1293.58	1411.82	1258.87	1264.28	1345.07	1194.00	1388.19	1369.97	1270.67	1244.66	1227.03	1302.97	1296.89	1296.79	1296.66
	August	Internal	1183.08	1194.54	1446.53	1174.44	1173.32	1306.12	1395.41	1448.85	1244.25	1179.42	1313.83	1147.43	1334.14	1236.22	1438.52	1177.43	1274.76	1299.25	1308.35	1308.26	1308.13
	September	Internal	1076.19	1044.38	1417.02	1118.41	1134.64	1080.06	1224.04	1193.76	1221.68	1241.69	1286.77	1089.10	1279.61	1120.74	1347.97	1153.76	1112.42	1361.24	1230.36	1231.73	1231.61
	October	Internal	868.82	913.30	918.34	907.75	914.13	1025.40	978.94	999.81	968.24	961.33	1020.38	942.93	953.24	913.12	948.83	924.93	972.93	1096.98	991.41	991.60	991.50
	November	Internal	1126.94	1205.62	1131.30	1164.13	983.85	1155.66	1175.56	1341.62	1192.48	1219.45	1322.10	1230.23	1334.64	1070.92	1379.78	1325.25	1474.57	1249.71	1263.09	1263.13	1263.04
	December	Internal	1928.77	1534.40	1879.60	1815.71	1836.65	1861.64	1707.73	1881.75	2185.96	1645.06	1739.82	1913.97	1813.39	1623.25	2062.96	1975.14	1966.39	1537.60	1859.87	1859.90	1859.81
	Elec. $/kWh																						
	January	Internal	0.0436	0.0473	0.0471	0.0488	0.0492	0.0451	0.0434	0.0377	0.0360	0.0314	0.0317	0.0297	0.0281	0.0273	0.0277	0.0269	0.0257	0.0257	[redacted]	[redacted]	[redacted]
	February	Internal	0.0447	0.0476	0.0476	0.0484	0.0462	0.0461	0.0442	0.0370	0.0341	0.0328	0.0314	0.0294	0.0290	0.0273	0.0278	0.0270	0.0246	0.0259	[redacted]	[redacted]	[redacted]
	March	Internal	0.0465	0.0507	0.0515	0.0490	0.0487	0.0453	0.0409	0.0377	0.0341	0.0332	0.0317	0.0301	0.0286	0.0284	0.0284	0.0276	0.0270	0.0260	[redacted]	[redacted]	[redacted]
	April	Internal	0.0503	0.0507	0.0512	0.0473	0.0495	0.0469	0.0404	0.0379	0.0351	0.0328	0.0328	0.0302	0.0290	0.0286	0.0292	0.0275	0.0276	0.0269	[redacted]	[redacted]	[redacted]
	May	Internal	0.0516	0.0548	0.0524	0.0497	0.0501	0.0472	0.0421	0.0394	0.0359	0.0340	0.0330	0.0313	0.0304	0.0301	0.0302	0.0291	0.0279	0.0276	[redacted]	[redacted]	[redacted]
	June	Internal	0.0507	0.0562	0.0529	0.0507	0.0490	0.0458	0.0416	0.0385	0.0360	0.0352	0.0321	0.0318	0.0306	0.0297	0.0298	0.0287	0.0285	0.0272	[redacted]	[redacted]	[redacted]
	July	Internal	0.0462	0.0537	0.0515	0.0488	0.0480	0.0451	0.0405	0.0374	0.0331	0.0332	0.0318	0.0310	0.0279	0.0285	0.0284	0.0279	0.0274	0.0265	[redacted]	[redacted]	[redacted]
	August	Internal	0.0487	0.0507	0.0502	0.0497	0.0475	0.0459	0.0413	0.0370	0.0331	0.0336	0.0321	0.0307	0.0288	0.0291	0.0288	0.0279	0.0273	0.0269	[redacted]	[redacted]	[redacted]
	September	Internal	0.0522	0.0519	0.0538	0.0495	0.0478	0.0469	0.0421	0.0375	0.0345	0.0338	0.0318	0.0313	0.0299	0.0299	0.0295	0.0284	0.0278	0.0264	[redacted]	[redacted]	[redacted]
	October	Internal	0.0562	0.0528	0.0574	0.0508	0.0488	0.0461	0.0421	0.0384	0.0360	0.0346	0.0326	0.0314	0.0307	0.0306	0.0306	0.0289	0.0287	0.0271	[redacted]	[redacted]	[redacted]
	November	Internal	0.0526	0.0506	0.0514	0.0500	0.0487	0.0471	0.0408	0.0372	0.0350	0.0331	0.0316	0.0302	0.0292	0.0299	0.0290	0.0274	0.0267	0.0266	[redacted]	[redacted]	[redacted]
	December	Internal	0.0490	0.0480	0.0491	0.0493	0.0456	0.0445	0.0389	0.0356	0.0333	0.0330	0.0305	0.0285	0.0284	0.0284	0.0275	0.0260	0.0260	0.0258	[redacted]	[redacted]	[redacted]
	Interaction Weather Variables																						
	January (HDD)	Internal	976	917	685	1043	708	890	790	856	657	846	701	688	642	996	716	901	735	624	862	802	802
	February (HDD)	Internal	870	907	786	805	1117	724	813	802	678	490	719	709	722	906	869	900	774	674	551	815	815
	March (HDD)	Internal	737	550	496	631	563	613	544	654	648	477	568	453	754	586	541	645	473	562	668	588	588
	April (HDD)	Internal	262	351	434	410	272	229	349	265	335	374	241	399	363	311	251	455	370	290	321	321	321
	September (CDD)	Internal	176	158	362	201	206	166	239	210	235	250	262	160	258	172	288	192	161	305	225	225	225
	November (HDD)	Internal	271	303	267	272	146	269	272	382	272	290	345	297	363	190	398	360	449	291	305	305	305
	December (HDD)	Internal	656	422	628	590	608	610	514	597	776	466	511	613	549	459	686	638	623	395	576	576	576
	Cooling Degree Days																						
	January	Internal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	February	Internal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	March	Internal	0	0	3	0	0	0	0	0	1	6	0	0	0	0	0	0	0	3	1	1	1
	April	Internal	13	2	0	2	17	14	5	7	7	9	7	13	0	7	10	1	1	22	7	7	7
	May	Internal	27	61	13	32	52	68	70	35	36	33	70	51	38	30	32	49	6	38	40	40	40
	June	Internal	164	136	96	204	134	188	269	193	145	117	253	92	125	179	152	132	55	183	155	155	155
	July	Internal	300	233	357	287	232	351	313	397	289	296	334	245	371	353	289	271	266	303	301	301	301
	August	Internal	273	294	451	270	273	346	402	422	288	244	327	223	332	267	413	235	302	312	318	318	318
	September	Internal	176	158	362	201	206	166	239	210	235	250	262	160	258	172	288	192	161	305	224	225	225
	October	Internal	32	70	64	63	55	139	53	47	43	55	69	40	30	39	34	25	67	142	58	58	58
	November	Internal	0	15	1	17	17	0	4	0	5	5	13	2	5	2	1	1	9	3	6	6	6
	December	Internal	0	5	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	Heating Degree Days																						
	January	Internal	976	917	685	1043	708	890	790	856	657	846	701	688	642	996	716	901	735	624	862	802	802
	February	Internal	870	907	786	805	1117	724	813	802	678	490	719	709	722	906	869	900	774	674	551	815	815
	March	Internal	608	550	496	631	563	613	544	654	648	477	568	453	754	586	541	645	473	562	668	588	588
	April	Internal	262	351	434	410	272	229	349	265	335	374	241	399	363	311	251	455	370	290	321	330	330
	May	Internal	106	98	162	142	37	116	63	115	165	122	58	132	88	94	109	136	211	38	115	115	115
	June	Internal	28	1	20	33	16	13	1	6	21	17	1	34	15	18	4	13	35	183	16	16	16
	July	Internal	0	2	0	0	3	0	0	0	0	1	0	1	0	0	0	0	0	303	0	0	0
	August	Internal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	312	0	0	0
	September	Internal	11	7	9	4	9	3	1	3	6	7	12	4	3	1	8	4	2	305	5	5	5
	October	Internal	93	74	50	63	77	63	128	158	115	78	113	95	96	53	73	83	72	142	88	88	88
	November	Internal	271	303	267	272	146	269	272	382	274	290	345	297	363	190	398	360	449	291	305	305	305
	December	Internal	656	422	628	590	608	610	514	597	776	466	511	613	549	459	686	638	623	395	576	576	576

HDD - Heating Degree Days
CDD - Cooling Degree Days

g:\fcast00\1999 fcst writeup\Data Series.xls

CONFIDENTIAL INFORMATION REDACTED

KENTUCKY UTILITIES COMPANY
1999 FORECAST
END-USE
HISTORICAL/FORECAST

Rate Class	Series	Source	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
RS	Elec. $/kWh	Internal	0.0447	0.0466	0.0478	0.0471	0.0467	0.0464	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Gas $/therm	Internal	0.6394	0.5990	0.5590	0.6050	0.6820	0.6620	0.6100	0.6450	0.6590	0.6650	0.6730	0.6820	0.6910	0.7060	0.7230	0.7400	0.7590	0.7720	0.7820	0.7910	0.8010
	Oil $/mmbtu	Internal	5.79	5.82	5.83	6.57	6.41	5.4	5.45	5.83	6.08	6.31	6.56	6.82	7.07	7.35	7.62	7.86	8.11	8.33	8.56	8.79	9.03
	Wood $/cord	RER	135.200	140.608	146.232	152.082	158.165	164.491	171.071	177.914	185.031	192.432	200.129	208.134	216.460	225.118	234.123	243.487	253.227	263.356	271.784	280.481	287.493
	Deflator	CBER	0.92	0.94	0.96	0.98	1	1.01	1.02	1.05	1.07	1.09	1.11	1.14	1.16	1.18	1.21	1.23	1.26	1.29	1.32	1.35	1.38
	Ave Income (000T)	CBER	28.17	29.14	30.37	30.51	31.40	31.90	32.13	32.25	32.38	32.53	32.64	32.90	33.25	33.64	34.06	34.51	34.95	35.40	35.86	36.36	36.85
	#/Household	CBER	2.58	2.56	2.58	2.56	2.53	2.51	2.49	2.47	2.45	2.43	2.41	2.40	2.39	2.38	2.37	2.37	2.36	2.35	2.34	2.34	2.33
	% Rural	RER	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	Norm HDD	Internal	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3[illegible]
	Norm CDD	Internal	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110
	Gas Avail New (%)	RER	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
	Gas Avail Exist (%)	RER	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
	Gas Htg Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Other Hgt Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Heat Pump Standard	RER	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
	Room A/C Standard	RER	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	Freezer Standard	RER	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18
	Elec Water Htg Standard	RER	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00	86.00
	Gas Water Htg Standard	RER	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00	54.00
	Dishwasher Standard	RER	0.44	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
	Lowflow Shower/Faucet (%)	RER	0.23	0.26	0.28	0.31	0.33	0.35	0.38	0.40	0.43	0.46	0.49	0.52	0.55	0.58	0.61	0.64	0.67	0.70	0.74	0.77	0.80
	SF Customers (000T)	Internal	178.32	179.29	180.21	179.93	180.58	181.31	182.14	182.87	183.58	184.34	185.32	186.25	186.24	186.63	186.97	187.26	187.55	187.85	188.12	188.41	188.70
	MF Customers (000T)	Internal	28.57	28.68	28.95	29.02	29.19	29.35	29.52	29.69	29.85	30.01	30.13	30.23	30.24	30.29	30.33	30.37	30.40	30.43	30.46	30.49	30.52
	MO Customers (000T)	Internal	18.00	18.00	18.00	17.96	17.90	17.89	17.88	17.87	17.86	17.83	17.81	17.78	17.69	17.63	17.57	17.50	17.43	17.37	17.30	17.23	17.17

RER - Regional Economic Resources (Default Data)
CBER - Center for Business & Economic Research

KENTUCKY UTILITIES COMPANY
1999 FORECAST
END-USE
HISTORICAL/FORECAST

Rate Class	Series	Source	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
FERS	Elec. $/kWh	Internal	0.0407	0.0423	0.0437	0.0429	0.0422	0.043	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Gas $/therm	Internal	0.6394	0.5990	0.5590	0.6050	0.6820	0.6620	0.6100	0.6450	0.6590	0.6650	0.6730	0.6820	0.6910	0.7060	0.7230	0.7400	0.7590	0.7720	0.7820	0.7910	0.8010
	Oil $/mmbtu	Internal	5.79	5.82	5.83	6.57	6.41	5.4	5.45	5.83	6.08	6.31	6.56	6.82	7.07	7.35	7.62	7.86	8.11	8.33	8.56	8.79	9.03
	Wood $/cord	RER	135.200	140.608	146.232	152.082	158.165	164.491	171.071	177.914	185.031	192.432	200.129	208.134	216.460	225.118	234.123	243.487	253.227	263.356	271.784	280.481	287.493
	Deflator	CBER	0.92	0.94	0.96	0.98	1	1.01	1.02	1.05	1.07	1.09	1.11	1.14	1.16	1.18	1.21	1.23	1.26	1.29	1.32	1.35	1.38
	Ave Income (000T)	CBER	28.17	29.14	30.37	30.51	31.40	31.90	32.13	32.25	32.38	32.53	32.64	32.90	33.25	33.64	34.06	34.51	34.95	35.40	35.86	36.36	36.85
	#/Household	CBER	2.58	2.56	2.58	2.56	2.53	2.51	2.49	2.47	2.45	2.43	2.41	2.40	2.39	2.38	2.37	2.37	2.36	2.35	2.34	2.34	2.33
	% Rural	RER	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.3[illegible]
	Norm HDD	Internal	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	36[illegible]
	Norm CDD	Internal	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110
	Gas Avail New (%)	RER	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
	Gas Avail Exist (%)	RER	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	Gas Htg Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Other Htg Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Heat Pump Standard	RER	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
	Gound Loop HP Standard	RER	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Room A/C Standard	RER	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	Freezer Standard	RER	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18	17.18
	Elec Water Htg Standard	RER	90.00	90.00	90.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	91.00	92.00	92.00	92.00	92.00
	Gas Water Htg Standard	RER	56.00	56.00	57.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	58.00	59.00	59.00	59.00	59.00
	Dishwasher Standard	RER	0.44	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
	Lowflow Shower/Faucet (%)	RER	0.29	0.33	0.37	0.40	0.43	0.47	0.49	0.52	0.55	0.58	0.61	0.64	0.66	0.69	0.71	0.74	0.76	0.78	0.81	0.84	0.86
	SF Customers (000T)	Internal	60.66	64.75	68.05	69.76	73.06	76.29	79.49	82.87	86.25	89.64	93.31	96.84	98.83	101.40	103.84	106.19	108.49	110.76	112.94	115.10	117.20
	MF Customers (000T)	Internal	34.70	35.89	37.99	38.88	40.47	41.94	43.44	45.00	46.57	48.14	49.36	50.52	51.08	51.88	52.63	53.35	54.05	54.75	55.42	56.09	56.74
	MO Customers (000T)	Internal	16.25	17.12	17.96	18.67	19.19	19.99	20.80	21.63	22.47	23.19	23.91	24.61	24.99	25.49	25.97	26.43	26.89	27.34	27.77	28.20	28.63

RER - Regional Economic Resources (Default Data)
CBER - Center for Business & Economic Research

OLD DOMINION POWER COMPANY
1999 FORECAST
END-USE
HISTORICAL/FORECAST

Rate Class	Series	Source	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Residential	Elec. $/kWh	Internal	0.0456	0.0466	0.0506	0.0520	0.0535	0.0550	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Gas $/therm	Internal	0.5753	0.6046	0.5795	0.5949	0.5908	0.5690	0.5729	0.5767	0.5910	0.6057	0.6206	0.6360	0.6517	0.6721	0.6932	0.7149	0.7373	0.7604	0.7871	0.8149	0.8435
	Oil $/mmbtu	Internal	5.93	5.96	6.17	6.98	6.63	6.49	6.36	6.37	6.45	6.53	6.62	6.71	6.80	6.88	6.96	7.04	7.12	7.20	7.30	7.40	7.50
	Wood $/cord	RER	135.20	140.61	146.23	152.08	158.16	164.49	171.07	177.91	185.03	192.43	200.13	208.13	216.46	225.12	234.12	243.49	253.23	263.36	271.78	280.48	289.46
	Deflator	CBER	1.4450	1.4820	1.5240	1.5700	1.6110	1.6550	1.7050	1.7590	1.8180	1.8820	1.9480	2.0200	2.0990	2.1810	2.2680	2.3580	2.4510	2.5480	2.6490	2.7530	2.8590
	Ave Income (000T)	CBER	10.75	11.08	11.30	12.03	12.42	12.87	13.37	13.91	14.49	15.02	15.63	16.28	17.00	17.80	18.64	19.43	20.23	20.32	20.41	20.55	20.71
	#/Household	CBER	2.57	2.56	2.55	2.55	2.54	2.54	2.54	2.53	2.53	2.52	2.52	2.51	2.51	2.50	2.50	2.50	2.50	2.49	2.50	2.47	2.47
	% Rural	RER	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.2[illegible]
	Norm HDD	Internal	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	4471	44[illegible]
	Norm CDD	Internal	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875	875
	Gas Avail New (%)	RER	5%	5%	5%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Gas Avail Exist (%)	RER	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
	Gas Htg Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Other Htg Standard	RER	80.00	80.00	80.00	80.00	80.00	80.00	80.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
	Heat Pump Standard	RER	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
	Room A/C Standard	RER	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	Freezer Standard	RER	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
	Elec Water Htg Standard	RER	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
	Gas Water Htg Standard	RER	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0	54.0
	Dishwasher Standard	RER	0.44	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46
	Lowflow Shower/Faucet (%)	RER	0.23	0.26	0.28	0.31	0.33	0.35	0.38	0.40	0.43	0.46	0.49	0.52	0.55	0.58	0.61	0.64	0.67	0.70	0.74	0.77	0.80
	SF Customers (000T)	Internal	15.85	15.97	16.11	16.22	16.36	16.42	16.54	16.66	16.76	16.90	17.01	17.13	17.26	17.38	17.50	17.62	17.48	17.87	17.87	17.87	17.87
	MF Customers (000T)	Internal	1.77	1.82	1.91	1.93	1.95	1.95	2.07	2.19	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22	2.22
	MO Customers (000T)	Internal	5.81	5.92	6.05	6.10	6.15	6.13	6.23	6.33	6.44	6.54	6.65	6.76	6.87	6.99	7.10	7.22	7.34	7.46	7.69	7.69	7.69

RER - Regional Economic Resources (Default Data)
CBER - Center for Business & Economic Research

KENTUCKY UTILITIES COMPANY
1999 FORECAST
END-USE

Rate Class	Series				UEC'S		Average	Average
RS	Calibration Inputs	Source	Units	SF	MF	MO	Efficiency	Saturation (%)
	Elec. Furnace		kWh	7875	3185	5991	3.41	1.50
	Heat Pump htg.		kWh	8690	2039	4766	5.88	3.98
	Elec. Room htg.		kWh	4801	2831	4242	3.41	1.87
	Secondary htg. elec.		kWh	263	263	263	N.A.	9.68
	Secondary htg. Stove		kBtu	19000	16000	27000	N.A.	3.04
	Secondary htg. Wood		kBtu	19000	16000	27000	N.A.	3.92
	Gas Furnace		kBtu	41861	33135	24881	0.69	63.10
	Oil Furnace		kBtu	37127	29387	22066	0.77	20.89
	Gas Hydronic		kBtu	43500	34432	25855	0.66	3.98
	Oil Hydronic		kBtu	38105	30162	22649	0.76	2.83
	Gas Room		kBtu	42791	33871	25438	0.67	1.50
	Oil Room		kBtu	37856	29965	22500	0.76	1.50
	Central A/C		kWh	2665	1665	2102	7.64	47.33
	Heat Pump Cooling		kWh	2335	1134	2857	7.37	3.98
	Room A/C		kWh	1425	715	1070	7.67	27.69
	Secondary Cooling		kWh	320	213	267	N.A.	5.12
	Elec. Water htg.		kWh	4159	2896	3146	2.82	36.77
	Gas Water htg.		kBtu	28381	19762	21468	0.49	59.57
	Oil Water htg.		kBtu	28381	19762	21468	0.49	3.66
	Elec. Range		kWh	1008	1008	1008	3.41	65.53
	Gas Range		kBtu	3439	3439	3439	1.00	27.50
	Oil Range		kBtu	3439	3439	3439	1.00	6.97
	Refrigerator 1		kWh	1699	1465	1861	6.78	100.00
	Refrigerator 2		kWh	891	891	891	5.05	14.22
	Freezer		kWh	1401	1400	1403	11.80	49.76
	Dishwasher		kWh	355	277	311	0.34	39.96
	Washer		kWh	121	81	82	4.16	84.71
	Elec. Dryer		kWh	1114	923	1374	0.40	70.94
	Gas Dryer		kBtu	3801	3149	4688	0.10	10.77
	Microwave		kWh	161	168	148	1.00	82.76
	Miscellaneous		kWh	1850	1764	1796	1.00	100.00

Source for Average Efficiency and Saturation is the CDA, RER, and Residential Survey

CDA - Conditional Demand Analysis
AEP - American Electric Power Survey
RER - Regional Economic Resources (Default Data)

KENTUCKY UTILITIES COMPANY
1999 FORECAST
END-USE

Rate Class	Series							
					UEC'S		Average	Average
FERS	Calibration Inputs	Source	Units	SF	MF	MO	Efficiency	Saturation (%)
	Elec. Furnace		kWh	7684	3106	5784	3.41	30.49
	Heat Pump htg.		kWh	8400	1980	4623	6.05	34.44
	Geothermal Heat Pump htg.		kWh	4755	4755	4755	9.64	2.64
	Elec. Room htg.		kWh	4693	2754	4126	3.41	24.10
	Secondary htg. elec.		kWh	1467	1471	1456	N.A.	4.69
	Secondary htg. Stove		kBtu	19000	5500	27000	N.A.	3.34
	Secondary htg. Wood		kBtu	19000	5500	27000	N.A.	3.39
	Gas Furnace		kBtu	40094	25632	27395	0.69	1.78
	Oil Furnace		kBtu	36363	23247	24846	0.78	5.68
	Gas Hydronic		kBtu	42684	27288	29166	0.66	0.35
	Oil Hydronic		kBtu	36895	23587	25210	0.76	0.35
	Gas Room		kBtu	39692	25375	27121	0.70	0.09
	Oil Room		kBtu	35985	23005	24588	0.77	0.08
	Central A/C		kWh	2510	1567	1948	8.14	31.81
	Heat Pump Cooling		kWh	2180	1061	2673	8.22	34.44
	Geothermal Heat Pump Cooling		kWh	1575	1575	1575	12.20	2.64
	Room A/C		kWh	1365	685	1025	7.67	23.20
	Secondary Cooling		kWh	179	97	85	N.A.	4.20
	Elec. Water htg.		kWh	4144	2891	3146	2.85	96.80
	Gas Water htg.		kBtu	28279	19708	21448	0.49	2.42
	Oil Water htg.		kBtu	28279	19708	21448	0.49	0.78
	Elec. Range		kWh	1008	1008	1008	3.41	100.00
	Gas Range		kBtu	3439	3439	3439	0.00	0.00
	Oil Range		kBtu	3439	3439	3439	0.00	0.00
	Refrigerator 1		kWh	1675	1440	1811	6.78	100.00
	Refrigerator 2		kWh	879	881	880	5.73	10.29
	Freezer		kWh	1377	1374	1370	11.80	43.77
	Dishwasher		kWh	353	225	308	0.35	49.83
	Washer		kWh	119	80	81	4.16	78.50
	Elec. Dryer		kWh	1102	913	1358	0.40	76.18
	Gas Dryer		kBtu	3757	3112	4630	0.10	3.41
	Microwave		kWh	161	168	148	1.00	87.75
	Miscellaneous		kWh	3334	3224	3275	1.00	100.00

Source for Average Efficiency and Saturation is the CDA, RER, and Residential Survey

CDA - Conditional Demand Analysis
AEP - American Electric Power Survey
RER - Regional Economic Resources (Default Data)

g:\fcast00\1999 Fcst Writeup\Data Series.xls

OLD DOMINION POWER COMPANY
1999 FORECAST
END-USE

Rate Class	Series			UEC'S			Average Efficiency	Average Saturation (%)
ODP	Calibration Inputs	Source	Units	SF	MF	MO		
	Elec. Furnace		kWh	7895	3193	6007	3.41	10.98
	Heat Pump htg.		kWh	9050	2122	4965	6.30	30.13
	Elec. Room htg.		kWh	4962	2928	4387	3.41	22.23
	Secondary htg. elec.		kWh	263	263	263	N.A.	1.44
	Secondary htg. Stove		kBtu	19000	16000	27000	N.A.	0.56
	Secondary htg. Wood		kBtu	19000	16000	27000	N.A.	0.72
	Gas Furnace		kBtu	41861	33135	24881	0.73	0.44
	Oil Furnace		kBtu	37127	29387	22066	0.76	32.44
	Gas Hydronic		kBtu	43500	34432	25855	0.67	1.71
	Oil Hydronic		kBtu	38105	30162	22649	0.76	1.68
	Gas Room		kBtu	42791	33871	25433	0.69	0.20
	Oil Room		kBtu	37856	29965	22500	0.77	0.20
	Central A/C		kWh	2526	1577	1992	7.60	12.78
	Heat Pump Cooling		kWh	2180	1059	2668	7.82	30.13
	Room A/C		kWh	1365	685	1025	7.99	27.17
	Secondary Cooling		kWh	320	213	267	N.A.	3.95
	Elec. Water htg.		kWh	4159	2896	3146	2.82	95.62
	Gas Water htg.		kBtu	28381	19762	21468	0.49	1.76
	Oil Water htg.		kBtu	28381	19762	21468	0.50	2.62
	Elec. Range		kWh	1008	1008	1008	3.41	87.13
	Gas Range		kBtu	3439	3439	3439	1.00	7.69
	Oil Range		kBtu	3439	3439	3439	1.00	5.19
	Refrigerator 1		kWh	1699	1465	1861	6.58	100.00
	Refrigerator 2		kWh	891	891	891	5.25	10.30
	Freezer		kWh	1401	1400	1403	10.98	49.83
	Dishwasher		kWh	355	227	311	0.34	32.36
	Washer		kWh	121	81	82	4.16	89.10
	Elec. Dryer		kWh	1114	923	1374	0.40	86.88
	Gas Dryer		kBtu	3801	3149	4688	0.10	3.80
	Microwave		kWh	161	168	148	1.00	81.98
	Miscellaneous		kWh	941	740	905	1.00	100.00

Source for Average Efficiency and Saturation is the CDA, RER, and Residential Survey

CDA - Conditional Demand Analysis
AEP - American Electric Power Survey
RER - Regional Economic Resources (Default Data)

KENTUCKY UTILITIES COMPANY
1999 FORECAST
RS FORECAST
AVERAGE SHARES (%)

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	1.50	1.52	1.53	1.54	1.55	1.56	1.57	1.59	1.60	1.61	1.63	1.64	1.65	1.65	1.66	1.67	1.68	1.69	1.69	1.70	1.71
	GFURN	63.10	63.16	63.23	63.27	63.33	63.38	63.44	63.50	63.55	63.61	63.67	63.72	63.77	63.81	63.86	63.91	63.96	64.01	64.05	64.10	64.15
	OFURN	20.89	20.83	20.75	20.70	20.63	20.56	20.49	20.42	20.35	20.28	20.20	20.13	20.08	20.02	19.96	19.91	19.85	19.79	19.74	19.68	19.62
	HPMP	3.98	4.04	4.11	4.14	4.20	4.26	4.33	4.39	4.45	4.52	4.59	4.65	4.68	4.73	4.77	4.82	4.86	4.90	4.94	4.98	5.02
	GH2O	2.83	2.81	2.79	2.78	2.77	2.75	2.73	2.72	2.70	2.69	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.60	2.59	2.58	2.57
	OH2O	2.83	2.80	2.78	2.77	2.75	2.73	2.71	2.69	2.67	2.65	2.63	2.61	2.60	2.58	2.57	2.55	2.54	2.53	2.51	2.50	2.48
	EROOM	1.87	1.88	1.88	1.89	1.89	1.89	1.90	1.90	1.91	1.91	1.91	1.92	1.92	1.92	1.93	1.93	1.93	1.94	1.94	1.94	1.94
	GROOM	1.50	1.49	1.47	1.47	1.45	1.44	1.43	1.42	1.40	1.39	1.38	1.37	1.36	1.35	1.34	1.33	1.32	1.32	1.31	1.30	1.29
	OROOM	1.50	1.48	1.46	1.45	1.43	1.42	1.40	1.38	1.36	1.35	1.33	1.31	1.30	1.29	1.28	1.26	1.25	1.24	1.23	1.22	1.20
COOLING	CAC	47.33	47.76	48.19	48.55	48.95	49.36	49.76	50.14	50.52	50.89	51.26	51.62	51.93	52.26	52.58	52.90	53.21	53.51	53.81	54.11	54.40
	HPMP	3.98	4.04	4.11	4.14	4.20	4.26	4.33	4.39	4.45	4.52	4.59	4.65	4.68	4.73	4.77	4.82	4.86	4.90	4.94	4.98	5.02
	RAC	27.69	27.41	27.11	26.96	26.71	26.45	26.19	25.94	25.70	25.45	25.20	24.95	24.79	24.60	24.41	24.23	24.06	23.88	23.71	23.54	23.37
	NONE	21.00	20.79	20.58	20.35	20.13	19.93	19.72	19.53	19.33	19.14	18.96	18.78	18.59	18.41	18.23	18.05	17.88	17.70	17.54	17.37	17.21
SEC. HEAT	STOVE	3.04	3.04	3.04	3.04	3.04	3.04	3.04	3.05	3.05	3.05	3.05	3.06	3.06	3.06	3.06	3.07	3.07	3.07	3.07	3.08	3.08
	FIRE	3.92	3.93	3.93	3.93	3.93	3.93	3.93	3.93	3.93	3.94	3.94	3.94	3.94	3.95	3.95	3.95	3.95	3.96	3.96	3.96	3.96
	ELEC	9.68	9.68	9.69	9.69	9.70	9.71	9.72	9.72	9.73	9.74	9.75	9.75	9.76	9.76	9.77	9.78	9.78	9.79	9.80	9.80	9.81
SEC. COOL	SRAC	5.12	5.10	5.07	5.06	5.04	5.02	4.99	4.97	4.95	4.93	4.90	4.88	4.87	4.85	4.84	4.82	4.81	4.79	4.78	4.77	4.75
VENT		89.48	89.54	89.62	89.65	89.71	89.77	89.84	89.90	89.96	90.02	90.08	90.14	90.17	90.22	90.26	90.30	90.34	90.39	90.43	90.47	90.51
WATER HEATER	ELEC	36.77	36.89	36.95	37.02	37.16	37.29	37.37	37.51	37.66	37.81	37.95	38.10	38.20	38.31	38.43	38.55	38.66	38.78	38.90	39.02	39.13
	GAS	59.57	59.47	59.43	59.38	59.25	59.15	59.07	58.96	58.83	58.71	58.59	58.47	58.40	58.31	58.22	58.13	58.03	57.94	57.85	57.76	57.68
	OIL	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.48	3.45	3.43	3.40	3.38	3.35	3.33	3.30	3.28	3.25	3.22	3.19
COOK	ELEC	65.53	65.56	65.58	65.59	65.63	65.66	65.68	65.71	65.75	65.79	65.82	65.85	65.87	65.88	65.90	65.91	65.93	65.95	65.96	65.98	65.99
	GAS	27.50	27.49	27.48	27.49	27.47	27.46	27.45	27.44	27.42	27.40	27.38	27.36	27.37	27.36	27.36	27.36	27.36	27.36	27.36	27.36	27.37
	OIL	6.97	6.96	6.94	6.92	6.90	6.88	6.87	6.85	6.83	6.81	6.80	6.78	6.77	6.75	6.74	6.72	6.71	6.69	6.68	6.66	6.65
REFRIGERATOR 1		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
REFRIGERATOR 2		14.22	14.26	14.29	14.34	14.39	14.43	14.47	14.51	14.55	14.59	14.64	14.69	14.75	14.81	14.87	14.94	15.00	15.07	15.14	15.21	15.28
FREEZER		49.76	49.93	50.09	50.29	50.46	50.63	50.79	50.96	51.13	51.29	51.45	51.62	51.80	51.98	52.16	52.33	52.52	52.69	52.87	53.05	53.23
DISH		39.96	40.18	40.41	40.57	40.79	41.01	41.24	41.46	41.67	41.89	42.13	42.36	42.53	42.73	42.93	43.13	43.33	43.54	43.75	43.96	44.18
WASHER		84.71	84.74	84.77	84.79	84.83	84.88	84.93	84.98	85.04	85.10	85.17	85.25	85.30	85.37	85.44	85.51	85.58	85.65	85.72	85.80	85.88
DRYER	ELEC	70.94	71.10	71.25	71.37	71.53	71.69	71.85	72.01	72.17	72.33	72.50	72.67	72.81	72.97	73.12	73.27	73.43	73.59	73.74	73.90	74.06
	GAS	10.77	10.80	10.83	10.87	10.89	10.92	10.95	10.97	11.00	11.02	11.04	11.06	11.09	11.11	11.14	11.16	11.19	11.21	11.24	11.27	11.29
MICRO		82.76	83.13	83.49	83.83	84.17	84.50	84.82	85.13	85.44	85.73	86.02	86.31	86.59	86.86	87.13	87.39	87.65	87.90	88.15	88.39	88.63
OTHER ELECTRIC		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

KENTUCKY UTILITIES COMPANY
1999 FORECAST
FERS FORECAST
AVERAGE SHARES (%)

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	30.49	30.08	29.64	29.54	29.11	28.84	28.59	28.35	28.12	27.88	27.67	27.48	27.38	27.25	27.14	27.04	26.94	26.84	26.76	26.68	26.60
	GFURN	1.78	1.68	1.59	1.54	1.48	1.41	1.35	1.30	1.24	1.20	1.15	1.11	1.09	1.06	1.04	1.01	0.99	0.97	0.95	0.93	0.91
	OFURN	5.68	5.34	5.03	4.86	4.62	4.40	4.20	4.00	3.82	3.65	3.50	3.36	3.28	3.18	3.09	3.01	2.93	2.85	2.78	2.72	2.65
	HPMP	34.44	36.00	37.44	38.14	39.37	40.39	41.34	42.26	43.12	43.94	44.69	45.38	45.80	46.29	46.74	47.16	47.56	47.94	48.30	48.65	48.98
	GHPMP	2.64	2.61	2.55	2.52	2.49	2.46	2.43	2.40	2.37	2.35	2.33	2.31	2.31	2.30	2.29	2.28	2.27	2.26	2.26	2.25	2.24
	GH2O	0.35	0.33	0.31	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.18	0.18	0.17	0.17
	OH2O	0.35	0.33	0.31	0.30	0.28	0.27	0.26	0.25	0.23	0.22	0.22	0.21	0.20	0.20	0.19	0.18	0.18	0.18	0.17	0.17	0.16
	EROOM	24.10	23.48	22.98	22.66	22.23	21.82	21.45	21.08	20.74	20.43	20.12	19.83	19.64	19.42	19.22	19.04	18.85	18.68	18.51	18.35	18.20
	GROOM	0.09	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04
	OROOM	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
COOLING	CAC	31.81	31.17	30.54	30.31	29.76	29.35	28.97	28.61	28.27	27.93	27.63	27.36	27.21	27.03	26.87	26.72	26.57	26.44	26.32	26.20	26.09
	HPMP	34.44	36.00	37.44	38.14	39.37	40.39	41.34	42.26	43.12	43.94	44.69	45.38	45.80	46.29	46.74	47.16	47.56	47.94	48.30	48.65	48.98
	GHPMP	2.64	2.61	2.55	2.52	2.49	2.46	2.43	2.40	2.37	2.35	2.33	2.31	2.31	2.30	2.29	2.28	2.27	2.26	2.26	2.25	2.24
	RAC	23.20	22.43	21.79	21.41	20.90	20.41	19.96	19.53	19.13	18.76	18.41	18.09	17.89	17.66	17.45	17.25	17.06	16.88	16.71	16.55	16.39
	NONE	23.20	22.43	21.79	21.41	20.90	20.41	19.96	19.53	19.13	18.76	18.41	18.09	17.89	17.66	17.45	17.25	17.06	16.88	16.71	16.55	16.39
SEC. HEAT	STOVE	3.34	3.46	3.53	3.57	3.64	3.70	3.76	3.81	3.86	3.91	3.97	4.02	4.06	4.10	4.13	4.17	4.20	4.23	4.26	4.29	4.31
	FIRE	3.39	3.48	3.53	3.56	3.61	3.66	3.70	3.74	3.78	3.81	3.86	3.90	3.93	3.96	3.99	4.01	4.04	4.06	4.08	4.11	4.13
	ELEC	4.69	4.72	4.72	4.73	4.74	4.75	4.76	4.77	4.78	4.79	4.80	4.81	4.82	4.83	4.84	4.85	4.86	4.87	4.88	4.89	4.90
SEC. COOL	SRAC	4.20	4.18	4.13	4.10	4.08	4.06	4.03	4.01	3.99	3.97	3.97	3.96	3.95	3.95	3.95	3.94	3.94	3.93	3.93	3.93	3.92
VENT		75.04	75.71	76.26	76.60	77.07	77.50	77.91	78.30	78.67	79.01	79.35	79.65	79.86	80.08	80.30	80.50	80.69	80.88	81.05	81.22	81.39
WATER HEATER	ELEC	96.80	96.98	97.15	97.24	97.37	97.49	97.60	97.70	97.80	97.89	97.98	98.05	98.09	98.15	98.19	98.24	98.28	98.32	98.36	98.40	98.43
	GAS	2.42	2.28	2.15	2.09	1.99	1.90	1.81	1.73	1.66	1.59	1.53	1.47	1.44	1.40	1.36	1.33	1.30	1.27	1.24	1.21	1.19
	OIL	0.78	0.74	0.70	0.67	0.64	0.61	0.59	0.56	0.54	0.52	0.50	0.48	0.47	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.38
COOK	ELEC	100.00	97.94	96.16	95.05	93.74	92.46	91.26	90.15	89.12	88.20	87.32	86.53	86.00	85.41	84.87	84.37	83.89	83.43	83.01	82.60	82.21
	GAS	0.00	1.73	3.26	4.22	5.33	6.42	7.44	8.40	9.27	10.06	10.79	11.47	11.92	12.42	12.89	13.32	13.73	14.13	14.50	14.85	15.19
	OIL	0.00	0.34	0.59	0.72	0.92	1.12	1.29	1.46	1.61	1.74	1.88	2.01	2.08	2.16	2.24	2.31	2.38	2.44	2.50	2.55	2.60
REFRIGERATOR 1		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
REFRIGERATOR 2		10.29	10.53	10.72	10.87	11.09	11.29	11.48	11.67	11.85	12.02	12.21	12.39	12.56	12.72	12.89	13.05	13.22	13.38	13.54	13.71	13.87
FREEZER		43.77	44.30	44.68	44.87	45.24	45.56	45.86	46.16	46.43	46.69	46.97	47.22	47.37	47.55	47.72	47.88	48.04	48.18	48.33	48.47	48.60
DISH		49.83	50.50	50.98	51.22	51.76	52.25	52.70	53.14	53.56	53.97	54.41	54.83	55.10	55.42	55.72	56.02	56.32	56.61	56.90	57.18	57.47
WASHER		78.50	78.94	79.01	79.16	79.35	79.60	79.84	80.09	80.34	80.57	80.88	81.18	81.38	81.61	81.84	82.06	82.27	82.49	82.70	82.91	83.11
DRYER	ELEC	76.18	76.50	76.51	76.64	76.80	77.00	77.18	77.37	77.56	77.73	77.99	78.22	78.42	78.63	78.84	79.04	79.24	79.44	79.63	79.83	80.02
	GAS	3.41	3.53	3.61	3.68	3.74	3.81	3.87	3.93	3.99	4.04	4.09	4.14	4.19	4.24	4.28	4.33	4.37	4.41	4.45	4.49	4.53
MICRO		87.75	88.05	88.24	88.46	88.68	88.89	89.09	89.27	89.45	89.62	89.81	89.99	90.18	90.36	90.53	90.70	90.86	91.02	91.18	91.33	91.48
OTHER ELECTRIC		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

OLD DOMINION POWER COMPANY
1999 FORECAST
AVERAGE SHARES (%)

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	10.98	10.86	10.75	10.65	10.53	10.45	10.35	10.26	10.17	10.09	10.01	9.94	9.86	9.80	9.73	9.67	9.68	9.56	9.55	9.51	9.47
	GFURN	0.44	0.46	0.49	0.52	0.55	0.58	0.60	0.63	0.66	0.69	0.71	0.74	0.77	0.79	0.82	0.84	0.86	0.89	0.91	0.94	0.96
	OFURN	32.44	32.15	31.79	31.59	31.37	31.28	30.93	30.59	30.35	30.14	29.93	29.73	29.52	29.31	29.11	28.90	28.84	28.49	28.29	28.23	28.17
	HPMP	30.13	30.54	31.03	31.33	31.67	31.84	32.35	32.86	33.18	33.47	33.74	34.02	34.31	34.59	34.87	35.15	35.17	35.72	35.92	36.02	36.12
	GH2O	1.71	1.69	1.67	1.66	1.66	1.65	1.64	1.62	1.61	1.60	1.59	1.58	1.57	1.56	1.55	1.54	1.53	1.52	1.50	1.50	1.50
	OH2O	1.68	1.66	1.64	1.63	1.62	1.61	1.59	1.57	1.55	1.54	1.52	1.51	1.49	1.48	1.46	1.45	1.44	1.42	1.40	1.40	1.39
	EROOM	22.23	22.23	22.21	22.19	22.16	22.14	22.08	22.01	22.00	21.99	21.99	21.98	21.97	21.95	21.93	21.90	21.94	21.84	21.86	21.84	21.82
	GROOM	0.20	0.20	0.21	0.22	0.22	0.23	0.24	0.24	0.25	0.26	0.26	0.27	0.27	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.30
	OROOM	0.20	0.20	0.21	0.21	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.26
COOLING	CAC	12.78	12.82	12.85	12.90	12.93	12.99	13.03	13.07	13.12	13.16	13.21	13.26	13.31	13.36	13.42	13.47	13.59	13.59	13.68	13.76	13.84
	HPMP	30.13	30.54	31.03	31.33	31.67	31.84	32.35	32.86	33.18	33.47	33.74	34.02	34.31	34.59	34.87	35.15	35.17	35.72	35.92	36.02	36.12
	RAC	27.17	27.23	27.23	27.36	27.47	27.68	27.66	27.63	27.67	27.73	27.78	27.83	27.87	27.90	27.93	27.95	28.12	27.97	27.97	28.13	28.28
	NONE	29.92	29.41	28.88	28.41	27.93	27.48	26.96	26.45	26.04	25.64	25.26	24.89	24.51	24.15	23.78	23.42	23.12	22.72	22.42	22.09	21.76
SEC. HEAT	STOVE	0.56	0.56	0.56	0.55	0.55	0.55	0.55	0.55	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
	FIRE	0.72	0.72	0.71	0.71	0.71	0.71	0.71	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.69	0.70	0.69	0.69	0.69
	ELEC	1.44	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.46	1.46	1.47	1.47	1.48	1.48	1.49	1.50	1.51	1.51	1.52	1.52	1.53
SEC. COOL	SRAC	3.95	3.96	3.97	3.99	4.01	4.04	4.05	4.05	4.06	4.07	4.08	4.09	4.10	4.11	4.12	4.12	4.15	4.13	4.14	4.16	4.19
VENT		73.98	74.01	74.06	74.09	74.12	74.15	74.24	74.33	74.36	74.38	74.40	74.43	74.46	74.49	74.53	74.57	74.55	74.67	74.68	74.70	74.73
WATER HEATER	ELEC	95.62	95.69	95.76	95.80	95.85	95.87	95.93	95.98	96.02	96.06	96.10	96.14	96.18	96.22	96.26	96.30	96.32	96.37	96.41	96.43	96.45
	GAS	1.76	1.74	1.72	1.70	1.69	1.68	1.67	1.66	1.65	1.64	1.63	1.62	1.60	1.59	1.58	1.57	1.57	1.55	1.54	1.53	1.53
	OIL	2.62	2.57	2.53	2.49	2.46	2.44	2.40	2.36	2.33	2.30	2.27	2.24	2.21	2.19	2.16	2.13	2.11	2.08	2.05	2.03	2.02
COOK	ELEC	87.13	87.07	87.04	86.95	86.87	86.74	86.69	86.64	86.57	86.50	86.43	86.36	86.30	86.23	86.17	86.11	85.93	85.99	85.90	85.77	85.64
	GAS	7.69	7.82	7.95	8.10	8.23	8.39	8.53	8.66	8.79	8.92	9.05	9.17	9.29	9.41	9.53	9.64	9.84	9.86	10.00	10.16	10.31
	OIL	5.19	5.11	5.01	4.96	4.90	4.87	4.78	4.70	4.64	4.58	4.52	4.47	4.41	4.36	4.30	4.25	4.23	4.15	4.09	4.07	4.05
REFRIGERATOR 1		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
REFRIGERATOR 2		10.30	10.39	10.49	10.58	10.66	10.76	10.90	11.04	11.16	11.27	11.39	11.52	11.65	11.80	11.96	12.13	12.33	12.49	12.69	12.87	13.05
FREEZER		49.83	49.85	49.80	49.90	49.97	50.15	50.12	50.11	50.21	50.33	50.48	50.63	50.78	50.95	51.13	51.31	51.62	51.71	51.93	52.20	52.46
DISH		32.36	32.95	33.52	34.24	35.01	35.82	36.56	37.37	38.32	39.39	40.52	41.73	43.06	44.51	46.09	47.80	49.38	51.40	53.00	54.56	56.10
WASHER		89.10	89.15	89.15	89.24	89.36	89.46	89.47	89.50	89.66	89.86	90.06	90.27	90.49	90.72	90.96	91.21	91.41	91.74	91.98	92.16	92.33
DRYER	ELEC	86.88	86.88	86.83	86.88	86.94	87.02	86.96	86.92	87.02	87.16	87.31	87.47	87.64	87.83	88.02	88.23	88.42	88.67	88.88	89.04	89.18
	GAS	3.80	3.80	3.80	3.82	3.85	3.87	3.89	3.91	3.93	3.96	3.99	4.02	4.05	4.08	4.11	4.15	4.16	4.22	4.23	4.26	4.29
MICRO		81.98	82.41	82.84	83.24	83.63	84.00	84.42	84.84	85.21	85.56	85.90	86.24	86.58	86.91	87.24	87.56	87.86	88.19	88.47	88.77	89.06
OTHER ELECTRIC		81.98	82.41	82.84	83.24	83.63	84.00	84.42	84.84	85.21	85.56	85.90	86.24	86.58	86.91	87.24	87.56	87.86	88.19	88.47	88.77	89.06

KENTUCKY UTILITIES COMPANY
1999 FORECAST
AVERAGE UEC'S
RS - SINGLE FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	7875	7960	8343	9717	8653	7169	8701	8745	8745	8755	8776	8810	8837	8878	8926	8967	9016	9071	9124	9177	9229
	GFURN	41861	40773	41060	45539	40119	31652	38456	37851	37341	37012	36742	36541	36411	36248	36127	35985	35876	35828	35800	35788	35792
	OFURN	37127	37073	37746	42305	38300	30952	37520	37126	36771	36548	36375	36256	36178	36079	36021	35953	35920	35928	35934	35946	35968
	HPMP	8690	8735	9097	10522	9290	7636	9196	9192	9162	9161	9188	9244	9308	9385	9470	9547	9626	9704	9776	9842	9901
	GH2O	43500	42818	43434	48269	42586	33562	40627	39857	39227	38830	38549	38378	38277	38217	38190	38142	38128	38178	38245	38324	38403
	OH2O	38105	38109	38834	43491	39365	31797	38514	38073	37694	37477	37342	37284	37265	37265	37310	37346	37416	37528	37634	37742	37847
	EROOM	4801	4861	5104	5950	5306	4402	5353	5388	5395	5409	5431	5460	5481	5512	5547	5578	5614	5653	5692	5730	5767
	GROOM	42791	40018	39671	44428	39505	31369	38249	37786	37436	37288	37233	37219	37177	37119	37088	37033	37011	37059	37133	37228	37332
	OROOM	37856	37286	37763	42413	38506	31194	37890	37566	37300	37186	37144	37115	37060	37000	36977	36937	36926	36962	36997	37040	37084
COOLING	CAC	2665	2367	2795	2112	1968	3057	2555	2546	2526	2511	2502	2498	2498	2500	2505	2508	2514	2522	2531	2540	2550
	HPMP	2335	2097	2488	1876	1733	2672	2215	2194	2168	2151	2143	2142	2146	2152	2161	2168	2178	2189	2201	2213	2225
	RAC	1425	1269	1504	1137	1064	1667	1412	1424	1429	1435	1444	1453	1460	1469	1479	1486	1495	1504	1514	1523	1532
SEC. HEAT	STOVE	19000	18902	19010	21374	19160	15082	18115	17978	17785	17620	17465	17361	17243	17113	17028	16900	16813	16726	16677	16624	16602
	FIRE	19000	18902	19011	21375	19162	15084	18118	17981	17789	17625	17470	17366	17248	17119	17034	16906	16819	16733	16684	16631	16610
	ELEC	263	264	273	319	285	236	285	289	289	288	287	287	285	285	285	284	285	285	285	285	285
SEC. COOL	SRAC	320	291	347	264	248	389	328	329	329	328	328	328	327	327	328	328	328	328	329	329	329
VENT		555	540	588	590	539	553	586	588	588	591	594	599	602	606	610	614	617	621	625	628	631
WATER HEATER	ELEC	4159	4134	4207	4288	4195	4329	4276	4296	4271	4242	4214	4192	4157	4135	4120	4095	4080	4066	4047	4032	4019
	GAS	28381	27907	28210	27632	26860	26830	27073	26713	26462	26351	26263	26208	26123	25997	25901	25752	25646	25585	25515	25467	25425
	OIL	28381	28208	28152	27345	27348	28171	27982	27593	27261	27026	26813	26637	26436	26212	26040	25831	25672	25539	25375	25234	25104
COOK	ELEC	1008	1011	1031	1048	1023	1057	1052	1048	1044	1042	1041	1039	1038	1036	1035	1034	1032	1031	1030	1029	1028
	GAS	3439	3393	3352	3312	3268	3227	3190	3154	3118	3089	3063	3039	3016	2992	2971	2950	2931	2914	2898	2885	2872
	OIL	3439	3395	3352	3312	3271	3236	3202	3169	3135	3106	3080	3054	3029	3003	2978	2954	2932	2911	2891	2872	2854
REFRIGERATOR 1		1699	1679	1691	1702	1636	1659	1611	1575	1532	1488	1447	1410	1375	1344	1317	1291	1267	1244	1223	1206	1194
REFRIGERATOR 2		891	862	855	846	802	804	775	752	728	706	685	665	644	625	607	589	572	557	542	528	515
FREEZER		1401	1399	1426	1452	1417	1462	1448	1445	1435	1422	1409	1399	1389	1381	1377	1372	1370	1370	1371	1373	1375
DISH		355	347	348	350	340	350	347	347	345	344	343	342	341	340	340	340	339	339	339	339	339
WASHER		121	121	124	126	124	128	127	128	127	127	127	127	127	127	127	128	128	128	128	128	128
DRYER	ELEC	1114	1105	1119	1134	1101	1131	1116	1111	1101	1093	1085	1079	1071	1065	1061	1056	1053	1051	1049	1048	1047
	GAS	3801	3711	3684	3606	3514	3473	3455	3398	3350	3317	3289	3264	3239	3211	3189	3166	3149	3138	3131	3127	3126
MICRO		161	162	166	169	166	172	172	172	172	172	172	172	171	171	171	171	171	172	172	172	172
OTHER ELECTRIC		1850	1926	2044	2164	2197	2354	2420	2507	2584	2659	2736	2815	2888	2964	3042	3117	3194	3271	3347	3424	3501
FUELS	ELEC	10460	10317	10897	10732	10414	11424	11200	11276	11300	11328	11367	11424	11462	11522	11596	11661	11739	11822	11905	11985	12091
	GAS	482	470	474	501	458	398	447	440	435	431	428	426	425	422	421	419	417	416	415	415	414
	OIL	11	11	11	12	11	9	11	10	10	10	10	10	10	10	10	10	10	10	10	9	9
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

KENTUCKY UTILITIES COMPANY
1999 FORECAST
AVERAGE UEC'S
RS - MULTI-FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	3185	3219	3361	3908	3479	2882	3499	3516	3516	3519	3526	3537	3544	3557	3573	3586	3602	3619	3636	3653	3669
	GFURN	33135	32343	32432	35906	31625	24966	30348	29884	29497	29239	29056	28922	28825	28705	28617	28510	28429	28390	28369	28361	28365
	OFURN	29387	29398	29878	33443	30307	24530	29783	29516	29281	29135	29032	28963	28889	28810	28762	28703	28672	28670	28666	28669	28680
	HPMP	2039	2052	2132	2463	2176	1789	2157	2157	2150	2149	2155	2167	2180	2196	2214	2230	2247	2263	2278	2292	2304
	GH2O	34432	33910	34303	38058	33576	26471	32056	31458	30975	30658	30427	30276	30161	30083	30029	29957	29912	29911	29925	29948	29971
	OH2O	30162	30174	30656	34271	31014	25058	30359	30017	29731	29556	29441	29380	29332	29303	29308	29304	29327	29377	29424	29472	29518
	EROOM	2831	2862	2991	3479	3100	2570	3123	3141	3144	3148	3156	3168	3174	3187	3201	3213	3228	3245	3260	3276	3291
	GROOM	33871	31672	31281	34962	31062	24655	30050	29675	29392	29252	29180	29135	29062	28974	28908	28823	28762	28752	28762	28789	28824
	OROOM	29965	29503	29767	33362	30262	24504	29752	29482	29264	29149	29086	29029	28946	28858	28799	28727	28677	28659	28641	28630	28621
COOLING	CAC	1665	1482	1743	1315	1225	1904	1592	1587	1575	1565	1561	1559	1559	1561	1564	1566	1570	1575	1580	1586	1592
	HPMP	1134	1023	1213	914	846	1307	1085	1076	1064	1056	1052	1051	1052	1054	1058	1060	1063	1068	1072	1076	1081
	RAC	715	636	751	567	530	830	703	708	710	713	716	720	722	726	729	732	735	738	742	745	748
SEC. HEAT	STOVE	16000	15973	16115	18144	16317	12886	15532	15463	15345	15251	15172	15135	15061	14987	14949	14872	14831	14790	14780	14768	14783
	FIRE	16000	15954	16043	18045	16190	12759	15343	15243	15095	14972	14873	14817	14742	14660	14615	14533	14486	14440	14424	14407	14416
	ELEC	16000	15954	16043	18045	16190	12759	15343	15243	15095	14972	14873	14817	14742	14660	14615	14533	14486	14440	14424	14407	14416
SEC. COOL	SRAC	213	194	231	176	166	260	219	220	220	220	220	220	220	220	221	221	222	222	222	223	223
VENT		312	303	329	331	301	307	326	327	328	329	330	332	334	336	337	339	340	342	344	345	346
WATER HEATER	ELEC	2896	2878	2928	2983	2917	3009	2972	2985	2968	2946	2926	2911	2885	2869	2858	2840	2829	2818	2804	2792	2783
	GAS	19762	19428	19637	19230	18690	18666	18831	18578	18400	18319	18253	18210	18145	18052	17980	17871	17791	17743	17687	17647	17612
	OIL	19762	19638	19599	19034	19036	19597	19454	19177	18940	18772	18620	18494	18350	18191	18068	17919	17805	17710	17591	17489	17394
COOK	ELEC	1008	1011	1031	1048	1023	1057	1052	1048	1044	1042	1040	1039	1038	1036	1035	1033	1032	1031	1030	1028	1027
	GAS	3439	3396	3354	3314	3271	3230	3194	3158	3123	3094	3069	3045	3022	2999	2977	2957	2938	2920	2905	2891	2878
	OIL	3439	3401	3364	3325	3288	3255	3224	3192	3160	3132	3108	3083	3058	3032	3007	2983	2960	2939	2919	2899	2881
REFRIGERATOR 1		1465	1452	1463	1473	1417	1439	1399	1369	1332	1295	1261	1230	1200	1173	1150	1127	1106	1086	1067	1052	1040
REFRIGERATOR 2		891	865	859	851	808	811	782	760	737	715	694	674	653	634	616	597	580	564	549	534	521
FREEZER		1400	1399	1426	1451	1417	1462	1448	1445	1435	1423	1410	1400	1389	1382	1377	1373	1371	1371	1371	1373	1376
DISH		227	222	222	224	217	224	222	222	221	220	219	219	218	218	218	217	217	217	217	217	217
WASHER		81	81	83	84	83	86	85	85	85	85	85	85	85	85	85	85	85	85	86	86	86
DRYER	ELEC	923	916	928	940	914	939	927	923	915	907	901	896	890	885	881	877	874	872	871	870	869
	GAS	3149	3075	3048	2983	2906	2871	2855	2807	2768	2740	2717	2698	2677	2655	2637	2619	2605	2596	2590	2588	2587
MICRO		168	169	173	177	173	180	179	180	180	179	179	179	179	179	179	179	179	179	179	179	179
OTHER ELECTRIC		1764	1836	1949	2064	2094	2244	2307	2390	2463	2536	2609	2684	2754	2826	2901	2972	3045	3118	3192	3265	3338
FUELS	ELEC	7702	7649	8043	8042	7814	8427	8352	8419	8449	8480	8519	8571	8610	8664	8727	8784	8850	8919	8988	9062	9141
	GAS	382	373	375	396	362	316	353	348	343	341	338	337	335	333	331	329	328	326	325	325	324
	OIL	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

KENTUCKY UTILITES COMPANY
1999 FORECAST
AVERAGE UEC'S
RS - MOBILE HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	5991	6043	6299	7300	6485	5362	6495	6513	6499	6491	6489	6496	6494	6503	6518	6527	6543	6561	6578	6596	6613
	GFURN	24881	24100	24049	26410	23144	18157	21940	21466	21055	20752	20490	20266	20064	19856	19674	19486	19320	19187	19070	18964	18869
	OFURN	22066	21873	22032	24428	21960	17615	21196	20808	20452	20177	19935	19725	19534	19339	19169	19000	18853	18728	18607	18492	18386
	HPMP	4766	4794	4981	5751	5081	4178	5037	5036	5021	5019	5031	5058	5085	5121	5160	5195	5231	5265	5296	5323	5346
	GH2O	25855	25268	25347	27890	24433	19117	22977	22373	21858	21479	21166	20917	20714	20532	20372	20206	20062	19951	19854	19765	19680
	OH2O	22649	22514	22716	25216	22681	18202	21904	21502	21142	20873	20649	20469	20316	20173	20056	19937	19839	19761	19684	19609	19535
	EROOM	4242	4285	4473	5187	4610	3815	4625	4642	4637	4635	4638	4647	4650	4660	4675	4685	4700	4717	4734	4750	4766
	GROOM	25433	23607	23156	25692	22688	17888	21655	21230	20879	20641	20452	20288	20124	19949	19791	19625	19479	19369	19277	19196	19122
	OROOM	22500	22014	22073	24570	22158	17825	21498	21152	20848	20626	20441	20266	20090	19909	19750	19587	19441	19319	19201	19088	18978
COOLING	CAC	2102	1853	2165	1618	1498	2312	1920	1902	1877	1857	1840	1829	1818	1809	1803	1796	1791	1787	1784	1782	1780
	HPMP	2857	2575	3055	2300	2128	3286	2729	2706	2676	2655	2643	2641	2640	2645	2651	2655	2662	2671	2679	2688	2697
	RAC	1070	945	1106	828	768	1193	1002	1002	998	994	991	989	985	983	981	978	976	974	972	971	969
SEC. HEAT	STOVE	27000	26770	26829	29982	26789	21000	25124	24836	24473	24163	23879	23666	23415	23161	22967	22718	22526	22339	22202	22062	21966
	FIRE	27000	26750	26789	29918	26715	20927	25020	24716	24340	24017	23721	23496	23235	22971	22767	22510	22309	22113	21967	21819	21714
	ELEC	263	263	271	314	279	230	277	280	279	277	275	274	271	270	269	267	267	266	265	264	263
SEC. COOL	SRAC	267	241	286	216	202	314	263	262	260	258	256	255	253	252	251	249	248	247	246	245	244
VENT		427	418	447	460	420	410	447	448	448	449	451	453	455	457	459	461	463	464	466	468	469
WATER HEATER	ELEC	3146	3127	3182	3243	3173	3274	3235	3251	3233	3211	3191	3175	3150	3134	3123	3106	3095	3086	3073	3062	3053
	GAS	21468	21097	21317	20875	20292	20271	20457	20190	20006	19929	19869	19835	19779	19691	19627	19522	19450	19411	19366	19338	19314
	OIL	21468	21322	21278	20634	20628	21312	21221	20954	20716	20545	20384	20248	20090	19911	19772	19605	19477	19370	19241	19131	19028
COOK	ELEC	1008	1011	1031	1048	1023	1058	1053	1049	1045	1043	1042	1041	1039	1038	1037	1035	1034	1033	1032	1030	1029
	GAS	3439	3391	3348	3305	3260	3217	3179	3142	3106	3076	3050	3026	3002	2979	2958	2937	2918	2902	2887	2873	2861
	OIL	3439	3394	3351	3306	3264	3228	3194	3160	3126	3097	3071	3045	3019	2993	2967	2943	2920	2899	2879	2861	2843
REFRIGERATOR 1		1861	1829	1833	1832	1755	1772	1715	1671	1621	1572	1527	1487	1450	1418	1390	1365	1342	1321	1301	1285	1275
REFRIGERATOR 2		891	860	850	839	795	796	766	743	719	697	675	655	635	616	598	581	564	549	535	521	509
FREEZER		1403	1399	1425	1450	1414	1458	1443	1440	1429	1417	1404	1394	1383	1376	1372	1368	1366	1366	1367	1369	1372
DISH		311	302	302	304	295	304	301	301	300	298	298	297	296	296	296	296	296	296	296	296	296
WASHER		82	82	84	86	84	87	86	87	86	86	86	87	86	86	87	87	87	87	87	87	87
DRYER	ELEC	1374	1361	1377	1392	1352	1388	1369	1362	1350	1340	1331	1324	1314	1307	1302	1297	1293	1291	1289	1288	1288
	GAS	4688	4557	4509	4400	4279	4222	4196	4123	4063	4023	3989	3962	3932	3902	3877	3854	3837	3827	3822	3822	3824
MICRO		148	149	152	156	153	158	158	158	158	158	158	158	158	157	158	158	158	158	158	158	158
OTHER ELECTRIC		1796	1870	1984	2101	2133	2286	2350	2435	2509	2583	2658	2734	2805	2879	2954	3027	3101	3176	3250	3325	3400
FUELS	ELEC	10647	10522	10967	10930	10606	11354	11192	11243	11236	11229	11232	11253	11255	11281	11322	11355	11403	11455	11508	11567	11633
	GAS	160	156	157	167	152	130	148	146	144	143	142	141	141	140	140	139	139	139	139	139	139
	OIL	11	11	11	12	11	9	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

KENTUCKY UTILITIES COMPANYE
1999 FORECAST
AVERAGE UEC'S
FERS - SINGLE FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	7684	7480	7394	8700	7565	6016	7323	7279	7214	7143	7067	7028	7014	7009	7015	7022	7035	7050	7068	7091	7115
	GFURN	40094	40143	41030	45424	40644	32352	39403	38776	38296	37916	37541	37353	37240	37152	37142	37124	37132	37177	37248	37355	37474
	OFURN	36363	37090	38153	42606	39139	31925	38864	38529	38261	38020	37743	37616	37532	37450	37428	37417	37444	37497	37561	37662	37774
	HPMP	8400	8085	7920	9249	7988	6316	7648	7579	7499	7426	7356	7332	7339	7354	7381	7407	7437	7465	7493	7525	7554
	GHPMP	4755	4624	4552	5328	4604	3629	4377	4307	4220	4132	4043	3978	3929	3886	3851	3816	3790	3770	3756	3748	3745
	GH2O	42684	42777	43713	48317	43158	34261	41575	40802	40205	39736	39294	39070	38958	38905	38899	38886	38903	38960	39044	39166	39285
	OH2O	36895	37558	38546	42934	39341	32008	38865	38432	38098	37820	37537	37434	37406	37415	37483	37554	37656	37777	37901	38053	38199
	EROOM	4693	4651	4657	5520	4854	3895	4781	4789	4776	4757	4731	4726	4729	4738	4754	4769	4787	4806	4825	4848	4870
	GROOM	39692	39721	40584	44916	40185	31963	38878	38209	37720	37365	37049	36958	36908	36849	36832	36804	36805	36858	36954	37101	37263
	OROOM	35985	36626	37603	41917	38443	31309	38059	37636	37318	37063	36810	36732	36693	36655	36664	36668	36694	36748	36815	36918	37025
COOLING	CAC	2510	2159	2416	1850	1691	2534	2133	2112	2086	2061	2037	2025	2022	2021	2024	2026	2030	2035	2040	2046	2053
	HPMP	2180	1881	2110	1615	1470	2197	1845	1824	1800	1778	1757	1746	1744	1744	1746	1749	1753	1758	1763	1769	1775
	GHPMP	1575	1398	1603	1245	1153	1746	1486	1484	1477	1467	1457	1453	1452	1454	1459	1464	1470	1477	1483	1491	1499
	RAC	1365	1182	1327	1014	931	1406	1199	1200	1197	1191	1184	1182	1182	1184	1188	1192	1197	1201	1206	1212	1218
SEC. HEAT	STOVE	19000	18663	18555	20624	18337	14324	17055	16777	16477	16199	15922	15735	15576	15407	15288	15138	15030	14923	14854	14790	14726
	FIRE	19000	18661	18553	20621	18334	14322	17052	16774	16474	16195	15919	15732	15573	15405	15286	15136	15028	14921	14852	14788	14724
	ELEC	1467	1408	1371	1624	1410	1113	1349	1358	1349	1334	1317	1308	1296	1290	1288	1282	1281	1279	1278	1277	1276
SEC. COOL	SRAC	179	157	177	137	126	189	160	160	158	157	155	154	154	153	153	152	152	152	151	151	151
VENT		654	634	659	707	631	602	666	668	669	668	667	669	671	675	679	683	687	690	693	695	697
WATER HEATER	ELEC	4144	4013	3881	4051	3885	3854	3858	3869	3847	3813	3776	3753	3728	3709	3701	3681	3673	3661	3644	3625	3613
	GAS	28279	28009	28284	27631	26828	26711	26917	26455	26135	25894	25636	25459	25302	25079	24914	24673	24502	24360	24232	24124	24069
	OIL	28279	28051	27830	26933	26986	27744	27558	27121	26781	26482	26166	25935	25730	25473	25296	25057	24893	24753	24586	24426	24311
COOK	ELEC	1008	983	954	994	949	949	956	952	948	944	941	938	937	936	934	933	931	930	929	927	926
	GAS	0	2984	2990	2971	2938	2917	2908	2895	2882	2870	2858	2852	2848	2844	2839	2835	2830	2826	2822	2819	2816
	OIL	0	2984	2970	2942	2922	2927	2925	2915	2904	2891	2876	2866	2859	2851	2843	2835	2827	2819	2811	2803	2795
REFRIGERATOR 1		1675	1574	1491	1526	1425	1385	1355	1320	1282	1246	1212	1185	1162	1142	1126	1111	1099	1087	1077	1070	1066
REFRIGERATOR 2		879	833	792	808	757	737	721	701	679	657	635	616	598	582	568	553	541	529	519	511	504
FREEZER		1377	1331	1291	1347	1289	1286	1291	1289	1283	1274	1264	1258	1251	1247	1245	1242	1242	1242	1243	1245	1246
DISH		353	338	325	336	321	320	320	320	319	317	315	314	313	313	312	312	312	312	312	312	312
WASHER		119	116	113	118	114	114	114	115	114	114	114	113	113	113	113	113	113	113	113	113	114
DRYER	ELEC	1102	1063	1024	1061	1010	1002	1000	995	986	976	966	959	953	948	945	942	939	938	936	935	935
	GAS	3757	3647	3596	3501	3393	3343	3318	3259	3215	3180	3148	3131	3118	3104	3093	3082	3074	3070	3069	3070	3072
MICRO		161	157	154	161	155	155	157	157	157	156	156	156	155	155	156	155	156	156	156	156	156
OTHER ELECTRIC		3334	3361	3380	3633	3588	3686	3807	3914	4005	4088	4167	4257	4342	4418	4498	4574	4653	4731	4809	4888	4968
FUELS	ELEC	21193	20543	20441	21786	20231	19555	20587	20654	20638	20596	20547	20580	20626	20692	20790	20870	20975	21077	21175	21281	21394
	GAS	11	11	11	12	11	10	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	OIL	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

KENTUCKY UTILITIES COMPANY
1999 FORCAST
AVERAGE UEC'S
FERS - MULTI-FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	3106	3075	3064	3633	3187	2556	3140	3148	3142	3131	3119	3118	3119	3125	3135	3142	3153	3163	3173	3185	3196
	GFURN	25632	25552	25975	28738	25614	20343	24751	24342	24026	23771	23522	23377	23271	23178	23130	23075	23037	23022	23021	23040	23067
	OFURN	23247	23607	24149	26948	24656	20066	24400	24175	23991	23823	23636	23530	23442	23353	23298	23248	23221	23212	23208	23223	23245
	HPMP	1980	1899	1823	2118	1813	1426	1723	1704	1684	1665	1652	1647	1648	1651	1656	1660	1665	1670	1674	1679	1683
	GHPMP	4755	4699	4675	5520	4821	3845	4690	4664	4613	4554	4492	4446	4399	4361	4328	4292	4265	4242	4225	4215	4209
	GH2O	27288	27225	27665	30554	27181	21529	26097	25596	25206	24894	24603	24435	24328	24254	24208	24154	24120	24110	24117	24144	24169
	OH2O	23587	23905	24398	27154	24782	20117	24400	24114	23888	23696	23505	23413	23361	23327	23328	23329	23349	23380	23413	23459	23502
	EROOM	2754	2702	2657	3129	2719	2163	2636	2624	2602	2578	2557	2546	2541	2539	2541	2541	2544	2547	2551	2556	2561
	GROOM	25375	25282	25689	28411	25317	20092	24412	23977	23655	23415	23204	23120	23053	22978	22927	22867	22825	22816	22833	22878	22932
	OROOM	23005	23311	23800	26511	24217	19679	23895	23614	23399	23222	23050	22974	22915	22854	22819	22779	22753	22745	22743	22761	22782
COOLING	CAC	1567	1369	1544	1190	1097	1656	1406	1403	1395	1387	1379	1378	1379	1382	1387	1391	1396	1400	1405	1410	1415
	HPMP	1061	912	1001	762	687	1021	855	844	832	821	812	808	807	806	807	808	809	810	812	814	816
	GHPMP	1575	1407	1616	1261	1172	1786	1530	1538	1540	1539	1536	1539	1542	1549	1557	1565	1575	1584	1594	1604	1614
	RAC	685	586	646	491	445	667	565	562	556	551	546	543	542	541	541	542	542	543	544	545	546
SEC. HEAT	STOVE	5500	5474	5450	6071	5417	4243	5065	4993	4910	4833	4764	4719	4679	4635	4605	4564	4535	4507	4488	4471	4453
	FIRE	5500	5505	5524	6179	5545	4365	5233	5178	5110	5045	4984	4946	4909	4869	4842	4804	4778	4751	4736	4721	4705
	ELEC	1471	1439	1416	1689	1481	1180	1440	1459	1458	1449	1438	1434	1426	1423	1424	1422	1422	1423	1424	1425	1425
SEC. COOL	SRAC	97	85	96	74	68	103	87	87	86	85	84	84	84	83	83	83	83	83	83	83	83
VENT		335	318	339	336	303	328	337	339	340	340	340	341	342	344	346	348	350	352	353	355	356
WATER HEATER	ELEC	2891	2797	2703	2820	2704	2681	2684	2691	2676	2652	2626	2610	2592	2579	2574	2559	2554	2547	2535	2522	2514
	GAS	19708	19504	19686	19224	18661	18573	18718	18396	18173	18008	17828	17704	17595	17440	17328	17161	17045	16950	16863	16790	16757
	OIL	19708	19533	19370	18739	18771	19292	19163	18858	18623	18416	18197	18036	17893	17714	17594	17428	17317	17223	17110	17001	16926
COOK	ELEC	1008	983	954	994	949	949	956	952	948	944	940	938	937	935	934	933	931	930	929	927	926
	GAS	0	2984	2997	2977	2942	2920	2911	2897	2884	2872	2859	2853	2848	2844	2839	2835	2830	2826	2822	2819	2816
	OIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REFRIGERATOR 1		1440	1369	1293	1324	1238	1205	1181	1151	1118	1087	1059	1037	1016	999	985	971	960	949	939	932	928
REFRIGERATOR 2		881	837	792	808	756	736	720	700	678	656	635	617	600	585	570	557	544	533	523	514	507
FREEZER		1374	1330	1289	1343	1286	1283	1287	1286	1279	1270	1261	1255	1248	1244	1242	1240	1240	1240	1241	1243	1244
DISH		225	216	207	215	205	204	205	204	203	202	201	200	200	199	199	199	199	199	199	199	199
WASHER		80	78	76	79	76	76	77	77	77	77	76	76	76	76	76	76	76	76	76	76	76
DRYER	ELEC	913	882	848	879	837	829	828	823	816	808	799	794	789	785	782	780	778	776	775	775	774
	GAS	3112	3061	3032	2953	2868	2828	2806	2755	2716	2684	2656	2639	2626	2612	2601	2589	2580	2574	2571	2569	2568
MICRO		168	164	160	168	162	162	163	164	164	163	163	163	162	162	162	162	162	162	162	163	163
OTHER ELECTRIC		3224	3251	3268	3513	3470	3564	3681	3784	3872	3953	4029	4116	4198	4272	4349	4423	4499	4574	4650	4727	4803
FUELS	ELEC	13534	13115	12982	13627	12802	12718	13083	13135	13131	13109	13091	13118	13152	13190	13249	13294	13358	13420	13479	13544	13615
	GAS	18	17	17	17	16	14	15	14	14	14	13	13	13	13	13	13	12	12	12	12	12
	OIL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

KENTUCKY UTILITIES COMPANY
1999 FORCAST
AVERAGE UEC'S
FERS - MOBILE HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	5784	5637	5547	6494	5652	4486	5456	5421	5367	5316	5262	5231	5213	5200	5195	5189	5188	5188	5189	5193	5197
	GFURN	27395	27293	27726	30671	27322	21694	26390	25952	25611	25336	25069	24911	24793	24689	24633	24569	24523	24502	24497	24512	24535
	OFURN	24846	25218	25781	28766	26308	21404	26024	25782	25584	25402	25201	25084	24986	24886	24822	24764	24730	24715	24706	24716	24734
	HPMP	4623	4509	4439	5200	4521	3588	4364	4341	4308	4278	4249	4242	4244	4251	4264	4274	4285	4296	4305	4314	4322
	GHPMP	4755	4697	4670	5513	4813	3837	4680	4654	4602	4544	4481	4435	4388	4349	4314	4278	4250	4227	4209	4198	4191
	GH2O	29166	29084	29535	32617	29003	22966	27835	27299	26881	26546	26235	26052	25933	25850	25795	25732	25690	25674	25676	25698	25719
	OH2O	25210	25537	26047	28987	26442	21459	26025	25718	25475	25268	25063	24962	24901	24861	24856	24852	24868	24896	24925	24968	25008
	EROOM	4126	3958	3859	4484	3888	3075	3730	3701	3664	3629	3594	3575	3565	3559	3559	3558	3560	3564	3568	3575	3581
	GROOM	27121	27007	27425	30329	27014	21434	26039	25573	25228	24971	24744	24651	24576	24491	24431	24362	24312	24297	24309	24350	24402
	OROOM	24588	24903	25409	28301	25840	20992	25486	25185	24954	24763	24579	24495	24428	24357	24315	24268	24235	24221	24214	24226	24242
COOLING	CAC	1948	1675	1865	1420	1299	1942	1633	1615	1595	1576	1558	1549	1544	1541	1541	1540	1540	1540	1541	1542	1543
	HPMP	2673	2343	2644	2031	1863	2796	2360	2342	2319	2297	2276	2266	2262	2260	2261	2261	2263	2265	2267	2270	2273
	GHPMP	1575	1406	1614	1259	1170	1783	1527	1535	1536	1535	1533	1535	1538	1544	1552	1560	1569	1578	1587	1597	1607
	RAC	1025	876	969	734	668	1001	847	842	834	825	816	810	807	804	803	801	800	800	799	799	799
SEC. HEAT	STOVE	27000	26705	26611	29471	26358	20608	24550	24158	23726	23348	22979	22726	22498	22257	22085	21866	21704	21543	21436	21334	21232
	FIRE	27000	26724	26645	29523	26412	20657	24616	24230	23801	23425	23057	22806	22578	22337	22164	21945	21783	21622	21514	21412	21309
	ELEC	1456	1408	1374	1622	1417	1121	1359	1368	1360	1346	1331	1322	1311	1305	1302	1297	1295	1293	1291	1290	1288
SEC. COOL	SRAC	85	75	84	65	60	90	76	75	75	74	73	73	72	72	72	71	71	71	71	71	70
VENT		489	468	491	506	453	457	487	489	488	487	486	487	487	489	491	493	495	496	498	500	502
WATER HEATER	ELEC	3146	3047	2946	3075	2949	2926	2929	2937	2921	2895	2867	2849	2830	2816	2810	2794	2788	2780	2767	2752	2743
	GAS	21448	21243	21453	20961	20349	20261	20419	20070	19827	19645	19449	19314	19196	19026	18901	18719	18589	18482	18385	18303	18262
	OIL	21448	21243	21453	20961	20349	20261	20419	20070	19827	19645	19449	19314	19196	19026	18901	18719	18589	18482	18385	18303	18262
COOK	ELEC	1008	983	954	994	949	949	956	952	948	944	940	938	937	935	934	932	931	930	928	927	926
	GAS	0	2984	2992	2972	2942	2921	2911	2897	2884	2872	2860	2853	2849	2844	2840	2835	2830	2826	2822	2819	2816
	OIL	0	2984	2970	2938	2919	2925	2924	2915	2904	2890	2876	2866	2859	2851	2843	2835	2827	2819	2811	2803	2795
REFRIGERATOR 1		1811	1708	1615	1644	1542	1498	1465	1426	1385	1346	1311	1282	1257	1235	1218	1202	1188	1176	1165	1157	1153
REFRIGERATOR 2		880	832	790	802	751	731	714	694	672	650	629	610	592	576	562	549	536	525	516	507	501
FREEZER		1370	1325	1286	1340	1284	1280	1285	1283	1277	1268	1259	1252	1245	1241	1239	1237	1237	1237	1238	1239	1240
DISH		308	295	283	293	280	279	280	279	278	276	275	274	273	273	273	272	272	272	272	272	272
WASHER		81	79	77	80	77	77	78	78	78	78	77	77	77	77	77	77	77	77	77	77	77
DRYER	ELEC	1358	1311	1262	1306	1245	1234	1232	1225	1214	1202	1189	1181	1174	1168	1164	1160	1157	1155	1153	1152	1152
	GAS	4630	4526	4470	4345	4222	4159	4127	4052	3995	3951	3910	3886	3869	3850	3836	3820	3809	3802	3799	3799	3800
MICRO		148	145	141	148	142	143	144	144	144	144	143	143	143	143	143	143	143	143	143	143	143
OTHER ELECTRIC		3275	3302	3320	3569	3525	3621	3739	3844	3934	4016	4094	4182	4265	4340	4419	4493	4570	4647	4724	4802	4880
FUELS	ELEC	18112	17474	17329	18269	17016	16620	17306	17336	17298	17243	17184	17188	17203	17229	17283	17321	17383	17444	17504	17572	17647
	GAS	16	16	16	17	16	14	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	OIL	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

OLD DOMINION POWER COMPANY
1999 FORECAST
AVERAGE UEC'S
SINGLE FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	7895	8144.7	8191.6	8451.2	8567	8875.5	9037.9	9219.6	9419.3	9593.4	9802.3	10026	10275	10554	10855	11131	11452	11435	11479	11512	11579
	GFURN	41861	41593	41594	42343	42509	43983	44472	44896	45356	45640	46138	46695	47362	48145	49041	49861	51120	50528	50494	50449	50589
	OFURN	37127	37225	37118	37644	38248	39669	40529	41298	42105	42812	43675	44615	45684	46904	48201	49353	50625	50495	50532	50525	50682
	HPMP	9050	9317.2	9345.7	9608.7	9701.9	10010	10154	10339	10559	10771	11038	11339	11688	12072	12481	12862	13279	13311	13392	13449	13538
	GH2O	43500	43417	43542	44396	44633	46033	46472	46906	47347	47663	48163	48741	49476	50354	51345	52228	53295	52895	52722	52531	52523
	OH2O	38105	38506	38631	39349	40085	41606	42458	43206	43985	44654	45477	46374	47405	48594	49891	51080	52404	52358	52464	52535	52773
	EROOM	4962	5125.3	5162.3	5333.6	5416.8	5617.1	5729.3	5854.1	5989.2	6111.2	6253.7	6406.7	6577.3	6767	6971.2	7159.8	7356.6	7379.4	7409.8	7433.2	7478.4
	GROOM	42791	40407	39169	39397	38988	40014	39998	39980	40089	40006	40219	40488	40855	41368	41988	42535	43748	42773	42709	42633	42704
	OROOM	37856	37282	36685	36985	37208	38420	38838	39136	39535	39739	40176	40633	41164	41849	42625	43310	44663	43763	43795	43807	43963
COOLING	CAC	2526	2563.8	2550.2	2618	2651.2	2881.1	2932.6	2992.9	3061.7	3123	3198.2	3279.6	3370.6	3471.4	3579.1	3678.2	3799.4	3792.5	3815.9	3835.1	3864.9
	HPMP	2180	2241.7	2245.3	2305.3	2323.8	2511.2	2543.5	2584.1	2632.3	2676.1	2732.3	2795.3	2868.2	2949.6	3037.2	3117.7	3209	3208.7	3222.4	3232.7	3252.1
	RAC	1365	1389.1	1382.8	1417.1	1431.5	1554	1586	1621.6	1660.1	1694.6	1735.1	1777.1	1822.9	1872.9	1925.6	1972.8	2024.8	2023.7	2028.5	2031.4	2040.4
SEC. HEAT	STOVE	19000	18981	18943	19098	19087	19468	19510	19575	19661	19724	19813	19916	20040	20178	20335	20462	20648	20568	20627	20650	20715
	FIRE	19000	18983	18949	19106	19097	19480	19523	19590	19678	19742	19833	19937	20063	20203	20361	20489	20675	20598	20658	20681	20747
	ELEC	263	268.96	265.86	269	269.8	276.17	277.76	279.68	281.92	283.83	286.13	288.65	291.48	294.55	297.89	300.82	304.65	304.54	305.81	306.52	307.88
SEC. COOL	SRAC	320	326.45	325.66	328.82	329.46	353.15	354.54	356.27	358.25	359.76	361.75	363.89	366.3	368.98	371.95	374.4	377.6	376.69	376.93	376.52	376.96
VENT		564.56	580.94	586.48	604.16	616.19	645.39	660.07	675.33	691.02	704.8	720.34	736.44	753.83	772.84	792.17	808.32	824.74	820.05	817.12	813.51	812.5
WATER HEATER	ELEC	4159	4213	4161.8	4169.2	4155.9	4153.8	4142.8	4142.3	4140.4	4137.6	4139.7	4142.7	4151.2	4161.3	4178.1	4185.8	4199	4194.9	4191.2	4169.4	4171
	GAS	28381	28129	28436	28515	28627	28990	29036	29158	29169	29178	29226	29284	29386	29461	29581	29638	29732	29700	29645	29456	29430
	OIL	28381	28394	28282	27821	28206	28507	28757	28965	29113	29280	29499	29758	30097	30482	30943	31363	31834	32179	32460	32565	32816
COOK	ELEC	1008	1023.7	1024.9	1025	1022.8	1023	1020.8	1019.5	1018.3	1016.5	1015.3	1014.1	1013	1012	1012.3	1011.4	1011.6	1010.9	1011.5	1006.8	1007.3
	GAS	3439	3393.1	3356.1	3328.8	3296.8	3277	3251.8	3232	3213.8	3194.6	3178.7	3164.1	3150.7	3138.4	3131.9	3122.9	3118.6	3112.2	3110.9	3093.9	3093.4
	OIL	3439	3405.4	3375.3	3350.6	3320.4	3300.1	3273.7	3251.6	3230.6	3208.1	3188.6	3169.9	3152.3	3135.8	3125.3	3112.9	3105.9	3098	3095.8	3079	3079.6
REFRIGERATOR 1		1699	1702.7	1665.6	1638.2	1599.7	1562.1	1519.4	1475.5	1433.6	1392.3	1357	1326.9	1302.4	1283.3	1269.3	1258.7	1249.8	1236.8	1225	1215.5	1210.5
REFRIGERATOR 2		891	884.28	858.19	842.56	821.39	801.8	782.27	762.81	744.4	725.81	707.75	689.9	672.89	657	642.34	628.16	615.85	600.35	587.25	575.4	565.86
FREEZER		1401	1414.7	1397.6	1390	1377	1365	1353.2	1341.5	1330.2	1318.1	1306.7	1297.2	1290.3	1285.9	1283.9	1283.3	1284.7	1283.3	1283.7	1286.1	1289.8
DISH		355	352.98	345.41	342.61	339.55	338.77	337.87	337.6	337.69	337.69	338.2	338.99	340.13	341.5	343.33	344.65	346.29	346.39	346.92	346.01	346.58
WASHER		121	123.22	122.85	123.63	123.65	124.07	124.21	124.54	124.92	125.16	125.55	125.99	126.51	127.09	127.9	128.48	129.21	129.39	129.76	129.38	129.79
DRYER	ELEC	1114	1124.9	1113.2	1113.5	1107.1	1105.2	1100.2	1097.1	1094.5	1090.5	1088.1	1086.1	1084.7	1083.9	1085.8	1086.2	1088.8	1086.8	1087.5	1081.5	1083.5
	GAS	3801	3752.2	3738.3	3724.4	3695.7	3697.9	3675.9	3663.2	3648.1	3630.7	3620.6	3613.9	3611.1	3608.3	3615.2	3617.3	3627	3622	3624.2	3603.7	3610
MICRO		161	164.2	163.96	165.08	165.37	166	166.46	167.08	167.75	168.29	168.96	169.68	170.48	171.33	172.36	173.15	174.05	174.2	174.5	174.23	174.55
OTHER ELECTRIC		941	990.15	1018.6	1048.2	1072.3	1099.2	1124.6	1151.4	1179	1206	1234.4	1263.6	1294.1	1318.8	1345.6	1370.7	1397	1417.6	1439.7	1455.9	1478.2
FUELS	ELEC	15543	16067	16022	17162	15854	15227	16269	16242	16227	16222	16216	16255	16330	16402	16786	16570	16659	16742	16823	16913	17007
	GAS	22	14	15	16	15	13	15	15	15	15	14	14	15	15	15	15	15	15	15	15	15
	OIL	17	8	8	9	8	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

OLD DOMINION POWER COMPANY
1999 FORCAST
AVERAGE UEC'S
MULTI-FAMILY HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	3193	3270.3	3264.1	3333.6	3360.6	3463.7	3475.7	3500.1	3550.6	3601.2	3660.5	3724.1	3795.1	3873.7	3958.7	4035.7	4115.5	4123.4	4134.1	4138.7	4155.5
	GFURN	33135	32540	31960	32215	32238	33251	32576	31981	32061	32290	32590	32914	33291	33701	34168	34587	35052	34925	34837	34715	34724
	OFURN	29387	29323	29096	29259	29606	30563	30940	31224	31626	32016	32487	33003	33594	34264	34976	35594	36217	36193	36180	36114	36164
	HPMP	2122	2175.8	2176	2217.4	2228.8	2288.4	2301.4	2324.5	2359.2	2394.8	2439.8	2491.5	2551.8	2617.5	2687.7	2752.6	2817.5	2831.4	2844.9	2852.1	2866
	GH2O	34432	33794	33124	33226	33046	33844	33016	32254	32140	32188	32332	32523	32803	33152	33565	33922	34315	34121	33958	33763	33686
	OH2O	30162	30038	29556	29711	30012	30953	30820	30606	30811	31100	31466	31873	32352	32911	33530	34087	34674	34660	34670	34635	34711
	EROOM	2928	3011.1	3022.7	3096.7	3130.9	3230.8	3273.6	3322	3377.6	3428.3	3487.5	3550.8	3621.2	3698.9	3782.8	3859.2	3938.3	3948.6	3961.6	3968.5	3987.1
	GROOM	33871	31986	30861	31094	31061	31946	31328	30773	30811	30990	31262	31563	31919	32319	32774	33168	33589	33435	33319	33170	33137
	OROOM	29965	29497	28895	29088	29423	30389	30279	30094	30339	30671	31076	31494	31958	32487	33066	33577	34109	34053	34028	33964	34012
COOLING	CAC	1577	1581.7	1552.5	1571.6	1578.7	1701.5	1698.9	1705.6	1728.2	1752.9	1783.5	1817.9	1857.5	1900.9	1947.5	1990.1	2033.8	2041.4	2049.8	2054.7	2065.1
	HPMP	685	695.69	691.69	704.36	709.93	768.21	779.89	792.93	808.01	822.05	838.12	854.73	872.59	891.73	911.89	929.75	948.26	950.19	952.76	953.9	957.85
	RAC	685	695.69	691.69	704.36	709.93	768.21	779.89	792.93	808.01	822.05	838.12	854.73	872.59	891.73	911.89	929.75	948.26	950.19	952.76	953.9	957.85
SEC. HEAT	STOVE	16000	15973	15909	16043	16046	16374	16352	16351	16419	16493	16583	16687	16809	16942	17090	17212	17338	17333	17377	17390	17439
	FIRE	16000	15797	15487	15495	15390	15667	15278	14991	14980	15034	15105	15189	15291	15404	15530	15635	15744	15733	15768	15775	15815
	ELEC	263	267.36	261.71	263.75	263.74	269.71	266.77	264.83	266.06	268.01	270.25	272.72	275.53	278.53	281.8	284.68	287.63	288.43	289.4	289.84	290.9
SEC. COOL	SRAC	213	217.63	217.31	219.78	220.63	236.89	237.64	238.63	240.24	241.75	243.52	245.4	247.48	249.71	252.14	254.22	256.37	256.58	256.93	256.84	257.33
VENT		335.14	344.3	347.44	355.9	360.84	379.15	385.38	391.83	398.59	404.58	411.32	418.29	425.77	433.83	442.2	449.29	456.25	455.04	454.13	452.58	452.48
WATER HEATER	ELEC	2896	2929.4	2889.5	2892.5	2881.7	2878.4	2870.2	2870.5	2868.2	2864.6	2864.2	2864.4	2868.3	2873.1	2882.4	2885.1	2892	2886.1	2880.9	2863.7	2862.7
	GAS	19762	19570	19769	19810	19878	20117	20154	20250	20250	20241	20260	20284	20338	20372	20437	20456	20504	20458	20400	20253	20219
	OIL	19762	19757	19671	19340	19598	19794	19977	20133	20227	20324	20458	20618	20832	21078	21374	21640	21952	22152	22324	22378	22532
COOK	ELEC	1008	1023.7	1024.6	1024.8	1022.5	1022.7	1020.2	1018.9	1017.7	1015.9	1014.7	1013.6	1012.5	1011.5	1011.8	1011	1011.2	1010.5	1011.1	1006.5	1007
	GAS	3439	3382.8	3330.5	3303.6	3272.4	3256.1	3222.1	3197.7	3181.1	3164.9	3151.4	3138.8	3127.2	3116.3	3111	3103	3099.6	3094.1	3093.5	3077.3	3077.4
	OIL	3439	3406	3376.7	3352.5	3322.9	3302.8	3276.6	3254.8	3233.8	3211.6	3192	3173.4	3155.7	3139.1	3128.5	3115.9	3108.9	3100.5	3098.1	3081.2	3081.7
REFRIGERATOR 1		1465	1453.4	1398.9	1372	1337.8	1306.7	1252.2	1202.9	1168.7	1138.6	1112.7	1091	1073.7	1060.6	1051.6	1045.2	1040	1031.1	1023.4	1017.5	1015.3
REFRIGERATOR 2		891	876	839.49	822.9	801.46	783.32	755.59	730.48	713.29	697.97	682.78	667.63	653.1	639.44	626.82	614.5	603.32	589.88	577.91	567.04	558.38
FREEZER		1400	1410	1387.5	1378.8	1365.4	1353.5	1337.6	1323.1	1311.9	1301	1290.6	1282.2	1276.2	1272.7	1271.4	1271.5	1273.4	1272.5	1273.3	1276	1280
DISH		227	225.45	220.19	218.48	216.61	216.21	215.43	215.14	215.25	215.33	215.71	216.28	217.04	217.96	219.16	220.04	221.1	221.2	221.55	220.99	221.37
WASHER		81	82.485	82.198	82.72	82.728	83.01	83.072	83.268	83.521	83.691	83.959	84.26	84.614	85.004	85.55	85.943	86.452	86.563	86.824	86.582	86.872
DRYER	ELEC	923	930.03	917.31	917.23	911.75	910.37	903.51	898.95	896.87	894.28	892.81	891.65	891	890.77	892.81	893.54	896.13	894.86	895.82	891.26	893.34
	GAS	3149	3094	3062.8	3047.6	3023	3027	2994.5	2977.1	2967	2956.8	2951.8	2949.2	2949.4	2949.4	2957.3	2961.2	2971.5	2969.2	2973.3	2958.7	2966
MICRO		168	171.34	171.09	172.26	172.56	173.22	173.7	174.34	175.04	175.61	176.31	177.06	177.89	178.78	179.85	180.68	181.61	181.77	182.09	181.8	182.14
OTHER ELECTRIC		740	778.66	800.85	824.14	843.09	864.21	884.14	905.25	926.98	948.18	970.55	993.58	1017.5	1037	1058.1	1077.8	1098.6	1114.7	1132.1	1144.8	1162.5
FUELS	ELEC	9920	9525	9459	9884	9207	9160	9481	9449	9423	9405	9388	9393	9419	9441	9470	9498	9530	9559	9586	9621	9659
	GAS	10	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7
	OIL	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

OLD DOMINION POWER COMPANY
1999 FORCAST
AVERAGE UEC'S
MOBILE HOMES

END-USE	OPTION	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HEATING	EFURN	6007	6173.5	6195	6339.1	6404	6604	6690.3	6787.5	6892	6984.9	7093.5	7209.9	7339.6	7482.4	7637.4	7776.5	7920.5	7931.7	7943	7952.9	7986.2
	GFURN	24881	24562	24436	24637	24651	25402	25423	25401	25351	25284	25272	25294	25371	25472	25638	25769	25944	25709	25429	25306	25279
	OFURN	22066	21868	21582	21591	21745	22401	22602	22732	22858	22963	23118	23306	23547	23833	24160	24417	24681	24528	24304	24221	24217
	HPMP	4965	5083	5077.3	5163.3	5181.9	5315.5	5348.6	5401.3	5469	5537.2	5625.9	5728.9	5850.4	5981.7	6123	6250.9	6378.5	6395.5	6404.6	6417.2	6444.8
	GH2O	25855	25682	25671	25936	25967	26653	26728	26785	26825	26830	26901	27008	27185	27412	27694	27925	28183	27980	27763	27602	27538
	OH2O	22649	22775	22769	22977	23298	24058	24386	24639	24890	25103	25370	25666	26018	26425	26882	27285	27710	27675	27625	27605	27672
	EROOM	4387	4509.6	4526.2	4627.2	4670.8	4815.2	4873	4939.3	5011.1	5075.3	5151.2	5233.2	5325.4	5427.6	5539.3	5639.9	5744.6	5753.2	5762.7	5770.4	5795
	GROOM	25433	24050	23383	23512	23446	24092	24008	23909	23798	23689	23644	23634	23677	23749	23885	23975	24093	23830	23501	23375	23331
	OROOM	22500	22174	21871	21981	22203	22914	23090	23184	23271	23338	23450	23574	23735	23935	24185	24380	24594	24408	24155	24083	24092
COOLING	CAC	1992	2009.9	1989.7	2018.4	2031.1	2188.4	2208.3	2234	2264.4	2293.1	2329.1	2369.9	2417.3	2469	2524.8	2575.3	2626.8	2633.5	2639.2	2644.7	2657.3
	HPMP	2668	2721.9	2709.5	2749.3	2753	2957.9	2968.7	2988.9	3016.2	3042.9	3079.7	3123.4	3176.2	3234.7	3299	3356.5	3416.1	3418.5	3419.2	3423.1	3436.8
	RAC	1025	1027.4	1009.7	1017.5	1016	1091.7	1099.4	1109.4	1120.6	1130.3	1142.7	1155.8	1170.6	1186.9	1204.9	1219.8	1235.7	1231.2	1226.1	1223.1	1224
SEC. HEAT	STOVE	27000	26986	26947	27177	27181	27739	27793	27879	27984	28071	28183	28318	28485	28667	28876	29040	29211	29162	29170	29187	29266
	FIRE	27000	26809	26588	26706	26604	27109	27012	26957	26917	26871	26847	26848	26884	26931	27014	27053	27101	26947	26790	26766	26797
	ELEC	263	268.43	264.8	267.43	267.88	274.14	274.89	276.03	277.39	278.66	280.21	282.04	284.26	286.65	289.4	291.73	294.17	294.45	294.53	295	296.09
SEC. COOL	SRAC	267	270.15	267.41	268.35	267.42	285.54	284.93	284.71	284.68	284.51	284.68	285.06	285.74	286.63	287.85	288.68	289.66	288.51	287.24	286.27	285.99
VENT		490.14	500.76	503.48	515.04	521.48	547	555.05	563.7	572.66	580.45	589.26	598.37	608.23	618.81	629.93	639.32	648.58	646.84	645.23	643.5	643.76
WATER HEATER	ELEC	3146	3185.8	3146.1	3151.4	3141.2	3139.5	3130.7	3129.9	3128.1	3125.7	3126.9	3128.8	3134.8	3141.9	3153.8	3158.9	3168.5	3163.9	3160.9	3143.5	3143.9
	GAS	21468	21277	21508	21566	21650	21923	21957	22048	22056	22061	22096	22138	22212	22264	22350	22387	22455	22419	22374	22224	22197
	OIL	21468	21480	21397	21046	21336	21564	21757	21920	22039	22171	22343	22545	22805	23101	23452	23771	24140	24387	24618	24692	24877
COOK	ELEC	1008	1023.7	1024.8	1024.9	1022.6	1022.8	1020.5	1019.3	1018.1	1016.2	1015	1013.8	1012.8	1011.8	1012.2	1011.4	1011.8	1011.1	1011.9	1007.3	1007.8
	GAS	3439	3379.8	3333	3301.1	3266.3	3247.1	3220.3	3200	3181.6	3163.1	3148.1	3134.7	3122.9	3112.2	3107.5	3100.3	3098	3093.5	3094.5	3078.9	3079.6
	OIL	3439	3393.5	3352.2	3321.5	3287.1	3266.7	3236.2	3211.3	3188.1	3164.8	3145	3127	3110.7	3096.1	3088.2	3078.8	3075.3	3070.9	3074.2	3059.7	3062.5
REFRIGERATOR 1		1861	1850.2	1796	1760.5	1715.3	1674.9	1622	1569.8	1520.4	1474.5	1435.3	1403	1377.6	1358.4	1345.4	1336.4	1329.5	1318.4	1309.9	1301.9	1298.7
REFRIGERATOR 2		891	874.57	841.16	822.28	799.03	779.6	757.48	736.06	715.83	696.31	677.47	659.46	642.83	627.65	614.3	601.79	590.91	578.16	566.81	557.12	549.55
FREEZER		1403	1409	1385.2	1374.4	1359.2	1346.9	1332.8	1319.7	1307.6	1295.6	1284.8	1276.5	1270.9	1268	1267.6	1268.6	1271.5	1271.3	1273	1275.9	1280
DISH		311	307.91	300.53	297.84	295.11	294.48	293.71	293.55	293.72	293.84	294.42	295.25	296.38	297.7	299.42	300.69	302.23	302.43	302.99	302.26	302.84
WASHER		82	83.504	83.233	83.761	83.767	84.053	84.142	84.358	84.609	84.775	85.043	85.348	85.709	86.11	86.67	87.078	87.605	87.728	88.022	87.767	88.052
DRYER	ELEC	1374	1385	1368.5	1368.1	1359.7	1357.5	1350.4	1345.8	1342	1336.9	1333.6	1331.1	1329.5	1328.7	1331.5	1332.4	1336.2	1334.3	1335.9	1329	1331.9
	GAS	4688	4624.7	4605.2	4586.5	4551.3	4554.6	4525.5	4508.4	4488.3	4466.6	4453.6	4445.3	4442.1	4438.9	4448	4451.4	4464.5	4458.9	4463.1	4438.7	4447.1
MICRO		148	150.94	150.73	151.75	152.02	152.6	153.02	153.59	154.2	154.7	155.32	155.98	156.72	157.5	158.44	159.17	159.99	160.13	160.41	160.16	160.45
OTHER ELECTRIC		905	952.27	979.52	1008	1031.2	1057	1081.4	1107.2	1133.8	1159.7	1187.1	1215.3	1244.6	1268.5	1294.3	1318.5	1344	1363.7	1385.2	1400.7	1422.2
FUELS	ELEC	14902	13768	13674	14436	13357	13047	13697	13646	13604	13576	13547	13554	13593	13627	13669	13713	13760	13805	13848	13897	13951
	GAS	10	7	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	OIL	4	3	3	3	3	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2
	WOOD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

G:\FCAST00\1999 Fcst Writeup\Data Series.xls

KENTUCKY UTILITIES COMPANY
1999 FORECAST
MONTHLY COMMERCIAL MODEL

Rate Class	Series	Source	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Commercial	kWh/Customer															
	January	Internal	-	5632	5219	5218	5438	5750	5380	5798	5676	5801	6026	5974	6015	6068
	February	Internal	4843	4880	5332	5383	4949	5571	5434	5950	5708	5412	5024	5785	5826	5879
	March	Internal	4865	4731	4805	4782	5383	5141	4969	5367	4952	5257	5406	5467	5507	5561
	April	Internal	4977	4882	4779	4875	4945	5008	4759	5314	5005	5190	5243	5360	5405	5461
	May	Internal	4289	4526	4794	4857	4787	4809	4836	5244	4813	4939	5099	5164	5211	5266
	June	Internal	5329	5347	6107	5143	5383	5616	5543	5857	5244	6332	5893	5950	5997	6053
	July	Internal	5838	5826	5932	5743	6324	6385	6472	6410	6334	6669	6489	6535	6581	6634
	August	Internal	5503	5761	6220	5944	6205	6140	6762	6432	6715	6480	6507	6553	6600	6654
	September	Internal	6244	6273	6474	5690	6437	5840	6521	6366	6250	6716	6549	6596	6645	6700
	October	Internal	4642	5106	4976	4922	4986	5041	4865	5126	5347	5838	5358	5404	5456	5513
	November	Internal	4509	4666	4738	4672	4793	4652	4857	4975	4983	4951	5159	5204	5257	5315
	December	Internal	5346	4970	5314	5289	5222	5013	5572	5593	5522	5378	5700	5746	5799	5857
	Commercial Employment															
	January	Internal	-	510403	518960	534103	551829	565068	591641	605153	619437	630268	647105	665484	676532	691056
	February	Internal	493429	511732	520311	535494	553266	566540	593182	606729	621050	631909	648790	667217	678294	692856
	March	Internal	498682	517180	525851	541195	559156	572572	599497	613189	627663	638637	655698	674321	685516	700233
	April	Internal	507788	524526	532651	547618	565034	585880	608607	620548	632352	644365	667165	681905	694640	709874
	May	Internal	513331	530251	538465	553595	571201	592276	615251	627321	639255	651399	674448	689349	702222	717623
	June	Internal	513804	530741	538962	554106	571728	592822	615818	627900	639845	652000	675070	689985	702870	718285
	July	Internal	481002	496344	506195	519224	537192	554828	577829	591034	601807	616063	633255	645443	658016	672454
	August	Internal	495625	511434	521585	535010	553524	571696	595397	609002	620103	634793	652507	665066	678021	692898
	September	Internal	515429	531870	542426	556388	575642	594540	619187	633337	644881	660158	678580	691641	705114	720585
	October	Internal	515699	528110	541477	560965	575365	594363	618684	631587	641714	665083	683553	696023	710485	726221
	November	Internal	518822	531308	544756	564362	578850	597962	622430	635411	645600	669111	687692	700238	714788	730619
	December	Internal	521341	533888	547401	567102	581660	600865	625452	638496	648735	672359	691031	703638	718258	734166
	Interaction Weather Variables															
	January (HDD)	Internal	-	846	701	688	642	996	716	901	735	624	862	819	819	819
	February (HDD)	Internal	677	490	719	709	722	906	869	900	774	674	551	843	843	843
	March (HDD)	Internal	649	477	568	453	754	586	541	645	473	562	668	604	604	604
	April (HDD)	Internal	335	374	241	399	363	311	251	455	370	290	328	328	328	328
	June (CDD)	Internal	145	117	253	92	125	179	152	132	55	183	139	139	139	139
	July (CDD)	Internal	289	296	334	245	371	353	289	271	266	303	302	302	302	302
	August (CDD)	Internal	288	244	327	223	332	267	413	235	302	312	292	292	292	292
	September (CDD)	Internal	235	250	262	160	258	172	288	192	161	305	220	220	220	220
	December (HDD)	Internal	776	465	511	613	549	459	686	638	623	395	584	584	584	584

HDD - Heating Degree Days
CDD - Cooling Degree Days

G:\FCAST00\1999 Fcst Writeup\Data Series 2.xls

KENTUCKY UTILITIES COMPANY
1999 FORECAST
MONTHLY INDUSTRIAL MODEL

Rate Class	Series		Source	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Industrial	kWh																			
	January		Internal	-	196052010	192615386	199543259	224763434	216472178	240564254	242366115	254752604	278006112	291263110	301361394	310731071	324977315	339323287	354658791	369230575
	February		Internal	183229937	203951670	208499088	221236990	215192362	240471716	242283608	265102681	282308910	284674137	277207407	308699638	318077204	332317488	346656923	361989731	376554825
	March		Internal	184783072	200718299	194311733	214594341	240095974	248689349	245397020	255022369	258960909	291761680	306487072	310471720	319898863	334211678	348624332	364035920	378675391
	April		Internal	193782276	209507031	201822885	217087094	231856961	243195076	245840443	262383719	275370774	292324825	303481733	313277126	325059562	338908792	354136806	369275966	384184874
	May		Internal	184676207	204450827	202950457	220136377	231925157	243202421	257922307	271009812	267959193	261133191	304861336	315868012	327753759	341718112	357075191	372344297	387375295
	June		Internal	206328859	218930591	229845819	229060184	238547605	252917332	261496428	275167222	287384400	323067975	320457679	331746570	343740673	357827739	373321716	388728205	403889923
	July		Internal	203824039	210489945	204822544	219902001	235519813	253878831	270787777	271824345	289783590	312017839	313444973	323368173	335932558	349354707	364909327	379753913	394520080
	August		Internal	190906291	210792531	223267112	233783914	241392188	263028822	282749113	282104491	304773345	302574814	319828886	329841366	342498559	356015925	371685281	386639052	401505709
	September		Internal	228936340	232758348	242573081	236707502	263239947	256575908	277268012	287646143	301063678	312412290	327978947	338018545	350705729	364254149	379960307	394949230	409848903
	October		Internal	184678389	206046724	214913092	223337014	233531958	242594263	250399635	265376871	287438673	294888589	311091594	319343018	333028063	346335909	362313290	376944972	391912160
	November		Internal	193975317	202078361	209649798	223576524	231816275	241681193	256370216	262021741	282083099	289593425	310744437	319004650	332686609	345989750	361965049	376593738	391551836
	December		Internal	200297065	197820976	212323012	217287654	237836316	246561991	242403217	268341036	276834110	301311172	313576714	321886080	335672348	349078914	365173770	379913394	394992587
	Service Territory Output																			
	January		CBER	-	8551851254	8553379618	8908800134	9264357557	9517257102	10011307156	10224075008	10862948670	11447761703	11969387136	12403137924	12746564297	13268731299	13794553629	14356645230	14890744259
	February		CBER	8273343275	8552006384	8424849421	8899570476	9221901066	9550697246	9996009789	10210123171	10848714488	11432106948	11953646900	12387504025	12731219559	13253168128	13778750833	14340743651	14874597450
	March		CBER	8321765852	8593562669	8425537388	8931513777	9237389122	9638920300	10049149613	10264634649	10907064225	11492535962	12016239507	12452456077	12797988782	13322595806	13850862227	14415742499	14952322444
	April		CBER	8389058246	8585451401	8447713355	9060730068	9323945916	9697538612	10122261059	10453385016	11056084978	11736193608	12147866672	12555282505	12987143637	13494758916	14052910699	14607805716	15154261299
	May		CBER	8466942489	8665714605	8499000638	9123372966	9310531951	9688250705	10197441647	10531038653	11139041693	11824045908	12239103782	12650246147	13085893949	13597728800	14160611211	14720269122	15271199692
	June		CBER	8561267530	8728186823	8524271947	9192561351	9320438510	9700494149	10280179397	10616475050	11230042653	11920527380	12339143292	12754144736	13193764088	13710096756	14277996874	14842690279	15398412105
	July		CBER	8459773219	8648550589	8428744756	9148523778	9237613188	9818825639	10333868942	10661805953	11294667499	11786770226	12206566024	12570476793	13030998688	13522960191	14093083048	14637181019	15178404754
	August		CBER	8518363459	8751814617	8456531853	9183967212	9251812191	9922489964	10395857756	10726160062	11363040287	11857341474	12281175701	12648193994	13112117578	13607569024	14181897297	14729997266	15274904234
	September		CBER	8514191266	8713711958	8461368821	9183583989	9290950077	10029872367	10415859371	10746789621	11385260767	11880514640	12305577450	12673563425	13138586274	13635175965	14210853120	14760241485	15306358608
	October		CBER	8601521321	8650407906	8411237704	9180032562	9311762732	9984225199	10478494060	10796004818	11635621699	12024403796	12475175514	12777615398	13279212791	13766984741	14352603017	14888897478	15437489190
	November		CBER	8593388745	8575752103	8416733448	9146995723	9332992976	10069887313	10466817847	10784232177	11623446414	12011518324	12462451817	12765213212	13266697486	13754296968	14339838968	14876023697	15424282270
	December		CBER	8706390775	8671972694	8552900896	9364506116	9664704301	10270383139	10553935110	10873368490	11720131856	12112442900	12566263270	12870826135	13376133655	13867524003	14457448103	14997698918	15550395957
	Interaction Weather Variables																			
	June	(CDD)	Internal	53	39	118	20	48	90	50	54	17	78	54	54	54	54	54	54	54
	July	(CDD)	Internal	147	155	185	115	222	208	146	137	139	161	162	162	162	162	162	162	162
	August	(CDD)	Internal	151	107	179	93	186	133	263	92	164	160	152	152	152	152	152	152	152
	September	(CDD)	Internal	108	121	130	53	142	72	160	74	63	166	103	103	103	103	103	103	103

CDD - Cooling Degree Days

KENTUCKY UTILITIES COMPANY
1999 FORECAST
ANNUAL MODELS
HISTORICAL/FORECAST

Rate Class	Series	Source	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Lighting	COL-POP Lights													
	Total Fixtures	Internal	19224	21606	23624	26672	28360	29491	32098	31244	34028	36414	36633	36943
	KW per Fixture	Internal	0.20480	0.20507	0.20553	0.20571	0.20601	0.20614	0.20622	0.20651	0.21789	0.21592	0.21971	0.21691
	Households	Internal	213303	219686	226257	233024	239807	246741	253833	261065	268521	276768	281828	285490
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0	0	0
	Street Lights													
	Total Fixtures	Internal	34425	34785	36071	37927	37979	39156	39834	40098	41201	43550	43576	44745
	KW per Fixture	Internal	0.26940	0.26805	0.27273	0.27648	0.27647	0.27699	0.27792	0.27842	0.28139	0.28295	0.28451	0.28597
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	Annual kWh	Internal	1361044291	1445189344	1578298488	1716903384	1704100000	1695989679	1855288828	1983281314	1951014382	2139160953	2112828381	2191431857
	Service Territory Output (000,000's)	CBER	4187	4341	4925	5539	5347	5060	5560	5970	6011	5983	5768	5937
	Cooling Degree Days	Internal	439	397	279	475	262	574	266	613	453	348	674	410
	Industrial Price	Internal	0.03053	0.03061	0.03016	0.02786	0.02968	0.03606	0.03077	0.03399	0.03867	0.03674	0.03489	0.03879
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	Annual kWh	Internal	841412383	923087135	1029373802	1169776771	1174295256	1299510792	1400151946	1601622443	1700057374	1680100414	1815224537	1847819614
	Cooling Season													
	Summer kWh	Internal	487174956	517804673	578065605	668511690	655336786	728699734	755763638	861796867	870809433	872664137	994609415	986713446
	Cooling Degree Days	Internal	1133	1016	791	1097	751	1129	705	1335	1064	860	1276	972
	Commercial Price	Internal	0.053435	0.052333	0.051939	0.047828	0.047755	0.052207	0.046068	0.048200	0.052277	0.050406	0.046250	0.050016
	Heating Season													
	Winter kWh		354237427	405282462	451308197	501265081	518958470	570811058	644388308	739825576	829247941	807436277	820615122	861106168
	Heating Degree Days	Internal	-	4566	3988	4018	3769	4154	3883	5119	5069	4677	4547	4494
	Commercial Employment	CBER	272492	283095	301650	314304	320962	330854	348050	361663	383695	396274	389097	387636
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0	0	0

			1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Lighting	COL-POP Lights													
	Total Fixtures	Internal	37480	37937	37600	37549	37272	34211	34737	35900	37418	39184	41367	44740
	KW per Fixture	Internal	0.21744	0.22010	0.22137	0.22405	0.22607	0.24875	0.24934	0.25196	0.25403	0.25205	0.24732	0.24056
	Households	Internal	288490	291763	295423	299686	305050	310543	314366	318310	322475	326497	331220	336500
	Binary Variable	Internal	0	0	0	0	0	1	1	1	1	1	1	0
	Street Lights													
	Total Fixtures	Internal	45314	46258	47274	48583	50150	51485	52604	54172	55676	57249	58794	60000
	KW per Fixture	Internal	0.28660	0.28757	0.28151	0.26954	0.25994	0.25324	0.24800	0.24000	0.23268	0.22499	0.22090	0.21557
	Binary Variable	Internal	0	0	0	0	0	1	1	1	1	1	1	0
Industrial	Annual kWh	Internal	2129208484	2288905439	2433149777	2441599781	2509939031	2074098216	2223729860	2335857219	2493597313	2537594007	2656252854	2825717990
	Service Territory Output (000,000's)	CBER	5647	5772	6532	6598	6555	7090	7704	8045	8189	8020	8641	8824
	Cooling Degree Days	Internal	345	778	454	357	545	662	729	459	422	612	281	598
	Industrial Price	Internal	0.04090	0.04202	0.04057	0.04099	0.04001	0.03616	0.03306	0.03020	0.02937	0.02909	0.02784	0.02712
	Binary Variable	Internal	0	0	0	0	0	1	1	1	1	1	1	1
Commercial	Annual kWh	Internal	2028516215	2056155565	2265014722	2422831645	2626435780	3554754315	3516539300	3563683855	3679240080	3872524508	3819266362	4055839372
	Cooling Season													
	Summer kWh	Internal	1046311095	1154741318	1177197291	1277830132	1420913322	1778796872	1818001525	1852150503	1930263399	2070213329	1977508689	2139345160
	Cooling Degree Days	Internal	952	1343	1057	952	1258	1346	1305	1036	995	1315	811	1154
	Commercial Price	Internal	0.051605	0.052248	0.050790	0.050449	0.049695	0.045653	0.042130	0.038306	0.036925	0.036237	0.035146	0.034483
	Heating Season													
	Winter kWh	Internal	982205120	901414247	1087817431	1145001513	1205522458	1775957443	1698537775	1711533352	1748976681	1802311179	1841757673	1916494212
	Heating Degree Days	Internal	4527	3971	4685	4321	4014	4271	4214	4181	4095	3843	3938	4282
	Commercial Employment	CBER	387677	392356	411444	428009	440958	463785	479726	498637	512875	520838	536174	553675
	Binary Variable	Internal	0	0	0	0	0	1	1	1	1	1	1	1

CBER - Center for Business & Economic Research

KENTUCKY UTILITIES COMPANY
1999 FORECAST
ANNUAL MODELS
HISTORICAL/FORECAST

			1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Lighting	COL-POP Lights											
	Total Fixtures	Internal	49316	54599	58837	62368	65959	70882	75573	80269	84889	89598
	KW per Fixture	Internal	0.23193	0.22077	0.21676	0.21728	0.21975	0.21258	0.20716	0.20240	0.19789	0.19348
	Households	Internal	343726	351163	354225	360379	366757	373271	379922	386588	393146	399830
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0
	Street Lights											
	Total Fixtures	Internal	61388	62676	60813	65402	66931	66631	67248	68171	69196	70255
	KW per Fixture	Internal	0.20983	0.20387	0.20569	0.17831	0.16320	0.15372	0.14477	0.13593	0.12731	0.12234
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0
Industrial	Annual kWh	Internal	2949269080	3073482030	3208366545	3368713285	3543766049	3692240506	3820214721	3945349685	4066635844	4195652783
	Service Territory Output (000,000's)	CBER	9304	9691	9977	10620	11150	11575	11931	12338	12808	13336
	Cooling Degree Days	Internal	503	619	357	383	650	533	533	533	533	533
	Industrial Price	Internal	0.02702	0.02719	0.02602	0.02553	0.02553	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1
Commercial	Annual kWh	Internal	4162960169	4334754354	4576353929	4548866163	4832925086	4924988685	5046793252	5172150219	5330741850	5470542177
	Cooling Season											
	Summer kWh	Internal	2171788610	2308441645	2374634088	2375352731	2594886348	2570342649	2631576714	2693848810	2763498311	2838100962
	Cooling Degree Days	Internal	1040	1208	904	857	1283	1096	1096	1096	1096	1096
	Commercial Price	Internal	0.034661	0.034871	0.033663	0.033460	0.033282	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Heating Season											
	Winter kWh	Internal	1991171559	2026312709	2201719841	2173513432	2238038738	2354646036	2415216538	2478301409	2567243539	2632441215
	Heating Degree Days	Internal	4583	3890	4863	4220	4083	4278	4278	4278	4278	4278
	Commercial Employment	CBER	570477	594183	607031	619599	633192	650697	665416	677953	692681	707237
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1

			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Lighting	COL-POP Lights											
	Total Fixtures	Internal	94100	96102	99102	101908	104580	107194	109793	112281	114744	117167
	KW per Fixture	Internal	0.18910	0.18473	0.18037	0.17601	0.17165	0.16729	0.16293	0.15857	0.15422	0.14986
	Households	Internal	406221	409062	413320	417304	421096	424807	428496	432027	435524	438963
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0
	Street Lights											
	Total Fixtures	Internal	71326	72400	73476	74552	75629	76705	77781	78858	79934	81010
	KW per Fixture	Internal	0.12234	0.12234	0.12234	0.12234	0.12234	0.12234	0.12234	0.12234	0.12234	0.12234
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0
Industrial	Annual kWh	Internal	4323783779	4455047531	4568016618	4708486590	4850712052	4995293756	5140246302	5284510912	5428530562	5573851029
	Service Territory Output (000,000's)	CBER	13853	14363	14879	15409	15952	16511	17073	17631	18186	18750
	Cooling Degree Days	Internal	533	533	533	533	533	533	533	533	533	533
	Industrial Price	Internal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1
Commercial	Annual kWh	Internal	5607297397	5703081639	5828617572	5954408658	6079338046	6206417211	6334847387	6462626792	6591371638	6720709315
	Cooling Season											
	Summer kWh	Internal	2915997071	2965662856	3029658141	3093863897	3157400225	322202513	3287556004	3352664716	3418331726	3484386484
	Cooling Degree Days	Internal	1096	1096	1096	1096	1096	1096	1096	1096	1096	1096
	Commercial Price	Internal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Heating Season											
	Winter kWh	Internal	2691300326	2737418783	2798959431	2860544761	2921937821	5884214698	3047291383	3109962076	3173039912	3236322831
	Heating Degree Days	Internal	4278	4278	4278	4278	4278	4278	4278	4278	4278	4278
	Employment	CBER	721688	736299	751493	767214	783152	799268	815711	832176	848614	865050
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1

CBER - Center for Business & Economic Research

KENTUCKY UTILITIES COMPANY
1999 FORECAST
ANNUAL MODEL
HISTORICAL/FORECAST

Rate Class	Series	Source	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Mine Power	East kWh/ton	Internal	18.8	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
	East tonnage (000T)	RDI	117.042	116.032	119.555	120.536	125.100	124.954	127.283	127.630	128.175	129.159	129.735	130.436	131.802	133.406	135.353	137.625	138.520	139.520	138.520
	East market share	Internal	6.80%	8.28%	6.73%	3.94%	3.90%	3.83%	4.02%	3.77%	3.44%	3.24%	2.99%	2.57%	2.19%	1.83%	1.40%	0.98%	0.76%	0.58%	0.46%
	West kWh/ton	Internal	14.6	14.9	14.9	16.4	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
	West tonnage (000T)	RDI	34.776	35.986	34.629	34.811	36.822	34.350	34.000	33.750	33.675	34.250	34.800	34.200	35.000	35.500	35.450	36.975	36.950	37.025	37.500
	West market share	Internal	53.87%	57.30%	66.72%	67.64%	65.71%	65.68%	64.83%	64.84%	65.56%	68.19%	69.77%	68.43%	63.97%	61.58%	59.41%	56.47%	48.79%	45.32%	42.14%

RDI - Resource Data International

OLD DOMINION POWER
1999 FORECAST
ANNUAL MODELS
HISTORICAL/FORECAST

Rate Class	Series	Source	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Lighting	COL-POP Lights																
	Total Fixtures	Internal	1190	1426	1721	1963	2211	2393	2636	2824	2984	3210	3201	3257	3387	3411	3382
	KW per Fixture	Internal	0.20700	0.20700	0.20714	0.20712	0.20711	0.20720	0.20718	0.20717	0.20733	0.20730	0.20715	0.20715	0.20707	0.20714	0.20706
	Households	Internal	16171	16704	17253	17818	18399	18997	19611	20244	20894	19340	18946	19886	22006	22173	22301
	Street Lights																
	Total Fixtures	Internal	2054	2082	2139	2205	2213	2228	2240	2260	2268	2331	2366	2371	2386	2385	2423
	KW per Fixture	Internal	0.23771	0.24210	0.24309	0.24296	0.24427	0.24434	0.24424	0.24067	0.24070	0.24448	0.24748	0.24750	0.24740	0.24761	0.24712
	Binary Variable	Internal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All Electric Schools	Customers	Internal	287	296	315	308	97	105	112	113	112	114	117	118	120	124	126
	kWh Sales	Internal	4643492	5346996	5580025	6208381	6627005	8438494	11429335	15421636	16327950	17314325	19318772	19327658	19482228	20502892	21888485
Commercial/Industrial	Customers	Internal	2307	2407	2507	2620	2687	2770	2877	2969	3051	3023	2995	3022	3059	3088	3094
	SIC 12 gWh	Internal	26.4	24.2	27.1	26.2	26.7	31.1	43.2	48.4	49.7	70.4	84.9	99.6	93.7	91.5	110.2
	Large Mining gWh	Internal	60.8	58.1	72.8	82.3	79.4	82.7	89.3	85.9	86.7	104.5	94.8	82.4	99.5	106.0	115.7
	All Other gWh	Internal	45.6	52.5	55.6	70.8	75.3	83.5	95.6	107.7	116.8	122.7	124.3	129.6	140.8	135.1	144.3
	Households	Internal	16171	16704	17253	17818	18399	18997	19611	20244	20894	19340	18946	19886	22006	22173	22301
	Binary	Internal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

			1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lighting	COL-POP Lights																
	Total Fixtures	Internal	3319	3313	3309	3314	3425	3530	3643	3763	3963	4188	4405	4610	4835	5025	5224
	KW per Fixture	Internal	0.20706	0.20699	0.20695	0.20723	0.207	0.20705	0.20811	0.20832	0.20815	0.20923	0.21068	0.21056	0.20954	0.20876	0.20976
	Households	Internal	22401	22389	22423	22476	22512	22622	22883	23157	23436	23713	24073	24248	24459	24807	25157
	Street Lights																
	Total Fixtures	Internal	2476	2503	2592	2548	2647	2632	2664	2676	2684	2699	2708	2714	2750	2749	2828
	kWh per Fixture	Internal	0.24528	0.24272	0.22185	0.20038	0.1938	0.18509	0.18367	0.17143	0.16061	0.15866	0.15961	0.15908	0.15677	0.15224	0.14863
	Binary Variable	Internal	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
All Electric Schools	Customers	Internal	127	130	136	140	141	141	152	170	174	165	161	161	161	167	167
	kWh Sales	Internal	21581749	24042525	24700027	25391839	25093296	25290096	25743392	25248840	23925485	23821872	24487171	25443740	24091150	23698943	23698943
Commercial/Industrial	Customers	Internal	3143.00	3211.00	3564.00	3356.00	3373.00	3441.00	3478.00	2527.00	3603.00	3666.00	3728.00	3801.00	3851.00	3919.00	3998.00
	SIC 12 gWh	Internal	106.4	108.5	124.9	131.4	135.2	131.0	123.9	127.2	118.8	121.7	138.1	144.1	164.1	174.8	182.3
	Large Mining gWh	Internal	111.3	103.7	103.5	95.0	93.5	93.0	92.1	99.9	99.0	93.7	58.8	31.8	15.9	0.0	0.0
	All Other gWh	Internal	148.7	153.2	157.0	160.6	162.9	174.1	184.4	189.4	200.4	207.6	217.3	229.3	231.6	235.5	247.8
	Households	Internal	22401	22389	22423	22476	22512	22622	22883	23157	23436	23713	24073	24248	24459	24807	25157
	Binary Variable	Internal	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1

			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Lighting	COL-POP Lights															
	Total Fixtures	Internal	5432	5612	5794	5978	6164	6350	6536	6723	6911	7099	7287	7366	7445	7524
	KW per Fixture	Internal	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976	0.20976
	Households	Internal	25511	25781	26051	26322	26595	26868	27142	27417	27693	27970	28247	28247	28247	28247
	Street Lights															
	Total Fixtures	Internal	2853	2877	2902	2927	2952	2976	3001	3026	3051	3076	3100	3125	3150	3175
	kWh per Fixture	Internal	0.1467	0.1448	0.14294	0.14111	0.1393	0.13753	0.13579	0.13407	0.13279	0.13279	0.13279	0.13279	0.13279	0.13279
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1	1	1	1	1
All Electric Schools	Customers	Internal	167	167	167	167	167	167	167	167	167	167	167	167	167	167
	kWh Sales	Internal	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943	23698943
Commercial/Industrial	Customers	Internal	4058.00	4118.00	4178.00	4238.00	4298.00	4358.00	4419.00	4479.00	4539.00	4599.00	4660.00	4720.00	4780.00	4840.00
	SIC 12 gWh	Internal	185.6	188.8	192.0	195.3	198.5	201.8	205.0	208.2	211.5	214.7	218.0	221.2	224.4	227.7
	Large Mining gWh	Internal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All Other gWh	Internal	256.0	264.0	272.0	280.0	288.0	296.0	304.0	312.0	320.0	328.0	336.0	343.5	350.9	358.3
	Households	Internal	25511	25781	26051	26322	26595	26868	27142	27417	27693	27970	28247	28247	28247	28247
	Binary Variable	Internal	1	1	1	1	1	1	1	1	1	1	1	1	1	1

CBER - Center for Business & Economic Research

KENTUCKY UTILITIES COMPANY
1999 FORECAST
ANNUAL MODEL
HISTORICAL/FORECAST

Rate Class	Series	Source	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Municipal	Primary														
	kWh Sales	Internal	243551800	256035500	259314700	293938800	295797700	305465500	322410000	324725800	340350200	365240500	377475300	393709000	403723405
	Households	Internal	46762	47897	49062	50258	50535	50817	51102	51395	51690	51994	52300	52614	52931
	Transmission														
	kWh Sales	Internal	576830253	588491316	616800376	657346860	651588565	652787056	691350548	711818692	729527583	766034357	814402494	856383918	883055991
	Industrial Output	Internal	188907969	189587483	191135731	179574170	172819523	164614386	173806047	191284597	182239898	186800290	223297457	240781401	225100634
	Paris														
	kWh Sales	Internal	27707220	27438610	27401487	28788642	28764498	28261792	30383305	30735707	31102989	32933527	33094945	33941407	34690514
	Cooling Degree Days	Internal	1393	1073	874	1281	985	974	1347	1076	987	1272	1355	1312	1049
	Heating Degree Days	Internal	3990	4463	4138	3933	3881	3632	3537	3992	3556	3529	3474	3838	3675

			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Municipal	Primary													
	kWh Sales	Internal	419542182	444570096	440294400	479026800	488033600	515855600	527521680	531829000	564409000	576176189	591950985	607633154
	Households	Internal	53256	54180	54992	55730	56451	57512	58418	59359	60025	60592	61171	61736
	Transmission													
	kWh Sales	Internal	896670674	950370489	942281829	#########	1038617230	1087927600	1117180734	1124964724	1164012515	1206662937	1242148926	1279689580
	Industrial Output	Internal	243365884	242649119	253999754	277634525	290868789	295282862	292298608	313909965	320870823	337307887	350985741	367058456
	Paris													
	kWh Sales	Internal	34068866	36791812	35398826	36794804	35954806	38683648	38826200	37413428	39110840	40377279	41017005	41656731
	Cooling Degree Days	Internal	1017	1335	826	1159	1049	1219	906	867	1311	1110	1110	1110
	Heating Degree Days	Internal	3167	3269	3425	3595	3614	3655	4135	3744	2988	3639	3639	3639

			2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Municipal	Primary													
	kWh Sales	Internal	623507192	639738502	656155065	672254052	688128090	703625007	718883744	734069703	749268894	764454852	779601114	794694447
	Households	Internal	62330	62978	63654	64282	64876	65413	65914	66404	66896	67386	67870	68346
	Transmission													
	kWh Sales	Internal	1319379600	1360247798	1401579028	#########	1480829951	1520375695	1559982148	1599661898	1639304228	1678761554	1718113954	1757574842
	Industrial Output	Internal	385636413	405587622	426078529	445012822	463083948	481493741	499974295	518540282	537062654	555369389	573553826	591864713
	Paris													
	kWh Sales	Internal	42296457	42936182	43575908	44215634	44855360	45495086	46134812	46774538	47414264	48053990	48693716	49333442
	Cooling Degree Days	Internal	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110	1110
	Heating Degree Days	Internal	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639	3639

COMMEND DATA FILES

```
;
;EX4: Exogenous Variables
;
    2 ;file version: do not edit
"KU 00Fcast uncalibrated"                        ;file description

;
;Exogenous Variables
;

;
;Exog Var Data Definitions
;
   33 ;Number of variables
 1975 ;Year Vars Begin
 2029 ;Year Vars End

;
;Exog Vars
;
"HDD"      "Deg Days" "Heating degree days"
"CDD"      "Deg Days" "Cooling degree days"
"P:HDD"    "Deg Days" "Peak heating degree days"
"P:CDD"    "Deg Days" "Peak cooling degree days"
"OPHSMO"   "Hours"    "Op Hours Small Office"
"OPHLGO"   "Hours"    "Op Hours Large Office"
"OPHRES"   "Hours"    "Op Hours Restaurant"
"OPHRET"   "Hours"    "Op Hours Retail"
"OPHGRC"   "Hours"    "Op Hours Grocery"
"OPHWRH"   "Hours"    "Op Hours Warehouse"
"OPHSCH"   "Hours"    "Op Hours Schools"
"OPHCOL"   "Hours"    "Op Hours Colleges"
"OPHHLT"   "Hours"    "Op Hours Health"
"OPHLDG"   "Hours"    "Op Hours Lodging"
"OPHMSC"   "Hours"    "Op Hours Miscellaneous"
"GDP"      "bill$"    "Gross Domestic Product"
"RESCUSTS" "Custs"    "Residential Customers"
"RateBlk1" "%"        ""
"RateBlk2" "%"        ""
"RateBlk3" "%"        ""
"RateBlk4" "%"        ""
"smelmult" "index"    "Small Office Electric Calibration Factor"
"loelmult" "index"    "Large Office Electric Calibration Factor"
"whelmult" "index"    "Warehouse Electric Calibration Factor"
"fdelmult" "index"    "Foodstore Electric Calibration Factor"
"rtelmult" "index"    "Retail Electric Calibration Factor"
"Scelmult" "index"    "Schools electric calibration Factor"
"Coelmult" "index"    "College electric calibration Factor"
"rselmult" "index"    "Restaurant electric calibration factor"
"hlelmult" "index"    "Health electric calibration factor"
"lgelmult" "index"    "Lodging electric calibration factor"
"mielmult" "index"    "Miscellaneous electric calibration factor"
"nselmult" "index"    "Not-In-Scope electric calibration factor"

;
;Exog Var Data Values
;
```

```
;         HDD       CDD     P:HDD     P:CDD    OPHSMO    OPHLGO    OPHRES
OPHRET
;  Deg Days  Deg Days  Deg Days  Deg Days     Hours     Hours     Hours
Hours
          4013      1129        40        12        55        65        90
70 ; 1975
          4466       705        40        12        55        65        90
70 ; 1976
          4620      1335        40        12        55        65        90
70 ; 1977
          5043      1064        40        12        55        65        90
70 ; 1978
          4755       860        40        12        55        65        90
70 ; 1979
          4568      1276        40        12        55        65        90
70 ; 1980
          4497       972        40        12        55        65        90
70 ; 1981
          4301       952        40        12        55        65        90
70 ; 1982
          4173      1343        40        12        55        65        90
70 ; 1983
          4596      1057        40        12        55        65        90
70 ; 1984
          4215       952        40        12        55        65        90
70 ; 1985
          4198      1258        40        12        55        65        90
70 ; 1986
          4151      1346        40        12        57        67        94
70.7 ; 1987
          4437      1304        40        12        59        69        98
71.4 ; 1988
          4237      1036        40        12        61        71       102
72.1 ; 1989
          3801       995        40        12        63        73       106
72.8 ; 1990
          3915      1315        40        12        64        74       108
73.1 ; 1991
          4025       811        40        12        65        75       110
73.4 ; 1992
          4277      1154        40        12        66        76       112
73.7 ; 1993
          4317      1040        40        12        67        77       114
74 ; 1994
          4333      1208        40        12        68        78       116
74.3 ; 1995
          4346      1099        40        12        68        78       116
74.3 ; 1996
          4346      1099        40        12        68        78       116
74.3 ; 1997
          4346      1099        40        12        68        78       116
74.3 ; 1998
          4346      1099        40        12        68        78       116
74.3 ; 1999
          4346      1099        40        12        68        78       116
74.3 ; 2000
```

```
              4346      1099      40        12        68        78        116
74.3    ;     2001
              4346      1099      40        12        68        78        116
74.3    ;     2002
              4346      1099      40        12        68        78        116
74.3    ;     2003
              4346      1099      40        12        68        78        116
74.3    ;     2004
              4346      1099      40        12        68        78        116
74.3    ;     2005
              4346      1099      40        12        68        78        116
74.3    ;     2006
              4346      1099      40        12        68        78        116
74.3    ;     2007
              4346      1099      40        12        68        78        116
74.3    ;     2008
              4346      1099      40        12        68        78        116
74.3    ;     2009
              4346      1099      40        12        68        78        116
74.3    ;     2010
              4346      1099      40        12        68        78        116
74.3    ;     2011
              4346      1099      40        12        68        78        116
74.3    ;     2012
              4346      1099      40        12        68        78        116
74.3    ;     2013
              4346      1099      40        12        68        78        116
74.3    ;     2014
              4346      1099      40        12        68        78        116
74.3    ;     2015
              4346      1099      40        12        68        78        116
74.3    ;     2016
              4346      1099      40        12        68        78        116
74.3    ;     2017
              4346      1099      40        12        68        78        116
74.3    ;     2018
              4346      1099      40        12        68        78        116
74.3    ;     2019
              4346      1099      40        12        68        78        116
74.3    ;     2020
              4346      1099      40        12        68        78        116
74.3    ;     2021
              4346      1099      40        12        68        78        116
74.3    ;     2022
              4346      1099      40        12        68        78        116
74.3    ;     2023
              4346      1099      40        12        68        78        116
74.3    ;     2024
              4346      1099      40        12        68        78        116
74.3    ;     2025
              4346      1099      40        12        68        78        116
74.3    ;     2026
              4346      1099      40        12        68        78        116
74.3    ;     2027

;           OPHGRC    OPHWRH    OPHSCH    OPHCOL    OPHHLT    OPHLDG    OPHMSC
GDP
```

```
;      Hours     Hours     Hours     Hours     Hours     Hours     Hours
bill$
         115        50        55        75       168       168        70
3222 ; 1975
         115        50        55        75       168       168        70
3381 ; 1976
         115        50        55        75       168       168        70
3533 ; 1977
         115        50        55        75       168       168        70
3704 ; 1978
         115        50        55        75       168       168        70
3797 ; 1979
         115        50        55        75       168       168        70
3776 ; 1980
         115        50        55        75       168       168        70
3843 ; 1981
         115        50        55        75       168       168        70
3760 ; 1982
         115        50        55        75       168       168        70
3907 ; 1983
         115        50        55        75       168       168        70
4149 ; 1984
         115        50        55        75       168       168        70
4280 ; 1985
         115        50        55        75       168       168        70
4405 ; 1986
         116      51.3      57.3      77.3       168       168        72
4540 ; 1987
         117      52.6      59.6      79.6       168       168        74
4719 ; 1988
         118      53.9      61.9      81.9       168       168        76
4837 ; 1989
         119      55.2      64.2      84.2       168       168        78
4885 ; 1990
       119.5      55.8      65.3      85.3       168       168        79
4821 ; 1991
         120      56.4      66.4      86.4       168       168        80
4920 ; 1992
       120.5        57      67.5      87.5       168       168        81
5070 ; 1993
         121      57.6      68.6      88.6       168       168        82
5227 ; 1994
       121.5      58.2      69.7      89.7       168       168        83
5344 ; 1995
       121.5      58.2      69.7      89.7       168       168        83
5479 ; 1996
       121.5      58.2      69.7      89.7       168       168        83
5619 ; 1997
       121.5      58.2      69.7      89.7       168       168        83
5748 ; 1998
       121.5      58.2      69.7      89.7       168       168        83
5888 ; 1999
       121.5      58.2      69.7      89.7       168       168        83
6032 ; 2000
       121.5      58.2      69.7      89.7       168       168        83
6171 ; 2001
```

```
            121.5      58.2      69.7      89.7       168       168        83
6312 ; 2002
            121.5      58.2      69.7      89.7       168       168        83
6465 ; 2003
            121.5      58.2      69.7      89.7       168       168        83
6604 ; 2004
            121.5      58.2      69.7      89.7       168       168        83
6731 ; 2005
            121.5      58.2      69.7      89.7       168       168        83
6858 ; 2006
            121.5      58.2      69.7      89.7       168       168        83
7005 ; 2007
            121.5      58.2      69.7      89.7       168       168        83
7135 ; 2008
            121.5      58.2      69.7      89.7       168       168        83
7255 ; 2009
            121.5      58.2      69.7      89.7       168       168        83
7387 ; 2010
            121.5      58.2      69.7      89.7       168       168        83
7520 ; 2011
            121.5      58.2      69.7      89.7       168       168        83
7653 ; 2012
            121.5      58.2      69.7      89.7       168       168        83
7780 ; 2013
            121.5      58.2      69.7      89.7       168       168        83
7911 ; 2014
            121.5      58.2      69.7      89.7       168       168        83
8041 ; 2015
            121.5      58.2      69.7      89.7       168       168        83
8173 ; 2016
            121.5      58.2      69.7      89.7       168       168        83
8308 ; 2017
            121.5      58.2      69.7      89.7       168       168        83
8449 ; 2018
            121.5      58.2      69.7      89.7       168       168        83
8593 ; 2019
            121.5      58.2      69.7      89.7       168       168        83
8739 ; 2020
            121.5      58.2      69.7      89.7       168       168        83
8888 ; 2021
            121.5      58.2      69.7      89.7       168       168        83
9039 ; 2022
            121.5      58.2      69.7      89.7       168       168        83
9192 ; 2023
            121.5      58.2      69.7      89.7       168       168        83
9300 ; 2024
            121.5      58.2      69.7      89.7       168       168        83
9450 ; 2025
            121.5      58.2      69.7      89.7       168       168        83
9600 ; 2026
            121.5      58.2      69.7      89.7       168       168        83
9700 ; 2027

; RESCUSTS  RateBlk1  RateBlk2  RateBlk3  RateBlk4  smelmult  loelmult
whelmult
;    Custs         %         %         %         %     index     index
index
```

```
       239122       0.1       0.2      0.33       0.5         0         0
 0 ; 1975
       247308       0.1       0.2      0.33       0.5         0         0
 0 ; 1976
       255717       0.1       0.2      0.33       0.5         0         0
 0 ; 1977
       264386       0.1       0.2      0.33       0.5         0         0
 0 ; 1978
       276768       0.1       0.2      0.33       0.5         0         0
 0 ; 1979
       281828       0.1       0.2      0.33       0.5         0         0
 0 ; 1980
       285490       0.1       0.2      0.33       0.5         0         0
 0 ; 1981
       288490       0.1       0.2      0.33       0.5         0         0
 0 ; 1982
       291763       0.1       0.2      0.33       0.5         0         0
 0 ; 1983
       295423       0.1       0.2      0.33       0.5         0         0
 0 ; 1984
       299686       0.1       0.2      0.33       0.5         0         0
 0 ; 1985
       305050       0.1       0.2      0.33       0.5         0         0
 0 ; 1986
       310543       0.1       0.2      0.33       0.5         0         0
 0 ; 1987
       314366       0.1       0.2      0.33       0.5         0         0
 0 ; 1988
       318310       0.1       0.2      0.33       0.5         0         0
 0 ; 1989
       322475       0.1       0.2      0.33       0.5         0         0
 0 ; 1990
       326497       0.1       0.2      0.33       0.5         0         0
 0 ; 1991
       331220       0.1       0.2      0.33       0.5         1         1
 1 ; 1992
       336618       0.1       0.2      0.33       0.5      0.95      0.96
 0.91 ; 1993
       342101       0.1       0.2      0.33       0.5      0.95      0.99
 0.9 ; 1994
       347676       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 1995
       351771       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 1996
       355920       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 1997
       360126       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 1998
       364381       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 1999
       368699       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 2000
       371798       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 2001
       374924       0.1       0.2      0.33       0.5      1.02       1.1
 0.9 ; 2002
```

```
      378091        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2003
      381273        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2004
      384476        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2005
      387011        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2006
      389564        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2007
      392143        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2008
      394738        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2009
      397360        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2010
      399362        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2011
      401381        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2012
      403415        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2013
      405462        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2014
      407522        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2015
      408998        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2016
      410485        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2017
      411978        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2018
      413480        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2019
      414990        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2020
      415891        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2021
      416797        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2022
      417713        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2023
      418713        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2024
      419713        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2025
      420000        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2026
      421000        0.1        0.2       0.33        0.5      1.02       1.1
0.9 ; 2027

;   fdelmult  rtelmult  Scelmult  Coelmult  rselmult  hlelmult  lgelmult
mielmult
;      index     index     index     index     index     index     index
index
           0         0         0         0         0         0         0
0 ; 1975
```

```
          0         0         0         0         0         0         0
0 ; 1976
          0         0         0         0         0         0         0
0 ; 1977
          0         0         0         0         0         0         0
0 ; 1978
          0         0         0         0         0         0         0
0 ; 1979
          0         0         0         0         0         0         0
0 ; 1980
          0         0         0         0         0         0         0
0 ; 1981
          0         0         0         0         0         0         0
0 ; 1982
          0         0         0         0         0         0         0
0 ; 1983
          0         0         0         0         0         0         0
0 ; 1984
          0         0         0         0         0         0         0
0 ; 1985
          0         0         0         0         0         0         0
0 ; 1986
          0         0         0         0         0         0         0
0 ; 1987
          0         0         0         0         0         0         0
0 ; 1988
          0         0         0         0         0         0         0
0 ; 1989
          0         0         0         0         0         0         0
0 ; 1990
          0         0         0         0         0         0         0
0 ; 1991
          1         1         1         1         1         1         1
1 ; 1992
       0.97      0.97      1.05         1         1      0.99      0.98
0.91 ; 1993
       0.94      0.97      1.05         1         1         1      1.02
0.86 ; 1994
       0.92      0.97      1.09         1         1         1      1.04
0.75 ; 1995
       0.92      0.97      1.09         1         1         1      1.04
0.76 ; 1996
       0.92      0.97      1.09         1         1         1      1.04
0.73 ; 1997
       0.92      0.97      1.09         1         1         1      1.04
0.71 ; 1998
       0.92      0.97      1.09         1         1         1      1.04
0.71 ; 1999
       0.92      0.97      1.09         1         1         1      1.04
0.72 ; 2000
       0.92      0.97      1.09         1         1         1      1.04
0.68 ; 2001
       0.92      0.97      1.09         1         1         1      1.04
0.69 ; 2002
       0.92      0.97      1.09         1         1         1      1.04
0.67 ; 2003
```

```
           0.92       0.97       1.09        1         1         1        1.04
0.67 ; 2004
           0.92       0.97       1.09        1         1         1        1.04
0.67 ; 2005
           0.92       0.97       1.09        1         1         1        1.04
0.67 ; 2006
           0.92       0.97       1.09        1         1         1        1.04
0.65 ; 2007
           0.92       0.97       1.09        1         1         1        1.04
0.65 ; 2008
           0.92       0.97       1.09        1         1         1        1.04
0.65 ; 2009
           0.92       0.97       1.09        1         1         1        1.04
0.65 ; 2010
           0.92       0.97       1.09        1         1         1        1.04
0.65 ; 2011
           0.92       0.97       1.09        1         1         1        1.04
0.66 ; 2012
           0.92       0.97       1.09        1         1         1        1.04
0.66 ; 2013
           0.92       0.97       1.09        1         1         1        1.04
0.66 ; 2014
           0.92       0.97       1.09        1         1         1        1.04
0.66 ; 2015
           0.92       0.97       1.09        1         1         1        1.04
0.66 ; 2016
           0.92       0.97       1.09        1         1         1        1.04
0.68 ; 2017
           0.92       0.97       1.09        1         1         1        1.04
0.68 ; 2018
           0.92       0.97       1.09        1         1         1        1.04
0.71 ; 2019
           0.92       0.97       1.09        1         1         1        1.04
0.72 ; 2020
           0.92       0.97       1.09        1         1         1        1.04
0.72 ; 2021
           0.92       0.97       1.09        1         1         1        1.04
0.72 ; 2022
           0.92       0.97       1.09        1         1         1        1.04
0.74 ; 2023
           0.92       0.97       1.09        1         1         1        1.04
0.75 ; 2024
           0.92       0.97       1.09        1         1         1        1.04
0.75 ; 2025
           0.92       0.97       1.09        1         1         1        1.04
0.75 ; 2026
           0.92       0.97       1.09        1         1         1        1.04
0.75 ; 2027

;  nselmult
;     index
             0 ; 1975
             0 ; 1976
             0 ; 1977
             0 ; 1978
             0 ; 1979
             0 ; 1980
```

```
          0 ; 1981
          0 ; 1982
          0 ; 1983
          0 ; 1984
          0 ; 1985
          0 ; 1986
          0 ; 1987
          0 ; 1988
          0 ; 1989
          0 ; 1990
          0 ; 1991
          1 ; 1992
       1.12 ; 1993
       1.14 ; 1994
       1.19 ; 1995
        1.2 ; 1996
        1.2 ; 1997
       1.12 ; 1998
       1.05 ; 1999
       1.05 ; 2000
       0.96 ; 2001
          1 ; 2002
       0.99 ; 2003
       0.98 ; 2004
       0.98 ; 2005
       0.97 ; 2006
       0.94 ; 2007
       0.94 ; 2008
       0.94 ; 2009
       0.95 ; 2010
       0.95 ; 2011
       0.95 ; 2012
       0.96 ; 2013
       0.97 ; 2014
       0.97 ; 2015
       0.98 ; 2016
       0.98 ; 2017
       0.99 ; 2018
       0.99 ; 2019
          1 ; 2020
       0.99 ; 2021
       0.99 ; 2022
          1 ; 2023
          1 ; 2024
       1.01 ; 2025
       1.01 ; 2026
       1.01 ; 2027

;Spreadsheet Links

;HDD
""                     0 ""             ""
;
;CDD
""                     0 ""             ""
;
;P:HDD
```

```
""                        0 ""                 ""
;
;P:CDD
""                        0 ""                 ""
;
;OPHSMO
""                        0 ""                 ""
;
;OPHLGO
""                        0 ""                 ""
;
;OPHRES
""                        0 ""                 ""
;
;OPHRET
""                        0 ""                 ""
;
;OPHGRC
""                        0 ""                 ""
;
;OPHWRH
""                        0 ""                 ""
;
;OPHSCH
""                        0 ""                 ""
;
;OPHCOL
""                        0 ""                 ""
;
;OPHHLT
""                        0 ""                 ""
;
;OPHLDG
""                        0 ""                 ""
;
;OPHMSC
""                        0 ""                 ""
;
;GDP
""                        0 ""                 ""
;
;RESCUSTS
""                        0 ""                 ""
;
;RateBlk1
""                        0 ""                 ""
;
;RateBlk2
""                        0 ""                 ""
;
;RateBlk3
""                        0 ""                 ""
;
;RateBlk4
""                        0 ""                 ""
;
;smelmult
```

```
""                                    0 ""                     ""
;
;loelmult
""                                    0 ""                     ""
;
;whelmult
""                                    0 ""                     ""
;
;fdelmult
""                                    0 ""                     ""
;
;rtelmult
""                                    0 ""                     ""
;
;Scelmult
""                                    0 ""                     ""
;
;Coelmult
""                                    0 ""                     ""
;
;rselmult
""                                    0 ""                     ""
;
;hlelmult
""                                    0 ""                     ""
;
;lgelmult
""                                    0 ""                     ""
;
;mielmult
""                                    0 ""                     ""
;
;nselmult
""                                    0 ""                     ""
;
;end of file
```

```
;
;EX1: Fuel Prices
;
    3 ;file version: do not edit
"KU 1998 Price Forecast for 99Fcast"            ;file description

;
;Fuel Price Data Definitions
;
    3 ;Number of fuels
 1980 ;Year Fuel History Begins
 1997 ;Year Fuel History Ends
 2029 ;Year Fuel Forecast Ends
 1992 ;Base Year For Real Prices

;
;Fuel Definitions
;
;Fuel     Units     #Rates Description
"Elec"    "kwh"         1 "Elec"
"Gas"     "therm"       1 "Gas"
"Oil"     "mmbtu"       1 "Oil"

;
;Rate Definitions
;
;Elec
;Rate   Rate Definition
"Elec"  "Elec"
;
;Gas
;Rate   Rate Definition
"Gas"   "Gas"
;
;Oil
;Rate   Rate Definition
"Oil"   "Oil"
;

;
;Fuel Prices
;
;      Elec        Gas        Oil
;      Elec        Gas        Oil
;     $/kwh    $/therm    $/mmbtu   Deflator
     0.0407      0.289       4.12     0.5785 ; 1980
     0.0481      0.335       5.47       0.63 ; 1981
     0.0516      0.433       5.28     0.6658 ; 1982
     0.0531      0.506       4.84     0.6978 ; 1983
     0.0527      0.493       5.09     0.7258 ; 1984
     0.0528      0.495       4.89     0.7539 ; 1985
     0.0513      0.455       3.08     0.7776 ; 1986
     0.0481      0.411       2.98       0.81 ; 1987
     0.0455      0.406       2.91     0.8442 ; 1988
     0.0435      0.419       3.05     0.8841 ; 1989
      0.044      0.435       3.61     0.9291 ; 1990
     0.0441      0.424          0     0.9694 ; 1991
```

CONFIDENTIAL INFORMATION REDACTED

```
      0.0433       0.422           0     1.0027 ; 1992
       0.043        0.46        2.76       1.03 ; 1993
      0.0435       0.566        2.56     1.0516 ; 1994
      0.0446       0.488       2.747     1.0797 ; 1995
      0.0442       0.527        3.17       1.11 ; 1996
      0.0441        0.59        2.96      1.124 ; 1997
      0.0432       0.561       2.321      1.144 ; 1998
  [redacted]  [redacted]        2.49      1.166 ; 1999
                               2.545      1.192 ; 2000
                               2.609      1.217 ; 2001
                               2.709      1.243 ; 2002
                               2.831      1.273 ; 2003
                               2.961      1.305 ; 2004
                               3.097      1.339 ; 2005
                               3.269      1.376 ; 2006
                               3.462      1.415 ; 2007
                               3.627      1.456 ; 2008
                               3.803        1.5 ; 2009
                               4.003      1.546 ; 2010
                               4.231      1.596 ; 2011
                               4.475      1.649 ; 2012
                               4.727      1.703 ; 2013
                               4.998      1.761 ; 2014
                               5.282      1.821 ; 2015
                               5.598      1.884 ; 2016
                               5.936      1.951 ; 2017
                               6.293      2.021 ; 2018
                               6.676      2.096 ; 2019
                               7.063      2.175 ; 2020
                               7.436      2.259 ; 2021
                               7.834      2.348 ; 2022
                               8.148       2.41 ; 2023
                               8.546      2.495 ; 2024
                               8.959      2.582 ; 2025
                                9.39      2.672 ; 2026
                               9.836      2.764 ; 2027
                              10.302      2.859 ; 2028

;
;Spreadsheet Links
;
;Elec
""                      0 ""              ""
;Gas
""                      0 ""              ""
;Oil
""                      0 ""              ""
;
;Fuel Price Deflator
;
""                      0 ""              ""
;

;end of file
```

```
;
;MP1: Market Profile
;
   2 ;file version: do not edit
"ku00Fcast uncalibrated"                    ;file description

;End Use Definitions
;Energy Units
;
;Units      1000ths    thousands  millions
"kWh"       "Wh"       "mWh"      "gWh"      ;Elec
"kBtu"      "Btu"      "mBtu"     "bBtu"     ;Gas
"kBtu"      "Btu"      "mBtu"     "bBtu"     ;Oil

 1992 ;Energy Base Year
   10 ;Number of End Uses
;
;Name    Long Name                Life      Pen  E   G   O
"HEAT"  "SPACE HEATING"           18        100 "X" "X" "X"
"COOL"  "COOLING"                 18        100 "X" "X" ""
"VENT"  "VENTILATION"             18        100 "X" ""  ""
"WATR"  "WATER HEATING"           10        100 "X" "X" "X"
"COOK"  "COOKING"                 10        100 "X" "X" "X"
"REFR"  "REFRIGERATION"           10        100 "X" ""  ""
"XLIT"  "NON-BUILDING"            33        100 "X" ""  ""
"ILIT"  "LIGHTING"                 7        100 "X" ""  ""
"OFEQ"  "OFFICE EQUIPMENT"         7        100 "X" ""  ""
"MISC"  "MISCELLANEOUS"            7        100 "X" "X" ""
;
;  SMALL OFFICES
;
;Average Shares
;  HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
   29.9     84.4      100       42     33.8     38.5      100      100      100      100
;Elec
   64.1        0        0     35.8        0        0        0        0        0        0
;Gas
    2.6        0        0        0        0        0        0        0        0        0
;Oil
;
;Average EUIs
;  HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
   5.61     4.46      1.8     0.52     1.74     0.42      2.1     4.53      1.4     1.75
;Elec
  61.94    30.31        0    16.32     6.81        0        0        0        0     0.92
;Gas
  350.5        0        0    125.4        0        0        0        0        0        0
;Oil
;
;Marginal Shares
;  HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
     50       90      100     61.9     56.8     56.8      100      100     79.3      100
;Elec
     30        0        0     16.5        0        0        0        0        0        0
;Gas
      3        0        0        0        0        0        0        0        0        0
;Oil
```

```
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    5.6    4.45     1.8    0.52    1.74    0.42     2.1    4.52     1.4    1.75
;Elec
  61.94   30.31       0   16.32    6.81       0       0       0       0    0.92
;Gas
  349.9       0       0   125.2       0       0       0       0       0       0
;Oil
;
;  LARGE OFFICES
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   46.3    92.9     100    62.3    52.6    73.6     100     100     100     100
;Elec
   47.7       0       0    25.9    17.4       0       0       0       0       0
;Gas
    2.4       0       0     7.8       0       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   5.03    6.54    2.82    0.55    0.97    0.39    2.11    6.54    2.82    2.33
;Elec
  38.59   48.67       0   14.67    8.76       0       0       0       0    0.15
;Gas
 245.36       0       0  121.66       0       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     56     100     100    74.3    60.4      75     100    99.1      97     100
;Elec
     42       0       0    25.7      15       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      5     6.5     2.8    0.55    0.96    0.39     2.1     6.5     2.8    2.32
;Elec
  38.59   48.67       0   14.67    8.76       0       0       0       0    0.15
;Gas
 245.36       0       0  121.66       0       0       0       0       0       0
;Oil
;
;  WAREHOUSES
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     16    15.8     100    42.2    54.9    65.6     100     100     100     100
;Elec
   43.9       0       0    13.9     0.5       0       0       0       0       0
;Gas
```

```
       4.4         0         0      28.4         0         0         0         0         0         0
;Oil
;
;Average EUIs
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
       4.3      1.62      0.21      0.13      0.42      3.34      0.52      1.91      0.15      0.19
;Elec
     50.28         0         0      6.35      2.94         0         0         0         0      0.21
;Gas
    169.71         0         0     11.19         0         0         0         0         0         0
;Oil
;
;Marginal Shares
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
        16        18       100      52.7       4.5      23.9       100       100         0       100
;Elec
        40         0         0      15.3       2.4         0         0         0         0         0
;Gas
         0         0         0         0         0         0         0         0         0         0
;Oil
;
;Marginal EUIs
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
       4.5       1.7      0.22      0.14      0.44       3.5      0.54         2      0.16       0.2
;Elec
     50.28         0         0      6.35      2.94         0         0         0         0      0.21
;Gas
    169.71         0         0     11.19         0         0         0         0         0         0
;Oil
;
;  FOODSTORES
;
;Average Shares
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
        30      67.8       100      49.5      51.8      99.8       100       100       100       100
;Elec
      58.4         0         0      34.1       4.2         0         0         0         0         0
;Gas
       3.3         0         0       7.1         1         0         0         0         0         0
;Oil
;
;Average EUIs
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
      6.83      4.19      2.32         1      4.86     26.35      1.46      8.73       0.6       1.3
;Elec
      51.7        70         0     21.39     15.27         0         0         0         0      0.04
;Gas
    101.17         0         0     19.54     51.56         0         0         0         0         0
;Oil
;
;Marginal Shares
;     HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
      30.7      98.5       100        67        79       100       100      99.8      77.1       100
;Elec
        45         0         0        32      10.7         0         0         0         0         0
;Gas
```

```
      0       0       0     0.3       1       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   6.84     4.2    2.32       1    4.87    26.4    1.46    8.75     0.6     1.3
;Elec
   51.7   54.69       0   21.39   15.27       0       0       0       0    0.04
;Gas
 101.17       0       0   19.54   51.56       0       0       0       0       0
;Oil
;
;  RETAIL
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   17.2    67.2     100    60.7    28.1    50.4     100     100     100     100
;Elec
   71.5       0       0    11.8       1       0       0       0       0       0
;Gas
    3.1       0       0     2.5     0.5       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    5.6    2.03    2.23    0.36    1.97    1.21    0.66    6.35    0.48    1.04
;Elec
  54.57   35.69       0   32.74   23.37       0       0       0       0    2.28
;Gas
 217.17       0       0   22.08   14.56       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   19.2    88.6     100      65    23.1    41.1     100     100     100     100
;Elec
     69       0       0      15     2.6       0       0       0       0       0
;Gas
    0.7       0       0     0.4       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    5.6    2.03    2.23    0.36    1.97    1.21    0.66    6.35    0.48    1.04
;Elec
  54.57   35.69       0   32.74   23.37       0       0       0       0    2.38
;Gas
 217.17       0       0   22.08   14.56       0       0       0       0       0
;Oil
;
;  SCHOOLS
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   20.1    76.8     100    35.6    57.8    92.1     100     100     100     100
;Elec
```

```
   54.4       0       0      48     9.2       0       0       0       0       0
;Gas
   25.2       0       0     9.9     9.2       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   4.52    2.31    2.65    0.88    1.11    0.41    0.88    4.96    0.29    0.99
;Elec
  42.26       0       0   18.33   11.18       0       0       0       0       0
;Gas
 151.02       0       0   21.42    2.74       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   28.6    97.2     100    49.9      69      90     100    96.6    80.6     100
;Elec
   45.7       0       0    45.6      31       0       0       0       0       0
;Gas
   17.7       0       0     4.5       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    4.1     2.1     2.4     0.8    1.01    0.37     0.8     4.5    0.26     0.9
;Elec
  42.26       0       0   18.33   11.18       0       0       0       0       0
;Gas
 151.02       0       0   21.42    2.74       0       0       0       0       0
;Oil
;
;  COLLEGES
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    1.2    54.1     100     4.9      53    97.8     100     100     100     100
;Elec
   28.4       0       0    23.6      47       0       0       0       0       0
;Gas
   69.3       0       0    69.5       0       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   7.33    5.78    1.79    1.05    1.89    1.05    1.58    5.48    0.84     2.1
;Elec
     50      25       0      10       5       0       0       0       0       4
;Gas
     40       0       0       9     5.3       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   16.6      90     100      20    57.4      80     100    99.8    98.1     100
;Elec
```

```
      25        0        0       20       42        0        0        0        0        0
;Gas
    58.4        0        0       60        0        0        0        0        0        0
;Oil
;
;Marginal EUIs
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    5.74     4.57     0.92     0.94     1.02        1     1.01     4.51     0.36     1.75
;Elec
   35.01    19.69        0     7.89     3.91        0        0        0        0     3.14
;Gas
      40        0        0        9      5.3        0        0        0        0        0
;Oil
;
;  RESTAURANTS
;
;Average Shares
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    15.4     64.7      100       26       62     97.9      100      100      100      100
;Elec
    52.1        0        0     45.4       38        0        0        0        0        0
;Gas
     5.5        0        0      3.2        0        0        0        0        0        0
;Oil
;
;Average EUIs
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    5.63     11.3     8.27     6.45    32.88    10.19     3.03     11.7     0.81     1.92
;Elec
      45       55        0       55       70        0        0        0        0        0
;Gas
      80        0        0      123      150        0        0        0        0        0
;Oil
;
;Marginal Shares
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    21.2     97.7      100     42.5       62      100      100     99.1     44.7      100
;Elec
      50        0        0     37.2       38        0        0        0        0        0
;Gas
       1        0        0        1        0        0        0        0        0        0
;Oil
;
;Marginal EUIs
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    5.58     11.2      8.2      6.4     32.6     10.1        3     11.6      0.8      1.9
;Elec
   29.33    40.34        0    40.34    51.31        0        0        0        0        0
;Gas
      80        0        0      123      150        0        0        0        0        0
;Oil
;
;  HEALTH
;
;Average Shares
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
```

```
   31.1    90.2     100    44.4    52.2      89     100     100     100     100
;Elec
   62.5       0       0    41.6    15.6       0       0       0       0       0
;Gas
    6.4       0       0     6.3     2.5       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   4.71    5.91    2.86    1.39    4.82    0.48     0.3    5.26    0.61    3.09
;Elec
     90      90       0      21      25       0       0       0       0      21
;Gas
     95       0       0      30      26       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   21.9    94.2     100      50      63    89.7     100      99    91.7     100
;Elec
   66.4       0       0      41    15.6       0       0       0       0       0
;Gas
      1       0       0       1       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    4.6    5.78     2.8    1.36    4.71    0.47    0.29    5.14     0.6    3.02
;Elec
   59.5   66.91       0   15.62    18.6       0       0       0       0   15.65
;Gas
     95       0       0      30      26       0       0       0       0       0
;Oil
;
;  LODGING
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   65.6    89.3     100    20.2    36.9    73.1     100     100     100     100
;Elec
   30.8       0       0    65.2      37       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   3.16     3.7    0.96    2.23    1.93    0.85    0.57     3.3    0.26    2.36
;Elec
     40      22       0      25      16       0       0       0       0      10
;Gas
     35       0       0      21       0       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
```

```
   64.6     100     100    34.8      63    81.7     100     100    71.1     100
;Elec
     20       0       0    65.2      37       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   3.16     3.7    0.96    2.23    1.93    0.85    0.57     3.3    0.26    2.36
;Elec
  27.85   17.23       0   19.54   12.54       0       0       0       0    7.83
;Gas
     35       0       0      21       0       0       0       0       0       0
;Oil
;
;  MISCELLANEOUS
;
;Average Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   18.7    57.3    54.8    42.8    53.7     100     100     100     100     100
;Elec
   45.6       0       0      44     8.5       0       0       0       0       0
;Gas
   15.4       0       0       0       0       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   4.61    2.59    0.78    0.32    0.51    0.35    0.49    4.54    0.32    0.85
;Elec
     40      22       0      15       4       0       0       0       0       4
;Gas
     30       0       0      18       0       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   28.1    87.2     100    64.2    50.8    62.2     100      93    37.3     100
;Elec
     52       0       0    33.6     8.5       0       0       0       0       0
;Gas
    1.2       0       0     0.2       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   4.49    2.52    0.76    0.57    1.16    0.64    0.63    4.42    0.31    0.83
;Elec
  36.25   22.46       0   15.34    4.11       0       0       0       0    4.07
;Gas
     30       0       0      18       0       0       0       0       0       0
;Oil
;
;  OUT-OF-SCOPE
;
;Average Shares
```

```
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0       0       0       0       0       0     100       0       0       0
;Elec
      0       0       0       0       0       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Average EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0       0       0       0       0       0       0       0       0       0
;Elec
      0       0       0       0       0       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Marginal Shares
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0       0       0       0       0       0     100       0       0       0
;Elec
      0       0       0       0       0       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;Marginal EUIs
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0       0       0       0       0       0       0       0       0       0
;Elec
      0       0       0       0       0       0       0       0       0       0
;Gas
      0       0       0       0       0       0       0       0       0       0
;Oil
;
;  SMALL OFFICES
;
;Summer Peak Fractions
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0     0.7    0.35     0.3    0.36   0.315       0   0.325       0   0.325
;
;Summer Load Shape
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0     433     423     100       0     700       0     350       0     350
;  1:00
      0     433     427     100       0     700       0     325       0     325
;  2:00
      0     433     429     100       0     700       0     325       0     325
;  3:00
      0     433     438     100       0     700       0     325       0     325
;  4:00
      0     467     456     200       0     700       0     400       0     400
;  5:00
      0     500     504     450       0     700       0     524       0     524
;  6:00
      0     600     606     650     150     850       0     631       0     631
;  7:00
```

```
        0      700      697      850      450     1000        0      850        0      850
;  8:00
        0      900      900     1000      500      900        0      893        0      893
;  9:00
        0      967      971     1000      400      800        0      961        0      961
; 10:00
        0     1000      980     1000      800      900        0     1000        0     1000
; 11:00
        0     1000      980     1000     1000     1000        0     1000        0     1000
; 12:00
        0      950      950     1000     1000     1000        0      950        0      950
; 13:00
        0     1000      980     1000      500      900        0     1000        0     1000
; 14:00
        0     1000     1000     1000      200      800        0      990        0      990
; 15:00
        0     1000      989     1000      200      800        0      981        0      950
; 16:00
        0      933      970     1000      200      800        0      932        0      850
; 17:00
        0      700      701      850        0      750        0      800        0      800
; 18:00
        0      500      489      600        0      700        0      700        0      700
; 19:00
        0      475      445      450        0      700        0      650        0      650
; 20:00
        0      467      420      200        0      700        0      600        0      600
; 21:00
        0      433      418      100        0      700        0      500        0      500
; 22:00
        0      400      383      100        0      700        0      450        0      450
; 23:00
        0      433      431      100        0      700        0      400        0      400
; 24:00
;
;Winter Peak Fractions
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
        1        0     0.33     0.38     0.36    0.315        0    0.325        0    0.325
;
;Winter Load Shape
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
      500        0      433      100        0      700        0      350        0      350
;  1:00
      600        0      433      100        0      700        0      325        0      325
;  2:00
      700        0      433      100        0      700        0      325        0      325
;  3:00
      700        0      433      100        0      700        0      325        0      325
;  4:00
      800        0      467      200        0      700        0      400        0      400
;  5:00
      900        0      500      450        0      700        0      524        0      524
;  6:00
     1000        0      600      650      150      850        0      631        0      631
;  7:00
     1000        0      700      850      450     1000        0      850        0      850
;  8:00
```

```
     900       0     900    1000     500     900       0     893       0     893
;   9:00
     800       0     967    1000     400     800       0     961       0     961
;  10:00
     600       0    1000    1000     800     900       0    1000       0    1000
;  11:00
     400       0    1000    1000    1000    1000       0    1000       0    1000
;  12:00
     200       0     950    1000    1000    1000       0     950       0     950
;  13:00
     100       0    1000    1000     500     900       0    1000       0    1000
;  14:00
     100       0    1000    1000     200     800       0     990       0     990
;  15:00
     100       0    1000    1000     200     800       0     981       0     950
;  16:00
     100       0     933    1000     200     800       0     932       0     850
;  17:00
     200       0     700     850       0     750       0     800       0     800
;  18:00
     400       0     500     600       0     700       0     700       0     700
;  19:00
     400       0     475     450       0     700       0     650       0     650
;  20:00
     400       0     467     200       0     700       0     600       0     600
;  21:00
     400       0     433     100       0     700       0     500       0     500
;  22:00
     400       0     400     100       0     700       0     450       0     450
;  23:00
     500       0     433     100       0     700       0     400       0     400
;  24:00
;
;  LARGE OFFICES
;
;Summer Peak Fractions
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       0     0.7    0.35     0.3    0.36   0.315       0   0.325       0   0.325
;
;Summer Load Shape
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       0     433     423     100       0     700       0     350       0     350
;   1:00
       0     433     427     100       0     700       0     325       0     325
;   2:00
       0     433     429     100       0     700       0     325       0     325
;   3:00
       0     433     438     100       0     700       0     325       0     325
;   4:00
       0     467     456     200       0     700       0     400       0     400
;   5:00
       0     500     504     450       0     700       0     524       0     524
;   6:00
       0     600     606     650     150     850       0     631       0     631
;   7:00
       0     700     697     850     450    1000       0     850       0     850
;   8:00
```

```
        0       900       900      1000       500       900         0       893         0       893
;    9:00
        0       967       971      1000       400       800         0       961         0       961
;   10:00
        0      1000       980      1000       800       900         0      1000         0      1000
;   11:00
        0      1000       980      1000      1000      1000         0      1000         0      1000
;   12:00
        0       950       950      1000      1000      1000         0       950         0       950
;   13:00
        0      1000       980      1000       500       900         0      1000         0      1000
;   14:00
        0      1000      1000      1000       200       800         0       990         0       990
;   15:00
        0      1000       989      1000       200       800         0       981         0       950
;   16:00
        0       933       970      1000       200       800         0       932         0       850
;   17:00
        0       700       701       850         0       750         0       800         0       800
;   18:00
        0       500       489       600         0       700         0       700         0       700
;   19:00
        0       475       445       450         0       700         0       650         0       650
;   20:00
        0       467       420       200         0       700         0       600         0       600
;   21:00
        0       433       418       100         0       700         0       500         0       500
;   22:00
        0       400       383       100         0       700         0       450         0       450
;   23:00
        0       433       431       100         0       700         0       400         0       400
;   24:00
;
;Winter Peak Fractions
;    HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
        1         0      0.33      0.38      0.36     0.315         0     0.325         0     0.325
;
;Winter Load Shape
;    HEAT      COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
      500         0       433       100         0       700         0       350         0       350
;    1:00
      600         0       433       100         0       700         0       325         0       325
;    2:00
      700         0       433       100         0       700         0       325         0       325
;    3:00
      700         0       433       100         0       700         0       325         0       325
;    4:00
      800         0       467       200         0       700         0       400         0       400
;    5:00
      900         0       500       450         0       700         0       524         0       524
;    6:00
     1000         0       600       650       150       850         0       631         0       631
;    7:00
     1000         0       700       850       450      1000         0       850         0       850
;    8:00
      900         0       900      1000       500       900         0       893         0       893
;    9:00
```

```
       800       0     967    1000     400     800       0     961       0     961
; 10:00
       600       0    1000    1000     800     900       0    1000       0    1000
; 11:00
       400       0    1000    1000    1000    1000       0    1000       0    1000
; 12:00
       200       0     950    1000    1000    1000       0     950       0     950
; 13:00
       100       0    1000    1000     500     900       0    1000       0    1000
; 14:00
       100       0    1000    1000     200     800       0     990       0     990
; 15:00
       100       0    1000    1000     200     800       0     981       0     950
; 16:00
       100       0     933    1000     200     800       0     932       0     850
; 17:00
       200       0     700     850       0     750       0     800       0     800
; 18:00
       400       0     500     600       0     700       0     700       0     700
; 19:00
       400       0     475     450       0     700       0     650       0     650
; 20:00
       400       0     467     200       0     700       0     600       0     600
; 21:00
       400       0     433     100       0     700       0     500       0     500
; 22:00
       400       0     400     100       0     700       0     450       0     450
; 23:00
       500       0     433     100       0     700       0     400       0     400
; 24:00
;
;  WAREHOUSES
;
;Summer Peak Fractions
;   HEAT     COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0     0.6     0.3     0.3    0.36   0.315       0   0.325       0   0.325
;
;Summer Load Shape
;   HEAT     COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0     433     423     400       0     700       0     350       0     350
;  1:00
         0     433     427     400       0     700       0     325       0     325
;  2:00
         0     433     429     400       0     700       0     325       0     325
;  3:00
         0     433     438     400       0     700       0     325       0     325
;  4:00
         0     467     456     400       0     700       0     400       0     400
;  5:00
         0     500     504     500     150     700       0     524       0     524
;  6:00
         0     600     606     650     250     850       0     631       0     631
;  7:00
         0     700     697     850     450    1000       0     850       0     850
;  8:00
         0     900     900    1000     500     900       0     893       0     893
;  9:00
```

```
       0     967     971    1000     400     800       0     961       0     961
; 10:00
       0    1000     980    1000     800     900       0    1000       0    1000
; 11:00
       0    1000     980    1000    1000    1000       0    1000       0    1000
; 12:00
       0     950     950    1000    1000    1000       0     950       0     950
; 13:00
       0    1000     980    1000     500     900       0    1000       0    1000
; 14:00
       0    1000    1000    1000     300     800       0     990       0     990
; 15:00
       0    1000     989    1000     300     800       0     981       0     950
; 16:00
       0     933     970    1000     300     800       0     932       0     850
; 17:00
       0     700     701     850       0     750       0     800       0     800
; 18:00
       0     500     489     600       0     700       0     700       0     700
; 19:00
       0     475     445     400       0     700       0     650       0     650
; 20:00
       0     467     420     400       0     700       0     600       0     600
; 21:00
       0     433     418     400       0     700       0     500       0     500
; 22:00
       0     400     383     400       0     700       0     450       0     450
; 23:00
       0     433     418     400       0     700       0     400       0     400
; 24:00
;
;Winter Peak Fractions
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     1.2    0.08   0.285    0.38    0.36   0.315       0   0.325       0   0.325
;
;Winter Load Shape
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     500       0     433     400       0     700       0     350       0     350
;  1:00
     600       0     433     400       0     700       0     325       0     325
;  2:00
     700       0     433     400       0     700       0     325       0     325
;  3:00
     700       0     433     400       0     700       0     325       0     325
;  4:00
     800       0     467     400       0     700       0     400       0     400
;  5:00
     900       0     500     500     150     700       0     524       0     524
;  6:00
    1000       0     600     650     250     850       0     631       0     631
;  7:00
    1000       0     700     850     450    1000       0     850       0     850
;  8:00
     900     350     900    1000     500     900       0     893       0     893
;  9:00
     800     500     967    1000     400     800       0     961       0     961
; 10:00
```

```
    600     700    1000    1000     800     900       0    1000       0    1000
; 11:00
    400     850    1000    1000    1000    1000       0    1000       0    1000
; 12:00
    200     900     950    1000    1000    1000       0     950       0     950
; 13:00
    100    1000    1000    1000     500     900       0    1000       0    1000
; 14:00
    100    1000    1000    1000     300     800       0     990       0     990
; 15:00
    100     900    1000    1000     300     800       0     981       0     950
; 16:00
    100     700     933    1000     300     800       0     932       0     850
; 17:00
    100     500     700     850       0     750       0     800       0     800
; 18:00
    200     150     500     600       0     700       0     700       0     700
; 19:00
    300       0     475     400       0     700       0     650       0     650
; 20:00
    400       0     467     400       0     700       0     600       0     600
; 21:00
    400       0     433     400       0     700       0     500       0     500
; 22:00
    400       0     400     400       0     700       0     450       0     450
; 23:00
    500       0     433     400       0     700       0     400       0     400
; 24:00
;
;  FOODSTORES
;
;Summer Peak Fractions
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0    0.75   0.295    0.25   0.295   0.315       0   0.295       0   0.295
;
;Summer Load Shape
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0     300     250     211     100     800       0     450       0     450
;  1:00
      0     300     250      79      50     800       0     350       0     350
;  2:00
      0     300     260      26      50     700       0     300       0     300
;  3:00
      0     350     274      26      50     600       0     300       0     300
;  4:00
      0     350     285      26     200     600       0     350       0     350
;  5:00
      0     375     300      26     333     700       0     500       0     500
;  6:00
      0     400     317      79     400     800       0     500       0     500
;  7:00
      0     420     417     105     350     800       0     500       0     500
;  8:00
      0     480     491     289     300     900       0     750       0     750
;  9:00
      0     650     576     316     300     900       0     800       0     800
; 10:00
```

```
       0     1000      639      579      667      900        0      800        0      800
; 11:00
       0     1000      887      500      800     1000        0      800        0      800
; 12:00
       0     1000      991      632      800     1000        0      800        0      800
; 13:00
       0     1000     1000      800      700     1000        0      800        0      800
; 14:00
       0     1000      950     1000      600      900        0      800        0      800
; 15:00
       0     1000      900      800      650      900        0      900        0      900
; 16:00
       0     1000      875      342      700     1000        0      950        0      950
; 17:00
       0     1000      865      395      900     1000        0     1000        0     1000
; 18:00
       0     1000      859      605     1000     1000        0     1000        0     1000
; 19:00
       0     1000      820      632      900     1000        0     1000        0     1000
; 20:00
       0      780      776     1000      600      900        0      900        0      900
; 21:00
       0      660      672     1000      500      900        0      750        0      750
; 22:00
       0      380      378     1000      400      900        0      600        0      600
; 23:00
       0      350      350      579      250      800        0      500        0      500
; 24:00
;
;Winter Peak Fractions
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
     1.3        0     0.28     0.31    0.295    0.315        0    0.295        0    0.295
;
;Winter Load Shape
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
     550        0      250      211      100      800        0      450        0      450
;  1:00
     510        0      250       79       50      800        0      350        0      350
;  2:00
     475        0      260       26       50      700        0      300        0      300
;  3:00
     460        0      274       26       50      600        0      300        0      300
;  4:00
     501        0      285       26      200      600        0      350        0      350
;  5:00
     504        0      300       26      333      700        0      500        0      500
;  6:00
     600        0      317       79      400      800        0      500        0      500
;  7:00
     700        0      417      105      350      800        0      500        0      500
;  8:00
     850        0      491      289      300      900        0      750        0      750
;  9:00
    1000        0      576      316      300      900        0      800        0      800
; 10:00
     985        0      639      579      667      900        0      800        0      800
; 11:00
```

```
     964     0     887     500     800    1000     0     800     0     800
 ; 12:00
     938     0     991     632     800    1000     0     800     0     800
 ; 13:00
     946     0    1000     800     700    1000     0     800     0     800
 ; 14:00
     864     0     950    1000     600     900     0     800     0     800
 ; 15:00
     737     0     900     800     650     900     0     900     0     900
 ; 16:00
     829     0     875     342     700    1000     0     950     0     950
 ; 17:00
     890     0     865     395     900    1000     0    1000     0    1000
 ; 18:00
     867     0     859     605    1000    1000     0    1000     0    1000
 ; 19:00
     820     0     820     632     900    1000     0    1000     0    1000
 ; 20:00
     731     0     776    1000     600     900     0     900     0     900
 ; 21:00
     646     0     672    1000     500     900     0     750     0     750
 ; 22:00
     602     0     378    1000     400     900     0     600     0     600
 ; 23:00
     600     0     350     579     250     800     0     500     0     500
 ; 24:00
 ;
 ;  RETAIL
 ;
 ;Summer Peak Fractions
 ;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       0    0.65   0.307    0.26   0.307   0.295       0   0.295       0   0.295
 ;
 ;Summer Load Shape
 ;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       0     300     400     150       0     700       0     350       0     200
 ;  1:00
       0     300     400     150       0     700       0     350       0     200
 ;  2:00
       0     300     400     150       0     700       0     350       0     200
 ;  3:00
       0     300     400     150       0     700       0     350       0     200
 ;  4:00
       0     400     400     150       0     700       0     350       0     200
 ;  5:00
       0     500     400     700       0     700       0     450       0     250
 ;  6:00
       0     600     417     700     200     700       0     500       0     400
 ;  7:00
       0     700     528     700     300     800       0     550       0     750
 ;  8:00
       0     700     639     800     400     900       0     800       0     893
 ;  9:00
       0     800     950    1000     400    1000       0     980       0     961
 ; 10:00
       0     900     950    1000     800    1000       0    1000       0    1000
 ; 11:00
```

```
        0     1000     1000     1000     1000     1000        0     1000        0     1000
; 12:00
        0     1000     1000     1000     1000     1000        0     1000        0     1000
; 13:00
        0     1000     1000     1000      500     1000        0     1000        0      990
; 14:00
        0     1000     1000     1000      500     1000        0     1000        0      981
; 15:00
        0     1000     1000     1000      700     1000        0     1000        0      981
; 16:00
        0     1000     1000     1000      700     1000        0      950        0      932
; 17:00
        0     1000      972     1000      600     1000        0      900        0      930
; 18:00
        0      800      917     1000      400     1000        0      850        0      850
; 19:00
        0      700      861      800      300      900        0      750        0      800
; 20:00
        0      600      778      700        0      800        0      600        0      500
; 21:00
        0      400      500      700        0      700        0      550        0      300
; 22:00
        0      300      400      500        0      700        0      450        0      200
; 23:00
        0      300      400      400        0      700        0      350        0      200
; 24:00
;
;Winter Peak Fractions
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
      1.1     0.05    0.292    0.325    0.307    0.295        0    0.295        0    0.295
;
;Winter Load Shape
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
      450        0      250      150        0      700        0      350        0      200
;  1:00
      449        0      250      150        0      700        0      350        0      200
;  2:00
      439        0      250      150        0      700        0      350        0      200
;  3:00
      444        0      250      150        0      700        0      350        0      200
;  4:00
      449        0      250      150        0      700        0      350        0      200
;  5:00
      526        0      250      700        0      700        0      450        0      250
;  6:00
      868        0      319      700      200      700        0      500        0      400
;  7:00
     1000        0      309      700      300      800        0      550        0      750
;  8:00
      900      350      436      800      400      900        0      800        0      893
;  9:00
      700      500      511     1000      400     1000        0      980        0      961
; 10:00
      500      700      511     1000      800     1000        0     1000        0     1000
; 11:00
      300      850      713     1000     1000     1000        0     1000        0     1000
; 12:00
```

```
        100      900      883     1000     1000     1000        0     1000        0     1000
;  13:00
        100     1000      883     1000      500     1000        0     1000        0      990
;  14:00
        100     1000      947     1000      500     1000        0     1000        0      981
;  15:00
        100      900     1000     1000      700     1000        0     1000        0      981
;  16:00
        200      700      936     1000      700     1000        0      950        0      932
;  17:00
        300      500      915     1000      600     1000        0      900        0      930
;  18:00
        400      150      766     1000      400     1000        0      850        0      850
;  19:00
        400        0      670      800      300      900        0      750        0      800
;  20:00
        425        0      468      700        0      800        0      600        0      500
;  21:00
        425        0      266      700        0      700        0      550        0      300
;  22:00
        450        0      250      500        0      700        0      450        0      200
;  23:00
        450        0      250      400        0      700        0      350        0      200
;  24:00
;
;   SCHOOLS
;
;Summer Peak Fractions
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
          0      0.9     0.28     0.24     0.28      0.3        0     0.28        0     0.28
;
;Summer Load Shape
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
          0      300      400      150        0      750        0      300        0      200
;   1:00
          0      300      400      150        0      700        0      300        0      200
;   2:00
          0      300      400      150        0      700        0      300        0      200
;   3:00
          0      300      400      150        0      700        0      300        0      200
;   4:00
          0      400      400      150        0      700        0      300        0      200
;   5:00
          0      500      400      700        0      700        0      500        0      500
;   6:00
          0      600      417      700      200      750        0      700        0      700
;   7:00
          0      700      528      700      300      750        0      800        0      800
;   8:00
          0      700      639      800      400      800        0      900        0      900
;   9:00
          0      800      950     1000      400      900        0     1000        0     1000
;  10:00
          0      900      950     1000      800      950        0     1000        0     1000
;  11:00
          0     1000     1000     1000     1000      950        0     1000        0     1000
;  12:00
```

```
      0     1000     1000     1000     1000      950        0     1000         0     1000
; 13:00
      0     1000     1000     1000      500      950        0     1000         0     1000
; 14:00
      0     1000     1000     1000      500     1000        0     1000         0     1000
; 15:00
      0     1000     1000     1000      700     1000        0     1000         0     1000
; 16:00
      0     1000     1000     1000      700     1000        0     1000         0     1000
; 17:00
      0     1000      972     1000      600     1000        0     1000         0     1000
; 18:00
      0      800      917     1000      400      950        0      900         0      900
; 19:00
      0      700      861      800      300      900        0      800         0      800
; 20:00
      0      600      778      700        0      900        0      700         0      700
; 21:00
      0      400      500      700        0      800        0      500         0      500
; 22:00
      0      300      400      500        0      750        0      300         0      200
; 23:00
      0      300      400      400        0      750        0      300         0      200
; 24:00
;
;Winter Peak Fractions
;  HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
   0.95        0     0.28    0.305     0.28     0.26        0     0.28        0     0.28
;
;Winter Load Shape
;  HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
    600        0      250      150        0      750        0      300        0      200
;  1:00
    600        0      250      150        0      700        0      300        0      200
;  2:00
    600        0      250      150        0      700        0      300        0      200
;  3:00
    600        0      250      150        0      700        0      300        0      200
;  4:00
    600        0      250      150        0      700        0      300        0      200
;  5:00
    600        0      250      700        0      700        0      500        0      500
;  6:00
    700        0      319      700      200      750        0      700        0      700
;  7:00
   1000        0      309      700      300      750        0      800        0      800
;  8:00
    900        0      436      800      400      800        0      900        0      900
;  9:00
    700        0      511     1000      400      900        0     1000        0     1000
; 10:00
    500        0      511     1000      800      950        0     1000        0     1000
; 11:00
    300        0      713     1000     1000      950        0     1000        0     1000
; 12:00
    100        0      883     1000     1000      950        0     1000        0     1000
; 13:00
```

```
    100       0     883    1000     500     950       0    1000       0    1000
; 14:00
    100       0     947    1000     500    1000       0    1000       0    1000
; 15:00
    100       0    1000    1000     700    1000       0    1000       0    1000
; 16:00
    100       0     936    1000     700    1000       0    1000       0    1000
; 17:00
    200       0     915    1000     600    1000       0    1000       0    1000
; 18:00
    300       0     766    1000     400     950       0     900       0     900
; 19:00
    300       0     670     800     300     900       0     800       0     800
; 20:00
    300       0     468     700       0     900       0     700       0     700
; 21:00
    400       0     266     700       0     800       0     500       0     500
; 22:00
    500       0     250     500       0     750       0     300       0     200
; 23:00
    600       0     250     400       0     750       0     300       0     200
; 24:00
;
;  COLLEGES
;
;Summer Peak Fractions
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0     0.7    0.28    0.28   0.325   0.315       0   0.325       0   0.325
;
;Summer Load Shape
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
      0     400     400     100       0     800       0     200       0     200
;  1:00
      0     400     400     100       0     800       0     200       0     200
;  2:00
      0     400     400     100       0     835       0     200       0     200
;  3:00
      0     400     400     100       0     865       0     200       0     200
;  4:00
      0     400     400     100       0     904       0     200       0     200
;  5:00
      0     483     483     250       0     939       0     400       0     400
;  6:00
      0     550     550     450       0     987       0     650       0     650
;  7:00
      0     650     650     650     250     990       0     850       0     850
;  8:00
      0     690     690     800     400     995       0    1000       0    1000
;  9:00
      0     759     759    1000     500     995       0    1000       0    1000
; 10:00
      0     793     793    1000     900    1000       0    1000       0    1000
; 11:00
      0     950     950    1000    1000     950       0    1000       0    1000
; 12:00
      0    1000    1000    1000    1000     930       0    1000       0    1000
; 13:00
```

```
         0    1000    1000    1000     500     910       0    1000       0    1000
; 14:00
         0     897     998    1000     200     874       0    1000       0    1000
; 15:00
         0     862     950    1000     200     870       0    1000       0    1000
; 16:00
         0     759     901    1000     200     861       0    1000       0    1000
; 17:00
         0     621     887     800       0     843       0    1000       0    1000
; 18:00
         0     552     823     650       0     840       0    1000       0    1000
; 19:00
         0     552     785     450       0     835       0     500       0     500
; 20:00
         0     552     650     250       0     800       0     418       0     418
; 21:00
         0     483     523     200       0     800       0     373       0     373
; 22:00
         0     450     483     100       0     800       0     200       0     200
; 23:00
         0     400     453     100       0     800       0     200       0     200
; 24:00
;
;Winter Peak Fractions
;     HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         1       0    0.28    0.33   0.325   0.315       0   0.325       0   0.325
;
;Winter Load Shape
;     HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       412       0     297     100       0     800       0     200       0     200
;  1:00
       431       0     264     100       0     800       0     200       0     200
;  2:00
       431       0     264     100       0     835       0     200       0     200
;  3:00
       431       0     231     100       0     865       0     200       0     200
;  4:00
       431       0     264     100       0     904       0     200       0     200
;  5:00
       700       0     222     250       0     939       0     400       0     400
;  6:00
      1000       0     240     450       0     987       0     650       0     650
;  7:00
      1000       0     252     650     250     990       0     850       0     850
;  8:00
       800       0     339     800     400     995       0    1000       0    1000
;  9:00
       600       0     588    1000     500     995       0    1000       0    1000
; 10:00
       300       0     670    1000     900    1000       0    1000       0    1000
; 11:00
       200       0     769    1000    1000     950       0    1000       0    1000
; 12:00
       200       0     910    1000    1000     930       0    1000       0    1000
; 13:00
       200       0     934    1000     500     910       0    1000       0    1000
; 14:00
```

```
     200        0      973     1000      200      874        0     1000        0     1000
; 15:00
     200        0     1000     1000      200      870        0     1000        0     1000
; 16:00
     300        0      838     1000      200      861        0     1000        0     1000
; 17:00
     300        0      655      800        0      843        0     1000        0     1000
; 18:00
     350        0      652      650        0      840        0     1000        0     1000
; 19:00
     400        0      627      450        0      835        0      500        0      500
; 20:00
     400        0      510      250        0      800        0      418        0      418
; 21:00
     400        0      456      200        0      800        0      373        0      373
; 22:00
     400        0      459      100        0      800        0      200        0      200
; 23:00
     400        0      390      100        0      800        0      200        0      200
; 24:00
;
;  RESTAURANTS
;
;Summer Peak Fractions
;  HEAT      COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
       0      0.6    0.252      0.2     0.28    0.315        0      0.3        0      0.3
;
;Summer Load Shape
;  HEAT      COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
       0      433      433      133        0      700        0      107        0      107
;  1:00
       0      433      433      133        0      700        0      104        0      104
;  2:00
       0      433      433      133        0      700        0      101        0      101
;  3:00
       0      433      433      133        0      700        0      104        0      104
;  4:00
       0      467      467      133        0      700        0      104        0      104
;  5:00
       0      567      567      133      250      800        0      200        0      200
;  6:00
       0      600      600      133      400      900        0      500        0      500
;  7:00
       0      700      700      250      500     1000        0      800        0      800
;  8:00
       0      900      900      400      600     1000        0      924        0      924
;  9:00
       0      967      967      667      600     1000        0      961        0      961
; 10:00
       0     1000     1000      733      800     1000        0     1000        0     1000
; 11:00
       0     1000     1000      933     1000     1000        0      921        0      921
; 12:00
       0     1000     1000     1000     1000     1000        0      885        0      885
; 13:00
       0     1000     1000     1000      500     1000        0     1000        0      888
; 14:00
```

```
       0    1000    1000     850     300    1000       0     950       0     832
; 15:00
       0    1000    1000     800     300     900       0     800       0     784
; 16:00
       0     933     933     533     300     800       0     600       0     742
; 17:00
       0     700     700     533       0     700       0     400       0     711
; 18:00
       0     500     500     400       0     700       0     400       0     593
; 19:00
       0     433     433     400       0     700       0     400       0     500
; 20:00
       0     467     467     300       0     700       0     400       0     400
; 21:00
       0     433     433     300       0     700       0     300       0     300
; 22:00
       0     400     400     133       0     700       0     132       0     132
; 23:00
       0     433     433     133       0     700       0     118       0     118
; 24:00
;
;Winter Peak Fractions
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
       1       0    0.36    0.45     0.4   0.315       0    0.36       0    0.36
;
;Winter Load Shape
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     300       0     350     133       0     700       0     107       0     107
;  1:00
     300       0     350     133       0     700       0     104       0     104
;  2:00
     300       0     484     133       0     700       0     101       0     101
;  3:00
     300       0     496     133       0     700       0     104       0     104
;  4:00
     500       0     496     133       0     700       0     104       0     104
;  5:00
     950       0     508     133     250     800       0     200       0     200
;  6:00
    1000       0     617     133     400     900       0     500       0     500
;  7:00
     800       0     824     250     500    1000       0     800       0     800
;  8:00
     600       0     820     400     600    1000       0     924       0     924
;  9:00
     400       0     828     667     600    1000       0     961       0     961
; 10:00
     200       0     859     733     800    1000       0    1000       0    1000
; 11:00
     200       0     941     933    1000    1000       0     921       0     921
; 12:00
     200       0     950    1000    1000    1000       0     885       0     885
; 13:00
     200       0     953    1000     500    1000       0    1000       0     888
; 14:00
     200       0    1000     850     300    1000       0     950       0     832
; 15:00
```

```
      100       0     859     800     300     900       0     800       0     784
;   16:00
      100       0     715     533     300     800       0     600       0     742
;   17:00
      200       0     547     533       0     700       0     400       0     711
;   18:00
      300       0     500     400       0     700       0     400       0     593
;   19:00
      300       0     450     400       0     700       0     400       0     500
;   20:00
      300       0     387     300       0     700       0     400       0     400
;   21:00
      300       0     350     300       0     700       0     300       0     300
;   22:00
      300       0     350     133       0     700       0     132       0     132
;   23:00
      300       0     350     133       0     700       0     118       0     118
;   24:00
;
;  HEALTH
;
;Summer Peak Fractions
;    HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
        0    0.65   0.272    0.25     0.3   0.315       0    0.32       0    0.34
;
;Summer Load Shape
;    HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
        0     410     410     200       0     500       0     329       0     329
;    1:00
        0     410     410     200       0     500       0     314       0     314
;    2:00
        0     410     410     200       0     500       0     298       0     298
;    3:00
        0     410     410     200       0     500       0     314       0     314
;    4:00
        0     410     410     200       0     600       0     333       0     333
;    5:00
        0     487     487     300     200     750       0     377       0     377
;    6:00
        0     600     600     400     400     900       0     639       0     639
;    7:00
        0     820     820     800     400    1000       0     643       0     643
;    8:00
        0     850     850     900     333    1000       0    1000       0    1000
;    9:00
        0     950     950    1000     333    1000       0    1000       0    1000
;   10:00
        0    1000    1000    1000     667    1000       0    1000       0    1000
;   11:00
        0    1000    1000    1000     900    1000       0    1000       0    1000
;   12:00
        0    1000    1000     900     900    1000       0    1000       0    1000
;   13:00
        0    1000    1000     800     700    1000       0    1000       0    1000
;   14:00
        0    1000    1000     700     500    1000       0    1000       0    1000
;   15:00
```

```
       0    1000    1000     700     500    1000       0     850       0     850
; 16:00
       0    1000     950     700     750    1000       0     750       0     800
; 17:00
       0     850     880     700     900    1000       0     700       0     800
; 18:00
       0     780     780     700    1000    1000       0     576       0     750
; 19:00
       0     718     725     800     850     900       0     550       0     700
; 20:00
       0     700     700     900     800     750       0     528       0     700
; 21:00
       0     500     500     900     667     600       0     500       0     500
; 22:00
       0     400     400     800     500     500       0     480       0     480
; 23:00
       0     400     400     400     333     500       0     450       0     450
; 24:00
;
;Winter Peak Fractions
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
   0.95       0    0.34    0.35    0.35   0.315       0    0.34       0    0.34
;
;Winter Load Shape
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    418       0     198     200       0     500       0     329       0     329
;  1:00
    418       0     188     200       0     500       0     314       0     314
;  2:00
    408       0     179     200       0     500       0     298       0     298
;  3:00
    500       0     188     200       0     500       0     314       0     314
;  4:00
    600       0     198     200       0     600       0     333       0     333
;  5:00
    700       0     224     300     200     750       0     377       0     377
;  6:00
    900       0     383     400     400     900       0     639       0     639
;  7:00
   1000       0     481     800     400    1000       0     643       0     643
;  8:00
    796       0     597     900     333    1000       0    1000       0    1000
;  9:00
    700       0     701    1000     333    1000       0    1000       0    1000
; 10:00
    500       0     692    1000     667    1000       0    1000       0    1000
; 11:00
    400       0     770    1000     900    1000       0    1000       0    1000
; 12:00
    200       0     831     900     900    1000       0    1000       0    1000
; 13:00
    200       0     873     800     700    1000       0    1000       0    1000
; 14:00
    200       0    1000     700     500    1000       0    1000       0    1000
; 15:00
    200       0     951     700     500    1000       0     850       0     850
; 16:00
```

```
     200        0       815       700       750      1000         0       750         0       800
; 17:00
     200        0       802       700       900      1000         0       700         0       800
; 18:00
     250        0       802       700      1000      1000         0       576         0       750
; 19:00
     300        0       669       800       850       900         0       550         0       700
; 20:00
     350        0       633       900       800       750         0       528         0       700
; 21:00
     350        0       406       900       667       600         0       500         0       500
; 22:00
     400        0       169       800       500       500         0       480         0       480
; 23:00
     400        0       166       400       333       500         0       450         0       450
; 24:00
;
;  LODGING
;
;Summer Peak Fractions
;   HEAT     COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
       0      0.7       0.3      0.25     0.295     0.295         0     0.295         0     0.295
;
;Summer Load Shape
;   HEAT     COOL      VENT      WATR      COOK      REFR      XLIT      ILIT      OFEQ      MISC
       0      716       716       167         0       700         0       488         0       300
;   1:00
       0      697       679       167         0       700         0       476         0       300
;   2:00
       0      684       684       167         0       700         0       470         0       300
;   3:00
       0      674       674       167         0       700         0       464         0       300
;   4:00
       0      674       674       167         0       700         0       464         0       400
;   5:00
       0      706       706       250       400       800         0       482         0       600
;   6:00
       0      750       750       500       600       900         0       735         0       735
;   7:00
       0      798       798       917       500      1000         0       783         0       783
;   8:00
       0      899       899      1000       400      1000         0       879         0       879
;   9:00
       0      900       900       950       400      1000         0      1000         0      1000
; 10:00
       0      918       918       833       667      1000         0       982         0       982
; 11:00
       0     1000       998       833       850      1000         0       985         0       985
; 12:00
       0     1000       999       833       800      1000         0      1000         0      1000
; 13:00
       0     1000      1000       833       700      1000         0      1000         0      1000
; 14:00
       0     1000       995       755       600      1000         0      1000         0      1000
; 15:00
       0     1000       987       755       750      1000         0       950         0       950
; 16:00
```

```
       0     950     950     755     950    1000       0     900       0     800
; 17:00
       0     899     899     755    1000    1000       0     850       0     700
; 18:00
       0     861     861     755     800    1000       0     800       0     500
; 19:00
       0     785     785     500     700     900       0     765       0     350
; 20:00
       0     795     795     333     400     800       0     681       0     300
; 21:00
       0     788     788     250       0     700       0     560       0     300
; 22:00
       0     747     747     167       0     700       0     512       0     300
; 23:00
       0     716     716     167       0     700       0     488       0     300
; 24:00
;
;Winter Peak Fractions
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    0.95    0.02    0.25    0.31   0.295   0.295       0   0.295       0   0.295
;
;Winter Load Shape
;   HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     756       0     716     167       0     700       0     488       0     300
;  1:00
     742       0     697     167       0     700       0     476       0     300
;  2:00
     750       0     684     167       0     700       0     470       0     300
;  3:00
     775       0     674     167       0     700       0     464       0     300
;  4:00
     800       0     674     167       0     700       0     464       0     400
;  5:00
     900       0     706     250     400     800       0     482       0     600
;  6:00
    1000       0     750     500     600     900       0     735       0     735
;  7:00
     900       0     798     917     500    1000       0     783       0     783
;  8:00
     700     350     899    1000     400    1000       0     879       0     879
;  9:00
     400     500     900     950     400    1000       0    1000       0    1000
; 10:00
     200     700     918     833     667    1000       0     982       0     982
; 11:00
     150     850    1000     833     850    1000       0     985       0     985
; 12:00
     150     900    1000     833     800    1000       0    1000       0    1000
; 13:00
     150    1000    1000     833     700    1000       0    1000       0    1000
; 14:00
     150    1000    1000     750     600    1000       0    1000       0    1000
; 15:00
     150     900    1000     750     750    1000       0     950       0     950
; 16:00
     150     700     950     750     950    1000       0     900       0     800
; 17:00
```

```
      200      500      899      750     1000     1000        0      850        0      700
; 18:00
      300      150      861      750      800     1000        0      800        0      500
; 19:00
      400        0      785      500      700      900        0      765        0      350
; 20:00
      500        0      795      333      400      800        0      681        0      300
; 21:00
      600        0      788      250        0      700        0      560        0      300
; 22:00
      650        0      747      167        0      700        0      512        0      300
; 23:00
      700        0      716      167        0      700        0      488        0      300
; 24:00
;
;  MISCELLANEOUS
;
;Summer Peak Fractions
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
        0      0.7    0.325     0.27    0.295    0.295        0    0.295        0    0.295
;
;Summer Load Shape
;    HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
        0      500      500      400       50      700        0      444        0      444
;  1:00
        0      500      510      300       50      700        0      457        0      457
;  2:00
        0      500      520      300       50      700        0      309        0      309
;  3:00
        0      500      530      350       50      700        0      296        0      296
;  4:00
        0      500      540      400      100      700        0      296        0      296
;  5:00
        0      500      556      600      300      800        0      556        0      556
;  6:00
        0      606      589      909      500      900        0      778        0      778
;  7:00
        0      697      700     1000      500     1000        0      864        0      864
;  8:00
        0      878      858      727      400     1000        0      568        0      568
;  9:00
        0      950      899      636      500     1000        0      556        0      556
; 10:00
        0      969      970      455      800     1000        0      284        0      284
; 11:00
        0     1000      979      455     1000     1000        0      272        0      272
; 12:00
        0     1000      986      455      950     1000        0      259        0      259
; 13:00
        0     1000      996      364      850     1000        0      259        0      259
; 14:00
        0     1000     1000      364      800     1000        0      272        0      272
; 15:00
        0     1000      986      364      850     1000        0      272        0      272
; 16:00
        0      969      965      364      950     1000        0      284        0      284
; 17:00
```

```
      0     969     951     455    1000    1000       0     284       0     284
; 18:00
      0     878     877     546     950    1000       0     580       0     580
; 19:00
      0     848     837     546     900     900       0     741       0     741
; 20:00
      0     788     787     546     900     900       0     938       0     938
; 21:00
      0     700     700     636     800     800       0    1000       0    1000
; 22:00
      0     600     600     636     500     700       0     889       0     889
; 23:00
      0     550     550     500     333     700       0     457       0     457
; 24:00
;
;Winter Peak Fractions
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    1.1       0    0.31    0.33   0.295   0.295       0   0.295       0   0.295
;
;Winter Load Shape
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    784       0     500     400      50     700       0     444       0     444
;  1:00
    823       0     500     300      50     700       0     457       0     457
;  2:00
    858       0     500     300      50     700       0     309       0     309
;  3:00
    852       0     500     350      50     700       0     296       0     296
;  4:00
    852       0     500     400     100     700       0     296       0     296
;  5:00
    900       0     500     600     300     800       0     556       0     556
;  6:00
   1000       0     606     909     500     900       0     778       0     778
;  7:00
    900       0     697    1000     500    1000       0     864       0     864
;  8:00
    800       0     878     727     400    1000       0     568       0     568
;  9:00
    500       0     950     636     500    1000       0     556       0     556
; 10:00
    300       0     969     455     800    1000       0     284       0     284
; 11:00
    200       0    1000     455    1000    1000       0     272       0     272
; 12:00
    200       0    1000     455     950    1000       0     259       0     259
; 13:00
    200       0    1000     364     850    1000       0     259       0     259
; 14:00
    200       0    1000     364     800    1000       0     272       0     272
; 15:00
    300       0    1000     364     850    1000       0     272       0     272
; 16:00
    400       0     969     364     950    1000       0     284       0     284
; 17:00
    600       0     969     455    1000    1000       0     284       0     284
; 18:00
```

```
       800       0     878     546     950    1000       0     580       0     580
 ; 19:00
       900       0     848     546     900     900       0     761       0     741
 ; 20:00
       800       0     788     546     900     900       0     938       0     938
 ; 21:00
       800       0     700     636     800     800       0    1000       0    1000
 ; 22:00
       775       0     600     636     500     700       0     889       0     889
 ; 23:00
       750       0     550     500     333     700       0     457       0     457
 ; 24:00
 ;
 ;  OUT-OF-SCOPE
 ;
 ;Summer Peak Fractions
 ;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0       0       0       0       0       0       0       0       0       0
 ;
 ;Summer Load Shape
 ;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0       0       0       0       0       0       0       0       0       0
 ;  1:00
         0       0       0       0       0       0       0       0       0       0
 ;  2:00
         0       0       0       0       0       0       0       0       0       0
 ;  3:00
         0       0       0       0       0       0       0       0       0       0
 ;  4:00
         0       0       0       0       0       0       0       0       0       0
 ;  5:00
         0       0       0       0       0       0       0       0       0       0
 ;  6:00
         0       0       0       0       0       0       0       0       0       0
 ;  7:00
         0       0       0       0       0       0       0       0       0       0
 ;  8:00
         0       0       0       0       0       0       0       0       0       0
 ;  9:00
         0       0       0       0       0       0       0       0       0       0
 ; 10:00
         0       0       0       0       0       0       0       0       0       0
 ; 11:00
         0       0       0       0       0       0       0       0       0       0
 ; 12:00
         0       0       0       0       0       0       0       0       0       0
 ; 13:00
         0       0       0       0       0       0       0       0       0       0
 ; 14:00
         0       0       0       0       0       0       0       0       0       0
 ; 15:00
         0       0       0       0       0       0       0       0       0       0
 ; 16:00
         0       0       0       0       0       0       0       0       0       0
 ; 17:00
         0       0       0       0       0       0       0       0       0       0
 ; 18:00
```

```
         0       0       0       0       0       0       0       0       0       0
; 19:00
         0       0       0       0       0       0       0       0       0       0
; 20:00
         0       0       0       0       0       0       0       0       0       0
; 21:00
         0       0       0       0       0       0       0       0       0       0
; 22:00
         0       0       0       0       0       0       0       0       0       0
; 23:00
         0       0       0       0       0       0       0       0       0       0
; 24:00
;
;Winter Peak Fractions
;     HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0       0       0       0       0       0       0       0       0       0
;
;Winter Load Shape
;     HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
         0       0       0       0       0       0       0       0       0       0
;  1:00
         0       0       0       0       0       0       0       0       0       0
;  2:00
         0       0       0       0       0       0       0       0       0       0
;  3:00
         0       0       0       0       0       0       0       0       0       0
;  4:00
         0       0       0       0       0       0       0       0       0       0
;  5:00
         0       0       0       0       0       0       0       0       0       0
;  6:00
         0       0       0       0       0       0       0       0       0       0
;  7:00
         0       0       0       0       0       0       0       0       0       0
;  8:00
         0       0       0       0       0       0       0       0       0       0
;  9:00
         0       0       0       0       0       0       0       0       0       0
; 10:00
         0       0       0       0       0       0       0       0       0       0
; 11:00
         0       0       0       0       0       0       0       0       0       0
; 12:00
         0       0       0       0       0       0       0       0       0       0
; 13:00
         0       0       0       0       0       0       0       0       0       0
; 14:00
         0       0       0       0       0       0       0       0       0       0
; 15:00
         0       0       0       0       0       0       0       0       0       0
; 16:00
         0       0       0       0       0       0       0       0       0       0
; 17:00
         0       0       0       0       0       0       0       0       0       0
; 18:00
         0       0       0       0       0       0       0       0       0       0
; 19:00
```

```
      0       0       0       0       0       0       0       0       0       0
; 20:00
      0       0       0       0       0       0       0       0       0       0
; 21:00
      0       0       0       0       0       0       0       0       0       0
; 22:00
      0       0       0       0       0       0       0       0       0       0
; 23:00
      0       0       0       0       0       0       0       0       0       0
; 24:00
;
;end of file
```

```
;
;FS1: Floor Stock
;
   2 ;file version: do not edit
"KU 00Forecast Floor Stock"                   ;file description

;Floor Stock Data Definitions

;Floor Stock Units
"SqFt"  "Square Feet"

   11 ;Number of Segments
 1920 ;Historical First Year
 2029 ;Forecast End Year
;
;Floor Stock Segment Definitions
;Name    Long Name                BYear   Stock Add?  StartYear  EndYear
"SMO"   "SMALL OFFICES"           1995    21.108 "N"       1968      1991
"LGO"   "LARGE OFFICES"           1995    14.945 "N"       1968      1991
"WRH"   "WAREHOUSES"              1995    22.227 "N"       1968      1991
"FOD"   "FOODSTORES"              1995    10.053 "N"       1968      1991
"RET"   "RETAIL"                  1995    36.796 "N"       1968      1991
"SCH"   "SCHOOLS"                 1995    21.404 "N"       1968      1991
"COL"   "COLLEGES"                1995    24.024 "N"       1968      1991
"RES"   "RESTAURANTS"             1995    4.7648 "N"       1968      1991
"HLT"   "HEALTH"                  1995    16.689 "N"       1968      1991
"LDG"   "LODGING"                 1995    8.5662 "N"       1968      1991
"MSC"   "MISCELLANEOUS"           1995    38.095 "N"       1968      1991
;
;Survival Functions
;1st Year          Additions
; Stock
; Surv   Age Remain  Age  Remain  Age Remain
  0.98   15      99   36      50   80      20 ;SMALL OFFICES
  0.98   15      99   36      50   80      20 ;LARGE OFFICES
  0.98   15      99   36      50   80      20 ;WAREHOUSES
  0.98   15      99   36      50   80      20 ;FOODSTORES
  0.98   15      99   36      50   80      20 ;RETAIL
 0.985   15      99   48      50   90      20 ;SCHOOLS
 0.985   15      99   48      50   90      20 ;COLLEGES
 0.985   15      99   48      50   90      20 ;RESTAURANTS
 0.985   15      99   48      50   90      20 ;HEALTH
  0.98   15      99   36      50   80      20 ;LODGING
 0.985   15      99   48      50   90      20 ;MISCELLANEOUS
;
;
;SMALL OFFICES
;
;Additions      Scale
         0     0.1458 ; 1920
         0     0.1464 ; 1921
         0     0.1471 ; 1922
         0     0.1479 ; 1923
         0     0.1487 ; 1924
         0     0.1496 ; 1925
         0     0.1505 ; 1926
         0     0.1515 ; 1927
```

```
0     0.1525 ; 1928
0     0.1536 ; 1929
0     0.1547 ; 1930
0     0.1559 ; 1931
0     0.1572 ; 1932
0     0.1584 ; 1933
0     0.1598 ; 1934
0     0.1611 ; 1935
0     0.1625 ; 1936
0     0.1639 ; 1937
0     0.1654 ; 1938
0     0.1669 ; 1939
0     0.1684 ; 1940
0     0.1689 ; 1941
0     0.1695 ; 1942
0       0.17 ; 1943
0     0.1705 ; 1944
0     0.1711 ; 1945
0     0.1716 ; 1946
0     0.1721 ; 1947
0     0.1725 ; 1948
0     0.1729 ; 1949
0     0.1732 ; 1950
0     0.1778 ; 1951
0     0.1823 ; 1952
0     0.1866 ; 1953
0     0.1908 ; 1954
0     0.1949 ; 1955
0     0.1988 ; 1956
0     0.2031 ; 1957
0     0.2074 ; 1958
0     0.2117 ; 1959
0     0.2159 ; 1960
0     0.2202 ; 1961
0     0.2245 ; 1962
0     0.2288 ; 1963
0     0.2331 ; 1964
0     0.2374 ; 1965
0     0.2417 ; 1966
0     0.2608 ; 1967
0       0.28 ; 1968
0     0.2991 ; 1969
0     0.3183 ; 1970
0     0.3374 ; 1971
0     0.3566 ; 1972
0     0.3757 ; 1973
0     0.3948 ; 1974
0     0.4139 ; 1975
0      0.433 ; 1976
0     0.4736 ; 1977
0      0.514 ; 1978
0     0.5543 ; 1979
0     0.5945 ; 1980
0     0.6345 ; 1981
0     0.6742 ; 1982
0     0.7138 ; 1983
0      0.753 ; 1984
```

```
         0      0.792 ; 1985
         0     0.8306 ; 1986
         0     0.8493 ; 1987
         0     0.8678 ; 1988
         0     0.8864 ; 1989
         0     0.9047 ; 1990
         0     0.9227 ; 1991
         0     0.9273 ; 1992
         0     0.9736 ; 1993
         0     0.9847 ; 1994
         0          1 ; 1995
;
;
;LARGE OFFICES
;
;Additions      Scale
         0     0.1458 ; 1920
         0     0.1464 ; 1921
         0     0.1471 ; 1922
         0     0.1479 ; 1923
         0     0.1487 ; 1924
         0     0.1496 ; 1925
         0     0.1505 ; 1926
         0     0.1515 ; 1927
         0     0.1525 ; 1928
         0     0.1536 ; 1929
         0     0.1547 ; 1930
         0     0.1559 ; 1931
         0     0.1572 ; 1932
         0     0.1584 ; 1933
         0     0.1598 ; 1934
         0     0.1611 ; 1935
         0     0.1625 ; 1936
         0     0.1639 ; 1937
         0     0.1654 ; 1938
         0     0.1669 ; 1939
         0     0.1684 ; 1940
         0     0.1689 ; 1941
         0     0.1695 ; 1942
         0       0.17 ; 1943
         0     0.1705 ; 1944
         0     0.1711 ; 1945
         0     0.1716 ; 1946
         0     0.1721 ; 1947
         0     0.1725 ; 1948
         0     0.1729 ; 1949
         0     0.1732 ; 1950
         0     0.1778 ; 1951
         0     0.1823 ; 1952
         0     0.1866 ; 1953
         0     0.1908 ; 1954
         0     0.1949 ; 1955
         0     0.1988 ; 1956
         0     0.2031 ; 1957
         0     0.2074 ; 1958
         0     0.2117 ; 1959
         0     0.2159 ; 1960
```

```
          0     0.2202 ; 1961
          0     0.2245 ; 1962
          0     0.2288 ; 1963
          0     0.2331 ; 1964
          0     0.2374 ; 1965
          0     0.2417 ; 1966
          0     0.2608 ; 1967
          0       0.28 ; 1968
          0     0.2991 ; 1969
          0     0.3183 ; 1970
          0     0.3374 ; 1971
          0     0.3566 ; 1972
          0     0.3757 ; 1973
          0     0.3948 ; 1974
          0     0.4139 ; 1975
          0      0.433 ; 1976
          0     0.4736 ; 1977
          0      0.514 ; 1978
          0     0.5543 ; 1979
          0     0.5945 ; 1980
          0     0.6345 ; 1981
          0     0.6742 ; 1982
          0     0.7138 ; 1983
          0      0.753 ; 1984
          0      0.792 ; 1985
          0     0.8306 ; 1986
          0     0.8493 ; 1987
          0     0.8678 ; 1988
          0     0.8864 ; 1989
          0     0.9047 ; 1990
          0     0.9227 ; 1991
          0     0.9273 ; 1992
          0     0.9736 ; 1993
          0     0.9847 ; 1994
          0          1 ; 1995
;
;
;WAREHOUSES
;
;Additions       Scale
          0     0.2119 ; 1920
          0     0.2133 ; 1921
          0     0.2147 ; 1922
          0     0.2163 ; 1923
          0     0.2179 ; 1924
          0     0.2196 ; 1925
          0     0.2214 ; 1926
          0     0.2232 ; 1927
          0     0.2252 ; 1928
          0     0.2272 ; 1929
          0     0.2292 ; 1930
          0      0.231 ; 1931
          0     0.2328 ; 1932
          0     0.2347 ; 1933
          0     0.2367 ; 1934
          0     0.2387 ; 1935
          0     0.2408 ; 1936
```

```
0      0.2429 ; 1937
0       0.245 ; 1938
0      0.2472 ; 1939
0      0.2495 ; 1940
0      0.2503 ; 1941
0      0.2511 ; 1942
0      0.2519 ; 1943
0      0.2527 ; 1944
0      0.2535 ; 1945
0      0.2542 ; 1946
0      0.2549 ; 1947
0      0.2556 ; 1948
0      0.2561 ; 1949
0      0.2566 ; 1950
0      0.2634 ; 1951
0        0.27 ; 1952
0      0.2765 ; 1953
0      0.2827 ; 1954
0      0.2888 ; 1955
0      0.2945 ; 1956
0      0.3057 ; 1957
0       0.317 ; 1958
0      0.3282 ; 1959
0      0.3395 ; 1960
0      0.3507 ; 1961
0       0.362 ; 1962
0      0.3733 ; 1963
0      0.3846 ; 1964
0      0.3959 ; 1965
0      0.4072 ; 1966
0      0.4267 ; 1967
0      0.4462 ; 1968
0      0.4657 ; 1969
0      0.4852 ; 1970
0      0.5047 ; 1971
0      0.5242 ; 1972
0      0.5436 ; 1973
0      0.5631 ; 1974
0      0.5825 ; 1975
0      0.6018 ; 1976
0      0.6219 ; 1977
0      0.6418 ; 1978
0      0.6615 ; 1979
0       0.681 ; 1980
0      0.7001 ; 1981
0      0.7189 ; 1982
0      0.7372 ; 1983
0      0.7552 ; 1984
0      0.7726 ; 1985
0      0.7894 ; 1986
0      0.8194 ; 1987
0      0.8491 ; 1988
0      0.8591 ; 1989
0      0.8686 ; 1990
0      0.8777 ; 1991
0      0.8966 ; 1992
0      0.9369 ; 1993
```

```
          0      0.981 ; 1994
          0          1 ; 1995
;
;
;FOODSTORES
;
;Additions      Scale
          0     0.2151 ; 1920
          0     0.2165 ; 1921
          0      0.218 ; 1922
          0     0.2195 ; 1923
          0     0.2212 ; 1924
          0     0.2229 ; 1925
          0     0.2247 ; 1926
          0     0.2266 ; 1927
          0     0.2285 ; 1928
          0     0.2306 ; 1929
          0     0.2327 ; 1930
          0     0.2345 ; 1931
          0     0.2363 ; 1932
          0     0.2383 ; 1933
          0     0.2403 ; 1934
          0     0.2423 ; 1935
          0     0.2444 ; 1936
          0     0.2466 ; 1937
          0     0.2488 ; 1938
          0      0.251 ; 1939
          0     0.2533 ; 1940
          0     0.2541 ; 1941
          0     0.2549 ; 1942
          0     0.2557 ; 1943
          0     0.2565 ; 1944
          0     0.2573 ; 1945
          0     0.2581 ; 1946
          0     0.2588 ; 1947
          0     0.2595 ; 1948
          0       0.26 ; 1949
          0     0.2605 ; 1950
          0     0.2674 ; 1951
          0     0.2742 ; 1952
          0     0.2807 ; 1953
          0     0.2871 ; 1954
          0     0.2932 ; 1955
          0      0.299 ; 1956
          0     0.3054 ; 1957
          0     0.3119 ; 1958
          0     0.3183 ; 1959
          0     0.3247 ; 1960
          0     0.3311 ; 1961
          0     0.3376 ; 1962
          0      0.344 ; 1963
          0     0.3505 ; 1964
          0      0.357 ; 1965
          0     0.3635 ; 1966
          0     0.3765 ; 1967
          0     0.3894 ; 1968
          0     0.4024 ; 1969
```

```
           0      0.4154 ; 1970
           0      0.4283 ; 1971
           0      0.4413 ; 1972
           0      0.4543 ; 1973
           0      0.4672 ; 1974
           0      0.4802 ; 1975
           0      0.4931 ; 1976
           0       0.523 ; 1977
           0      0.5527 ; 1978
           0      0.5823 ; 1979
           0      0.6116 ; 1980
           0      0.6407 ; 1981
           0      0.6695 ; 1982
           0       0.698 ; 1983
           0      0.7261 ; 1984
           0      0.7539 ; 1985
           0      0.7812 ; 1986
           0      0.8189 ; 1987
           0      0.8565 ; 1988
           0      0.8679 ; 1989
           0      0.8792 ; 1990
           0      0.8903 ; 1991
           0      0.9138 ; 1992
           0      0.9524 ; 1993
           0      0.9849 ; 1994
           0           1 ; 1995
;
;
;RETAIL
;
;Additions       Scale
           0      0.1255 ; 1920
           0      0.1263 ; 1921
           0      0.1272 ; 1922
           0      0.1281 ; 1923
           0      0.1291 ; 1924
           0      0.1301 ; 1925
           0      0.1311 ; 1926
           0      0.1322 ; 1927
           0      0.1334 ; 1928
           0      0.1346 ; 1929
           0      0.1358 ; 1930
           0      0.1368 ; 1931
           0      0.1379 ; 1932
           0       0.139 ; 1933
           0      0.1402 ; 1934
           0      0.1414 ; 1935
           0      0.1426 ; 1936
           0      0.1439 ; 1937
           0      0.1452 ; 1938
           0      0.1465 ; 1939
           0      0.1478 ; 1940
           0      0.1482 ; 1941
           0      0.1487 ; 1942
           0      0.1492 ; 1943
           0      0.1497 ; 1944
           0      0.1502 ; 1945
```

```
           0      0.1506 ; 1946
           0       0.151 ; 1947
           0      0.1514 ; 1948
           0      0.1517 ; 1949
           0       0.152 ; 1950
           0       0.156 ; 1951
           0        0.16 ; 1952
           0      0.1638 ; 1953
           0      0.1675 ; 1954
           0      0.1711 ; 1955
           0      0.1745 ; 1956
           0      0.1878 ; 1957
           0      0.2011 ; 1958
           0      0.2144 ; 1959
           0      0.2277 ; 1960
           0      0.2411 ; 1961
           0      0.2544 ; 1962
           0      0.2677 ; 1963
           0      0.2811 ; 1964
           0      0.2944 ; 1965
           0      0.3078 ; 1966
           0      0.3152 ; 1967
           0      0.3227 ; 1968
           0      0.3301 ; 1969
           0      0.3376 ; 1970
           0       0.345 ; 1971
           0      0.3524 ; 1972
           0      0.3598 ; 1973
           0      0.3671 ; 1974
           0      0.3745 ; 1975
           0      0.3817 ; 1976
           0      0.4228 ; 1977
           0      0.4638 ; 1978
           0      0.5045 ; 1979
           0      0.5451 ; 1980
           0      0.5854 ; 1981
           0      0.6254 ; 1982
           0       0.665 ; 1983
           0      0.7043 ; 1984
           0      0.7431 ; 1985
           0      0.7814 ; 1986
           0      0.8193 ; 1987
           0      0.8567 ; 1988
           0      0.8685 ; 1989
           0      0.8798 ; 1990
           0      0.8905 ; 1991
           0      0.9141 ; 1992
           0      0.9524 ; 1993
           0      0.9849 ; 1994
           0           1 ; 1995
;
;
;SCHOOLS
;
;Additions       Scale
           0      0.5676 ; 1920
           0      0.5717 ; 1921
```

```
0      0.576 ; 1922
0     0.5803 ; 1923
0     0.5848 ; 1924
0     0.5894 ; 1925
0     0.5941 ; 1926
0      0.599 ; 1927
0     0.6039 ; 1928
0     0.6089 ; 1929
0     0.6141 ; 1930
0     0.6191 ; 1931
0     0.6242 ; 1932
0     0.6294 ; 1933
0     0.6347 ; 1934
0     0.6401 ; 1935
0     0.6456 ; 1936
0     0.6512 ; 1937
0     0.6568 ; 1938
0     0.6626 ; 1939
0     0.6684 ; 1940
0     0.6701 ; 1941
0     0.6719 ; 1942
0     0.6737 ; 1943
0     0.6756 ; 1944
0     0.6776 ; 1945
0     0.6795 ; 1946
0     0.6815 ; 1947
0     0.6835 ; 1948
0     0.6855 ; 1949
0     0.6874 ; 1950
0     0.6891 ; 1951
0     0.6906 ; 1952
0     0.6921 ; 1953
0     0.6936 ; 1954
0     0.6949 ; 1955
0     0.6961 ; 1956
0     0.7013 ; 1957
0     0.7063 ; 1958
0      0.711 ; 1959
0     0.7156 ; 1960
0       0.72 ; 1961
0     0.7241 ; 1962
0     0.7279 ; 1963
0     0.7314 ; 1964
0     0.7346 ; 1965
0     0.7375 ; 1966
0      0.749 ; 1967
0     0.7602 ; 1968
0     0.7711 ; 1969
0      0.782 ; 1970
0     0.7928 ; 1971
0     0.8037 ; 1972
0     0.8145 ; 1973
0     0.8254 ; 1974
0     0.8362 ; 1975
0     0.8471 ; 1976
0     0.8534 ; 1977
0     0.8598 ; 1978
```

```
            0     0.8662 ; 1979
            0     0.8726 ; 1980
            0      0.879 ; 1981
            0     0.8855 ; 1982
            0      0.892 ; 1983
            0     0.8986 ; 1984
            0     0.9052 ; 1985
            0     0.9118 ; 1986
            0     0.9156 ; 1987
            0     0.9194 ; 1988
            0     0.9269 ; 1989
            0     0.9344 ; 1990
            0     0.9417 ; 1991
            0     0.9479 ; 1992
            0     0.9531 ; 1993
            0     0.9786 ; 1994
            0          1 ; 1995
;
;
;COLLEGES
;
;Additions        Scale
            0     0.5714 ; 1920
            0     0.5755 ; 1921
            0     0.5798 ; 1922
            0     0.5842 ; 1923
            0     0.5887 ; 1924
            0     0.5933 ; 1925
            0     0.5981 ; 1926
            0     0.6029 ; 1927
            0     0.6079 ; 1928
            0      0.613 ; 1929
            0     0.6182 ; 1930
            0     0.6232 ; 1931
            0     0.6284 ; 1932
            0     0.6336 ; 1933
            0     0.6389 ; 1934
            0     0.6444 ; 1935
            0     0.6499 ; 1936
            0     0.6555 ; 1937
            0     0.6612 ; 1938
            0     0.6669 ; 1939
            0     0.6728 ; 1940
            0     0.6745 ; 1941
            0     0.6763 ; 1942
            0     0.6782 ; 1943
            0     0.6801 ; 1944
            0      0.682 ; 1945
            0      0.684 ; 1946
            0      0.686 ; 1947
            0      0.688 ; 1948
            0       0.69 ; 1949
            0      0.692 ; 1950
            0     0.6936 ; 1951
            0     0.6952 ; 1952
            0     0.6967 ; 1953
            0     0.6982 ; 1954
```

```
          0     0.6995 ; 1955
          0     0.7007 ; 1956
          0     0.7059 ; 1957
          0     0.7109 ; 1958
          0     0.7157 ; 1959
          0     0.7203 ; 1960
          0     0.7247 ; 1961
          0     0.7288 ; 1962
          0     0.7326 ; 1963
          0     0.7362 ; 1964
          0     0.7394 ; 1965
          0     0.7423 ; 1966
          0     0.7539 ; 1967
          0     0.7652 ; 1968
          0     0.7762 ; 1969
          0     0.7871 ; 1970
          0      0.798 ; 1971
          0     0.8089 ; 1972
          0     0.8199 ; 1973
          0     0.8308 ; 1974
          0     0.8417 ; 1975
          0     0.8527 ; 1976
          0     0.8584 ; 1977
          0     0.8642 ; 1978
          0       0.87 ; 1979
          0     0.8758 ; 1980
          0     0.8817 ; 1981
          0     0.8876 ; 1982
          0     0.8936 ; 1983
          0     0.8996 ; 1984
          0     0.9056 ; 1985
          0     0.9117 ; 1986
          0     0.9154 ; 1987
          0     0.9191 ; 1988
          0     0.9267 ; 1989
          0     0.9342 ; 1990
          0     0.9416 ; 1991
          0     0.9476 ; 1992
          0     0.9531 ; 1993
          0     0.9786 ; 1994
          0          1 ; 1995
;
;
;RESTAURANTS
;
;Additions       Scale
          0     0.2155 ; 1920
          0      0.217 ; 1921
          0     0.2186 ; 1922
          0     0.2203 ; 1923
          0      0.222 ; 1924
          0     0.2237 ; 1925
          0     0.2255 ; 1926
          0     0.2274 ; 1927
          0     0.2293 ; 1928
          0     0.2312 ; 1929
          0     0.2331 ; 1930
```

```
0      0.235 ; 1931
0      0.237 ; 1932
0      0.239 ; 1933
0      0.241 ; 1934
0      0.243 ; 1935
0     0.2451 ; 1936
0     0.2472 ; 1937
0     0.2494 ; 1938
0     0.2515 ; 1939
0     0.2537 ; 1940
0     0.2544 ; 1941
0     0.2551 ; 1942
0     0.2558 ; 1943
0     0.2565 ; 1944
0     0.2572 ; 1945
0      0.258 ; 1946
0     0.2587 ; 1947
0     0.2595 ; 1948
0     0.2602 ; 1949
0     0.2609 ; 1950
0     0.2674 ; 1951
0     0.2739 ; 1952
0     0.2803 ; 1953
0     0.2868 ; 1954
0     0.2931 ; 1955
0     0.2995 ; 1956
0     0.3063 ; 1957
0     0.3131 ; 1958
0     0.3198 ; 1959
0     0.3265 ; 1960
0      0.333 ; 1961
0     0.3394 ; 1962
0     0.3458 ; 1963
0      0.352 ; 1964
0     0.3581 ; 1965
0      0.364 ; 1966
0     0.3704 ; 1967
0     0.3767 ; 1968
0     0.3827 ; 1969
0     0.3888 ; 1970
0     0.3949 ; 1971
0     0.4009 ; 1972
0      0.407 ; 1973
0      0.413 ; 1974
0      0.419 ; 1975
0      0.425 ; 1976
0     0.4609 ; 1977
0     0.4968 ; 1978
0     0.5327 ; 1979
0     0.5685 ; 1980
0     0.6043 ; 1981
0       0.64 ; 1982
0     0.6757 ; 1983
0     0.7113 ; 1984
0     0.7469 ; 1985
0     0.7823 ; 1986
0     0.8201 ; 1987
```

```
          0     0.8577 ; 1988
          0     0.8691 ; 1989
          0     0.8804 ; 1990
          0     0.8915 ; 1991
          0     0.9151 ; 1992
          0     0.9524 ; 1993
          0     0.9849 ; 1994
          0          1 ; 1995
;
;
;HEALTH
;
;Additions       Scale
          0     0.0779 ; 1920
          0     0.0785 ; 1921
          0     0.0791 ; 1922
          0     0.0797 ; 1923
          0     0.0803 ; 1924
          0     0.0809 ; 1925
          0     0.0816 ; 1926
          0     0.0823 ; 1927
          0     0.0829 ; 1928
          0     0.0836 ; 1929
          0     0.0843 ; 1930
          0      0.085 ; 1931
          0     0.0857 ; 1932
          0     0.0864 ; 1933
          0     0.0872 ; 1934
          0     0.0879 ; 1935
          0     0.0887 ; 1936
          0     0.0894 ; 1937
          0     0.0902 ; 1938
          0      0.091 ; 1939
          0     0.0918 ; 1940
          0      0.092 ; 1941
          0     0.0923 ; 1942
          0     0.0925 ; 1943
          0     0.0928 ; 1944
          0      0.093 ; 1945
          0     0.0933 ; 1946
          0     0.0936 ; 1947
          0     0.0939 ; 1948
          0     0.0941 ; 1949
          0     0.0944 ; 1950
          0     0.0968 ; 1951
          0     0.0991 ; 1952
          0     0.1014 ; 1953
          0     0.1038 ; 1954
          0     0.1061 ; 1955
          0     0.1084 ; 1956
          0     0.1213 ; 1957
          0     0.1342 ; 1958
          0      0.147 ; 1959
          0     0.1598 ; 1960
          0     0.1726 ; 1961
          0     0.1853 ; 1962
          0      0.198 ; 1963
```

```
          0     0.2106 ; 1964
          0     0.2232 ; 1965
          0     0.2358 ; 1966
          0     0.2495 ; 1967
          0     0.2632 ; 1968
          0     0.2768 ; 1969
          0     0.2904 ; 1970
          0      0.304 ; 1971
          0     0.3176 ; 1972
          0     0.3311 ; 1973
          0     0.3446 ; 1974
          0     0.3581 ; 1975
          0     0.3716 ; 1976
          0     0.4059 ; 1977
          0     0.4402 ; 1978
          0     0.4745 ; 1979
          0     0.5087 ; 1980
          0     0.5428 ; 1981
          0     0.5769 ; 1982
          0     0.6109 ; 1983
          0     0.6448 ; 1984
          0     0.6785 ; 1985
          0     0.7122 ; 1986
          0     0.7516 ; 1987
          0     0.7908 ; 1988
          0     0.8133 ; 1989
          0     0.8355 ; 1990
          0     0.8576 ; 1991
          0     0.8901 ; 1992
          0     0.9368 ; 1993
          0     0.9751 ; 1994
          0          1 ; 1995
;
;
;LODGING
;
;Additions       Scale
          0     0.0867 ; 1920
          0     0.0873 ; 1921
          0     0.0879 ; 1922
          0     0.0885 ; 1923
          0     0.0891 ; 1924
          0     0.0898 ; 1925
          0     0.0906 ; 1926
          0     0.0913 ; 1927
          0     0.0921 ; 1928
          0     0.0929 ; 1929
          0     0.0937 ; 1930
          0     0.0945 ; 1931
          0     0.0952 ; 1932
          0      0.096 ; 1933
          0     0.0968 ; 1934
          0     0.0976 ; 1935
          0     0.0985 ; 1936
          0     0.0994 ; 1937
          0     0.1003 ; 1938
          0     0.1012 ; 1939
```

```
0      0.1021 ; 1940
0      0.1024 ; 1941
0      0.1027 ; 1942
0      0.1031 ; 1943
0      0.1034 ; 1944
0      0.1037 ; 1945
0      0.1041 ; 1946
0      0.1043 ; 1947
0      0.1046 ; 1948
0      0.1048 ; 1949
0       0.105 ; 1950
0      0.1077 ; 1951
0      0.1103 ; 1952
0      0.1129 ; 1953
0      0.1153 ; 1954
0      0.1177 ; 1955
0      0.1199 ; 1956
0       0.134 ; 1957
0       0.148 ; 1958
0      0.1621 ; 1959
0      0.1761 ; 1960
0      0.1901 ; 1961
0      0.2042 ; 1962
0      0.2182 ; 1963
0      0.2323 ; 1964
0      0.2463 ; 1965
0      0.2604 ; 1966
0      0.2888 ; 1967
0      0.3171 ; 1968
0      0.3455 ; 1969
0      0.3738 ; 1970
0      0.4021 ; 1971
0      0.4304 ; 1972
0      0.4587 ; 1973
0      0.4869 ; 1974
0      0.5151 ; 1975
0      0.5432 ; 1976
0      0.5691 ; 1977
0      0.5949 ; 1978
0      0.6206 ; 1979
0       0.646 ; 1980
0      0.6711 ; 1981
0       0.696 ; 1982
0      0.7205 ; 1983
0      0.7445 ; 1984
0      0.7681 ; 1985
0      0.7912 ; 1986
0      0.8351 ; 1987
0      0.8786 ; 1988
0       0.904 ; 1989
0      0.9287 ; 1990
0      0.9526 ; 1991
0      0.9888 ; 1992
0       0.988 ; 1993
0       0.988 ; 1994
0           1 ; 1995
;
```

```
;
;MISCELLANEOUS
;
;Additions      Scale
          0     0.5067 ; 1920
          0     0.5104 ; 1921
          0     0.5142 ; 1922
          0     0.5181 ; 1923
          0     0.5221 ; 1924
          0     0.5262 ; 1925
          0     0.5304 ; 1926
          0     0.5347 ; 1927
          0     0.5392 ; 1928
          0     0.5437 ; 1929
          0     0.5483 ; 1930
          0     0.5527 ; 1931
          0     0.5573 ; 1932
          0      0.562 ; 1933
          0     0.5667 ; 1934
          0     0.5715 ; 1935
          0     0.5764 ; 1936
          0     0.5814 ; 1937
          0     0.5864 ; 1938
          0     0.5915 ; 1939
          0     0.5967 ; 1940
          0     0.5982 ; 1941
          0     0.5998 ; 1942
          0     0.6015 ; 1943
          0     0.6032 ; 1944
          0     0.6049 ; 1945
          0     0.6066 ; 1946
          0     0.6084 ; 1947
          0     0.6102 ; 1948
          0     0.6119 ; 1949
          0     0.6137 ; 1950
          0     0.6151 ; 1951
          0     0.6165 ; 1952
          0     0.6179 ; 1953
          0     0.6192 ; 1954
          0     0.6204 ; 1955
          0     0.6215 ; 1956
          0     0.6261 ; 1957
          0     0.6305 ; 1958
          0     0.6348 ; 1959
          0     0.6389 ; 1960
          0     0.6427 ; 1961
          0     0.6464 ; 1962
          0     0.6498 ; 1963
          0     0.6529 ; 1964
          0     0.6558 ; 1965
          0     0.6583 ; 1966
          0     0.6687 ; 1967
          0     0.6787 ; 1968
          0     0.6884 ; 1969
          0     0.6981 ; 1970
          0     0.7077 ; 1971
          0     0.7174 ; 1972
```

```
         0     0.7271 ; 1973
         0     0.7368 ; 1974
         0     0.7465 ; 1975
         0     0.7562 ; 1976
         0     0.7616 ; 1977
         0      0.767 ; 1978
         0     0.7725 ; 1979
         0     0.7779 ; 1980
         0     0.7834 ; 1981
         0      0.789 ; 1982
         0     0.7945 ; 1983
         0     0.8001 ; 1984
         0     0.8058 ; 1985
         0     0.8115 ; 1986
         0     0.8426 ; 1987
         0     0.8738 ; 1988
         0      0.883 ; 1989
         0     0.8921 ; 1990
         0     0.9012 ; 1991
         0     0.9323 ; 1992
         0     0.9572 ; 1993
         0     0.9797 ; 1994
         0          1 ; 1995
;
;
;
;SMALL OFFICES
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    21.2735           0           0           0 ; 1996
    21.6933           0           0           0 ; 1997
    22.1324           0           0           0 ; 1998
    22.6165           0           0           0 ; 1999
     23.074           0           0           0 ; 2000
    23.4917           0           0           0 ; 2001
    23.8634           0           0           0 ; 2002
    24.1994           0           0           0 ; 2003
    24.5252           0           0           0 ; 2004
    24.8469           0           0           0 ; 2005
    25.1655           0           0           0 ; 2006
    25.4872           0           0           0 ; 2007
    25.8109           0           0           0 ; 2008
    26.1122           0           0           0 ; 2009
    26.3828           0           0           0 ; 2010
    26.6422           0           0           0 ; 2011
```

```
    26.8986            0            0            0 ; 2012
    27.1447            0            0            0 ; 2013
    27.3888            0            0            0 ; 2014
    27.6359            0            0            0 ; 2015
     27.881            0            0            0 ; 2016
    28.1149            0            0            0 ; 2017
    28.3344            0            0            0 ; 2018
    28.5489            0            0            0 ; 2019
    28.7674            0            0            0 ; 2020
    29.0656            0            0            0 ; 2021
    29.3495            0            0            0 ; 2022
    29.5507            0            0            0 ; 2023
    29.7805            0            0            0 ; 2024
    30.0419            0            0            0 ; 2025
    30.3054            0            0            0 ; 2026
     30.605            0            0            0 ; 2027
;
;LARGE OFFICES
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    15.0398            0            0            0 ; 1996
    15.3309            0            0            0 ; 1997
    15.6855            0            0            0 ; 1998
    16.0261            0            0            0 ; 1999
    16.3537            0            0            0 ; 2000
    16.6776            0            0            0 ; 2001
    16.9937            0            0            0 ; 2002
    17.2766            0            0            0 ; 2003
    17.5326            0            0            0 ; 2004
    17.7808            0            0            0 ; 2005
    18.0207            0            0            0 ; 2006
    18.2542            0            0            0 ; 2007
    18.4899            0            0            0 ; 2008
    18.7143            0            0            0 ; 2009
    18.9127            0            0            0 ; 2010
    19.0935            0            0            0 ; 2011
     19.269            0            0            0 ; 2012
    19.4272            0            0            0 ; 2013
    19.5694            0            0            0 ; 2014
    19.7064            0            0            0 ; 2015
    19.8408            0            0            0 ; 2016
    19.9659            0            0            0 ; 2017
    20.0736            0            0            0 ; 2018
    20.1704            0            0            0 ; 2019
    20.2652            0            0            0 ; 2020
```

```
    20.4144           0           0           0 ; 2021
    20.5781           0           0           0 ; 2022
    20.6209           0           0           0 ; 2023
    20.6489           0           0           0 ; 2024
    20.6772           0           0           0 ; 2025
    20.7055           0           0           0 ; 2026
     20.733           0           0           0 ; 2027
;
;WAREHOUSES
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    22.9386           0           0           0 ; 1996
    23.6194           0           0           0 ; 1997
     24.241           0           0           0 ; 1998
     24.857           0           0           0 ; 1999
    25.4533           0           0           0 ; 2000
    26.0412           0           0           0 ; 2001
    26.5785           0           0           0 ; 2002
    27.0566           0           0           0 ; 2003
    27.5208           0           0           0 ; 2004
    28.0017           0           0           0 ; 2005
    28.4827           0           0           0 ; 2006
    28.9694           0           0           0 ; 2007
    29.4363           0           0           0 ; 2008
     29.847           0           0           0 ; 2009
    30.2211           0           0           0 ; 2010
    30.5755           0           0           0 ; 2011
    30.8961           0           0           0 ; 2012
     31.169           0           0           0 ; 2013
    31.4278           0           0           0 ; 2014
    31.6669           0           0           0 ; 2015
    31.8778           0           0           0 ; 2016
    32.0663           0           0           0 ; 2017
    32.2379           0           0           0 ; 2018
     32.401           0           0           0 ; 2019
    32.5642           0           0           0 ; 2020
    32.7836           0           0           0 ; 2021
    32.9805           0           0           0 ; 2022
    33.0648           0           0           0 ; 2023
    33.1239           0           0           0 ; 2024
    33.1802           0           0           0 ; 2025
    33.2364           0           0           0 ; 2026
     33.292           0           0           0 ; 2027
;
;FOODSTORES
```

```
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    10.3107           0           0           0 ; 1996
    10.5394           0           0           0 ; 1997
    10.7712           0           0           0 ; 1998
    11.0141           0           0           0 ; 1999
    11.2507           0           0           0 ; 2000
    11.4841           0           0           0 ; 2001
    11.6999           0           0           0 ; 2002
    11.8988           0           0           0 ; 2003
    12.1013           0           0           0 ; 2004
    12.3135           0           0           0 ; 2005
    12.5288           0           0           0 ; 2006
    12.7468           0           0           0 ; 2007
    12.9488           0           0           0 ; 2008
    13.1221           0           0           0 ; 2009
    13.2805           0           0           0 ; 2010
    13.4368           0           0           0 ; 2011
    13.5703           0           0           0 ; 2012
    13.6793           0           0           0 ; 2013
    13.7824           0           0           0 ; 2014
    13.8738           0           0           0 ; 2015
    13.9499           0           0           0 ; 2016
    14.0142           0           0           0 ; 2017
    14.0706           0           0           0 ; 2018
    14.1258           0           0           0 ; 2019
    14.1822           0           0           0 ; 2020
     14.271           0           0           0 ; 2021
    14.3486           0           0           0 ; 2022
    14.3784           0           0           0 ; 2023
     14.398           0           0           0 ; 2024
    14.4119           0           0           0 ; 2025
    14.4262           0           0           0 ; 2026
      14.44           0           0           0 ; 2027
;
;RETAIL
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
```

```
              0 ; Variable 4 Coefficient
              0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
      37.74           0           0           0 ; 1996
    38.5755           0           0           0 ; 1997
    39.4243           0           0           0 ; 1998
    40.3141           0           0           0 ; 1999
     41.181           0           0           0 ; 2000
    42.0354           0           0           0 ; 2001
    42.8251           0           0           0 ; 2002
    43.5511           0           0           0 ; 2003
    44.2944           0           0           0 ; 2004
    45.0701           0           0           0 ; 2005
    45.8591           0           0           0 ; 2006
    46.6567           0           0           0 ; 2007
    47.3953           0           0           0 ; 2008
    48.0292           0           0           0 ; 2009
    48.6103           0           0           0 ; 2010
    49.1811           0           0           0 ; 2011
    49.6701           0           0           0 ; 2012
    50.0686           0           0           0 ; 2013
    50.4465           0           0           0 ; 2014
    50.7804           0           0           0 ; 2015
    51.0607           0           0           0 ; 2016
    51.2946           0           0           0 ; 2017
    51.5017           0           0           0 ; 2018
     51.704           0           0           0 ; 2019
    51.9103           0           0           0 ; 2020
    52.2347           0           0           0 ; 2021
    52.5182           0           0           0 ; 2022
    52.6285           0           0           0 ; 2023
    52.6993           0           0           0 ; 2024
    52.7513           0           0           0 ; 2025
     52.804           0           0           0 ; 2026
     52.857           0           0           0 ; 2027
;
;SCHOOLS
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
              0 ; Constant Coefficient
              1 ; Variable 1 Coefficient
              0 ; Variable 2 Coefficient
              0 ; Variable 3 Coefficient
              0 ; Variable 4 Coefficient
              0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    21.6617           0           0           0 ; 1996
    22.1255           0           0           0 ; 1997
    22.4869           0           0           0 ; 1998
    22.8583           0           0           0 ; 1999
```

```
    23.2496           0           0           0 ; 2000
     23.629           0           0           0 ; 2001
    23.9606           0           0           0 ; 2002
    24.2764           0           0           0 ; 2003
    24.5763           0           0           0 ; 2004
    24.8743           0           0           0 ; 2005
    25.1752           0           0           0 ; 2006
     25.477           0           0           0 ; 2007
    25.7849           0           0           0 ; 2008
    26.0967           0           0           0 ; 2009
    26.4036           0           0           0 ; 2010
    26.7084           0           0           0 ; 2011
    27.0213           0           0           0 ; 2012
     27.343           0           0           0 ; 2013
    27.6668           0           0           0 ; 2014
    27.9955           0           0           0 ; 2015
    28.3291           0           0           0 ; 2016
    28.6608           0           0           0 ; 2017
    28.9935           0           0           0 ; 2018
    29.3291           0           0           0 ; 2019
    29.6717           0           0           0 ; 2020
    30.0739           0           0           0 ; 2021
    30.3897           0           0           0 ; 2022
    30.6291           0           0           0 ; 2023
    30.8813           0           0           0 ; 2024
    31.1385           0           0           0 ; 2025
    31.4007           0           0           0 ; 2026
     31.663           0           0           0 ; 2027
;
;COLLEGES
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    24.3133           0           0           0 ; 1996
    24.8343           0           0           0 ; 1997
    25.2403           0           0           0 ; 1998
    25.6571           0           0           0 ; 1999
    26.0954           0           0           0 ; 2000
    26.5212           0           0           0 ; 2001
    26.8931           0           0           0 ; 2002
    27.2488           0           0           0 ; 2003
    27.5847           0           0           0 ; 2004
    27.9206           0           0           0 ; 2005
    28.2566           0           0           0 ; 2006
    28.5961           0           0           0 ; 2007
    28.9428           0           0           0 ; 2008
```

```
    29.2913          0            0            0 ; 2009
    29.6362          0            0            0 ; 2010
    29.9794          0            0            0 ; 2011
    30.3297          0            0            0 ; 2012
    30.6908          0            0            0 ; 2013
    31.0537          0            0            0 ; 2014
    31.4237          0            0            0 ; 2015
    31.7974          0            0            0 ; 2016
    32.1693          0            0            0 ; 2017
    32.5429          0            0            0 ; 2018
    32.9202          0            0            0 ; 2019
    33.3046          0            0            0 ; 2020
    33.7555          0            0            0 ; 2021
    34.1112          0            0            0 ; 2022
    34.3789          0            0            0 ; 2023
     34.661          0            0            0 ; 2024
    34.9502          0            0            0 ; 2025
    35.2448          0            0            0 ; 2026
      35.54          0            0            0 ; 2027
;
;RESTAURANTS
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    4.88699          0            0            0 ; 1996
    4.99529          0            0            0 ; 1997
    5.10518          0            0            0 ; 1998
    5.22034          0            0            0 ; 1999
    5.33263          0            0            0 ; 2000
    5.44332          0            0            0 ; 2001
    5.54554          0            0            0 ; 2002
    5.63962          0            0            0 ; 2003
    5.73578          0            0            0 ; 2004
    5.83625          0            0            0 ; 2005
    5.93847          0            0            0 ; 2006
    6.04165          0            0            0 ; 2007
    6.13733          0            0            0 ; 2008
    6.21943          0            0            0 ; 2009
    6.29482          0            0            0 ; 2010
    6.36861          0            0            0 ; 2011
    6.43187          0            0            0 ; 2012
    6.48362          0            0            0 ; 2013
    6.53249          0            0            0 ; 2014
    6.57578          0            0            0 ; 2015
    6.61204          0            0            0 ; 2016
    6.64222          0            0            0 ; 2017
```

```
    6.66906          0           0           0 ; 2018
    6.69525          0           0           0 ; 2019
    6.72209          0           0           0 ; 2020
     6.7641          0           0           0 ; 2021
    6.80083          0           0           0 ; 2022
    6.81505          0           0           0 ; 2023
    6.82431          0           0           0 ; 2024
    6.83086          0           0           0 ; 2025
    6.83773          0           0           0 ; 2026
      6.845          0           0           0 ; 2027
;
;HEALTH
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    17.0095          0           0           0 ; 1996
    17.6409          0           0           0 ; 1997
    18.3513          0           0           0 ; 1998
    18.9808          0           0           0 ; 1999
    19.5063          0           0           0 ; 2000
    19.9891          0           0           0 ; 2001
    20.4368          0           0           0 ; 2002
    20.8578          0           0           0 ; 2003
    21.2702          0           0           0 ; 2004
    21.6649          0           0           0 ; 2005
    22.0394          0           0           0 ; 2006
    22.4051          0           0           0 ; 2007
    22.7692          0           0           0 ; 2008
     23.129          0           0           0 ; 2009
    23.4687          0           0           0 ; 2010
    23.7806          0           0           0 ; 2011
    24.0599          0           0           0 ; 2012
    24.3223          0           0           0 ; 2013
    24.5966          0           0           0 ; 2014
    24.8922          0           0           0 ; 2015
    25.2025          0           0           0 ; 2016
    25.5105          0           0           0 ; 2017
    25.8034          0           0           0 ; 2018
    26.0812          0           0           0 ; 2019
    26.3532          0           0           0 ; 2020
    26.6655          0           0           0 ; 2021
    26.8373          0           0           0 ; 2022
    26.8373          0           0           0 ; 2023
    26.8373          0           0           0 ; 2024
    26.8373          0           0           0 ; 2025
    26.8373          0           0           0 ; 2026
```

```
     26.837             0             0             0 ; 2027
;
;LODGING
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
     8.5662             0             0             0 ; 1996
    8.70539             0             0             0 ; 1997
    8.90452             0             0             0 ; 1998
    9.09398             0             0             0 ; 1999
    9.27763             0             0             0 ; 2000
    9.45936             0             0             0 ; 2001
    9.64495             0             0             0 ; 2002
    9.80927             0             0             0 ; 2003
    9.95233             0             0             0 ; 2004
    10.0877             0             0             0 ; 2005
    10.2172             0             0             0 ; 2006
     10.339             0             0             0 ; 2007
    10.4666             0             0             0 ; 2008
    10.5864             0             0             0 ; 2009
    10.6889             0             0             0 ; 2010
    10.7778             0             0             0 ; 2011
    10.8668             0             0             0 ; 2012
    10.9422             0             0             0 ; 2013
     11.004             0             0             0 ; 2014
    11.0639             0             0             0 ; 2015
      11.12             0             0             0 ; 2016
    11.1722             0             0             0 ; 2017
    11.2109             0             0             0 ; 2018
    11.2399             0             0             0 ; 2019
    11.2669             0             0             0 ; 2020
    11.3327             0             0             0 ; 2021
    11.4216             0             0             0 ; 2022
    11.4332             0             0             0 ; 2023
    11.4332             0             0             0 ; 2024
    11.4332             0             0             0 ; 2025
    11.4332             0             0             0 ; 2026
     11.433             0             0             0 ; 2027
;
;MISCELLANEOUS
;
;Forecast
"STK" ; Method
"LIN" ; Form
"NO"  ; Lag
         0 ; Constant Coefficient
```

```
         1 ; Variable 1 Coefficient
         0 ; Variable 2 Coefficient
         0 ; Variable 3 Coefficient
         0 ; Variable 4 Coefficient
         0 ; Lag Coefficient
;
;Exogenous Variable Values
;Variable 1  Variable 2  Variable 3  Variable 4
    38.6398           0           0           0 ; 1996
    39.6319           0           0           0 ; 1997
    40.5795           0           0           0 ; 1998
    41.4887           0           0           0 ; 1999
    42.3545           0           0           0 ; 2000
    43.1861           0           0           0 ; 2001
    43.9493           0           0           0 ; 2002
    44.6607           0           0           0 ; 2003
    45.3411           0           0           0 ; 2004
    46.0111           0           0           0 ; 2005
     46.676           0           0           0 ; 2006
    47.3419           0           0           0 ; 2007
     48.015           0           0           0 ; 2008
    48.6788           0           0           0 ; 2009
    49.3105           0           0           0 ; 2010
    49.9205           0           0           0 ; 2011
    50.5284           0           0           0 ; 2012
    51.1373           0           0           0 ; 2013
    51.7504           0           0           0 ; 2014
    52.3758           0           0           0 ; 2015
    53.0117           0           0           0 ; 2016
    53.6434           0           0           0 ; 2017
    54.2658           0           0           0 ; 2018
     54.884           0           0           0 ; 2019
    55.5054           0           0           0 ; 2020
    56.1682           0           0           0 ; 2021
    56.6176           0           0           0 ; 2022
    56.8423           0           0           0 ; 2023
    57.0847           0           0           0 ; 2024
    57.3425           0           0           0 ; 2025
    57.6035           0           0           0 ; 2026
     57.866           0           0           0 ; 2027
;
;SMALL OFFICES
;
"C:\COMMEND4\KU98"                                "NEWFLOOR.WK1"
1996 "SMO"             ; Variable 1 Coefficient
""                                                ""
0 ""                ; Variable 2 Coefficient
""                                                ""
0 ""                ; Variable 3 Coefficient
""                                                ""
0 ""                ; Variable 4 Coefficient
;
;LARGE OFFICES
;
"c:\COMMEND4\KU98"                                "NEWFLOOR.WK1"
1996 "LGO"             ; Variable 1 Coefficient
```

```
""                                                        ""
0 ""              ; Variable 2 Coefficient
""                                                        ""
0 ""              ; Variable 3 Coefficient
""                                                        ""
0 ""              ; Variable 4 Coefficient
;
;WAREHOUSES
;
"c:\COMMEND4\KU98"                                        "NEWFLOOR.WK1"
1996 "WRH"           ; Variable 1 Coefficient
""                                                        ""
0 ""              ; Variable 2 Coefficient
""                                                        ""
0 ""              ; Variable 3 Coefficient
""                                                        ""
0 ""              ; Variable 4 Coefficient
;
;FOODSTORES
;
"c:\COMMEND4\KU98"                                        "NEWFLOOR.WK1"
1996 "FOD"           ; Variable 1 Coefficient
""                                                        ""
0 ""              ; Variable 2 Coefficient
""                                                        ""
0 ""              ; Variable 3 Coefficient
""                                                        ""
0 ""              ; Variable 4 Coefficient
;
;RETAIL
;
"c:\COMMEND4\KU98"                                        "NEWFLOOR.WK1"
1996 "RET"           ; Variable 1 Coefficient
""                                                        ""
0 ""              ; Variable 2 Coefficient
""                                                        ""
0 ""              ; Variable 3 Coefficient
""                                                        ""
0 ""              ; Variable 4 Coefficient
;
;SCHOOLS
;
"c:\COMMEND4\KU98"                                        "NEWFLOOR.WK1"
1996 "SCH"           ; Variable 1 Coefficient
""                                                        ""
0 ""              ; Variable 2 Coefficient
""                                                        ""
0 ""              ; Variable 3 Coefficient
""                                                        ""
0 ""              ; Variable 4 Coefficient
;
;COLLEGES
;
"c:\COMMEND4\KU98"                                        "NEWFLOOR.WK1"
1996 "COL"           ; Variable 1 Coefficient
""                                                        ""
0 ""              ; Variable 2 Coefficient
```

```
""                                                              ""
0 ""              ; Variable 3 Coefficient
""                                                              ""
0 ""              ; Variable 4 Coefficient
;
;RESTAURANTS
;
"c:\COMMEND4\KU98"                                              "NEWFLOOR.WK1"
1996 "RES"          ; Variable 1 Coefficient
""                                                              ""
0 ""              ; Variable 2 Coefficient
""                                                              ""
0 ""              ; Variable 3 Coefficient
""                                                              ""
0 ""              ; Variable 4 Coefficient
;
;HEALTH
;
"c:\COMMEND4\KU98"                                              "NEWFLOOR.WK1"
1996 "HLT"          ; Variable 1 Coefficient
""                                                              ""
0 ""              ; Variable 2 Coefficient
""                                                              ""
0 ""              ; Variable 3 Coefficient
""                                                              ""
0 ""              ; Variable 4 Coefficient
;
;LODGING
;
"c:\COMMEND4\KU98"                                              "NEWFLOOR.WK1"
1996 "LDG"          ; Variable 1 Coefficient
""                                                              ""
0 ""              ; Variable 2 Coefficient
""                                                              ""
0 ""              ; Variable 3 Coefficient
""                                                              ""
0 ""              ; Variable 4 Coefficient
;
;MISCELLANEOUS
;
"c:\COMMEND4\KU98"                                              "NEWFLOOR.WK1"
1996 "MSC"          ; Variable 1 Coefficient
""                                                              ""
0 ""              ; Variable 2 Coefficient
""                                                              ""
0 ""              ; Variable 3 Coefficient
""                                                              ""
0 ""              ; Variable 4 Coefficient
;
;end of file
```

```
;
;ED1: Economic Data
;
    5 ;file version: do not edit
"Commend 3.2 National Forecast."                ;file description

;Discount Rates
;Block 1    Block 2    Block 3    Block 4
"RateBlk1" "RateBlk2" "RateBlk3" "RateBlk4"
;
;Discount Block Weights
;Block 1  Block 2  Block 3  Block 4
      25       25       25       25 ;SMALL OFFICES
      25       25       25       25 ;LARGE OFFICES
      25       25       25       25 ;WAREHOUSES
      25       25       25       25 ;FOODSTORES
      25       25       25       25 ;RETAIL
      34       33       33        0 ;SCHOOLS
      34       33       33        0 ;COLLEGES
      25       25       25       25 ;RESTAURANTS
      34       33       33        0 ;HEALTH
      34       33       33        0 ;LODGING
      25       25       25       25 ;MISCELLANEOUS
;
;Price Weights
;Curnt  Lag 1  Lag 2  Lag 3  Lag 4  Lag 5
  12.5     25     25     25   12.5      0
;
;Efficiency Option Elasticities
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
     -5      -5      -4      -1      -1      -1      -2      -5      -5      -3
;SMALL OFFICES
     -6      -6      -6      -2      -2      -2      -3      -6      -6      -5
;LARGE OFFICES
     -4      -4      -2      -1      -1      -6      -2      -3      -1      -1
;WAREHOUSES
     -6      -6      -3      -3      -5      -7    -1.5      -6      -5      -4
;FOODSTORES
   -5.5    -5.5    -3.5    -1.5    -1.5    -1.5      -3    -5.5    -4.5    -3.5
;RETAIL
   -5.5    -5.5    -2.5    -1.5    -1.5    -1.5      -1    -4.5    -2.5    -1.5
;SCHOOLS
     -6      -6      -3      -3      -3      -2    -1.5      -6      -4      -3
;COLLEGES
     -6      -6      -5      -4      -6      -5      -2      -5      -3      -4
;RESTAURANTS
     -6      -6      -6    -4.5      -4      -3      -2      -6      -6      -3
;HEALTH
   -5.5    -5.5    -4.5    -3.5    -3.5    -2.5    -1.5    -4.5    -1.5    -3.5
;LODGING
     -4      -4      -2      -1      -1      -1      -1      -4      -4      -3
;MISCELLANEOUS
;
;Fuel Choice Elasticities
;  HVAC    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
  -3.75   -0.75   -0.75      -1      -1      -1      -1      -1 ;SMALL OFFICES
   -4.5    -1.5    -1.5      -1      -1      -1      -1      -1 ;LARGE OFFICES
```

```
    -3   -0.75   -0.75      -1      -1      -1      -1      -1 ;WAREHOUSES
  -4.5   -2.25   -3.75      -1      -1      -1      -1      -1 ;FOODSTORES
 -4.13   -1.13   -1.13      -1      -1      -1      -1      -1 ;RETAIL
 -4.13   -1.13   -1.13      -1      -1      -1      -1      -1 ;SCHOOLS
  -4.5   -2.25   -2.25      -1      -1      -1      -1      -1 ;COLLEGES
  -4.5      -3    -4.5      -1      -1      -1      -1      -1 ;RESTAURANTS
  -4.5   -3.38      -3      -1      -1      -1      -1      -1 ;HEALTH
 -4.13   -2.63   -2.63      -1      -1      -1      -1      -1 ;LODGING
    -3   -0.75   -0.75      -1      -1      -1      -1      -1 ;MISCELLANEOUS
;
;Utilization Elasticities
; HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;SMALL OFFICES
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;LARGE OFFICES
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;WAREHOUSES
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;FOODSTORES
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;RETAIL
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;SCHOOLS
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;COLLEGES
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;RESTAURANTS
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;HEALTH
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;LODGING
 -0.18   -0.18   -0.15   -0.15   -0.05    -0.1   -0.18   -0.18   -0.05   -0.05
;MISCELLANEOUS
;
;Weather Elasticities
;HEAT          HEAT  COOL          COOL  PEAKHEAT PEAKHEAT   PEAKCOOL PEAKCOOL
;MULT          ELAS  MULT          ELAS    MULT     ELAS       MULT     ELAS
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;SMALL OFFICES
"HDD"             1 "CDD"          0.35 "P:HDD"            1 "P:CDD"       0.35
;LARGE OFFICES
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;WAREHOUSES
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;FOODSTORES
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;RETAIL
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;SCHOOLS
"HDD"             1 "CDD"           0.4 "P:HDD"            1 "P:CDD"        0.4
;COLLEGES
"HDD"             1 "CDD"          0.45 "P:HDD"            1 "P:CDD"       0.45
;RESTAURANTS
"HDD"             1 "CDD"          0.35 "P:HDD"            1 "P:CDD"       0.35
;HEALTH
```

```
"HDD"            1 "CDD"          0.4 "P:HDD"          1 "P:CDD"          0.4
;LODGING
"HDD"            1 "CDD"          0.4 "P:HDD"          1 "P:CDD"          0.4
;MISCELLANEOUS
;
;Operating Hours Elasticities
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
       0     0.63     0.65      0.8     0.75     0.16        0     0.65     0.52     0.52
"OPHSMO"     ;SMALL OFFICES
       0     0.47     0.45      0.7     0.84      0.2        0     0.53     0.47     0.47
"OPHLGO"     ;LARGE OFFICES
       0     0.67     0.54     0.82     0.82     0.05        0     0.54     0.37     0.37
"OPHWRH"     ;WAREHOUSES
       0     0.58     0.13      0.7     0.84     0.13        0     0.28      0.2      0.2
"OPHGRC"     ;FOODSTORES
       0     0.63     0.49     0.79     0.79     0.08        0     0.65     0.38     0.38
"OPHRET"     ;RETAIL
       0     0.47     0.36      0.6     0.77     0.14        0     0.77     0.79     0.79
"OPHSCH"     ;SCHOOLS
       0     0.54     0.43     0.67     0.67     0.33        0     0.43     0.43     0.43
"OPHCOL"     ;COLLEGES
       0     0.67      0.2     0.56      0.5     0.14        0     0.54     0.54        0
"OPHRES"     ;RESTAURANTS
       0     0.56     0.17     0.77     0.88     0.17        0     0.36     0.56     0.17
"OPHHLT"     ;HEALTH
       0     0.59     0.19     0.78     0.87     0.29        0     0.59     0.59     0.59
"OPHLDG"     ;LODGING
       0     0.35     0.16     0.65      0.8     0.16        0     0.41     0.52     0.52
"OPHMSC"     ;MISCELLANEOUS
;
;Occupancy Rate Elasticities
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
       0        0        0        0        0        0        0        0        0        0
" "          ;SMALL OFFICES
       0        0        0        0        0        0        0        0        0        0
" "          ;LARGE OFFICES
       0        0        0        0        0        0        0        0        0        0
" "          ;WAREHOUSES
       0        0        0        0        0        0        0        0        0        0
" "          ;FOODSTORES
       0        0        0        0        0        0        0        0        0        0
" "          ;RETAIL
       0        0        0        0        0        0        0        0        0        0
" "          ;SCHOOLS
       0        0        0        0        0        0        0        0        0        0
" "          ;COLLEGES
       0        0        0        0        0        0        0        0        0        0
" "          ;RESTAURANTS
       0        0        0        0        0        0        0        0        0        0
" "          ;HEALTH
       0        0        0        0        0        0        0        0        0        0
" "          ;LODGING
       0        0        0        0        0        0        0        0        0        0
" "          ;MISCELLANEOUS
;
;Other Elasticities
;   HEAT     COOL     VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
```

```
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec SMALL OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec LARGE OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec WAREHOUSES
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec FOODSTORES
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec RETAIL
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec SCHOOLS
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec COLLEGES
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec RESTAURANTS
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec HEALTH
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec LODGING
      0       0       0       0       0       0       0       0       0       0
" "        ;Elec MISCELLANEOUS
;
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas SMALL OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas LARGE OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas WAREHOUSES
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas FOODSTORES
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas RETAIL
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas SCHOOLS
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas COLLEGES
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas RESTAURANTS
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas HEALTH
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas LODGING
      0       0       0       0       0       0       0       0       0       0
" "        ;Gas MISCELLANEOUS
;
      0       0       0       0       0       0       0       0       0       0
" "        ;Oil SMALL OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Oil LARGE OFFICES
      0       0       0       0       0       0       0       0       0       0
" "        ;Oil WAREHOUSES
      0       0       0       0       0       0       0       0       0       0
" "        ;Oil FOODSTORES
      0       0       0       0       0       0       0       0       0       0
" "        ;Oil RETAIL
```

```
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil SCHOOLS
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil COLLEGES
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil RESTAURANTS
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil HEALTH
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil LODGING
       0      0      0      0      0      0      0      0      0      0
" "        ;Oil MISCELLANEOUS
;
;
;Calibration Factors
;  HEAT   COOL   VENT   WATR   COOK   REFR   XLIT   ILIT   OFEQ   MISC
       1      1      1      1      1      1      1      1      1      1
"smelmult" ;Elec SMALL OFFICES
       1      1      1      1      1      1      1      1      1      1
"loelmult" ;Elec LARGE OFFICES
       1      1      1      1      1      1      1      1      1      1
"whelmult" ;Elec WAREHOUSES
       1      1      1      1      1      1      1      1      1      1
"fdelmult" ;Elec FOODSTORES
       1      1      1      1      1      1      1      1      1      1
"rtelmult" ;Elec RETAIL
       1      1      1      1      1      1      1      1      1      1
"Scelmult" ;Elec SCHOOLS
       1      1      1      1      1      1      1      1      1      1
"Coelmult" ;Elec COLLEGES
       1      1      1      1      1      1      1      1      1      1
"rselmult" ;Elec RESTAURANTS
       1      1      1      1      1      1      1      1      1      1
"hlelmult" ;Elec HEALTH
       1      1      1      1      1      1      1      1      1      1
"lgelmult" ;Elec LODGING
       1      1      1      1      1      1      1      1      1      1
"mielmult" ;Elec MISCELLANEOUS
;
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas SMALL OFFICES
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas LARGE OFFICES
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas WAREHOUSES
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas FOODSTORES
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas RETAIL
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas SCHOOLS
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas COLLEGES
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas RESTAURANTS
       0      0      0      0      0      0      0      0      0      0
" "        ;Gas HEALTH
```

```
        0       0       0       0       0       0       0       0       0       0
" "         ;Gas LODGING
        0       0       0       0       0       0       0       0       0       0
" "         ;Gas MISCELLANEOUS
;
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil SMALL OFFICES
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil LARGE OFFICES
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil WAREHOUSES
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil FOODSTORES
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil RETAIL
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil SCHOOLS
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil COLLEGES
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil RESTAURANTS
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil HEALTH
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil LODGING
        0       0       0       0       0       0       0       0       0       0
" "         ;Oil MISCELLANEOUS
;
;
;Fuel Share Inertia Factors
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;SMALL OFFICES
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;LARGE OFFICES
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;WAREHOUSES
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;FOODSTORES
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;RETAIL
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;SCHOOLS
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;COLLEGES
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;RESTAURANTS
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;HEALTH
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;LODGING
    0.8     0.8       1     0.8     0.8       1       1       1       1       1
;MISCELLANEOUS
;
;EUI Inertia Factors
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT    OFEQ    MISC
```

```
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;SMALL OFFICES
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;LARGE OFFICES
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;WAREHOUSES
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;FOODSTORES
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;RETAIL
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;SCHOOLS
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;COLLEGES
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;RESTAURANTS
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;HEALTH
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;LODGING
    0.5     0.5     0.5        0        0        0     0.5     0.5        0        0
;MISCELLANEOUS
;
;Retrofit Penetration Changes
;  HEAT    COOL    VENT    WATR    COOK    REFR    XLIT    ILIT
    0.2    0.25       0       0       0       0       0       0 ;SMALL OFFICES
    0.2    0.25       0       0       0       0       0       0 ;LARGE OFFICES
    0.2    0.25       0       0       0       0       0       0 ;WAREHOUSES
    0.2    0.25       0       0       0       0       0       0 ;FOODSTORES
    0.2    0.25       0       0       0       0       0       0 ;RETAIL
    0.1    0.05       0       0       0       0       0       0 ;SCHOOLS
    0.1     0.2       0       0       0       0       0       0 ;COLLEGES
    0.1     0.2       0       0       0       0       0       0 ;RESTAURANTS
    0.2    0.25       0       0       0       0       0       0 ;HEALTH
   0.15    0.25       0       0       0       0       0       0 ;LODGING
    0.1     0.2       0       0       0       0       0       0 ;MISCELLANEOUS
;
;Miscellaneous Equipment Trend Rates
;
; Trend1          Trend2          Trend3          Trend4          Trend5
; Year    Rate    Year    Rate    Year    Rate    Year    Rate    Year    Rate
  1995       1    2000     0.5       0       0       0       0       0       0 ;SMALL
OFFICES
  1995       1    2000     0.5       0       0       0       0       0       0 ;LARGE
OFFICES
  1995       1    2000     0.5       0       0       0       0       0       0
;WAREHOUSES
  1995       1    2000     0.5       0       0       0       0       0       0
;FOODSTORES
  1995       1    2000     0.5       0       0       0       0       0       0 ;RETAIL
  1995       1    2000     0.5       0       0       0       0       0       0 ;SCHOOLS
  1995       1    2000     0.5       0       0       0       0       0       0 ;COLLEGES
  1995       1    2000     0.5       0       0       0       0       0       0
;RESTAURANTS
  1995       1    2000     0.5       0       0       0       0       0       0 ;HEALTH
  1995       1    2000     0.5       0       0       0       0       0       0 ;LODGING
```

```
  1995      1   2000    0.5      0      0      0      0      0      0
;MISCELLANEOUS
;
;Miscellaneous Equipment Trend Rates
;
; Trend6        Trend7        Trend8        Trend9        Trend10
; Year   Rate   Year   Rate   Year   Rate   Year   Rate   Year   Rate
     0      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES
     0      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES
     0      0      0      0      0      0      0      0      0      0
;WAREHOUSES
     0      0      0      0      0      0      0      0      0      0
;FOODSTORES
     0      0      0      0      0      0      0      0      0      0 ;RETAIL
     0      0      0      0      0      0      0      0      0      0 ;SCHOOLS
     0      0      0      0      0      0      0      0      0      0 ;COLLEGES
     0      0      0      0      0      0      0      0      0      0
;RESTAURANTS
     0      0      0      0      0      0      0      0      0      0 ;HEALTH
     0      0      0      0      0      0      0      0      0      0 ;LODGING
     0      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS
;
;Office Equipment Trend Rates
;
; Trend1        Trend2        Trend3        Trend4        Trend5
; Year   Rate   Year   Rate   Year   Rate   Year   Rate   Year   Rate
  1995      2      0      0      0      0      0      0      0      0 ;SMALL
OFFICES
  1995      2      0      0      0      0      0      0      0      0 ;LARGE
OFFICES
  1995    0.5      0      0      0      0      0      0      0      0
;WAREHOUSES
  1995    0.5      0      0      0      0      0      0      0      0
;FOODSTORES
  1995      1      0      0      0      0      0      0      0      0 ;RETAIL
  1995      1      0      0      0      0      0      0      0      0 ;SCHOOLS
  1995      1      0      0      0      0      0      0      0      0 ;COLLEGES
  1995    0.5      0      0      0      0      0      0      0      0
;RESTAURANTS
  1995      1      0      0      0      0      0      0      0      0 ;HEALTH
  1995    0.5      0      0      0      0      0      0      0      0 ;LODGING
  1995      1      0      0      0      0      0      0      0      0
;MISCELLANEOUS
;
;Office Equipment Trend Rates
;
; Trend6        Trend7        Trend8        Trend9        Trend10
; Year   Rate   Year   Rate   Year   Rate   Year   Rate   Year   Rate
     0      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES
     0      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES
     0      0      0      0      0      0      0      0      0      0
;WAREHOUSES
```

```
     0      0      0      0      0      0      0      0      0      0
;FOODSTORES
     0      0      0      0      0      0      0      0      0      0 ;RETAIL
     0      0      0      0      0      0      0      0      0      0 ;SCHOOLS
     0      0      0      0      0      0      0      0      0      0 ;COLLEGES
     0      0      0      0      0      0      0      0      0      0
;RESTAURANTS
     0      0      0      0      0      0      0      0      0      0 ;HEALTH
     0      0      0      0      0      0      0      0      0      0 ;LODGING
     0      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS
;
;Thermal Shell Price Elasticities
;
;Heat Loss      Heat Gain
            0.1             0.1 ;SMALL OFFICES
            0.1             0.1 ;LARGE OFFICES
            0.1             0.1 ;WAREHOUSES
            0.1             0.1 ;FOODSTORES
            0.1             0.1 ;RETAIL
            0.1             0.1 ;SCHOOLS
            0.1             0.1 ;COLLEGES
            0.1             0.1 ;RESTAURANTS
            0.1             0.1 ;HEALTH
            0.1             0.1 ;LODGING
            0.1             0.1 ;MISCELLANEOUS
;
;Thermal Integrity Trends
;
; Trend1          Trend2        Trend3        Trend4        Trend5
; Year    Rate    Year   Rate   Year   Rate   Year   Rate   Year   Rate
  1992      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES --   HEAT
  1992      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES --   COOL
;
  1992      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES --   HEAT
  1992      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES --   COOL
;
  1992      0      0      0      0      0      0      0      0      0
;WAREHOUSES --   HEAT
  1992      0      0      0      0      0      0      0      0      0
;WAREHOUSES --   COOL
;
  1992      0      0      0      0      0      0      0      0      0
;FOODSTORES --   HEAT
  1992      0      0      0      0      0      0      0      0      0
;FOODSTORES --   COOL
;
  1992      0      0      0      0      0      0      0      0      0 ;RETAIL --
HEAT
  1992      0      0      0      0      0      0      0      0      0 ;RETAIL --
COOL
;
```

```
  1992      0      0      0      0      0      0      0      0      0 ;SCHOOLS -
-   HEAT
  1992      0      0      0      0      0      0      0      0      0 ;SCHOOLS -
-   COOL
;
  1992      0      0      0      0      0      0      0      0      0 ;COLLEGES
--   HEAT
  1992      0      0      0      0      0      0      0      0      0 ;COLLEGES
--   COOL
;
  1992      0      0      0      0      0      0      0      0      0
;RESTAURANTS --    HEAT
  1992      0      0      0      0      0      0      0      0      0
;RESTAURANTS --    COOL
;
  1992      0      0      0      0      0      0      0      0      0 ;HEALTH --
HEAT
  1992      0      0      0      0      0      0      0      0      0 ;HEALTH --
COOL
;
  1992      0      0      0      0      0      0      0      0      0 ;LODGING -
-   HEAT
  1992      0      0      0      0      0      0      0      0      0 ;LODGING -
-   COOL
;
  1992      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS --    HEAT
  1992      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS --    COOL
;
;
;Thermal Integrity Trends
;
; Trend6        Trend7        Trend8        Trend9        Trend10
; Year   Rate   Year   Rate   Year   Rate   Year   Rate   Year   Rate
     0      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES --   HEAT
     0      0      0      0      0      0      0      0      0      0 ;SMALL
OFFICES --   COOL

     0      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES --   HEAT
     0      0      0      0      0      0      0      0      0      0 ;LARGE
OFFICES --   COOL

     0      0      0      0      0      0      0      0      0      0
;WAREHOUSES --    HEAT
     0      0      0      0      0      0      0      0      0      0
;WAREHOUSES --    COOL

     0      0      0      0      0      0      0      0      0      0
;FOODSTORES --    HEAT
     0      0      0      0      0      0      0      0      0      0
;FOODSTORES --    COOL

     0      0      0      0      0      0      0      0      0      0 ;RETAIL --
HEAT
```

```
     0      0      0      0      0      0      0      0      0      0 ;RETAIL --
COOL

     0      0      0      0      0      0      0      0      0      0 ;SCHOOLS -
-    HEAT
     0      0      0      0      0      0      0      0      0      0 ;SCHOOLS -
-    COOL

     0      0      0      0      0      0      0      0      0      0 ;COLLEGES
--    HEAT
     0      0      0      0      0      0      0      0      0      0 ;COLLEGES
--    COOL

     0      0      0      0      0      0      0      0      0      0
;RESTAURANTS --    HEAT
     0      0      0      0      0      0      0      0      0      0
;RESTAURANTS --    COOL

     0      0      0      0      0      0      0      0      0      0 ;HEALTH --
HEAT
     0      0      0      0      0      0      0      0      0      0 ;HEALTH --
COOL

     0      0      0      0      0      0      0      0      0      0 ;LODGING -
-    HEAT
     0      0      0      0      0      0      0      0      0      0 ;LODGING -
-    COOL

     0      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS --    HEAT
     0      0      0      0      0      0      0      0      0      0
;MISCELLANEOUS --    COOL

;
;
;end of file
```

```
;
;TD1: Technology Data
;
    2 ;file version: do not edit
"KU 1998 Technology Database"                    ;file description

;Heat Pump Data
;Shares  RelEUI
     42        2 ;SMALL OFFICES
     20        2 ;LARGE OFFICES
      9        2 ;WAREHOUSES
     26        2 ;FOODSTORES
     27        2 ;RETAIL
     34        2 ;SCHOOLS
     37        2 ;COLLEGES
      9        2 ;RESTAURANTS
     31        2 ;HEALTH
     23        2 ;LODGING
     24        2 ;MISCELLANEOUS
;
;Capital Costs
;
;SMO     LGO      WRH      FOD      RET      SCH      COL      RES
  2.521   3.118   2.521    2.389    2.521     3.45     3.45    5.175 ;Elec HEAT
  2.919   2.654   2.919    2.787    2.919    3.318    3.318    5.706 ;Gas HEAT
  3.052   2.919   3.052    2.919    3.052    3.981    3.981    5.972 ;Oil HEAT
;
  3.052   4.976   2.919    2.853    2.919    6.104    6.104    5.706 ;Elec COOL
  3.848   5.772   3.716    3.649    3.716      6.9      6.9    6.635 ;Gas COOL
;
  1.991   4.047   0.664    0.664    0.664    0.664    0.664    4.246 ;Elec VENT
;
   0.08   0.066    0.04    0.119     0.04    0.199    0.199    1.725 ;Elec WATR
  0.066   0.053    0.04    0.133    0.053    0.173    0.159     1.46 ;Gas WATR
  0.066   0.053   0.066    0.199    0.066    0.173    0.159    1.327 ;Oil WATR
;
   0.08    0.08   0.027    0.133     0.08    0.106    0.199    3.981 ;Elec COOK
   0.08    0.08   0.027    0.133     0.08    0.106    0.199    3.981 ;Gas COOK
   0.08    0.08   0.027    0.133     0.08    0.106    0.199    3.981 ;Oil COOK
;
  0.133   0.133   5.308    6.635    0.133    0.133    0.133    3.318 ;Elec REFR
;
  0.398   0.398   0.133    0.398    0.332    0.265    0.265    0.265 ;Elec XLIT
;
  4.246   4.246   1.194    4.246    3.583    2.787    3.052    3.185 ;Elec ILIT
;
  6.635   6.635   0.398    4.645    4.645    1.327    1.327    1.991 ;Elec OFEQ
;
  2.123   2.654   0.664    1.659    1.991    0.332    0.664    3.318 ;Elec MISC
  0.027   0.027   0.133    0.013    0.013     0.08    0.133    0.013 ;Gas MISC
  0.027   0.027   0.133    0.013    0.013     0.08    0.133    0.013 ;Oil MISC
;
   6.57    8.39    6.42      6.2     6.42    10.36    10.36    12.55 ;Elec HTPMP
;

;
;HLT     LDG      MSC
```

```
   3.118    3.118    2.521 ;Elec HEAT
   2.654    2.654    2.919 ;Gas HEAT
   2.919    2.919    3.052 ;Oil HEAT
 ;
   4.246    4.246    2.919 ;Elec COOL
   4.777    4.777    3.716 ;Gas COOL
 ;
   3.981    3.981    0.664 ;Elec VENT
 ;
   0.212    0.265     0.04 ;Elec WATR
   0.186    0.186    0.053 ;Gas WATR
   0.173    0.199    0.066 ;Oil WATR
 ;
   0.265    0.664     0.08 ;Elec COOK
   0.265    0.664     0.08 ;Gas COOK
   0.265    0.664     0.08 ;Oil COOK
 ;
   0.212    0.398    0.133 ;Elec REFR
 ;
   0.332    0.265    0.332 ;Elec XLIT
 ;
   3.185    2.521    3.583 ;Elec ILIT
 ;
   9.289    0.464    3.052 ;Elec OFEQ
 ;
   1.991    1.991    1.991 ;Elec MISC
   0.265    0.212    0.133 ;Gas MISC
   0.265    0.212    0.133 ;Oil MISC
 ;
    7.59     7.59     6.42 ;Elec HTPMP
 ;

 ;
 ;
 ;Tradeoff Data
 ;
 ;Elasticity    High     Low
           -1     15     -20 ;HEAT E
         -1.5     20     -30 ;HEAT G
         -1.5     20     -30 ;HEAT O
         -1.5     20     -30 ;COOL E
         -1.5     20     -20 ;COOL G
         -1.5     20     -30 ;VENT E
           -1     15     -20 ;WATR E
           -1     20     -30 ;WATR G
           -1     20     -30 ;WATR O
           -1     10     -15 ;COOK E
           -1     10     -20 ;COOK G
           -1     10     -20 ;COOK O
           -1     25     -30 ;REFR E
         -1.5     25     -50 ;XLIT E
         -1.5     20     -20 ;ILIT E
           -1     15     -15 ;OFEQ E
           -1     15     -15 ;MISC E
           -1     25     -25 ;MISC G
           -1     25     -25 ;MISC O
        -1.25     15     -25 ;HTPMP E
```

```
;
;Efficiency Trend Rate
;
1 ;Trends Active?( 1=TRUE 0=FALSE)
;
; Trend1         Trend2         Trend3         Trend4         Trend5
; Year   Rate    Year   Rate    Year   Rate    Year   Rate    Year   Rate
     0      0       0      0       0      0       0      0       0      0 ;HEAT E --
HiEUI
     0      0       0      0       0      0       0      0       0      0 ;HEAT E --
LowEUI
;
  1995  -0.15    2015 -0.075       0      0       0      0       0      0 ;HEAT G --
HiEUI
  1995  -0.25    2015  -0.15       0      0       0      0       0      0 ;HEAT G --
LowEUI
;
  1995  -0.15    2015 -0.075       0      0       0      0       0      0 ;HEAT O --
HiEUI
  1995  -0.25    2015  -0.15       0      0       0      0       0      0 ;HEAT O --
LowEUI
;
  1995   -0.3    2015  -0.15       0      0       0      0       0      0 ;COOL E --
HiEUI
  1995   -0.5    2015  -0.25       0      0       0      0       0      0 ;COOL E --
LowEUI
;
  1995   -0.5    2015  -0.25       0      0       0      0       0      0 ;COOL G --
HiEUI
  1995     -1    2015   -0.5       0      0       0      0       0      0 ;COOL G --
LowEUI
;
     0      0       0      0       0      0       0      0       0      0 ;VENT E --
HiEUI
     0      0       0      0       0      0       0      0       0      0 ;VENT E --
LowEUI
;
     0      0       0      0       0      0       0      0       0      0 ;WATR E --
HiEUI
  1995  -0.15    2015 -0.075       0      0       0      0       0      0 ;WATR E --
LowEUI
;
     0      0       0      0       0      0       0      0       0      0 ;WATR G --
HiEUI
  1995  -0.25    2015  -0.15       0      0       0      0       0      0 ;WATR G --
LowEUI
;
     0      0       0      0       0      0       0      0       0      0 ;WATR O --
HiEUI
  1995  -0.25    2015  -0.15       0      0       0      0       0      0 ;WATR O --
LowEUI
;
     0      0       0      0       0      0       0      0       0      0 ;COOK E --
HiEUI
     0      0       0      0       0      0       0      0       0      0 ;COOK E --
LowEUI
;
```

```
     0       0       0       0       0       0       0       0       0        0 ;COOK G --
HiEUI
     0       0       0       0       0       0       0       0       0        0 ;COOK G --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;COOK O --
HiEUI
     0       0       0       0       0       0       0       0       0        0 ;COOK O --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;REFR E --
HiEUI
  1995   -0.25    2015   -0.15       0       0       0       0       0        0 ;REFR E --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;XLIT E --
HiEUI
     0       0       0       0       0       0       0       0       0        0 ;XLIT E --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;ILIT E --
HiEUI
  1995    -0.5    2015   -0.25       0       0       0       0       0        0 ;ILIT E --
LowEUI
;
  1995   -0.15    2015   -0.15       0       0       0       0       0        0 ;OFEQ E --
HiEUI
  1995   -0.25    2015   -0.15       0       0       0       0       0        0 ;OFEQ E --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;MISC E --
HiEUI
  1995   -0.25    2015   -0.15       0       0       0       0       0        0 ;MISC E --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;MISC G --
HiEUI
     0       0       0       0       0       0       0       0       0        0 ;MISC G --
LowEUI
;
     0       0       0       0       0       0       0       0       0        0 ;MISC O --
HiEUI
     0       0       0       0       0       0       0       0       0        0 ;MISC O --
LowEUI
;
  1995   -0.25    2015   -0.15       0       0       0       0       0        0 ;HTPMP E -
- HiEUI
  1995    -0.5    2015   -0.25       0       0       0       0       0        0 ;HTPMP E -
- LowEUI
;
;
;Efficiency Trend Rate
;
; Trend6          Trend7          Trend8          Trend9          Trend10
; Year    Rate    Year    Rate    Year    Rate    Year    Rate    Year    Rate
     0       0       0       0       0       0       0       0       0        0 ;HEAT E --
HiEUI
```

```
         0         0         0         0         0         0         0         0         0          0 ;HEAT E --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;HEAT G --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;HEAT G --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;HEAT O --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;HEAT O --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;COOL E --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;COOL E --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;COOL G --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;COOL G --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;VENT E --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;VENT E --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;WATR E --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;WATR E --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;WATR G --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;WATR G --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;WATR O --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;WATR O --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;COOK E --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;COOK E --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;COOK G --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;COOK G --
LowEUI
;
         0         0         0         0         0         0         0         0         0          0 ;COOK O --
HiEUI
         0         0         0         0         0         0         0         0         0          0 ;COOK O --
LowEUI
```

```
;
     0     0     0     0     0     0     0     0     0      0 ;REFR E --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;REFR E --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;XLIT E --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;XLIT E --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;ILIT E --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;ILIT E --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;OFEQ E --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;OFEQ E --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;MISC E --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;MISC E --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;MISC G --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;MISC G --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;MISC O --
HiEUI
     0     0     0     0     0     0     0     0     0      0 ;MISC O --
LowEUI
;
     0     0     0     0     0     0     0     0     0      0 ;HTPMP E -
- HiEUI
     0     0     0     0     0     0     0     0     0      0 ;HTPMP E -
- LowEUI
;
;
;Cost Trend Rate
;
0 ;Trends Active?( 1=TRUE 0=FALSE)
;
; Trend1         Trend2         Trend3         Trend4          Trend5
; Year   Rate   Year   Rate   Year   Rate   Year   Rate    Year   Rate
     0     0     0     0     0     0     0     0     0      0 ;HEAT E --
LowCost
     0     0     0     0     0     0     0     0     0      0 ;HEAT E --
HiCost
;
     0     0     0     0     0     0     0     0     0      0 ;HEAT G --
LowCost
     0     0     0     0     0     0     0     0     0      0 ;HEAT G --
HiCost
```

```
;
     0      0      0      0      0      0      0      0      0      0 ;HEAT O --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;HEAT O --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;COOL E --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;COOL E --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;COOL G --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;COOL G --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;VENT E --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;VENT E --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;WATR E --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;WATR E --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;WATR G --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;WATR G --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;WATR O --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;WATR O --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;COOK E --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;COOK E --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;COOK G --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;COOK G --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;COOK O --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;COOK O --
HiCost
;
     0      0      0      0      0      0      0      0      0      0 ;REFR E --
LowCost
     0      0      0      0      0      0      0      0      0      0 ;REFR E --
HiCost
;
```

```
       0      0      0      0      0      0      0      0      0      0 ;XLIT E --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;XLIT E --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;ILIT E --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;ILIT E --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;OFEQ E --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;OFEQ E --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;MISC E --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;MISC E --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;MISC G --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;MISC G --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;MISC O --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;MISC O --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;HTPMP E -
 - LowCost
       0      0      0      0      0      0      0      0      0      0 ;HTPMP E -
 - HiCost
 ;
 ;
 ;Cost Trend Rate
 ;
 ; Trend6        Trend7        Trend8        Trend9        Trend10
 ; Year   Rate   Year   Rate   Year   Rate   Year   Rate   Year   Rate
       0      0      0      0      0      0      0      0      0      0 ;HEAT E --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;HEAT E --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;HEAT G --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;HEAT G --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;HEAT O --
 LowCost
       0      0      0      0      0      0      0      0      0      0 ;HEAT O --
 HiCost
 ;
       0      0      0      0      0      0      0      0      0      0 ;COOL E --
 LowCost
```

```
      0       0       0       0       0       0       0       0       0       0 ;COOL E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;COOL G --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;COOL G --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;VENT E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;VENT E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;WATR E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;WATR E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;WATR G --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;WATR G --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;WATR O --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;WATR O --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;COOK E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;COOK E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;COOK G --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;COOK G --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;COOK O --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;COOK O --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;REFR E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;REFR E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;XLIT E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;XLIT E --
HiCost
;
      0       0       0       0       0       0       0       0       0       0 ;ILIT E --
LowCost
      0       0       0       0       0       0       0       0       0       0 ;ILIT E --
HiCost
```

```
;
     0      0      0      0      0      0      0      0      0       0 ;OFEQ E --
LowCost
     0      0      0      0      0      0      0      0      0       0 ;OFEQ E --
HiCost
;
     0      0      0      0      0      0      0      0      0       0 ;MISC E --
LowCost
     0      0      0      0      0      0      0      0      0       0 ;MISC E --
HiCost
;
     0      0      0      0      0      0      0      0      0       0 ;MISC G --
LowCost
     0      0      0      0      0      0      0      0      0       0 ;MISC G --
HiCost
;
     0      0      0      0      0      0      0      0      0       0 ;MISC O --
LowCost
     0      0      0      0      0      0      0      0      0       0 ;MISC O --
HiCost
;
     0      0      0      0      0      0      0      0      0       0 ;HTPMP E -
- LowCost
     0      0      0      0      0      0      0      0      0       0 ;HTPMP E -
- HiCost
;
;
;Cooling Interaction Parameters
;
;  VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
      0        0        0        0        0     0.48     0.56     0.56 ;SMALL OFFICES
      0        0        0        0        0      0.7     0.77     0.77 ;LARGE OFFICES
      0        0        0        0        0     0.23     0.15     0.15 ;WAREHOUSES
      0        0        0        0        0     0.59      0.8      0.8 ;FOODSTORES
      0        0        0        0        0     0.53     0.62     0.62 ;RETAIL
      0        0        0        0        0     0.39     0.53     0.53 ;SCHOOLS
      0        0        0        0        0      0.4      0.4      0.4 ;COLLEGES
      0        0        0        0        0     0.73     0.93     0.93 ;RESTAURANTS
      0        0        0        0        0     0.86     0.95     0.95 ;HEALTH
      0        0        0        0        0     0.64     0.69     0.69 ;LODGING
      0        0        0        0        0      0.5      0.5      0.5 ;MISCELLANEOUS
;
;Heating Interaction Parameters
;
;  VENT     WATR     COOK     REFR     XLIT     ILIT     OFEQ     MISC
      0        0        0        0        0     0.27     0.23     0.23 ;SMALL OFFICES
      0        0        0        0        0     0.16     0.12     0.12 ;LARGE OFFICES
      0        0        0        0        0     0.25     0.18     0.18 ;WAREHOUSES
      0        0        0        0        0     0.28     0.11     0.11 ;FOODSTORES
      0        0        0        0        0     0.33     0.27     0.27 ;RETAIL
      0        0        0        0        0     0.47     0.35     0.35 ;SCHOOLS
      0        0        0        0        0     0.47     0.35     0.35 ;COLLEGES
      0        0        0        0        0     0.05     0.05        0 ;RESTAURANTS
      0        0        0        0        0     0.13     0.05     0.05 ;HEALTH
      0        0        0        0        0     0.13     0.19     0.19 ;LODGING
      0        0        0        0        0      0.3      0.3      0.3 ;MISCELLANEOUS
;
```

```
;Efficiency Parameters
;
;   Elec     Gas      Oil     Elec     Gas
;   HEAT     HEAT     HEAT    COOL     COOL
   4.47     0.75     0.7      11        1 ;SMALL OFFICES
   3.91     0.75     0.7      14        1 ;LARGE OFFICES
   3.63     0.75     0.7      11        1 ;WAREHOUSES
   4.09     0.75     0.7      11        1 ;FOODSTORES
    4.1     0.75     0.7      12        1 ;RETAIL
   4.28     0.75     0.7      11        1 ;SCHOOLS
   4.37     0.75     0.7      11        1 ;COLLEGES
   3.65     0.75     0.7      11        1 ;RESTAURANTS
    4.2     0.75     0.7      14        1 ;HEALTH
      4     0.75     0.7      12        1 ;LODGING
   3.74     0.75     0.7      11        1 ;MISCELLANEOUS
;
;Shell Interaction Parameters
;
;Heating    Cooling
;Impacts    Impacts
        -1          -1 ;SMALL OFFICES
        -1          -1 ;LARGE OFFICES
        -1          -1 ;WAREHOUSES
        -1          -1 ;FOODSTORES
        -1          -1 ;RETAIL
        -1          -1 ;SCHOOLS
        -1          -1 ;COLLEGES
        -1          -1 ;RESTAURANTS
        -1          -1 ;HEALTH
        -1          -1 ;LODGING
        -1          -1 ;MISCELLANEOUS
;
;end of file
```

```
;
;SD1: Standards and DSM Data
;
    4 ;file version: do not edit
"1998 KU COMMEND Forecast"                    ;file description

;Standards & DSM Data Definitions
    5 ;Number of Standard Definitions
;
;Standards & DSM Segment Definitions
;Name     Long Name                 1stYear CompYear     Max% Isactive(Y/N)
"HEAT"   "ASHRAE 90.1P HEAT"          1997     1998       100 "N"
"COOL"   "ASHRAE 90.1P COOL"          1997     1998       100 "N"
"WATER"  "ASHRAE 90.1P WATER"         1997     1998       100 "Y"
"SHELL"  "ASHRAE 90.1P SHELL"         1997     1998       100 "N"
"EPAMO"  "EPACT Motors"               1998     2000       100 "Y"
;
;Equipment Efficiency Standards
;
;SMALL OFFICES
;Name      Percent Name      Percent Name      Percent Name      Percent Name
Percent
""              0 ""             0 ""             0 ""             0 ""
0 ;HEAT   E
"HEAT"         90 ""             0 ""             0 ""             0 ""
0 ;HEAT   G
"HEAT"         90 ""             0 ""             0 ""             0 ""
0 ;HEAT   O
"COOL"         95 ""             0 ""             0 ""             0 ""
0 ;COOL   E
""              0 ""             0 ""             0 ""             0 ""
0 ;COOL   G
"EPAMO"        95 ""             0 ""             0 ""             0 ""
0 ;VENT   E
"WATER"        90 ""             0 ""             0 ""             0 ""
0 ;WATR   E
"WATER"        85 ""             0 ""             0 ""             0 ""
0 ;WATR   G
"WATER"        85 ""             0 ""             0 ""             0 ""
0 ;WATR   O
""              0 ""             0 ""             0 ""             0 ""
0 ;COOK   E
""              0 ""             0 ""             0 ""             0 ""
0 ;COOK   G
""              0 ""             0 ""             0 ""             0 ""
0 ;COOK   O
""              0 ""             0 ""             0 ""             0 ""
0 ;REFR   E
""              0 " "            0 ""             0 ""             0 ""
0 ;XLIT   E
""              0 ""             0 ""             0 ""             0 ""
0 ;ILIT   E
""              0 ""             0 ""             0 ""             0 ""
0 ;OFEQ   E
"EPAMO"        95 ""             0 ""             0 ""             0 ""
0 ;MISC   E
```

```
""             0 ""          0 ""          0 ""          0 ""
0 ;MISC   G
""             0 ""          0 ""          0 ""          0 ""
0 ;MISC   O
"COOL"        95 ""          0 ""          0 ""          0 ""
0 ;HTPMP E
;
;LARGE OFFICES
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
""             0 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
"HEAT"        90 ""          0 ""          0 ""          0 ""
0 ;HEAT   G
"HEAT"        90 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"COOL"        95 ""          0 ""          0 ""          0 ""
0 ;COOL   E
""             0 ""          0 ""          0 ""          0 ""
0 ;COOL   G
"EPAMO"       95 ""          0 ""          0 ""          0 ""
0 ;VENT   E
"WATER"       90 ""          0 ""          0 ""          0 ""
0 ;WATR   E
"WATER"       85 ""          0 ""          0 ""          0 ""
0 ;WATR   G
"WATER"       85 ""          0 ""          0 ""          0 ""
0 ;WATR   O
""             0 ""          0 ""          0 ""          0 ""
0 ;COOK   E
""             0 ""          0 ""          0 ""          0 ""
0 ;COOK   G
""             0 ""          0 ""          0 ""          0 ""
0 ;COOK   O
""             0 ""          0 ""          0 ""          0 ""
0 ;REFR   E
""             0 " "         0 ""          0 ""          0 ""
0 ;XLIT   E
""             0 ""          0 ""          0 ""          0 ""
0 ;ILIT   E
""             0 ""          0 ""          0 ""          0 ""
0 ;OFEQ   E
"EPAMO"       95 ""          0 ""          0 ""          0 ""
0 ;MISC   E
""             0 ""          0 ""          0 ""          0 ""
0 ;MISC   G
""             0 ""          0 ""          0 ""          0 ""
0 ;MISC   O
"COOL"        95 ""          0 ""          0 ""          0 ""
0 ;HTPMP E
;
;WAREHOUSES
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
""             0 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
```

```
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT  G
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT  O
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;COOL  E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOL  G
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;VENT  E
"WATER"       90 ""         0 ""         0 ""         0 ""
0 ;WATR  E
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR  G
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR  O
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK  E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK  G
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK  O
""             0 ""         0 ""         0 ""         0 ""
0 ;REFR  E
""             0 ""         0 ""         0 ""         0 ""
0 ;XLIT  E
""             0 ""         0 ""         0 ""         0 ""
0 ;ILIT  E
""             0 ""         0 ""         0 ""         0 ""
0 ;OFEQ  E
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;MISC  E
""             0 ""         0 ""         0 ""         0 ""
0 ;MISC  G
""             0 ""         0 ""         0 ""         0 ""
0 ;MISC  O
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;HTPMP E
;
;FOODSTORES
;Name     Percent Name   Percent Name   Percent Name   Percent Name
Percent
""             0 ""         0 ""         0 ""         0 ""
0 ;HEAT  E
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT  G
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT  O
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;COOL  E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOL  G
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;VENT  E
"WATER"       90 ""         0 ""         0 ""         0 ""
0 ;WATR  E
```

```
"WATER"        85 ""         0 ""         0 ""         0 ""
0 ;WATR  G
"WATER"        85 ""         0 ""         0 ""         0 ""
0 ;WATR  O
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  E
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  G
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  O
""              0 ""         0 ""         0 ""         0 ""
0 ;REFR  E
""              0 ""         0 ""         0 ""         0 ""
0 ;XLIT  E
""              0 ""         0 ""         0 ""         0 ""
0 ;ILIT  E
""              0 ""         0 ""         0 ""         0 ""
0 ;OFEQ  E
"EPAMO"        95 ""         0 ""         0 ""         0 ""
0 ;MISC  E
""              0 ""         0 ""         0 ""         0 ""
0 ;MISC  G
""              0 ""         0 ""         0 ""         0 ""
0 ;MISC  O
"COOL"         95 ""         0 ""         0 ""         0 ""
0 ;HTPMP E
;
;RETAIL
;Name     Percent Name   Percent Name   Percent Name   Percent Name
Percent
""              0 ""         0 ""         0 ""         0 ""
0 ;HEAT  E
"HEAT"         90 ""         0 ""         0 ""         0 ""
0 ;HEAT  G
"HEAT"         90 ""         0 ""         0 ""         0 ""
0 ;HEAT  O
"COOL"         95 ""         0 ""         0 ""         0 ""
0 ;COOL  E
""              0 ""         0 ""         0 ""         0 ""
0 ;COOL  G
"EPAMO"        95 ""         0 ""         0 ""         0 ""
0 ;VENT  E
"WATER"        90 ""         0 ""         0 ""         0 ""
0 ;WATR  E
"WATER"        85 ""         0 ""         0 ""         0 ""
0 ;WATR  G
"WATER"        85 ""         0 ""         0 ""         0 ""
0 ;WATR  O
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  E
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  G
""              0 ""         0 ""         0 ""         0 ""
0 ;COOK  O
""              0 ""         0 ""         0 ""         0 ""
0 ;REFR  E
```

```
""              0 ""          0 ""          0 ""          0 ""
0 ;XLIT   E
""              0 ""          0 ""          0 ""          0 ""
0 ;ILIT   E
""              0 ""          0 ""          0 ""          0 ""
0 ;OFEQ   E
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;MISC   E
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC   G
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC   O
"COOL"         95 ""          0 ""          0 ""          0 ""
0 ;HTPMP E
;
;SCHOOLS
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
""              0 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
"HEAT"         90 ""          0 ""          0 ""          0 ""
0 ;HEAT   G
"HEAT"         90 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"COOL"         95 ""          0 ""          0 ""          0 ""
0 ;COOL   E
""              0 ""          0 ""          0 ""          0 ""
0 ;COOL   G
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;VENT   E
"WATER"        90 ""          0 ""          0 ""          0 ""
0 ;WATR   E
"WATER"        85 ""          0 ""          0 ""          0 ""
0 ;WATR   G
"WATER"        85 ""          0 ""          0 ""          0 ""
0 ;WATR   O
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK   E
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK   G
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK   O
""              0 ""          0 ""          0 ""          0 ""
0 ;REFR   E
""              0 ""          0 ""          0 ""          0 ""
0 ;XLIT   E
""              0 ""          0 ""          0 ""          0 ""
0 ;ILIT   E
""              0 ""          0 ""          0 ""          0 ""
0 ;OFEQ   E
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;MISC   E
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC   G
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC   O
```

```
"COOL"       95 ""        0 ""        0 ""        0 ""
0 ;HTPMP E
;
;COLLEGES
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
""            0 ""        0 ""        0 ""        0 ""
0 ;HEAT  E
"HEAT"       90 ""        0 ""        0 ""        0 ""
0 ;HEAT  G
"HEAT"       90 ""        0 ""        0 ""        0 ""
0 ;HEAT  O
"COOL"       95 ""        0 ""        0 ""        0 ""
0 ;COOL  E
""            0 ""        0 ""        0 ""        0 ""
0 ;COOL  G
"EPAMO"      95 ""        0 ""        0 ""        0 ""
0 ;VENT  E
"WATER"      90 ""        0 ""        0 ""        0 ""
0 ;WATR  E
"WATER"      85 ""        0 ""        0 ""        0 ""
0 ;WATR  G
"WATER"      85 ""        0 ""        0 ""        0 ""
0 ;WATR  O
""            0 ""        0 ""        0 ""        0 ""
0 ;COOK  E
""            0 ""        0 ""        0 ""        0 ""
0 ;COOK  G
""            0 ""        0 ""        0 ""        0 ""
0 ;COOK  O
""            0 ""        0 ""        0 ""        0 ""
0 ;REFR  E
""            0 ""        0 ""        0 ""        0 ""
0 ;XLIT  E
""            0 ""        0 ""        0 ""        0 ""
0 ;ILIT  E
""            0 ""        0 ""        0 ""        0 ""
0 ;OFEQ  E
"EPAMO"      95 ""        0 ""        0 ""        0 ""
0 ;MISC  E
""            0 ""        0 ""        0 ""        0 ""
0 ;MISC  G
""            0 ""        0 ""        0 ""        0 ""
0 ;MISC  O
"COOL"       95 ""        0 ""        0 ""        0 ""
0 ;HTPMP E
;
;RESTAURANTS
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
""            0 ""        0 ""        0 ""        0 ""
0 ;HEAT  E
"HEAT"       90 ""        0 ""        0 ""        0 ""
0 ;HEAT  G
"HEAT"       90 ""        0 ""        0 ""        0 ""
0 ;HEAT  O
```

```
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;COOL   E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOL   G
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;VENT   E
"WATER"       90 ""         0 ""         0 ""         0 ""
0 ;WATR   E
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR   G
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR   O
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK   E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK   G
""             0 ""         0 ""         0 ""         0 ""
0 ;COOK   O
""             0 ""         0 ""         0 ""         0 ""
0 ;REFR   E
""             0 ""         0 ""         0 ""         0 ""
0 ;XLIT   E
""             0 ""         0 ""         0 ""         0 ""
0 ;ILIT   E
""            .0 ""         0 ""         0 ""         0 ""
0 ;OFEQ   E
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;MISC   E
""             0 ""         0 ""         0 ""         0 ""
0 ;MISC   G
""             0 ""         0 ""         0 ""         0 ""
0 ;MISC   O
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;HTPMP E
;
;HEALTH
;Name     Percent Name   Percent Name   Percent Name   Percent Name
Percent
""             0 ""         0 ""         0 ""         0 ""
0 ;HEAT   E
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT   G
"HEAT"        90 ""         0 ""         0 ""         0 ""
0 ;HEAT   O
"COOL"        95 ""         0 ""         0 ""         0 ""
0 ;COOL   E
""             0 ""         0 ""         0 ""         0 ""
0 ;COOL   G
"EPAMO"       95 ""         0 ""         0 ""         0 ""
0 ;VENT   E
"WATER"       90 ""         0 ""         0 ""         0 ""
0 ;WATR   E
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR   G
"WATER"       85 ""         0 ""         0 ""         0 ""
0 ;WATR   O
```

```
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   E
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   G
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   O
""               0 ""             0 ""             0 ""             0 ""
0 ;REFR   E
""               0 ""             0 ""             0 ""             0 ""
0 ;XLIT   E
""               0 ""             0 ""             0 ""             0 ""
0 ;ILIT   E
""               0 ""             0 ""             0 ""             0 ""
0 ;OFEQ   E
"EPAMO"         95 ""             0 ""             0 ""             0 ""
0 ;MISC   E
""               0 ""             0 ""             0 ""             0 ""
0 ;MISC   G
""               0 ""             0 ""             0 ""             0 ""
0 ;MISC   O
"COOL"          95 ""             0 ""             0 ""             0 ""
0 ;HTPMP E
;
;LODGING
;Name     Percent Name     Percent Name     Percent Name     Percent Name
Percent
""               0 ""             0 ""             0 ""             0 ""
0 ;HEAT   E
"HEAT"          90 ""             0 ""             0 ""             0 ""
0 ;HEAT   G
"HEAT"          90 ""             0 ""             0 ""             0 ""
0 ;HEAT   O
"COOL"          95 ""             0 ""             0 ""             0 ""
0 ;COOL   E
""               0 ""             0 ""             0 ""             0 ""
0 ;COOL   G
"EPAMO"         95 ""             0 ""             0 ""             0 ""
0 ;VENT   E
"WATER"         90 ""             0 ""             0 ""             0 ""
0 ;WATR   E
"WATER"         85 ""             0 ""             0 ""             0 ""
0 ;WATR   G
"WATER"         85 ""             0 ""             0 ""             0 ""
0 ;WATR   O
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   E
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   G
""               0 ""             0 ""             0 ""             0 ""
0 ;COOK   O
""               0 ""             0 ""             0 ""             0 ""
0 ;REFR   E
""               0 ""             0 ""             0 ""             0 ""
0 ;XLIT   E
""               0 ""             0 ""             0 ""             0 ""
0 ;ILIT   E
```

```
""              0 ""          0 ""          0 ""          0 ""
0 ;OFEQ  E
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;MISC  E
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC  G
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC  O
"COOL"         95 ""          0 ""          0 ""          0 ""
0 ;HTPMP E
;
;MISCELLANEOUS
;Name      Percent Name     Percent Name     Percent Name     Percent Name
Percent
""              0 ""          0 ""          0 ""          0 ""
0 ;HEAT  E
"HEAT"         90 ""          0 ""          0 ""          0 ""
0 ;HEAT  G
"HEAT"         90 ""          0 ""          0 ""          0 ""
0 ;HEAT  O
"COOL"         95 ""          0 ""          0 ""          0 ""
0 ;COOL  E
""              0 ""          0 ""          0 ""          0 ""
0 ;COOL  G
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;VENT  E
"WATER"        90 ""          0 ""          0 ""          0 ""
0 ;WATR  E
"WATER"        85 ""          0 ""          0 ""          0 ""
0 ;WATR  G
"WATER"        85 ""          0 ""          0 ""          0 ""
0 ;WATR  O
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK  E
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK  G
""              0 ""          0 ""          0 ""          0 ""
0 ;COOK  O
""              0 ""          0 ""          0 ""          0 ""
0 ;REFR  E
""              0 ""          0 ""          0 ""          0 ""
0 ;XLIT  E
""              0 ""          0 ""          0 ""          0 ""
0 ;ILIT  E
""              0 ""          0 ""          0 ""          0 ""
0 ;OFEQ  E
"EPAMO"        95 ""          0 ""          0 ""          0 ""
0 ;MISC  E
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC  G
""              0 ""          0 ""          0 ""          0 ""
0 ;MISC  O
"COOL"         95 ""          0 ""          0 ""          0 ""
0 ;HTPMP E
;
;Thermal Efficiency Standards
;
```

```
;SMALL OFFICES
;Name       Percent Name      Percent Name      Percent Name      Percent Name
Percent
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   G
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   O
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   G
;
;
;LARGE OFFICES
;Name       Percent Name      Percent Name      Percent Name      Percent Name
Percent
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   G
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   O
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   G
;
;
;WAREHOUSES
;Name       Percent Name      Percent Name      Percent Name      Percent Name
Percent
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   G
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   O
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   G
;
;
;FOODSTORES
;Name       Percent Name      Percent Name      Percent Name      Percent Name
Percent
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   E
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   G
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;HEAT   O
"SHELL"         10 ""            0 ""            0 ""            0 ""
0 ;COOL   E
```

```
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   G
;
;
;RETAIL
;Name      Percent Name     Percent Name     Percent Name     Percent Name
Percent
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   G
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   O
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   G
;
;
;SCHOOLS
;Name      Percent Name     Percent Name     Percent Name     Percent Name
Percent
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   G
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   O
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   G
;
;
;COLLEGES
;Name      Percent Name     Percent Name     Percent Name     Percent Name
Percent
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   G
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   O
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;COOL   G
;
;
;RESTAURANTS
;Name      Percent Name     Percent Name     Percent Name     Percent Name
Percent
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   E
"SHELL"        10 ""        0 ""        0 ""        0 ""
0 ;HEAT   G
```

```
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   G
;
;
;HEALTH
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   G
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   G
;
;
;LODGING
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   G
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   G
;
;
;MISCELLANEOUS
;Name      Percent Name    Percent Name    Percent Name    Percent Name
Percent
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   G
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;HEAT   O
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   E
"SHELL"        10 ""          0 ""          0 ""          0 ""
0 ;COOL   G
;
;
;
;Equipment Efficiency Incentives
;
"N" ;
```

```
;Incentives active? ( Y or N )
;
;SMALL OFFICES
;Year         Eff      Incent% Year        Eff      Incent% Year         Eff      Incent%
    0          0          0      0          0          0      0          0          0 ;HEAT  E
    0          0          0      0          0          0      0          0          0 ;HEAT  G
    0          0          0      0          0          0      0          0          0 ;HEAT  O
    0          0          0      0          0          0      0          0          0 ;COOL  E
    0          0          0      0          0          0      0          0          0 ;COOL  G
    0          0          0      0          0          0      0          0          0 ;VENT  E
    0          0          0      0          0          0      0          0          0 ;WATR  E
    0          0          0      0          0          0      0          0          0 ;WATR  G
    0          0          0      0          0          0      0          0          0 ;WATR  O
    0          0          0      0          0          0      0          0          0 ;COOK  E
    0          0          0      0          0          0      0          0          0 ;COOK  G
    0          0          0      0          0          0      0          0          0 ;COOK  O
    0          0          0      0          0          0      0          0          0 ;REFR  E
    0          0          0      0          0          0      0          0          0 ;XLIT  E
    0          0          0      0          0          0      0          0          0 ;ILIT  E
    0          0          0      0          0          0      0          0          0 ;OFEQ  E
    0          0          0      0          0          0      0          0          0 ;MISC  E
    0          0          0      0          0          0      0          0          0 ;MISC  G
    0          0          0      0          0          0      0          0          0 ;MISC  O
    0          0          0      0          0          0      0          0          0 ;HTPMP E
;
;LARGE OFFICES
;Year         Eff      Incent% Year        Eff      Incent% Year         Eff      Incent%
    0          0          0      0          0          0      0          0          0 ;HEAT  E
    0          0          0      0          0          0      0          0          0 ;HEAT  G
    0          0          0      0          0          0      0          0          0 ;HEAT  O
    0          0          0      0          0          0      0          0          0 ;COOL  E
    0          0          0      0          0          0      0          0          0 ;COOL  G
    0          0          0      0          0          0      0          0          0 ;VENT  E
    0          0          0      0          0          0      0          0          0 ;WATR  E
    0          0          0      0          0          0      0          0          0 ;WATR  G
    0          0          0      0          0          0      0          0          0 ;WATR  O
    0          0          0      0          0          0      0          0          0 ;COOK  E
    0          0          0      0          0          0      0          0          0 ;COOK  G
    0          0          0      0          0          0      0          0          0 ;COOK  O
    0          0          0      0          0          0      0          0          0 ;REFR  E
    0          0          0      0          0          0      0          0          0 ;XLIT  E
    0          0          0      0          0          0      0          0          0 ;ILIT  E
    0          0          0      0          0          0      0          0          0 ;OFEQ  E
    0          0          0      0          0          0      0          0          0 ;MISC  E
    0          0          0      0          0          0      0          0          0 ;MISC  G
    0          0          0      0          0          0      0          0          0 ;MISC  O
    0          0          0      0          0          0      0          0          0 ;HTPMP E
;
;WAREHOUSES
;Year         Eff      Incent% Year        Eff      Incent% Year         Eff      Incent%
    0          0          0      0          0          0      0          0          0 ;HEAT  E
    0          0          0      0          0          0      0          0          0 ;HEAT  G
    0          0          0      0          0          0      0          0          0 ;HEAT  O
    0          0          0      0          0          0      0          0          0 ;COOL  E
    0          0          0      0          0          0      0          0          0 ;COOL  G
    0          0          0      0          0          0      0          0          0 ;VENT  E
    0          0          0      0          0          0      0          0          0 ;WATR  E
```

```
      0       0        0     0       0        0     0       0        0 ;WATR  G
      0       0        0     0       0        0     0       0        0 ;WATR  O
      0       0        0     0       0        0     0       0        0 ;COOK  E
      0       0        0     0       0        0     0       0        0 ;COOK  G
      0       0        0     0       0        0     0       0        0 ;COOK  O
      0       0        0     0       0        0     0       0        0 ;REFR  E
      0       0        0     0       0        0     0       0        0 ;XLIT  E
      0       0        0     0       0        0     0       0        0 ;ILIT  E
      0       0        0     0       0        0     0       0        0 ;OFEQ  E
      0       0        0     0       0        0     0       0        0 ;MISC  E
      0       0        0     0       0        0     0       0        0 ;MISC  G
      0       0        0     0       0        0     0       0        0 ;MISC  O
      0       0        0     0       0        0     0       0        0 ;HTPMP E
;
;FOODSTORES
;Year        Eff   Incent% Year      Eff   Incent% Year      Eff  Incent%
      0       0        0     0       0        0     0       0        0 ;HEAT  E
      0       0        0     0       0        0     0       0        0 ;HEAT  G
      0       0        0     0       0        0     0       0        0 ;HEAT  O
      0       0        0     0       0        0     0       0        0 ;COOL  E
      0       0        0     0       0        0     0       0        0 ;COOL  G
      0       0        0     0       0        0     0       0        0 ;VENT  E
      0       0        0     0       0        0     0       0        0 ;WATR  E
      0       0        0     0       0        0     0       0        0 ;WATR  G
      0       0        0     0       0        0     0       0        0 ;WATR  O
      0       0        0     0       0        0     0       0        0 ;COOK  E
      0       0        0     0       0        0     0       0        0 ;COOK  G
      0       0        0     0       0        0     0       0        0 ;COOK  O
      0       0        0     0       0        0     0       0        0 ;REFR  E
      0       0        0     0       0        0     0       0        0 ;XLIT  E
      0       0        0     0       0        0     0       0        0 ;ILIT  E
      0       0        0     0       0        0     0       0        0 ;OFEQ  E
      0       0        0     0       0        0     0       0        0 ;MISC  E
      0       0        0     0       0        0     0       0        0 ;MISC  G
      0       0        0     0       0        0     0       0        0 ;MISC  O
      0       0        0     0       0        0     0       0        0 ;HTPMP E
;
;RETAIL
;Year        Eff   Incent% Year      Eff   Incent% Year      Eff  Incent%
      0       0        0     0       0        0     0       0        0 ;HEAT  E
      0       0        0     0       0        0     0       0        0 ;HEAT  G
      0       0        0     0       0        0     0       0        0 ;HEAT  O
      0       0        0     0       0        0     0       0        0 ;COOL  E
      0       0        0     0       0        0     0       0        0 ;COOL  G
      0       0        0     0       0        0     0       0        0 ;VENT  E
      0       0        0     0       0        0     0       0        0 ;WATR  E
      0       0        0     0       0        0     0       0        0 ;WATR  G
      0       0        0     0       0        0     0       0        0 ;WATR  O
      0       0        0     0       0        0     0       0        0 ;COOK  E
      0       0        0     0       0        0     0       0        0 ;COOK  G
      0       0        0     0       0        0     0       0        0 ;COOK  O
      0       0        0     0       0        0     0       0        0 ;REFR  E
      0       0        0     0       0        0     0       0        0 ;XLIT  E
      0       0        0     0       0        0     0       0        0 ;ILIT  E
      0       0        0     0       0        0     0       0        0 ;OFEQ  E
      0       0        0     0       0        0     0       0        0 ;MISC  E
      0       0        0     0       0        0     0       0        0 ;MISC  G
```

```
    0        0         0    0        0          0    0        0         0 ;MISC  O
    0        0         0    0        0          0    0        0         0 ;HTPMP E
;
;SCHOOLS
;Year      Eff   Incent% Year      Eff    Incent% Year      Eff   Incent%
    0        0         0    0        0          0    0        0         0 ;HEAT  E
    0        0         0    0        0          0    0        0         0 ;HEAT  G
    0        0         0    0        0          0    0        0         0 ;HEAT  O
    0        0         0    0        0          0    0        0         0 ;COOL  E
    0        0         0    0        0          0    0        0         0 ;COOL  G
    0        0         0    0        0          0    0        0         0 ;VENT  E
    0        0         0    0        0          0    0        0         0 ;WATR  E
    0        0         0    0        0          0    0        0         0 ;WATR  G
    0        0         0    0        0          0    0        0         0 ;WATR  O
    0        0         0    0        0          0    0        0         0 ;COOK  E
    0        0         0    0        0          0    0        0         0 ;COOK  G
    0        0         0    0        0          0    0        0         0 ;COOK  O
    0        0         0    0        0          0    0        0         0 ;REFR  E
    0        0         0    0        0          0    0        0         0 ;XLIT  E
    0        0         0    0        0          0    0        0         0 ;ILIT  E
    0        0         0    0        0          0    0        0         0 ;OFEQ  E
    0        0         0    0        0          0    0        0         0 ;MISC  E
    0        0         0    0        0          0    0        0         0 ;MISC  G
    0        0         0    0        0          0    0        0         0 ;MISC  O
    0        0         0    0        0          0    0        0         0 ;HTPMP E
;
;COLLEGES
;Year      Eff   Incent% Year      Eff    Incent% Year      Eff   Incent%
    0        0         0    0        0          0    0        0         0 ;HEAT  E
    0        0         0    0        0          0    0        0         0 ;HEAT  G
    0        0         0    0        0          0    0        0         0 ;HEAT  O
    0        0         0    0        0          0    0        0         0 ;COOL  E
    0        0         0    0        0          0    0        0         0 ;COOL  G
    0        0         0    0        0          0    0        0         0 ;VENT  E
    0        0         0    0        0          0    0        0         0 ;WATR  E
    0        0         0    0        0          0    0        0         0 ;WATR  G
    0        0         0    0        0          0    0        0         0 ;WATR  O
    0        0         0    0        0          0    0        0         0 ;COOK  E
    0        0         0    0        0          0    0        0         0 ;COOK  G
    0        0         0    0        0          0    0        0         0 ;COOK  O
    0        0         0    0        0          0    0        0         0 ;REFR  E
    0        0         0    0        0          0    0        0         0 ;XLIT  E
    0        0         0    0        0          0    0        0         0 ;ILIT  E
    0        0         0    0        0          0    0        0         0 ;OFEQ  E
    0        0         0    0        0          0    0        0         0 ;MISC  E
    0        0         0    0        0          0    0        0         0 ;MISC  G
    0        0         0    0        0          0    0        0         0 ;MISC  O
    0        0         0    0        0          0    0        0         0 ;HTPMP E
;
;RESTAURANTS
;Year      Eff   Incent% Year      Eff    Incent% Year      Eff   Incent%
    0        0         0    0        0          0    0        0         0 ;HEAT  E
    0        0         0    0        0          0    0        0         0 ;HEAT  G
    0        0         0    0        0          0    0        0         0 ;HEAT  O
    0        0         0    0        0          0    0        0         0 ;COOL  E
    0        0         0    0        0          0    0        0         0 ;COOL  G
    0        0         0    0        0          0    0        0         0 ;VENT  E
```

```
    0         0         0    0         0         0    0         0         0 ;WATR  E
    0         0         0    0         0         0    0         0         0 ;WATR  G
    0         0         0    0         0         0    0         0         0 ;WATR  O
    0         0         0    0         0         0    0         0         0 ;COOK  E
    0         0         0    0         0         0    0         0         0 ;COOK  G
    0         0         0    0         0         0    0         0         0 ;COOK  O
    0         0         0    0         0         0    0         0         0 ;REFR  E
    0         0         0    0         0         0    0         0         0 ;XLIT  E
    0         0         0    0         0         0    0         0         0 ;ILIT  E
    0         0         0    0         0         0    0         0         0 ;OFEQ  E
    0         0         0    0         0         0    0         0         0 ;MISC  E
    0         0         0    0         0         0    0         0         0 ;MISC  G
    0         0         0    0         0         0    0         0         0 ;MISC  O
    0         0         0    0         0         0    0         0         0 ;HTPMP E
;
;HEALTH
;Year       Eff   Incent% Year       Eff   Incent% Year       Eff   Incent%
    0         0         0    0         0         0    0         0         0 ;HEAT  E
    0         0         0    0         0         0    0         0         0 ;HEAT  G
    0         0         0    0         0         0    0         0         0 ;HEAT  O
    0         0         0    0         0         0    0         0         0 ;COOL  E
    0         0         0    0         0         0    0         0         0 ;COOL  G
    0         0         0    0         0         0    0         0         0 ;VENT  E
    0         0         0    0         0         0    0         0         0 ;WATR  E
    0         0         0    0         0         0    0         0         0 ;WATR  G
    0         0         0    0         0         0    0         0         0 ;WATR  O
    0         0         0    0         0         0    0         0         0 ;COOK  E
    0         0         0    0         0         0    0         0         0 ;COOK  G
    0         0         0    0         0         0    0         0         0 ;COOK  O
    0         0         0    0         0         0    0         0         0 ;REFR  E
    0         0         0    0         0         0    0         0         0 ;XLIT  E
    0         0         0    0         0         0    0         0         0 ;ILIT  E
    0         0         0    0         0         0    0         0         0 ;OFEQ  E
    0         0         0    0         0         0    0         0         0 ;MISC  E
    0         0         0    0         0         0    0         0         0 ;MISC  G
    0         0         0    0         0         0    0         0         0 ;MISC  O
    0         0         0    0         0         0    0         0         0 ;HTPMP E
;
;LODGING
;Year       Eff   Incent% Year       Eff   Incent% Year       Eff   Incent%
    0         0         0    0         0         0    0         0         0 ;HEAT  E
    0         0         0    0         0         0    0         0         0 ;HEAT  G
    0         0         0    0         0         0    0         0         0 ;HEAT  O
    0         0         0    0         0         0    0         0         0 ;COOL  E
    0         0         0    0         0         0    0         0         0 ;COOL  G
    0         0         0    0         0         0    0         0         0 ;VENT  E
    0         0         0    0         0         0    0         0         0 ;WATR  E
    0         0         0    0         0         0    0         0         0 ;WATR  G
    0         0         0    0         0         0    0         0         0 ;WATR  O
    0         0         0    0         0         0    0         0         0 ;COOK  E
    0         0         0    0         0         0    0         0         0 ;COOK  G
    0         0         0    0         0         0    0         0         0 ;COOK  O
    0         0         0    0         0         0    0         0         0 ;REFR  E
    0         0         0    0         0         0    0         0         0 ;XLIT  E
    0         0         0    0         0         0    0         0         0 ;ILIT  E
    0         0         0    0         0         0    0         0         0 ;OFEQ  E
    0         0         0    0         0         0    0         0         0 ;MISC  E
```

```
    0        0        0     0        0        0     0        0        0 ;MISC  G
    0        0        0     0        0        0     0        0        0 ;MISC  O
    0        0        0     0        0        0     0        0        0 ;HTPMP E
;
;MISCELLANEOUS
;Year       Eff    Incent% Year      Eff   Incent% Year      Eff   Incent%
    0        0        0     0        0        0     0        0        0 ;HEAT  E
    0        0        0     0        0        0     0        0        0 ;HEAT  G
    0        0        0     0        0        0     0        0        0 ;HEAT  O
    0        0        0     0        0        0     0        0        0 ;COOL  E
    0        0        0     0        0        0     0        0        0 ;COOL  G
    0        0        0     0        0        0     0        0        0 ;VENT  E
    0        0        0     0        0        0     0        0        0 ;WATR  E
    0        0        0     0        0        0     0        0        0 ;WATR  G
    0        0        0     0        0        0     0        0        0 ;WATR  O
    0        0        0     0        0        0     0        0        0 ;COOK  E
    0        0        0     0        0        0     0        0        0 ;COOK  G
    0        0        0     0        0        0     0        0        0 ;COOK  O
    0        0        0     0        0        0     0        0        0 ;REFR  E
    0        0        0     0        0        0     0        0        0 ;XLIT  E
    0        0        0     0        0        0     0        0        0 ;ILIT  E
    0        0        0     0        0        0     0        0        0 ;OFEQ  E
    0        0        0     0        0        0     0        0        0 ;MISC  E
    0        0        0     0        0        0     0        0        0 ;MISC  G
    0        0        0     0        0        0     0        0        0 ;MISC  O
    0        0        0     0        0        0     0        0        0 ;HTPMP E
;
;Specific DSM Programs
;
;Specific DSM Program Definitions
;
"N" ;Active? ( Y or N )
    1 ;Number of Specific Programs
;
;   Long Name            Bldg        Max%      Use%      EUI%  MinVint  MaxVint
Active
""                      ""            0         0         0        0        0 "Y"
;
;
;Specific DSM Program Impacts
;      1
;
       0 ;HEAT|Elec (kWh)
       0 ;COOL|Elec (kWh)
       0 ;VENT|Elec (kWh)
       0 ;WATR|Elec (kWh)
       0 ;COOK|Elec (kWh)
       0 ;REFR|Elec (kWh)
       0 ;XLIT|Elec (kWh)
       0 ;ILIT|Elec (kWh)
       0 ;OFEQ|Elec (kWh)
       0 ;MISC|Elec (kWh)
;
       0 ;HEAT|Gas (kBtu)
       0 ;COOL|Gas (kBtu)
       0 ;WATR|Gas (kBtu)
       0 ;COOK|Gas (kBtu)
```

```
        0 ;MISC|Gas (kBtu)
;
        0 ;HEAT|Oil (kBtu)
        0 ;WATR|Oil (kBtu)
        0 ;COOK|Oil (kBtu)
        0 ;MISC|Oil (kBtu)
;
;
;
;Specific DSM Program Diffusion
;
;   Year      %       Year     %       Year     %       Year     %       Year
%
        0        0       0        0       0        0       0        0       0
0 ; -
;
;General DSM Programs
;
;General DSM Program Definitions
;
""   ;Active? ( Y or N )
     0 ;Number of General Programs
;
;   Long Name          EndUse  Bldg    Fuel        EUI%      USE%     Start
End  Active
;
;
;General DSM Program Annual End-Impacts
;
;end of file
```

RECEIVED
NOV 22 1999
PUBLIC SERVICE COMMISSION

LG&E
A SUBSIDIARY OF
LG&E ENERGY

KU
A SUBSIDIARY OF
LG&E ENERGY

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE JOINT INTEGRATED RESOURCE PLAN OF	)	
LOUISVILLE GAS AND ELECTRIC COMPANY AND	)	CASE NO. 99-430
KENTUCKY UTILITIES COMPANY	)	

Volume III
Integrated Resource Plan

November 22, 1999

Technical Appendix

KENTUCKY UTILITIES COMPANY
and
LOUISVILLE GAS & ELECTRIC COMPANY

Analysis of Reserve Margin Planning Criteria

Prepared by

Generation Systems Planning

October 1999

LOUISVILLE GAS AND ELCTRIC/KENTUCKY UTILITIES COMPANY
ANALYSIS OF
RESERVE MARGIN PLANNING CRITERIA

TABLE OF CONTENTS

ANALYSIS OF LG&E/KU RESERVE MARGIN PLANNING CRITERIA
EXECUTIVE SUMMARY

Prior to the merger of the respective companies, Kentucky Utilities Company (KU) used a reserve margin target of 17.6% (representing a 15.0% capacity margin) and Louisville Gas & Electric (LG&E) used a reserve margin target of 16.0% (representing a 13.8% capacity margin) as the planning criteria for resource planning. The need to maintain a level of capacity in reserve is well established in the utility industry. Additional generation capacity must be available should there be an unexpected loss of generation, reduced generation capacity due to equipment problems, unanticipated load growth, variances in load due to extreme weather conditions, and/or disruptions in contracted purchased power. KU's last formal evaluation of the appropriate margin level, which suggested the reserve margin target of 17.6%, was completed in October, 1994. KU was in the process of reviewing its margin criteria at the time the merger with LG&E was under consideration. Results of that abbreviated study indicated that KU could lower its target reserve margin to 15.0%. In generation planning studies LG&E has been using the target reserve margin of 16.0% since 1995. Since the merger, the Companies have been using a planning reserve margin level of 14.0%. Several events have occurred since either company last formally evaluated their margin criteria; KU has installed four 110MW combustion turbines at E.W. Brown, LG&E and KU have merged, the merged company has installed two additional 164MW combustion turbines at E. W. Brown and the wholesale power market has shown price volatility that was unprecedented prior to the summer of 1998. These events further diversify the available generation mix and indicate that the Companies review its margin requirements.

The key variables for studies of this type are: (1) the number and length of planned generating unit outages and maintenance outages, (2) generating unit forced/equivalent forced outage rates, (3) the availability of purchase power capacity for import and (4) the customers perceived cost of unserved/emergency energy. The availability of the Companies' existing units is based on historical data. The availability of proposed generating units is such that it falls within the accepted availability for units of a given type, size and class. Since there is no industry standard for the cost of unserved energy, an EPRI study, adjusted to reflect recent market volatility was used to determine a base unserved energy cost. Sensitivity values around the base value of unserved energy cost were evaluated as were market, load and unit availability sensitivities. The PROSCREEN II computer model was used in the evaluation and the minimization of present value of revenue requirements (PVRR) was used as the primary decision factor.

Optimization study runs were used to create a least costly ordering of supply-side options for various reserve margin levels given each set of key variables. This methodology was repeated for all possible combinations of the key variables over a range of reserve margins. Study cases run for reserve margins around the reserve margin associated with the minimum PVRR did not show a significant increase in PVRR. Therefore, cases with reserve margins that showed PVRR within a small variance of the minimum PVRR were considered as economically equivalent.

The base series of the base case indicates that a 12% target reserve margin represents the greatest system reliability under the given set of assumptions. Furthermore, given the base case assumptions used in this study, together with the detailed sensitivity analysis performed on the purchase power market and summer peak load, a reserve margin in the range of 11%-14% would be optimal.

KENTUCKY UTILITIES COMPANY AND LOUISVILLE GAS & ELECTRIC ANALYSIS OF RESERVE MARGIN PLANNING CRITERIA

INTRODUCTION

Prior to the merger of the respective companies, Kentucky Utilities Company (KU) used a reserve margin[1] target of 17.6% (representing a 15.0% capacity margin[2]) and Louisville Gas & Electric (LG&E) used a reserve margin target of 16.0% (representing a 13.8% capacity margin) as the planning criteria for generation expansion planning. The need to maintain a level of capacity in reserve is well established in the utility industry. Additional capacity must be available (either in the form of physical generators or purchase power) should there be an unexpected loss of generation, reduced generation capacity due to equipment problems, unanticipated load growth, variances in load due to extreme weather conditions, and/or disruptions in contracted purchased power.

KU's most recent "formal" evaluation of the appropriate margin level suggested a reserve margin target of 17.6%. That analysis was completed in October, 1994. LG&E has been using the target reserve margin of 16.0% since early 1995 in generation planning studies. KU was in the process of reviewing its margin criteria at the time the merger with LG&E was being considered. Results of that abbreviated, pre-merger analysis indicated that KU could potentially lower the target reserve margin to 15.0%. Since the merger, the Companies have been using a planning reserve margin level of 14.0%. Several events have occurred since either company last evaluated their margin criteria: (1) KU has installed four 110MW combustion turbines at E.W. Brown; (2) LG&E and KU have merged; (3) the merged company has installed two additional 164MW combustion turbines at E. W. Brown; and (4) the power market has shown price volatility that was unprecedented

---

[1] Reserve Margin %= (Total Supply Capability – Peak Load) / Peak Load

[2] Capacity Margin % = (Total Supply Capability – Peak Load) / Total Supply Capability

prior to the summer 1998. The net effect is that the generation system has changed (by the addition of smaller increments of capacity with relatively quick start-up times and the larger pool of supply-side alternatives available to the merged company) and the purchase power market has matured. This study was conducted to evaluate and document the economics of maintaining various target reserve margin levels given these changes. As a result of this study, a recommendation of a target reserve margin for planning purposes can be made.

The study was conducted using the PROSCREEN II (V18R1.1) computer model. PROSCREEN II is a capital and production costing computer model with the capability to compute total fuel, fixed and variable operating costs for existing and future units as well as the capability to develop a least-cost resource plan for future years. PROSCREEN II can also evaluate the reliability of electricity power supply and model power transactions. Finally, PROSCREEN II calculates an annual and study period present-value cost for each computer simulation run. A minimum present value criterion will be used in this study as the principal economic decision parameter.

This report will: (1) provide a summary of the study methodology and assumptions; (2) detail the assumptions that most strongly influence margin analysis; (3) describe the scenarios and sensitivities developed; and finally; (4) suggest the least-cost target reserve margin level for the combined KU/LG&E system.

STUDY METHODOLOGY

The methodology used in the analysis consisted of using PROSCREEN II to create an optimized supply strategy for a specified reserve margin level and set of assumptions/ key variables. A series of PROSCREEN II optimizations were made for each set of base case assumptions and sensitivities (discussed later) at each target reserve margin level ranging from 7% to 14%. Seven percent is an arbitrarily selected low number while fourteen percent is the current planning margin. The optimizations define the optimum generation construction/purchase power level needed to satisfy the user input target reserve margin requirements. The objective of the optimizations is to balance the cost associated with maintaining a reliable supply system with the customers perceived cost of unserved energy. The optimizations produced the least-cost supply-side plans for the Companies (one at each target reserve margin). The reserve margin level which yields the minimum present value revenue requirements for each set of assumptions and key variables could then be determined. The reserve margin levels suggested by the analysis can then by reviewed to determine the least-cost reserve margin planning level for the Companies.

STUDY ASSUMPTIONS

Appendix-A of this report provides detailed information describing the inputs used in the modeling of KU, LG&E and Owensboro Municipal Utilities' (OMU) generating systems. Utilizing the multi-area production costing capability of PROSCREEN II, each utility (LG&E, KU and OMU) is modeled separately. This allows for more accurate simulation of the contractual arrangements between KU and OMU.

Several inputs strongly influence the ability to maintain a planned level of reserve margin in resource expansion studies of this type. These inputs include: (1) the number and length of planned generating unit outages and unit maintenance outages, (2) generating unit forced/equivalent forced outage rates, (3) the availability of purchase power capacity for import and (4) the customers perceived cost of unserved/emergency energy.

(1) Unit Planned Outages

A planned outage (PO) is defined as the removal of a generating unit from service to perform work on specific components that is scheduled well in advance and has a predetermined start date and duration. The guidelines for the scheduling of major and minor planned outages on baseload units in the LG&E and KU systems at the time this analysis was conducted are shown in Table 1.

Table 1
KU/LG&E Planned Outage Practices

	Minor Maintenance		Major Maintenance	
	Duration	Time Between	Duration	Time Between
LG&E	4 weeks	~ 1.5 years	8 weeks	~ 7 years
KU	3 weeks	~ 1 year	8 weeks	~ 7 years

As shown in Table 1, LG&E anticipates that on average, units will be out 4 weeks for minor planned outage work every 18 months, while KU anticipates annual minor planned outages to last approximately 3 weeks. Both companies anticipate baseload units requiring an average of 8 weeks to complete a major planned outage every 7 years. These planned maintenance practices were the accepted practices observed by each company prior to the merger. Planned maintenance duration and scheduling philosophies are currently being revised to reflect best practices across both Companies. However, the maintenance practices summarized above should be representative of future maintenance needs.

(2) Unit Forced Outages/Equivalent Forced Outages

Forced outages are events that require the full unit be removed from service immediately. Forced outage rates (FORs) are defined as the total number of forced outage hours/(total number of forced outage hours + total number of service hours). Equivalent forced outage rates (EFORs) are similar to FORs but include hours in which the unit is derated (capable of operating but unable to operate at full load). FORs and EFORs provide information on how often particular events cause unit outages or derates. The rates are developed from the KU/LG&E Generator Availability Data System (GADS). GADS is a historical database which contains historical unit outage information for each unit. Using data from the six year period 1993-1998, the forced outage rate and equivalent forced outage rate were calculated for each unit.

A maintenance outage (MO) is defined as the removal of a generating unit from service to perform work on specific components that could have been deferred beyond the end of the next weekend, but requires that the unit be removed from service before the next major or minor planned outage. Maintenance outages, like forced outages and forced derates, may occur at any time during the year, may have flexible start dates, and may or may not have a predetermined duration. To capture the random nature of the event that triggers a MO and to maximize the effect of the MO event on system capacity (i.e. reduce the generating system capability during the weekday when load is greatest instead of on the weekend), maintenance outage hours have been included in the modeled forced outage rates of the units.

Table 2 shows the modeled base forced outage rate and modeled base equivalent forced outage rate for each baseload unit.

Table 2
Modeled FOR and EFOR

Unit	FOR %	EFOR %
Brown 1	2.34%	4.13%
Brown 2	2.24%	3.91%
Brown 3	5.41%	6.55%
Cane Run 4	10.03%	11.26%
Cane Run 5	16.08%	19.90%
Cane Run 6	18.64%	21.32%
Ghent 1	6.01%	7.54%
Ghent 2	3.52%	4.08%
Ghent 3	4.23%	4.43%
Ghent 4	4.16%	4.30%
Green River 3	5.50%	5.51%
Green River 4	12.11%	13.87%
Mill Creek 1	10.05%	12.20%
Mill Creek 2	11.09%	12.94%
Mill Creek 3	10.83%	12.56%
Mill Creek 4	8.80%	11.38%
Pineville 3	6.32%	6.33%
Trimble County	4.14%	4.79%
Tyrone 3	3.96%	6.36%

Above includes effects of Maintenance Outage Hours (MOHs)

(3) Availability of Firm Purchase Capability

The Companies are interconnected through their transmission system with nine other control areas. Starting in 1999, the Companies have contracted for the purchase of firm summer capacity from the following two utilities: Electric Energy Incorporated (EEI) and OMU. The contracts with EEI and OMU extend through the study period. The EEI contract is modeled in PROSCREEN II as a purchase power unit with a capacity of 200 MW. The dispatch of purchase power units in PROSCREEN II approximates the actual dispatch of the EEI purchase capacity. KU's future purchases from OMU are modeled using PROSCREEN II's multi-area modeling feature which parallels the actual dispatching of KU and OMU units. However, in order to model a least-cost dispatch of the combined KU/LG&E and OMU generating systems, a detailed model of the OMU generation system is required. The details of the OMU generation system model and the amount of on-peak capacity available from OMU by year during the study period can be found in Appendix-A.

Additional purchase options that could supply capacity to serve the Companies' peak load requirements are call option purchases and spot (or hourly) purchases. Studies indicate that with two generators out of service on the Companies' system, the transmission system could support up to an additional 800MW of imports. Therefore, eight 100 MW, 100$/MWh call options were made available to PROVIEW in all summer periods (June-August) for each year thru 2003. It was assumed that price estimates of the option market beyond 2003 were subject to too great a variance for use in this analysis. For the purposes of this study, a call option is defined as a block (100MW) of power available June through August (through 2003 only) and delivered at a fixed energy price (100$/MWh). If the call option is selected by PROVIEW, the demand cost associated with the call option for the three summer months is paid in full regardless of whether any energy is supplied. Since a call option is in essence a contractual purchase obligation, if selected as a supply-side resource, it is considered to be 100% available. If energy is requested by the purchaser it is supplied at the strike price of 100$/MWh.

A maximum of 200MW of spot purchases were also modeled in PROVIEW. Spot purchases are short term market purchases that can have a large energy cost and very little or no demand cost associated with them. This cost profile is due to the fact that spot purchases have a short turnaround from when a supplier is notified and when he is expected to deliver. Although spot purchases are normally considered to be non-firm capacity, this study assumes that they contribute toward meeting the Companies target reserve margin. However, to reflect the fact that, on rare occasions, the spot/hourly market may not have power available, the spot market was assumed to have only a 95%

availability. Table 3 and Appendix-A Tables 4, 5, and 6 convey information associated with purchases made available to PROSCREEN II.

Table 3
Modeled Summer Peak Purchases

Supplier	MW	Availability	Term
OMU	*	Smith 1 – 83% Smith 2 – 86%	Throughout Study Period
EEI	200MW	94%	Throughout Study Period
Call Options	8-100MW	100%	June – August 1998 through 2003
Spot	200 MW	95%	June – August 1999 through 2003

*See Appendix-A – Table 5

Aside from the contractual and spot purchases discussed above, one additional purchase type is modeled in PROSCREEN II: emergency or unserved energy.

(4) Cost of Emergency/Unserved Energy

Since the amount of emergency energy determined by the model is a direct measure of the system's inability to meet its demands, emergency purchases are a key factor in determining the optimal target reserve margin level for use in resource planning studies. The cost of emergency/ unserved energy is defined as the cost to a customer during an outage on the transmission or distribution system, or for capacity shortages which would result in a power outage. No industry standard exist for this cost. The perceived and realized cost of this type of energy is highly dependent on customer type (i.e., residential, commercial, industrial), the duration of the outage, and the frequency at which outages occur. A residential customer who might only be inconvenienced by an outage would likely place a lower value on this type of energy than an industrial customer who may incur a substantial economic loss due to an outage. Likewise, within customer classes, the value of unserved energy can vary greatly due to individual customer needs. In addition to variations customers place on unserved energy, the following attributes of the outage or curtailment may affect the overall perceived value: timing (hour, season), duration, magnitude (partial or total), advance notice given, frequency, and coverage (area affected).

A 1990 EPRI report titled "Cost Benefit Analysis of Power System Reliability Determination of Interruption Costs" addresses the issue of determining a value for customer outages. By analyzing the results of a detailed survey of 27 utilities, the report determined the value those utilities place on unserved energy for reliability planning. The survey results help to determine the value for customer outages that can be applied to unserved energy in this study. Average unserved energy values calculated for each customer class in the EPRI study are shown below in Table 4. The approximate percentage of the Companies' energy sales by class during 1998 is applied to the survey results and a weighted average unserved energy cost estimate is calculated. To reflect the recent volatility of the spot purchase power market, an additional 2$/kWh is added to the weighted sum.

TABLE 4
OUTAGE COST ESTIMATES

CLASS	AVERAGE ESTIMATE[3] ($/UNSERVED kWh)	LG&E/KU CUSTOMER SALES (%)	WEIGHTED COST ($/UNSERVED kWh)
Residential	0.9	36	0.3
Commercial	7.1	28	2.0
Industrial	7.3	36	2.7
		Weighted Sum	4.9
		Market Adjustment	2.0
		Est. Base Cost of Unserved Energy	~7

Based on the results as shown in Table 4, a base cost of $7 per kWh for unserved energy is used in this study. An estimate of customer load not served during power outages or capacity

---

[3] EPRI results were presented in mixed year dollars and no attempt was made to escalate these values.

shortages is determined by the PROSCREEN II model and labeled as "Unserved Energy". To consider the sensitivity of results to the base assumption of $7/kwh value for unserved energy, values of $5/kwh and $9/kwh were also evaluated in this study.

PROSCREEN II BASE ANALYSIS

The availability of a 200MW spot market purchase and an unserved energy cost of $7/kwh were the values used for the base series. Combinations of the spot purchase and various unserved energy costs were evaluated as sensitivities to the base case. Table 5, summarizes the key variables for the six series of cases evaluated. For each series, eight PROVIEW optimizations were conducted with a minimum target reserve margin ranging from 7% to 14% (in 1% increments). Each optimization produced the least-cost supply-side strategy.

Series 2, referred to as the "Base Case Series", utilizes the base key variable assumptions of 200 MW of spot purchase capability and $7/kwh for unserved energy. Series 1 and Series 6 represent the boundary values for the sensitivity variables analyzed in this study. Series 1, the most optimistic case, simulates the availability of 200MW spot purchase capacity and the lowest cost for unserved energy ($5/kwh). Series 6, the most pessimistic case, assumes that no spot market purchase capability is available from the market and the highest unserved energy cost ($9/kwh).

Table 5
Identification of Key Variables Evaluated

Series #	Target Reserve Margin Range Evaluated (%)	Spot Purchase Modeled	Unserved Energy Cost ($/kWh)
1	7% to 14% in 1% increments	Yes	5.0
2*	7% to 14% in 1% increments	Yes	7.0
3	7% to 14% in 1% increments	Yes	9.0
4	7% to 14% in 1% increments	No	5.0
5	7% to 14% in 1% increments	No	7.0
6	7% to 14% in 1% increments	No	9.0

*This series contains the "base" assumptions of the spot purchase being available and unserved energy costs of 7$/kwh.

PROSCREEN II optimizations were conducted to determine the reserve margin level which yields the minimum PVRR under all scenarios. At each target reserve margin level, the key variables were held constant. The optimization studies evaluate the cost and reliability effects of all combinations of potential generating technologies. This produces a list of expansion plans, all of which meet both the pre-specified user constraints and the specific target reserve margin criterion. The capital costs and production costs (including the cost of unserved energy) of each plan determined by the model, and the plan with the lowest PVRR is selected as the least-cost expansion plan for that case. Performing optimization simulations at each reserve margin level assures that the optimal (least costly) ordering of units is maintained. The results of the optimizations determine the reserve margin level at which the minimum PVRR occurs for each series.

The optimization results for the base case series are shown in Figure 1. The larger values of PVRR at the high or low end of the reserve margin scale shown in Figure 1 reflect the increase in costs due to capital expenditures or unserved energy respectively. The increased in PVRR on the upper ends of the curves (higher reserve margin levels), is a function of increase capital expenditures for generation construction associated with maintaining the higher reserve margin. Conversely, the increase in PVRR values at the lower target reserve margin levels is a function of the value placed on unserved energy. The minimum PVRR (indicated by the arrow), which for the base series occurs at 10% reserve margin, strikes a balance between capital expenditures associated with maintaining reserve margin and the value placed on unserved energy . However, Figure 1 does demonstrate that the PVRR values are relatively the same near and around the minimum PVRR. For example, there is less than 0.5% difference between the PVRR of the 10% reserve margin level and the 9% or 11% reserve margin level. This indicates that at the higher reserve margin levels, a greater level of system reliability can be attained with minimal increase in cost. For this reason, it is difficult to recommend a single reserve margin level in and around the range suggested by the minimum PVRR for each series. Visual inspection of Figure 2, which shows the PVRR of all the series, reveals that all the curves are relatively flat around the minimum values. The overall flatness of the curves around the minimum value suggests that cases with a PVRR value within a small variance of the minimum PVRR could be considered economically identical or nearly identical. Figure 3 illustrates this. All reserve margins that are within 0.5% of the series minimum are considered to be economically equivalent. The reserve margin ranges shown in Figure 3 exceed the series minimum PVRR by less than 0.5%. Considering costs within a range of 0.5% allows for a more narrow analysis of possible reserve margin planning levels. Table 6, below, shows the range of reserve margin levels within 0.5% of the minimum cost for each series. The table summarizes the ranges of reserve margins for each set of case assumptions where the cost of maintaining these reserve margins is equivalent.

Table 6
Reserve Margin Levels Considered Economically Equivalent

Series #	Spot Purchase Modeled	Unserved Energy Cost ($/kWh)	Econ. Equivalent Reserve Margin
1	Yes	5.0	7% to 11%
2*	Yes	7.0	8% to 12%
3	Yes	9.0	9% to 13%
4	No	5.0	7% to 11%
5	No	7.0	9% to 11%
6	No	9.0	9% to 13%

*This series contains the "base" assumptions of the spot purchase being available and unserved energy costs of 7$/kwh.

The base case series suggests a reserve margin level in the range from 8% to 12%. As previously stated each range of reserve margin levels in Table 6 can be viewed as representing reserve margin levels which can be maintained at approximately equivalent cost. The sensitivity series (Series 1, 3-6) reflects the range of uncertainty inherent in the assumptions and provide a lower and an upper bound to the reserve margin levels suggested by the base series. A 12% reserve margin represents the greatest system reliability at an equivalent cost for the base series. An 11% reserve margin represents the greatest system reliability that is common to all the sensitivity series. These results indicate that given the assumptions, an 11% target reserve margin would provide maximum reliability at the lowest cost (i.e. 11% is the maximum target reserve margin value that occurs in the most cases). Therefore, based on the base analysis, it would appear that the target reserve margin could be reduced to 11%.

SENSITIVITIES: AVAILABILITY AND LOAD

To further enhance the study, a unit availability sensitivity and a load forecast sensitivity were conducted. The base analysis was conducted assuming that the historical unit availabilities are valid approximations of the units' future performance and that future summer peak loads are "normal." However, it is interesting to note the ranges of optimal reserve margin if future unit availabilities are slightly less available than historical or summer peak load is slightly greater than forecasted.

The estimated modeled availability of the Companies' coal-fired units is approximately 84%. If the forced outage rates of the coal-fired units are increased such that the availability is decreased by about 5% (to 79%) and the above analysis is repeated, Figure 4 is produced. Figure 4 shows the costs associated with maintaining 7% to 14% reserve margin assuming the coal-fired units are just 5% less available than they were in the base case. Notice a shift toward the higher margin levels when Figure 4 is compared with Figure 2. Figure 5 illustrates those ranges over which the associated costs exceed the minimum cost by less than or equal to 5%. These reliability ranges are considered equivalent since very little cost differential exists between them. The equivalent margins of Figure 5 are summarize below in Table 7. Note that the maximum reserve margin level evaluated (14%) was not increased.

Table 7
Reserve Margin Levels Considered Economically Equivalent (Decreased Availability)

Series #	Spot Purchase Modeled	Unserved Energy Cost ($/kWh)	Econ. Equivalent Reserve Margin
1	Yes	5.0	10% to 14%
2*	Yes	7.0	12% to 14%
3	Yes	9.0	13% to 14%
4	No	5.0	10% to 14%
5	No	7.0	12% to 14%
6	No	9.0	13% to 14%

*This series contains the "base" assumptions of the spot purchase being available and unserved energy costs of 7$/kwh.
"Decreased Availability" implies a 5% reduction in the Companies' coal-fired weighted equivalent availability.

Decreasing the availability of the coal-fired units by approximately 5% has the effect of shifting the range of economically equivalent reserve margins upwards by about 3% (compare Table 7 to Table 6). For the base series (Series 2), the equivalent reserve margin range changed from 8% -12% to 12%-14%. As anticipated, Series 1, 3-6 also had a slight shift upward in the ranges considered economically equivalent. The maximum target reserve margin value that occurs in the most series after the availability sensitivity is 14%. Therefore, based on an availability sensitivity, no change in the Companies' reserve margin criteria would be necessary.

Increasing the summer (July) peak load forecast by 5% reflects the fact that precise load forecasting is highly unlikely. Evaluating plans for durability in times of higher than anticipated load allows a more thorough strategy and, potentially, a lesser reliance on the high priced summer market. In this sensitivity case, it was assumed that the Companies' July peak load was 5% higher than forecasted. No adjustments were made to the energy in July, so increasing the July peak worsened the monthly load factor and dictated more conservative planning. Figure 6 shows the cost associated with maintaining 7%-14% reserve margin given a higher than forecasted summer peak load. Figure 7 and Table 8, show the equivalent reserve margin ranges resulting from optimizations of a higher than forecasted load scenario. The reserve margins shown in Table 8 are calculated based on the installed capacity and the base load forecast- not the installed capacity and the high load. This is done to better represent the situation where the Companies are anticipating the summer peak loads reflected by the base forecast but the observed peak loads are higher than expected.

Table 8
Reserve Margin Levels Considered Economically Equivalent (Increased Peak Load)

Series #	Spot Purchase Modeled	Unserved Energy Cost ($/kWh)	Econ. Equivalent Reserve Margin
1	Yes	5.0	11.3% to 14.5%
2*	Yes	7.0	13.5% to 16.6%
3	Yes	9.0	13.7% to 17.5%
4	No	5.0	11.2% to 14.2%
5	No	7.0	12.3% to 16.5%
6	No	9.0	13.3% to 17.3%

*This series contains the "base" assumptions of the spot purchase being available and unserved energy costs of 7$/kwh. Reserve margin values calculated based on installed capacity and <u>base</u> load forecast.

Series 2, when evaluated in a higher than forecasted load scenario results in a range of economically equivalent margins from 13.5% to 16.6%. The minimum and maximum of all other Series are 11.2% for Series 4 and 17.3% for Series 6. The maximum target reserve margin that occurs most frequently in all Series is 14.2%. Therefore, based on a summer peak load sensitivity, no change in the Companies' target reserve margin is necessary.

SUMMARY AND RECOMMENDATION

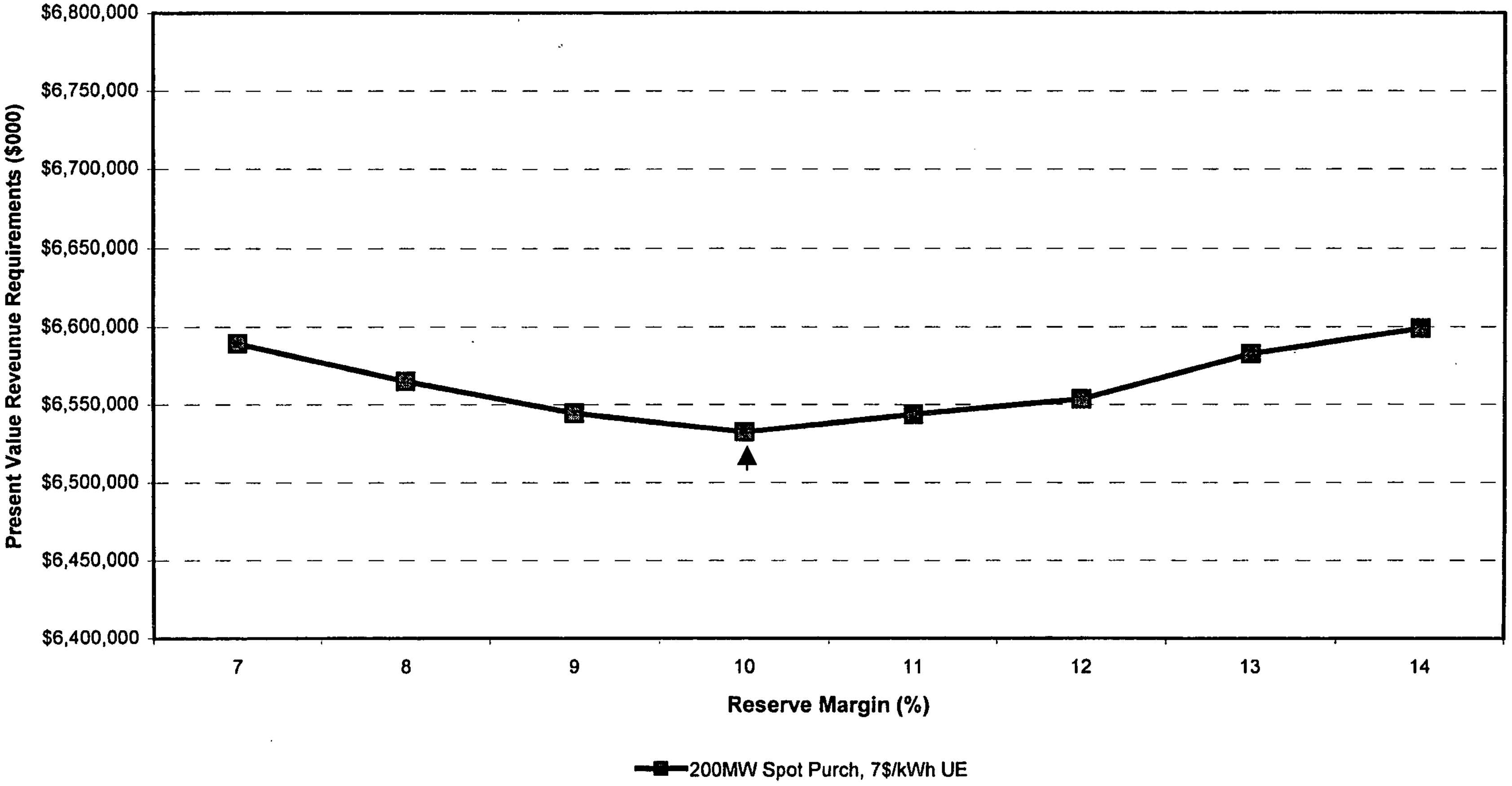
Key variables representing a base case series of simulations and sensitivity were analyzed in optimization studies. The key variables were evaluated over a range of target reserve margin levels. For each series, the minimum reserve margin level was determined. This minimum value strikes the best balance between the value of unserved energy and capital expenditures for generation construction or purchased power options. The balance between unserved energy cost and capital expenditures/purchase power is apparent through graphical analysis as the relatively flat region near and around the minimum PVRR value for each case. This suggests that reserve margins in this region of values can be maintained at or near the same cost. Therefore, the value for reserve margin at the high end of the base case range of reserve margins can be recommended as the planning reserve margin because it represents the maximum system reliability at the lowest cost. The analysis summarized in Table 6, Table 7 and Table 8 suggest an 11%, 14% and 14.2% reserve margin respectively. These values of reserve margin are the largest that occur in the most ranges, meaning they are the margins that provide the most reliable service at the least cost across a broad range of assumptions. Based upon the base series of the base case, a 12% target reserve margin represents the greatest system reliability under the given set of assumptions. Furthermore, given the assumptions and sensitivities analyzed in this study and the volatile power market environment of the past two summers this analysis suggest on optimal reserve margin in the range of 11% - 14%.

Base Unit Availability

Figure 1

Present Value Rev Requirements vs Reserve Margin

with 200MW of Spot Market Purchase Capacity Available and Unserved Energy at 7$/kWh

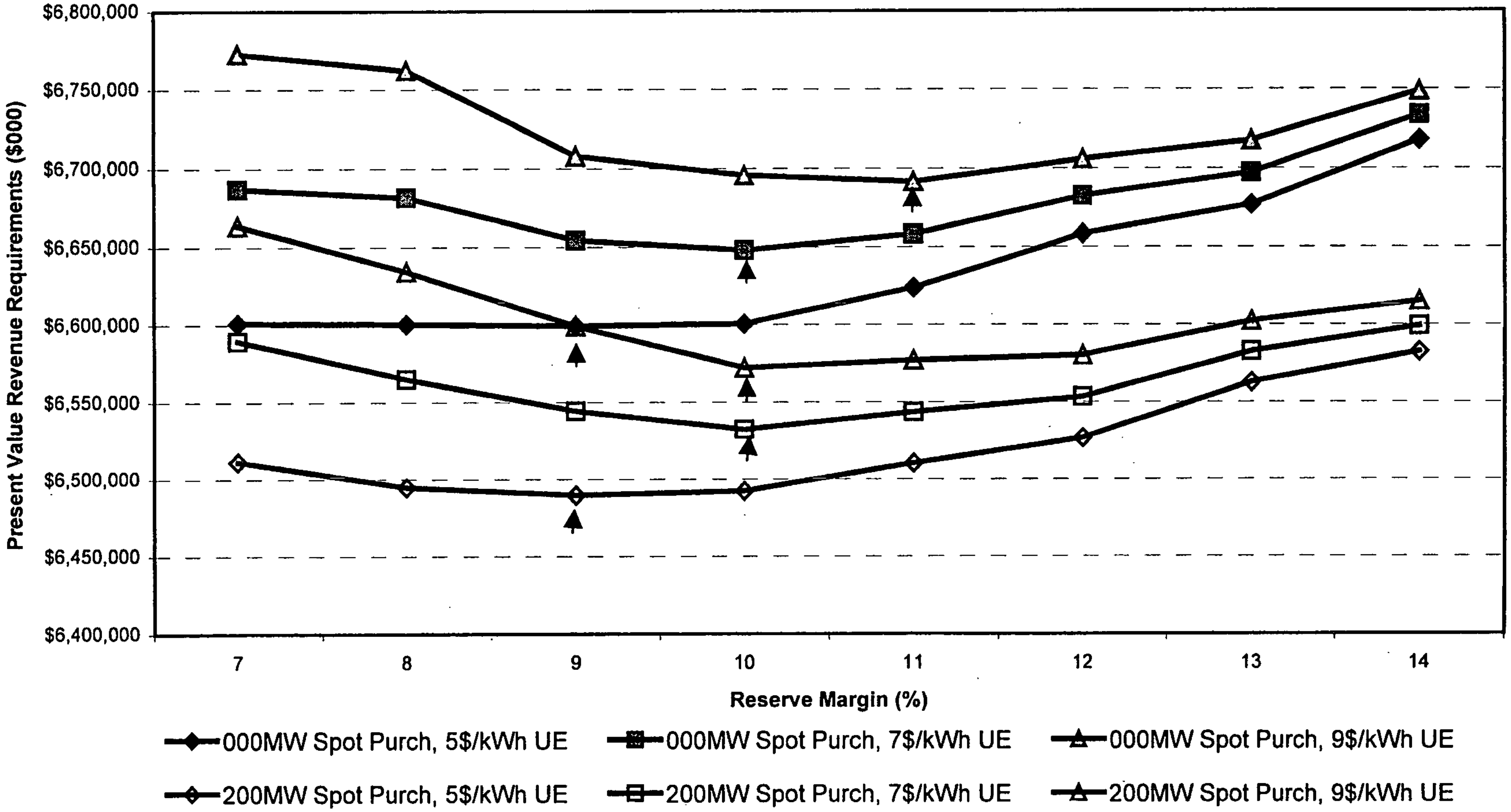


Base Unit Availability

Figure 2

Present Value Rev Requirements vs Reserve Margin

With and Without 200MW Spot Market Purchase Capability and Unserved Energy at 5, 7 & 9 $/kWh



m:\irp1999\98margin\7-14%RM\7-14%rm.xls Page Tab: 200&000MW @ 5,7 & 9 Date: 11/9/1999 (Stub)

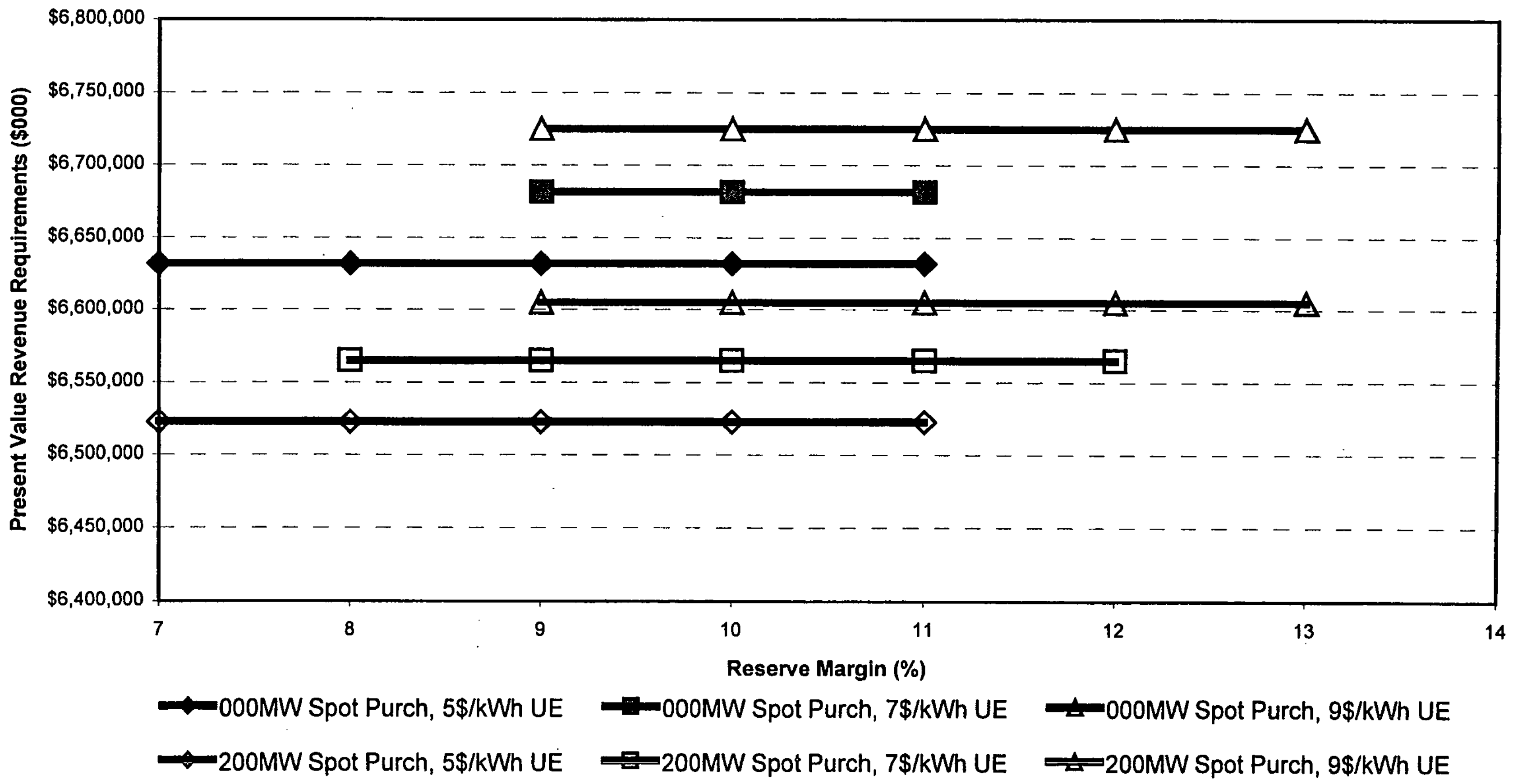
Proscreen V18R1.1

Base Unit Availability

Figure 3

Present Value Rev Requirements vs Reserve Margin

Margins within 0.5% of Minimum Cost



m:\irp1999\98margin\7-14%rm\ 7-14%rm.xls Page Tab: Equal RM Date: 11/9/1999 (Stub)

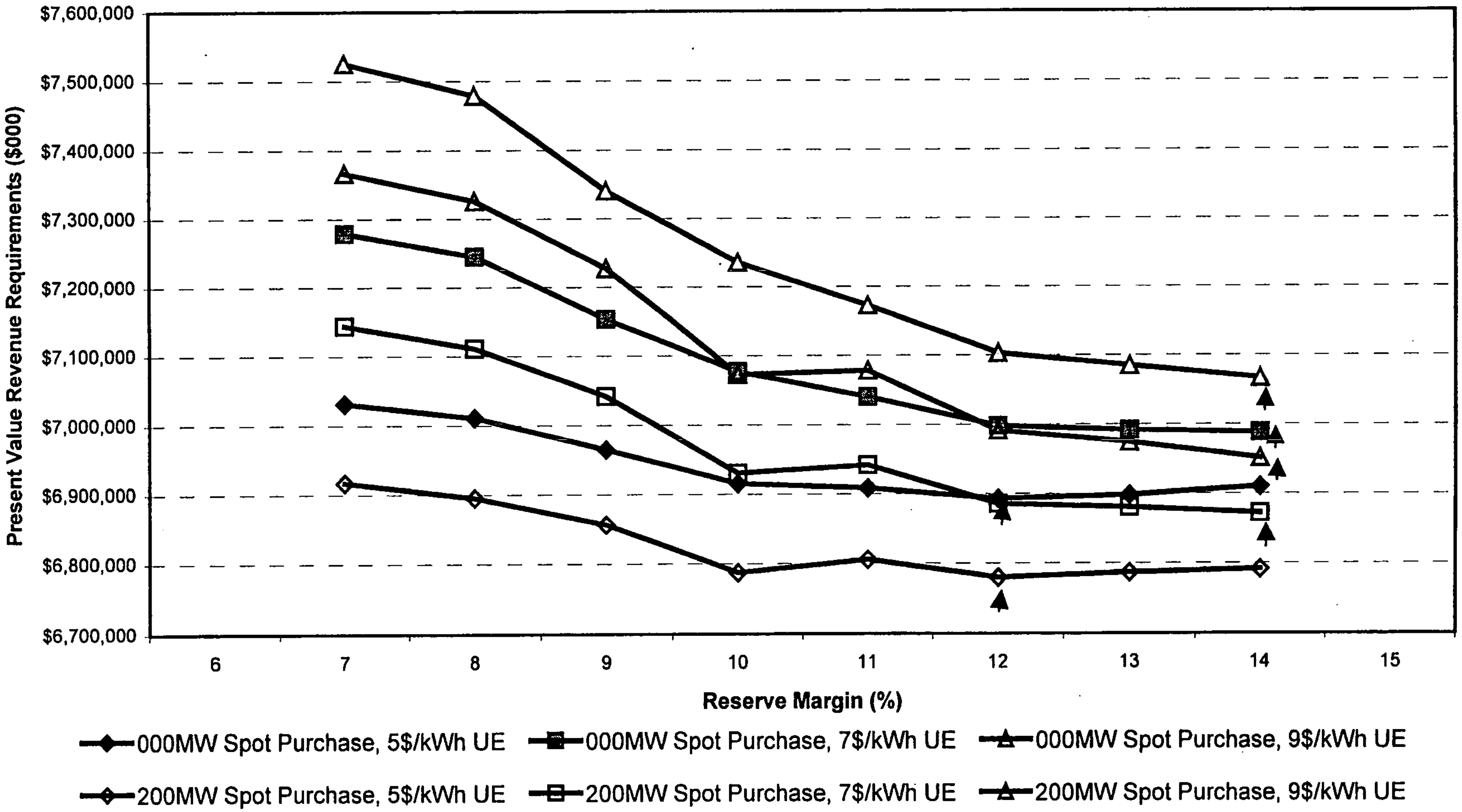
Proscreen V18R1.1

Lower Coal Availability by ~5%

Figure 4

Present Value Rev Requirements vs Reserve Margin

With and Without 200MW Spot Market Purchase Capacity and Unserved Energy at 5, 7 & 9 $/kWh



m:\irp1999\98margin\lowavail\ 7-14%rm.xls Page Tab: 200&000MW @ 5,7 & 9 Date: 11/9/1999 (Stub)

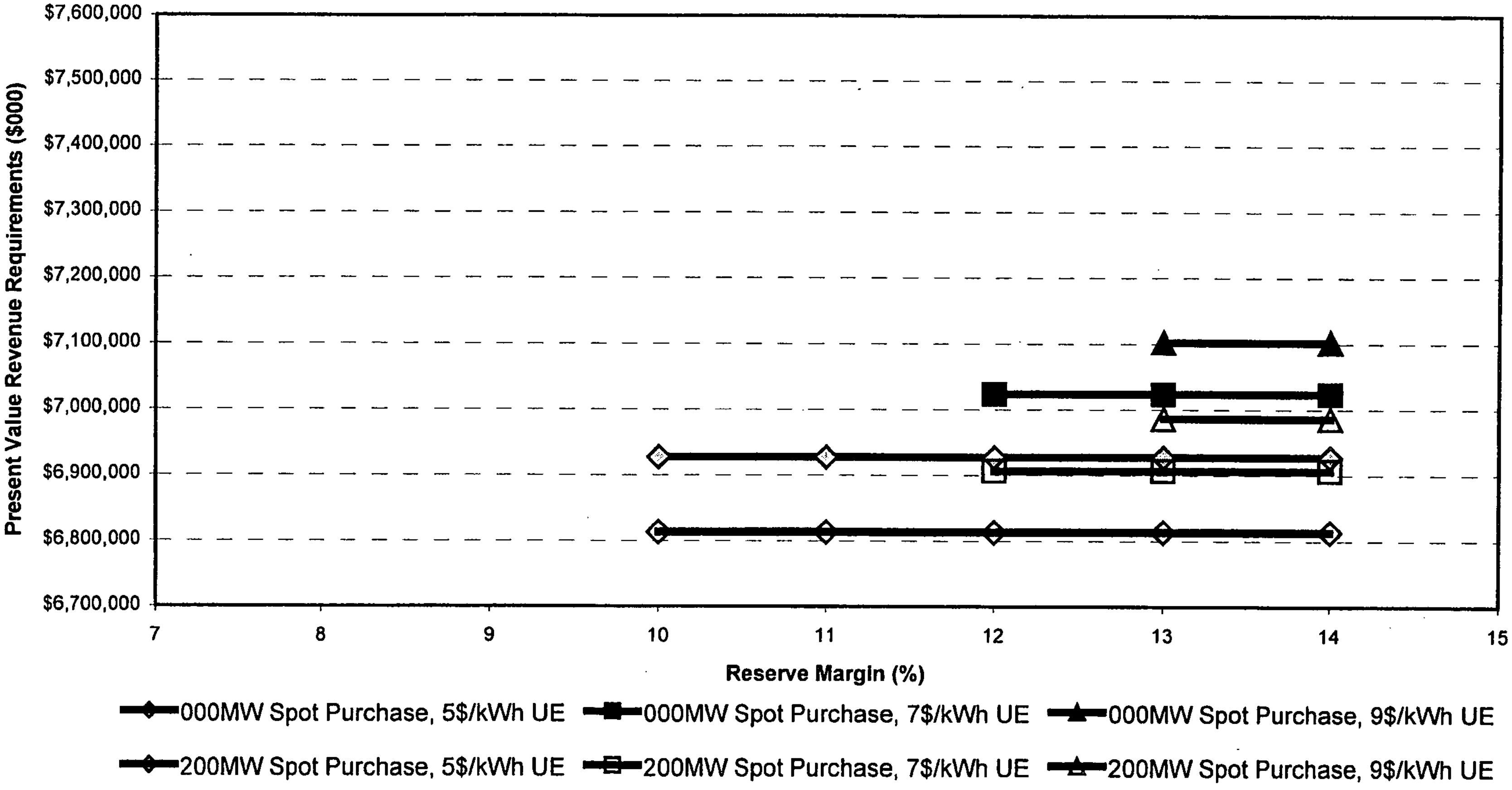
Proscreen V18R1.1

Figure 5

Lower Coal Availability by ~5%

Present Value Rev Requirements vs Reserve Margin

Margins within 0.5% of Minimum Cost



m:\irp1999\98margin\lowavail\ 7-14%rm.xls Page Tab: Equal RM Date: 11/9/1999 (Stub)

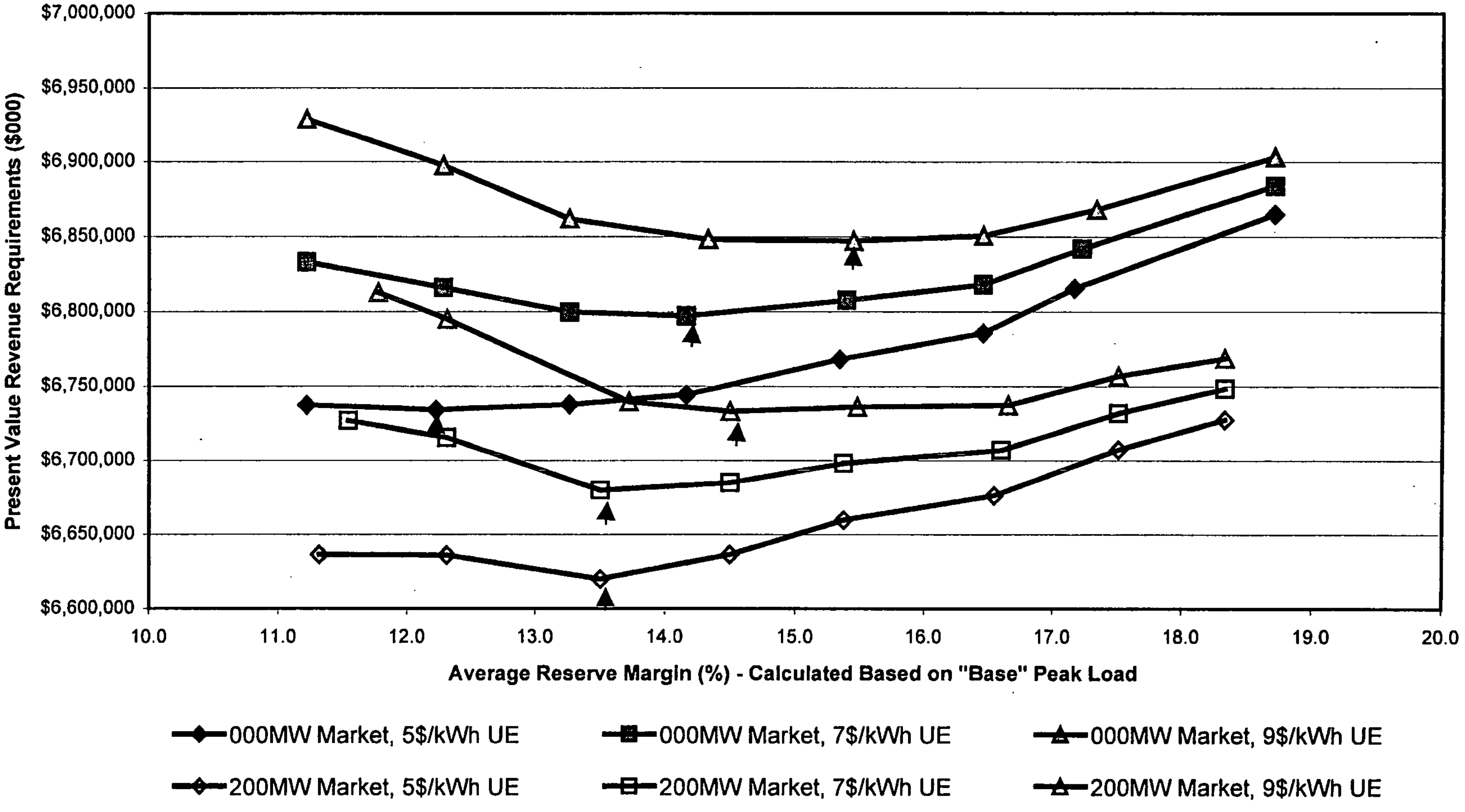
Proscreen V18R1.1

Increase July Peak Load by 5%

Figure 6

Present Value Rev Requirements vs Avg Reserve Margin

With and Without 200MW Spot Market Purchase and Unserved Energy at 5, 7 & 9 $/kWh

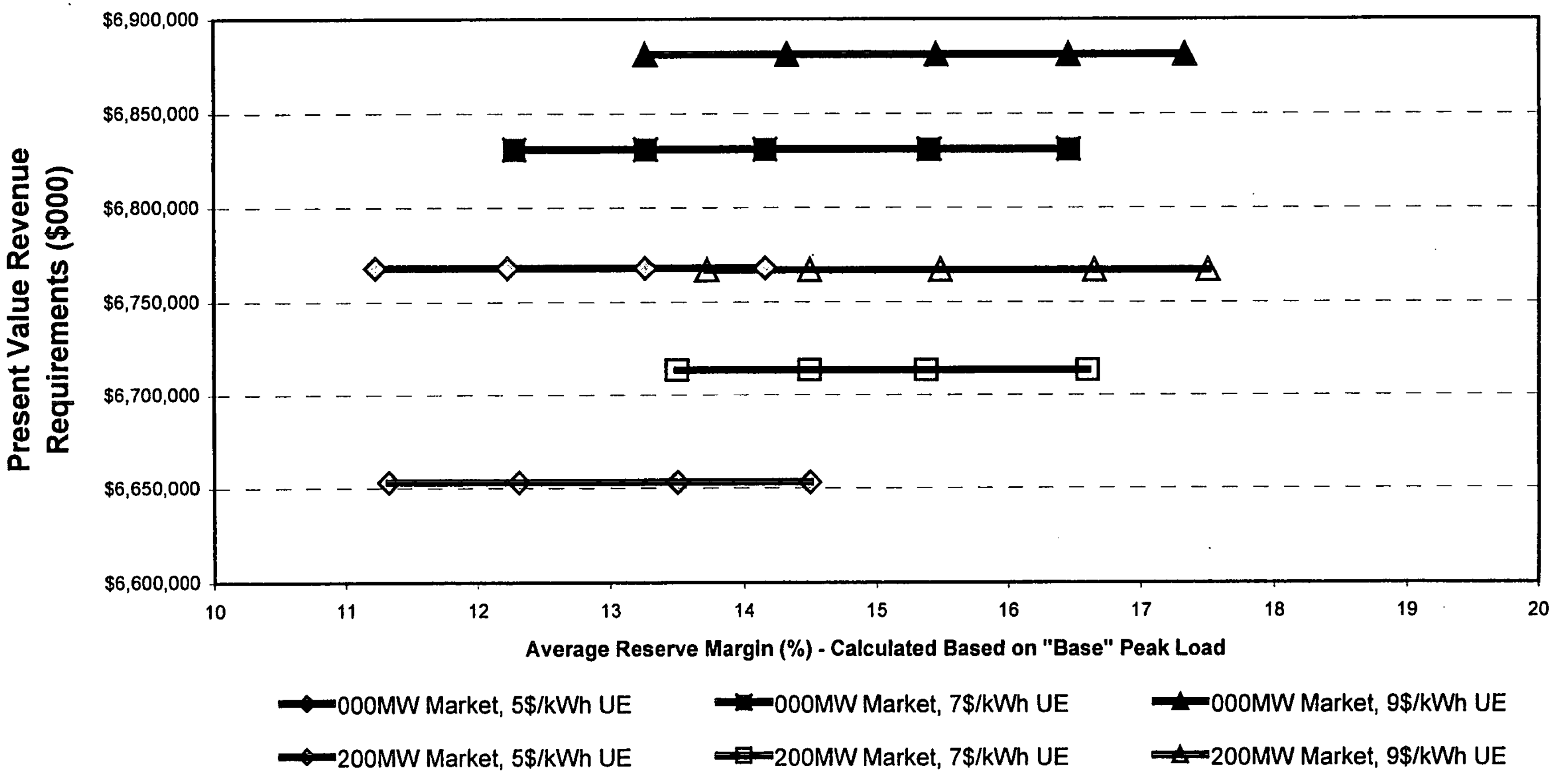


Increase July Peak Load by 5%

Figure 7

Present Value Rev Requirements vs Average Reserve Margin

Margins within 0.5% of Minimum Cost



m:\irp1999\98margin\badldfct\ 5-12%rm.xls Page Tab: Equal RM Date: 11/9/1999 (Stub)

Proscreen V18R1.1

DATA ITEMS USED IN OPTIMAL MARGIN ANALYSIS

Existing System Data

The PROSCREEN-II computer program is used to model Louisville Gas & Electric's (LG&E) and Kentucky Utilities Company's (KU) generating systems. These models simulate the dispatch of both companies generating units and other purchases to serve load, and of Owensboro Municipal Utilities' (OMU) generating units and purchases to serve OMU's load and maintain their reserve requirements. The remaining generation available from OMU's units after meeting their requirements is economically dispatched by the Companies. The following sections outline the information and the sources of the information used in the programs to model KU, LG&E and OMU generating systems.

A) General Data Items

1. Base Year - 1998

2. Study Period - 1998 to 2013 (with an additional 15 years of end effects)

3. Economic Assumptions

   Revenue requirements are determined on an annual basis and discounted to the base year giving a present worth of revenue requirements. Discounting is performed using a discount rate, which is assumed to remain constant for all years.

4. Financial Parameters:

a. Discount Rate:	9.69%
b. Capital/O&M costs Escalation Rates:	3.0%/3.25%
c. Combined Federal and State tax rate:	40.36%
d. Fixed Charge Rates:	
30 Year (CTs)-	13.46%
40 Year (Phase 3 of CC)-	12.36%

5. Retirements

   The operating life of all existing units is extended beyond the end of the study period. (no retirements)

6. Unserved Energy Cost

   The cost placed on unserved energy is varied from the base value of $7/kwh (1998$) to $5 and $9/kwh (escalated at 2.0% annually).

7. Load Forecast - See Appendix-A Table 1

   LG&E: Energy and Demand Forecast 1998-2028 (Load Forecasting)

   KU: Energy and Demand Forecast 1998-2028 (Load Forecasting)

   OMU: OMU forecast 1998 through 2007 extended through 2027 (Based on OMU fax received: 7/2/98).

8. Hourly Load File Used

   LG&E and KU typical hourly loads files are provided with the forecast by Forecasting. OMU typical hourly loads files are developed based on an OMU historical loadshape.

9. KU/LG&E Unit Data

   a. Installed Capacity - See Appendix A Table 2

      Based on revised May 20, 1998 Unit Test Results.

   b. Equivalent Forced Outage Rate - See Appendix-A Table 2

      KU historical GADS data using 5 years of historical data (1993-1998). Five year averages have been increased for inclusion of maintenance outage hours (MOHs) to better reflect actual unit availability of each unit.

   c. Heat Rates - See Appendix-A Table 2

      1997-1998 adjusted unit heat rate curves.

   d. Fuel Cost - See Appendix-A Table 3

      Fuel forecast from Fuels Management (Sept-Oct '98)

   e. Maintenance Schedules -

      Maintenance inputs were determined by reviewing the Companies' projected maintenance as of June 1999. Planned outages are scheduled to optimize reserves and reliability over all months of each year.

10. OMU Unit Data

a. Installed Capacity - (OMU 8/16/97 test data)

OMU (Smith Unit 1): 140
OMU (Smith Unit 2): 274

b. Equivalent Forced Outage Rate

OMU (Smith Unit 1): 10.09%
OMU (Smith Unit 2): 6.69%

Based on OMU historical GADS data (1995-1996)

c. Heat Rates –

OMU (Smith Unit 1): 10299 Btu/kWh
OMU (Smith Unit 2): 10798 Btu/kWh

d. Heat Content of Fuel: 11205 Btu/lb.

e. Maintenance Schedules -

Planned outage inputs were determined by reviewing OMU's seven year planned outage schedule and historical data.

f. Contract Demand Sale to KU - See Appendix-A Table 4 (Based on OMU Fax: 7/2/98)

g. Fuel Cost - See Appendix-A Table 5 - (OMU fax: 8/12/93).

Based on fuel information received from Fuel Procurement in Sept/Oct 1998. Fuel costs include associated costs for fuel handling and limestone.

h. OMU Scrubber O&M (Smith Units 1 & 2)
   - i. Variable O&M: Limestone charges included in fuel cost.
   - ii. Removal Efficiency: 96%

11. Purchases

a. Contract Demand - See Appendix-A Table 4

EEInc. (Firm): 200 MW each year

Virginia Power (Firm): 110MW for Jan-Feb 1998 only.

Cinergy (Firm): 110MW June, July, Aug '98 and Jan, Feb '99 only.

Enron (Firm): 110MW Jan-Feb '99 only.

Market Purchase; Peak Hrs- Off Peak Months
(Purchase Option #2, Firm): 500MW Jan-May, Sept-Dec

Market Purchase; Off Peak Hrs-All Months
(Economy/Non-Firm): 700MW Jan-May, Sep-Dec
500MW June, July & Aug

OVEC (Economy/Non-Firm); KU-9MW Jan-Dec
LG&E- 35.4MW July (Varies by month)

PROVIEW 100 Call Option (Firm): 100MW Jun-Aug of 1998-2003
On Peak hours only

PROVIEW Market Purchase Option #1 (Firm):
200MW Jun-Aug on Peak Hrs only

b. Equivalent Forced Outage Rate

EEInc.: - 6.39%; Note: KU owns 20% of six units at Joppa. A single purchase unit was used to model KU's portion of the six units. Each unit was assumed to have the same FOR and the probability of KU's 20% being available was assigned to the purchase unit.

Virginia Power: 0.0%

Cinergy : 0.0%

Enron: 0.0%

Market Purchase; Peak Hrs- Off Peak Months Purchase Option #2: 0.0%

Market Purchase; Off Peak Hrs-All Months: 0.0%

OVEC: 0.0%

PROVIEW 100$ Call Option: 0.0%

PROVIEW Hourly Market Purchase Option #1: 5.0%

c. Full Load Heat Rate (BTU/KWH)

EEInc.: 10500

d. Heat Content of Fuel (BTU/LB)

EEInc.: 10800

e. Fuel Cost

See Appendix-A Table 5

f. Demand Cost

See Appendix-A Table 6

g. Maintenance
EEInc: A 33 MW derate for 13 weeks in the spring and fall (derived from EEInc. Joppa Historical Data).

EXPANSION PLAN ALTERNATIVES

Data used to model expansion plan alternatives. All units are natural gas/oil fired CTs or CCs.

A) Characteristics of the supply-side alternatives

1. EFOR

All the units in the expansion plan are Combustion Turbines (CTs) with an EFOR= 6.0% or Combined Cycle Units (CCs) with an EFOR= 10%.

Appendix A-Table 1
Summer Peak (MW) /Annual Energy (GWh) Forecasts

	LGE Forecasted...		KU Forecasted...		OMU Forecasted...	
Year	Peak (MW)	Energy (GWh)	Peak (MW)	Energy (GWh)	Peak (MW)	Energy (GWh)
1999	2,532	11,620	3,743	19,339	192	875
2000	2,583	11,858	3,843	19,841	197	899
2001	2,630	12,089	3,911	20,241	198	912
2002	2,677	12,311	3,988	20,690	200	919
2003	2,724	12,525	4,079	21,167	201	925
2004	2,770	12,717	4,194	21,728	203	932
2005	2,816	12,913	4,295	22,148	204	938
2006	2,868	13,114	4,375	22,584	206	945
2007	2,923	13,322	4,451	23,029	207	952
2008	2,984	13,534	4,522	23,539	210	964
2009	3,039	13,737	4,611	23,922	213	978
2010	3,103	13,952	4,709	24,368	217	993
2011	3,163	14,152	4,806	24,774	220	1,008
2012	3,212	14,338	4,875	25,264	223	1,023
2013	3,265	14,527	4,941	25,630	227	1,038

LGE peak/energy values do not reflect effects of interruptible or sales associated with EKPC.

Appendix A-Table 2
Louisville Gas and Electric/ Kentucky Utilities Generator Data

Unit	Installed Year	Summer Rating (MW)	EFOR %	Heat Rate (Mbtu/MWh)
Brown 1	1957	104	4.13%	10.433
Brown 2	1963	168	3.91%	9.940
Brown 3	1971	439	6.55%	10.086
Brown 6	1999	164	5.00%	10.500
Brown 7	1999	164	5.00%	10.500
Brown 8	1995	110	7.00%	12.163
Brown 9	1995	110	7.00%	12.163
Brown 10	1995	110	7.00%	12.163
Brown 11	1996	110	7.00%	12.163
Ghent 1	1974	483	7.54%	10.138
Ghent 2	1977	492	4.08%	10.033
Ghent 3	1981	493	4.43%	10.154
Ghent 4	1984	494	4.30%	9.986
Green River 1	1950	26	19.95%	18.000
Green River 2	1950	27	19.95%	18.000
Green River 3	1954	71	5.51%	14.097
Green River 4	1959	103	13.87%	12.037
Tyrone 1	1947	27	4.13%	18.000
Tyrone 2	1948	31	7.58%	18.000
Tyrone 3	1953	71	6.36%	12.934
Dix Dam 1-3	1925	24	0.00%	N/A
Lock 7	1927	2	0.00%	N/A
Haefling 1-3	1970	45	16.50%	18.000
Pineville 3	1951	34	6.33%	12.603
Cane Run 4	1962	155	11.26%	10.452
Cane Run 5	1966	168	19.90%	10.130
Cane Run 6	1969	240	21.32%	9.995
Mill Creek 1	1972	303	12.20%	10.447
Mill Creek 2	1974	301	12.94%	10.586
Mill Creek 3	1978	386	12.56%	10.262
Mill Creek 4	1982	480	11.38%	10.102
Trimble (75%)	1990	371	4.79%	10.033
Cane Run 11	1968	16	53.00%	18.000
Paddys Run 11	1968	17	19.00%	18.000
Paddys Run 12	1968	26	56.00%	18.000
Waterside 7	1964	17	55.00%	17.000
Waterside 8	1964	16	48.00%	18.000
Zorn 1	1969	16	23.00%	N/A
Ohio Falls	1928	48	0.00%	N/A

Confidential Information Redacted

Appendix A-Table 3
Louisville Gas and Electric/ Kentucky Utilities Fuel Costs ($/Mbtu)

	Brown 1-3		Gr River 1-4	Tyrone 3	Ghent			Pineville 3	KU Oil	Haeffling 1-3	Brown CT	Cane Run 4-6	Mill Creek 1-4	Trimble	LGE Gas	LGE Oil
Year	2.3# SO2	1.2# SO2	4.3# SO2	1.4# SO2	5.5# SO2	1.1# SO2	0.8# SO2	1.4# SO2		Gas	Gas	6.0# SO2	6.4 # SO2	7.9 # SO2		
1999	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Appendix A-Table 4
Kentucky Utilities/Louisville Gas and Electric July Purchase (MW)

Year	EEI	OMU	Market Off-Peak	OVEC	8-Proview Call Options	Proview Spot Purch
1999	200	199	500	~40	100	200
2000	200	192	500	~40	100	200
2001	200	186	500	~40	100	200
2002	200	185	500	~40	100	200
2003	200	183	500	~40	100	200
2004	200	182	500	~40		
2005	200	180	500	~40		
2006	200	178	500	~40		
2007	200	177	500	~40		
2008	200	175	500	~40		
2009	200	171	500	~40		
2010	200	168	500	~40		
2011	200	164	500	~40		
2012	200	160	500	~40		
2013	200	156	500	~40		

Appendix A-Table 5

Modeled Fuel Costs Associated with Purchase Alternatives ($/Mbtu)

Year	EEI (Firm)	OMU (Firm)
1999	[redacted]	[redacted]
2000	[redacted]	[redacted]
2001	[redacted]	[redacted]
2002	[redacted]	[redacted]
2003	[redacted]	[redacted]
2004	[redacted]	[redacted]
2005	[redacted]	[redacted]
2006	[redacted]	[redacted]
2007	[redacted]	[redacted]
2008	[redacted]	[redacted]
2009	[redacted]	[redacted]
2010	[redacted]	[redacted]
2011	[redacted]	[redacted]
2012	[redacted]	[redacted]
2013	[redacted]	[redacted]

Appendix A-Table 6

Modeled Purchase Power Demand Costs ($/MW-Wk)

Year	EEI (Firm)	OMU (Firm)
1999	2,755	1,610
2000	2,687	1,661
2001	2,736	2,124
2002	2,777	2,187
2003	2,818	2,112
2004	2,859	2,084
2005	2,910	2,131
2006	2,924	2,179
2007	2,942	2,323
2008	2,989	2,426
2009	3,038	2,359
2010	3,089	2,320
2011	3,143	2,383
2012	3,197	2,445
2013	3,254	2,602

Note:
EEI and OMU demand charges are for calander years shown.

Kentucky Utilities Company
and
Louisville Gas & Electric Company

Screening of Demand-Side Management Options

Prepared by

Generation Systems Planning

September 1999

Table of Contents

INTRODUCTION

Kentucky Utilities Company and Louisville Gas & Electric Company (the Companies) evaluate future electric service requirements of customers with balanced consideration of demand-side or supply-side resource options. The purpose of this study is to evaluate and screen available demand-side management (DSM) alternatives to be included in the integrated analysis portion of the 1999 Integrated Resource Plan. The Companies formed an inter-departmental team to select the DSM options. This DSM team brainstormed to identify a broad range of DSM alternatives. Each alternative was investigated and evaluated using a two step screening process. The first step was qualitative in nature, where each alternative was evaluated based on four criteria. The alternatives that passed the first step underwent a second step of screening that was quantitative in nature. The quantitative screening process was broken down into two separate phases and is discussed in the Quantitative Screening Process section of this report. The DSM programs that passed the quantitative screening process were then aggregated into three DSM programs to compete with supply-side alternatives in the integrated analysis.

QUALITATIVE SCREENING PROCESS

The DSM team identified a list of 82 alternatives (referred to as the "long list") to be evaluated (see EXHIBIT DSM-1). Next, criteria were defined to facilitate an objective evaluation of the alternatives. Based upon the Companies' objectives to provide low cost, reliable energy to our customers and the comments from the PSC Staff Report on each of the Companies' most recently filed integrated resource plan (IRP), four criteria were selected. The next task was to assign weights or values to each of the criteria. The highest weights were assigned to the criteria judged to be the most important to develop a successful DSM program.

The two most important criteria were customer acceptance and the effectiveness of each DSM alternative in meeting load shape objectives. Each potential DSM option was evaluated, based on a scale of 0 to 4, using the four criteria. The four criteria, their weights, and an explanation of each are shown on EXHIBIT DSM-2.

QUALITATIVE SCREENING RESULTS

The results of the qualitative screening process are shown on EXHIBIT DSM-3. EXHIBIT DSM-4 depicts a graphical representation of the results of the qualitative screening process. Each bar in the graph represents the weighted average of the evaluations. The weighted averages are ranked from the highest to the lowest. The horizontal dark line on EXHIBIT DSM-3 and EXHIBIT DSM-4 delineates desirable programs produced by the qualitative screening analysis which resulted in sixteen DSM options for further analysis. Of the sixteen programs, nine programs target residential customers, five target commercial customers, and two target industrial customers. These sixteen options were then evaluated in the quantitative screening process.

QUANTITATIVE SCREENING PROCESS

The 16 options that passed the qualitative screening process were modeled in more detail using EPRI's DSManager software. DSManager is a PC-based software package developed by EPS Solutions under contract with EPRI. It is a screening tool that determines the cost effectiveness of DSM options by modeling their costs and benefits over a period of time. The program simplifies the "real world" by using 48 typical days to represent a year. There are four daily load shapes per month, each representing a specific type of day. The day types are high, medium, and low weekday, and weekend. For each of the 16 DSM options that were modeled in

DSManager, load shapes in this 48-day format were developed for scenarios with and without the DSM option. Not every DSM option evaluated required 48 daily load shapes. For example, modeling of the direct load control of central air conditioners required only 16 daily load shapes for each scenario, since air conditioners are only used, generally, during the four hottest months of the year. Also required by the DSManager program is the Companies' aggregate system load shape. This system load shape was converted into 48 daily load shapes. DSManager utilizes marginal energy costs to estimate the change in production costs resulting from the implementation of each DSM option. A detailed production-costing model, ENPRO, was used to determine the marginal energy costs used by DSManager.

DSManager calculates the net present value of the quantifiable costs and benefits assignable to both the Companies and the customers participating in a DSM program. For each DSM initiative, DSManager requires the administrative costs, participant's costs, life span of the technology, expected level of participation, expected level of free-riders, and rate schedules. DSManager calculates changes to the participant's bill, changes in the Companies' revenue, changes in production costs, and changes in the peak demand. The present value for each DSM alternative is calculated, by DSManager, and reported as the costs and benefits using the 5 "California Tests." These 5 tests include the participant, utility cost, ratepayer impact measure (RIM), total resource cost (TRC), and societal cost tests. The Companies used only the participant and TRC tests to screen DSM options. The participant test includes changes in all costs and benefits to the customer installing the DSM option. The TRC test combines the RIM and participant tests and indicates overall benefits of the DSM option to the average customer, whereas the RIM test considers all impacts to the non-participants.

The quantitative screening was set up in two phases. In phase I, the cost to administer the program was not considered and it was assumed that the program had only one participant per company. This phase was created to remove non-cost effective programs. If the benefits of a program do not exceed the cost of the program without the administration cost, then it will not pass with a higher penetration of customers and the added burden of the administrative costs. The only cost included in this phase was the incremental cost of the DSM alternative. For example, the direct load control programs had the cost of installing the control switch on the appliance and the heat pump programs had the incremental cost to install a more efficient HVAC system. Of the sixteen programs evaluated, eleven programs passed the TRC in this phase and were further evaluated in greater detail in phase II of the quantitative analysis. EXHIBIT DSM-5 is a list of the assumptions used in phase I of the quantitative analysis and the resulting TRC benefit cost ratio.

Each program that passed phase I of the quantitative screening process was put through a program design phase (Phase II). The costs to administer the programs and the expected levels of penetration for each Company were added to the 11 programs that passed Phase I. See EXHIBIT DSM-2 for a complete description of the quantitative screening process. A breakdown of the cost to deliver each program to the targeted customers, the number of customers expected to participate in each program, and other pertinent assumptions can be found on EXHIBIT DSM-6 through EXHIBIT DSM-16. The demand and energy impacts of each program along with the free rider penetration and the life of the measure were the same in both phases of the quantitative analysis and are shown on EXHIBIT DSM-5.

QUANTITATIVE SCREENING RESULTS

DSManager calculates the net present value of the costs and benefits of a given DSM program and calculates the benefit to cost ratios for each of the perspectives of the California Tests. Results of the programs evaluated in phase II of the quantitative screening process are shown on EXHIBIT DSM-17. The programs are ranked by the benefit to cost ratios for the TRC test. Several of the programs had infinite benefit to cost ratios for the Participants test since the participants are not expected to have any tangible costs associated with participating in the DSM program.

DSM Resources that failed the Quantitative Screening Process

Below are descriptions of the programs that failed the quantitative screening and the reasons they failed.

Air-Air heat pump program (R)

High efficiency heat pumps have lower peak demands and lower energy usage than standard efficiency models. The highest efficiency models that could be used in residential applications have Seasonal Energy Efficiency Ratios (SEERs) in excess of 16. The federal government established a minimum efficiency SEER standard of 10 that became effective on January 1, 1992, so customers that purchase ultra-high efficiency models can expect significantly lower electricity bills. Furthermore, these higher efficiency models could help the Companies retard its peak demand growth.

For analytical purposes, two programs for residential customers in which the Companies would encourage the purchase of high efficiency heat pumps were analyzed. One program represented customers that have resistive heat. The other program assumed the participants would have installed a less efficient heat pump if they did not participate. High equipment costs, relative to the energy and demand savings, caused this program to fail the quantitative screening. As mentioned in the Quantitative Screening Process section above, the costs to implement and manage this program were not considered in this evaluation since the costs already outweighed the benefits. Adding additional cost to the program would only have increased the cost side of the equation without changing the benefit side.

Water Heater Replacement (R)

This program would persuade customers with electric water heaters to swap out their electric water heater with a gas water heater. This would remove some load off of the system peak. However, this program failed screening because the energy and demand savings were not significant enough to overcome the cost of installation.

Thermal energy storage program (C)

Thermal energy storage (TES) systems consist of cooling equipment (chillers or icemakers), a thermal storage mass (typically ice, cooled water, or eutectic salt), and a cold air distribution system. Whereas the chillers in a conventional cooling system are sized for the maximum cooling load, the combination of the cooling equipment and the storage tank in a TES system is sized for the maximum cooling load. Consequently, cooling loads that vary dramatically during a day or during a week are the best candidates for TES. Even with assuming the TOD on-peak window would be narrowed from 14 hours to 10 hours, this program failed the quantitative screening because the savings were not enough to overcome the high cost of installation.

Low E Windows (R)

This program would promote the use of low emissivity coatings (Low-E) on windows in residential new construction and existing window replacement. Low-E coatings reduce solar gain in the cooling season and heat loss in the heating season. This program failed because the energy and demand savings were not significant enough to overcome the incremental cost over non-Low-E windows.

Water heating direct load control program (R,C)

Direct load control (DLC) switches can be used to interrupt power to electric water heaters during periods of high electricity demand. The storage aspect of water heaters permits more aggressive cycling strategies than those typically used for air conditioners.

Research indicates that DLC switches installed on water heaters can be expected to decrease demand by an average of 0.3 kilowatts during summer peak periods. While this technology is not as effective at reducing summer peaks as air conditioning DLC, the costs associated with a stand-alone program are comparable. Consequently, the Companies modeled the water heater DLC programs as a "piggyback" to the air conditioning programs. Customers that wanted a DLC switch installed on their air conditioner or heat pump would also be given the opportunity to have a switch installed on their water heater.

Despite this joint program benefit, the water heater DLC program failed the quantitative screening because the benefits of the peak reduction (avoided capacity costs) were not enough to overcome the cost of DLC switches and their installation.

DSM Resources That Passed Quantitative Screening

The programs that passed the quantitative phase of the screening were aggregated into 3 programs and included in the integrated analysis.

Air conditioning direct load control program (R,C)

Direct load control (DLC) of residential and commercial central air conditioners and heat pumps can be an effective method to reduce temperature-sensitive peaks caused by the use of air conditioning equipment. Radio-controlled relay switches can be used to interrupt power to an air conditioner or heat pump compressor unit during periods of high demand. Paging systems in today's marketplace offer the potential to use paging frequencies to communicate with the switches. Air conditioning DLC programs, implemented by a host of utilities throughout the United States, have generally been very successful with regard to customer participation, customer satisfaction and peak reduction. Typically, a cycling strategy is implemented that results in power to compressors being interrupted 20 to 30 minutes each hour.

For analytical purposes, the Companies modeled two DLC programs that targeted central air conditioners and heat pumps, one for residential customers and the other for commercial customers. The Companies would market this program through whatever channels that are determined to be cost-effective. Customers would be encouraged to enter the program by the Companies' offer to apply a monthly credit to their electric bill for each of the four summer months, June through September. Program participants would not incur any direct costs. These two programs were combined with the direct load control of pool pump program to create one DLC program to compete with supply-side alternatives in the integrated analysis.

Pool Pump direct load control program (R)

Direct load control of residential pool pumps can be an effective method to reduce summer peaks. This program is similar to the direct load control program for air conditioning equipment in delivery and would probably be marketed along with any other direct load control program. Typically, swimming pool pumps run non-stop in the summer months and are not required to run 24 hours per day to adequately filter the pool. Therefore, a cycling strategy was assumed to be 8 consecutive hours during the peak days of the summer. Customers would be encouraged to enter the program by the Companies' offer to apply a monthly credit to their electric bill for each of the four summer months. Program participants would not incur any direct costs. This program was combined with the direct load control of air conditioning programs to create one DLC program to compete with supply-side alternatives in the integrated analysis.

High efficiency outdoor lighting program (R)

Many residential customers like outdoor lighting for security and aesthetic reasons. The lowest cost options for customers are the standard incandescent fixtures. This program would encourage customers to install high intensity discharge (HID) fixtures which cost more to install but have considerable energy savings. This program was aggregated with the other lighting programs that passed the screening process and the water heater wrap program.

High efficiency lighting program (C,I)

The efficiency of fluorescent lighting equipment has improved dramatically in recent years. Electronic ballasts and more efficient bulbs offer customers an opportunity to dramatically reduce their lighting loads. Commercial customers are believed to be the best targets for lighting programs since lighting typically represents a third of their total electricity cost, and the coincidence factor with the Companies' system peaks is high. Although lighting does not typically represent a high percentage of most industrial customers' electricity usage, the load factor and coincidence factor can be quite high.

For analytical purposes, the Companies created and modeled a program to promote high efficiency lighting to commercial and industrial customers. The Companies would encourage customers to retrofit existing lighting programs with high efficiency lighting. Customers would purchase the lighting products through normal sales channels. The Commercial and Industrial High Efficiency Lighting programs were aggregated with the residential lighting program and the water heater wrap program to compete with supply-side alternatives in the integrated analysis.

Water Heater Wrap Up Program (R)

There are approximately 275,000 electric water heaters on the Companies' combined system. Each of these water heaters are heating and storing water constantly to be ready at the twist of a knob. This program would encourage customers to install a water heater blanket to improve the insulation of their electric water heater. This program was combined with the Lighting programs listed above for analysis purposes to create a single "Efficient Lighting" program to compete with the supply-side alternatives in the integrated analysis.

Standby generation program (C,I)

The Companies' customers own a considerable amount of diesel-powered generating equipment. If customers would agree to run these generators at the Companies' request, the Companies could defer peaking capacity additions and compensate these customers through billing credits.

The DSM Team designed a standby generation program based on the LG&E interruptible rate schedule. The primary difference would be that customers would not be required to commit to a firm level of service. They would merely agree to operate their generators at the Companies' request (up to 250 hours per year). Customers would be responsible for all fuel and maintenance costs. The Companies would be responsible for metering costs and would also give customers a $3.30 per kilowatt-month capacity credit. This capacity credit would be based on the average capacity delivered by the customer during the last five control periods—instances that the Companies asked the customer to run their generator(s). Since capacity payments would be based on delivered capacity rather than contracted capacity, the rate schedule would not contain a penalty clause for nonperformance. However, the Companies' would reserve the right to remove any customer from the program if performance does not meet the Companies' needs or expectations. Energy delivered as part of this program would be purchased from customers at the current avoided energy cost on file with the PSC. Any energy used by customers during control periods would be billed at the customers' normal rate.

Customers participating in the program would be required to either isolate their generators from the Companies' system through the use of open transfer switches or install paralleling equipment, which meets the Companies' protective standards. Since paralleling equipment can be quite expensive (over $100,000 per installation), eligible customers could be expected to utilize open transfer switches that many already own.

The Companies could use a variety of methods to dispatch the backup generators. For a small standby generation program, the Companies could require customers to install a dedicated telephone line and could request customers to operate their generator verbally using telephones. The customer would be responsible for starting the generator. If the program expanded significantly, the Companies could use computer-generated facsimile messages to contact customers. The customer would be responsible for starting the generator and calling the Companies' to verify receipt of the fax. Verbal telephone contact could serve as a backup communication system for those customers whose fax machines were busy for an extended period of time. The Commercial and Industrial Standby Generations were combined to create one Standby Generation program to compete with supply-side alternatives in the integrated analysis.

RECOMMENDATIONS

The nine programs that passed the quantitative screening process were aggregated into three DSM programs before competing with the supply-side alternatives in the integrated analysis. The direct load control (DLC) of residential air conditioning, the DLC of swimming pools, and the DLC of commercial air conditioning programs were aggregated into one DLC program. The two standby generation programs (commercial and industrial) were aggregated into another DSM program. The three lighting programs (residential, commercial and industrial) and the water heater wrap program were aggregated into the third DSM program. Aggregating the programs provided two benefits in the integrated analysis.

1. It reduces computer simulation time because of fewer alternatives.
2. It makes the DSM programs larger (in peak MW reduction).

Aggregate Program	Individual Programs
Direct Load Control (5 phases of 22 MW each)	Residential DLC of Central A/C Residential DLC of Pool Pumps Commercial DLC of Central A/C
Efficient Lighting (2 phases of 23 MW each)	Residential Outdoor Lighting Commercial Lighting Industrial Lighting Water Heater Wrap Up
Standby Generation (4 phases of 20 MW each)	Commercial Standby Generation Industrial Standby Generation

Each of the three aggregated DSM programs was then broken down into phases of similar size (approximately 20 MW). Multiple phases were used to better approximate the ramping up of participants and peak reduction. The size of each phase was set at comparable levels to level the playing field among the DSM programs. The integrated analysis is used to determine the direction the Companies should go in meeting the future needs of our customers. Any DSM program that passes the integrated analysis would be put through a rigorous design phase and would begin as a pilot program.

DSM program design is a complex, dynamic, and time-consuming activity. With the real cost of electricity decreasing and, more importantly, the percent of income spent on electricity decreasing, conservation measures have been receiving less and less attention over the last few years. The level of participation assumed in these DSM programs may err on the optimistic side to give the DSM programs the benefit of doubt. However, alternatives that are ultimately selected through this evaluation process may not be implemented as they have been described in this document. DSM alternatives that are ultimately implemented will be subjected to a much more rigorous program design cycle, which could result in program concepts and program details being changed significantly.

EXHIBIT DSM-1

Long List of DSM Alternatives

Residential

1 Direct Load Control of Central Air Conditioning
2 Geothermal Heat Pump
3 Air-Air Heat Pump (replacing resistive heat)
4 Air-Air Heat Pump (replacing heat pump)
5 Air-Air Heat Pump (replacing gas heat)
6 Room Air Conditioner Replacement
7 Gas Air Conditioning
8 Electric Thermal Storage (special rate)
9 Dual Fuel Heating System
10 Direct Load Control of Electric Water Heaters
11 Water Heater Replacement (elect. to elect.)
12 Water Heater Replacement (elect. to gas)
13 Water Heater Replacement (gas to elect.)
14 Water Heater Wrap Up
15 Conservation - Efficient Envelope
16 House Doctor - Energy Audit
17 Energy Efficient Lighting
18 High Efficiency Outdoor Lighting (retrofit)
19 High Efficiency Outdoor Lighting (new)
20 Energy Efficient Products
21 Refrigerator Replacement
22 Direct Load Control of Swimming Pool Pumps
23 Removal of 2nd Refrigerator
24 Removal of 2nd Freezer
25 Low E Windows (new construction)
26 Low Flow Shower Heads
27 Setback Thermostats
28 Smart Thermostats (special rate)
29 TOD Rates
30 Seasonal Rate Differential
31 Demand Subscription
32 Efficient Construction
33 Education
34 Fuel Cells
35 Micro Turbines
36 Reciprocating Engines
37 Sterling Engines
38 Photovoltaic
39 Solar Water Heating
40 Windmills

EXHIBIT DSM-1

Long List of DSM Alternatives

Commerical

41 Gas Air Conditioning
42 Thermal Energy Storage (special rate)
43 Direct Load Control of Central Air Conditioning
44 High Efficiency Cooling
45 Desiccant Cooling
46 Geothermal Heat Pump (new construction)
47 Direct Load Control of Electric Water Heaters
48 Energy Audit
49 High Efficiency Lighting
50 Energy Management System
51 Polarized Refrigerant Oxidant Agent
52 Low E Windows (new construction)
53 Convection Ovens
54 High Efficiency Fryers
55 High Efficiency Motors/ASD Motors
56 Refrigeration Case Covers/Doors
57 TOD Rates
58 Interruptible Rates
59 Seasonal Rate Differential
60 Education
61 Construction Building Standards
62 Standby Generation (special rate)
63 Fuel Cells
64 Micro Turbines
65 Sterling Engines
66 Photovoltaic
67 Solar Water Heating
68 Windmills

Industrial

69 Thermal Energy Storage (special rate)
70 High Efficiency HVAC Systems
71 Process and Energy Audit
72 High Efficiency Lighting
73 Variable Speed Motors
74 High Efficiency Motor and Adjustable Speed Drives
75 Energy Management System
76 Compressed Air System Upgrade
77 Refrigeration System Upgrades
78 TOD Rates
79 Interruptible Rates
80 Seasonal Rate Differential
81 Education
82 Standby Generation (special rate)

EXHIBIT DSM-2

DSM Screening Process for 1999 IRP

Qualitative Screening Criteria

Criteria	Description	Weighting
Customer Cost	Will a participant's benefits exceed their costs by utilizing this measure?	20%
Customer Acceptance	Are there an acceptable number of customers willing to participate to create a successful program?	30%
Maturity of Technology/ Data Confidence	Is the technology commercially available? Is the necessary data available to evaluate this measure?	20%
Meets Load Shape Objectives	Does the measure have the ability to reduce the seasonal coincident peak demand or increase the annual system load factor?	30%

Each DSM measure will be given a grade for each criterion based on a zero to four scale with four being an excellent rating. Any DSM measure that fails any one criterion (score of 0), fails the qualitative screening. The weighted averages of the ratings will be calculated and the measures that are below the selected cutoff will be eliminated from further evaluation. The selected cutoff will be determined from any obvious breakpoints between the sorted weighted average scores of the measures.

Quantitative Screening Criteria

The quantitative screening analysis will be performed in DSManager and will consist of the following phases.

Phase I:

Phase I will not include the cost to administer the program and will include only one participant per company. All programs that pass the Total Resource Cost Test (TRC) will be analyzed in Phase II.

Phase II:

Each program passing Phase I will be evaluated again, using all costs including the cost of administration and the best estimate of penetration. Each program has to pass the Participants Test and the TRC to be evaluated further.

Each of the DSM programs that pass Phase II of the quantitative screening may be aggregated to create a larger program(s). The aggregate program(s) will then compete with supply-side options in the integrated planning model.

EXHIBIT DSM-3

Preliminary DSM Screening
Sorted

	CLASS	Program	Customer Cost 20%	Customer Acceptance 30%	Maturity of Technology/ Data Confidence 20%	Meets Load Shape Objectives 30%	Weighted Average
1	R	Direct Load Control of Electric Water Heaters	4	3	4	4	3.7
2	R	Direct Load Control of Swimming Pool Pumps	4	3	4	4	3.7
3	C	Direct Load Control of Electric Water Heaters	4	3	4	4	3.7
4	C	Thermal Energy Storage (special rate)	3	3	4	4	3.5
5	C	High Efficiency Lighting	3	4	4	3	3.5
6	R	Direct Load Control of Central Air Conditioning	4	2	4	4	3.4
7	C	Direct Load Control of Central Air Conditioning	4	2	4	4	3.4
8	R	Water Heater Wrap Up	4	4	4	2	3.4
9	C	Standby Generation (special rate)	2	3	4	4	3.3
10	I	Standby Generation (special rate)	2	3	4	4	3.3
11	R	Air-Air Heat Pump (replacing resistive heat)	3	3	4	3	3.2
12	R	Air-Air Heat Pump (replacing heat pump)	3	3	4	3	3.2
13	R	Water Heater Replacement (elect. to gas)	3	3	4	3	3.2
14	R	High Efficiency Outdoor Lighting (new)	3	3	4	3	3.2
15	R	Low E Windows (new construction)	3	3	4	3	3.2
16	I	High Efficiency Lighting	3	3	4	3	3.2
17	I	Interruptible Rates	3	1	4	4	2.9
18	I	TOD Rates	4	2	3	3	2.9
19	R	Conservation - Efficient Envelope	3	3	4	2	2.9
20	R	House Doctor - Energy Audit	4	4	3	1	2.9
21	R	Energy Efficient Products	3	3	4	2	2.9
22	C	Energy Audit	4	3	3	2	2.9
23	C	TOD Rates	4	2	3	3	2.9
24	I	Compressed Air System Upgrade	3	3	4	2	2.9
25	R	Removal of 2nd Refrigerator	4	2	4	2	2.8
26	R	Removal of 2nd Freezer	4	2	4	2	2.8
27	R	Low Flow Shower Heads	4	2	4	2	2.8
28	C	Low E Windows (new construction)	2	3	3	3	2.8
29	I	Thermal Energy Storage (special rate)	2	3	3	3	2.8
30	R	Smart Thermostats (special rate)	3	2	2	4	2.8
31	R	Geothermal Heat Pump	2	2	4	3	2.7
32	R	Air-Air Heat Pump (replacing gas heat)	2	2	4	3	2.7
33	R	Dual Fuel Heating System	2	2	4	3	2.7
34	R	Water Heater Replacement (gas to elect.)	2	2	4	3	2.7
35	R	Efficient Construction	3	3	3	2	2.7
36	C	High Efficiency Cooling	2	2	4	3	2.7
37	C	Geothermal Heat Pump (new construction)	3	3	3	2	2.7
38	C	Energy Management System	3	3	3	2	2.7
39	C	High Efficiency Motors/ASD Motors	3	3	3	2	2.7
40	I	High Efficiency HVAC Systems	2	2	4	3	2.7
41	I	High Efficiency Motor and Adjustable Speed Drive	3	3	3	2	2.7
42	I	Energy Management System	3	3	3	2	2.7
43	R	High Efficiency Outdoor Lighting (retrofit)	2	3	4	2	2.7
44	R	Education	4	4	2	1	2.7

EXHIBIT DSM-3

Preliminary DSM Screening
Sorted

	CLASS	Program	Customer Cost 20%	Customer Acceptance 30%	Maturity of Technology/ Data Confidence 20%	Meets Load Shape Objectives 30%	Weighted Average
45	I	Seasonal Rate Differential	4	2	2	3	2.7
46	R	Room Air Conditioner Replacement	3	2	4	2	2.6
47	R	Water Heater Replacement (elect. to elect.)	3	2	4	2	2.6
48	R	TOD Rates	4	2	3	2	2.6
49	R	Seasonal Rate Differential	4	2	3	2	2.6
50	C	Seasonal Rate Differential	4	2	3	2	2.6
51	R	Setback Thermostats	4	3	3	1	2.6
52	R	Gas Air Conditioning	2	1	3	4	2.5
53	R	Electric Thermal Storage (special rate)	2	2	3	3	2.5
54	R	Energy Efficient Lighting	2	3	3	2	2.5
55	R	Refrigerator Replacement	2	3	3	2	2.5
56	R	Reciprocating Engines	1	2	4	3	2.5
57	C	Gas Air Conditioning	2	1	3	4	2.5
58	C	Convection Ovens	2	3	3	2	2.5
59	C	High Efficiency Fryers	2	3	3	2	2.5
60	C	Refrigeration Case Covers/Doors	3	2	3	2	2.4
61	C	Education	4	3	2	1	2.4
62	I	Process and Energy Audit	3	3	3	1	2.4
63	I	Refrigeration System Upgrades	2	2	4	2	2.4
64	C	Desiccant Cooling	2	2	2	3	2.3
65	C	Polarized Refrigerant Oxidant Agent	3	3	1	2	2.3
66	C	Solar Water Heating	2	2	3	2	2.2
67	I	Variable Speed Motors	2	2	3	2	2.2
68	I	Education	4	2	2	1	2.1
69	R	Solar Water Heating	1	2	3	2	2
70	C	Fuel Cells	2	2	2	2	2
71	C	Photovoltaic	2	2	2	2	2
72	C	Construction Building Standards	1	2	2	2	1.8
73	R	Sterling Engines	1	1	2	3	1.8
74	C	Micro Turbines	2	2	1	2	1.8
75	C	Sterling Engines	1	1	2	3	1.8
76	R	Micro Turbines	1	2	1	2	1.6
77	R	Fuel Cells	1	1	2	2	1.5
78	R	Photovoltaic	1	1	2	2	1.5
79	R	Windmills	1	1	2	2	1.5
80	C	Windmills	1	1	2	2	1.5
81	R	Demand Subscription	4	0	1	4	0
82	C	Interruptible Rates	4	0	4	4	0

EXHIBIT DSM-4
Results of Qualitative Screening

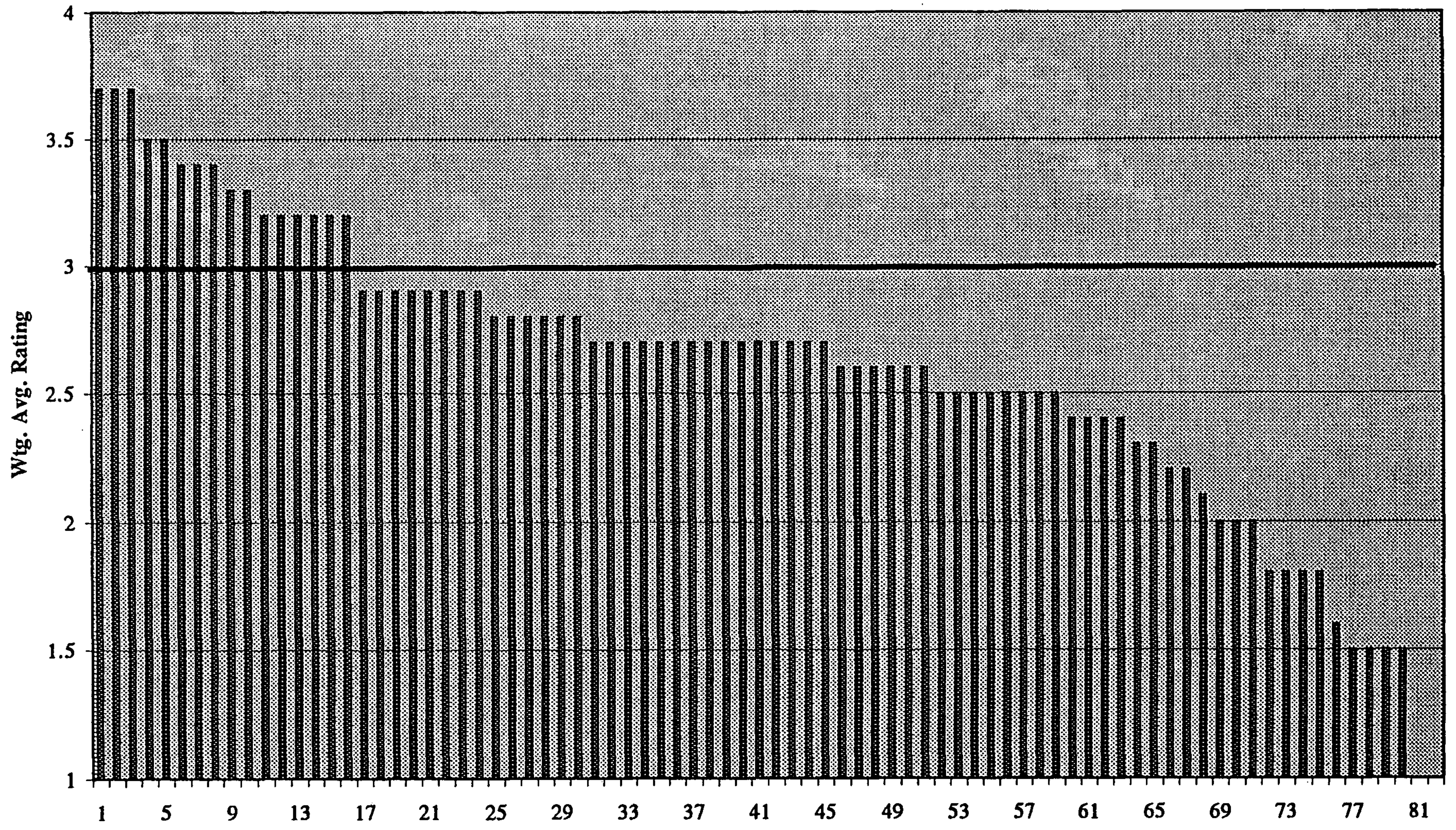


EXHIBIT DSM-5

Assumptions and Results of Phase I Quantitative Screening Process

			Per Participant						
Customer Class	Program Description	Program Name in DSManager	Cost	Peak kw Reduction	Annual kWh Reduction	New Participants	% Free Riders	Measure Lifetime	Phase I TRC B/C
C	Direct Load Control of Central Air Conditioning	99CDLCAC	135	2.4	199	2	0	20	14.55
I	Standby Generation (special rate)	99ISTNDB	50000	1000	184000	2	0	20	9.21
R	Direct Load Control of Central Air Conditioning	99RDLCAC	135	0.96	79.5	2	0	20	5.82
R	Direct Load Control of Swimming Pool Pumps	99RDLCPP	135	0.746	131	2	0	20	4.92
R	WH wrap up	99RWHRAP	15	0.02	258	2	0	20	4.04
C	Standby Generation (special rate)	99CSTNDB	87500	500	92000	2	0	20	2.63
R	Direct Load Control of Electric Water Heaters	99RDLCWH	135	0.43	0	2	0	20	2.37
C	Direct Load Control of Electric Water Heaters	99CDLCWH	135	0.3	0	2	0	20	1.64
I	High Efficiency Lighting	99ILIGHT	100000	90	628275	2	0	20	1.64
R	High Efficiency Outdoor Lighting (new)	99ROUTLT	65	0.02	459	2	0	20	1.51
C	High Efficiency Lighting	99CLIGHT	50000	45	208328	2	0	20	1.23
R	Air-Air Heat Pump (replacing resistive heat)	99RAAHPR	3500	0.89	10025	2	0	20	0.70
R	Water Heater Replacement (elect. to gas)	99RWHGAS	500	0.43	5800	2	0	20	0.63
C	Thermal Energy Storage (special rate)	99CTES	63300	64.95	37328	2	0	20	0.60
R	Low E Windows (new construction)	99RLOWEW	360	0.15	645	2	0	20	0.55
R	Air-Air Heat Pump (replacing heat pump)	99RAAHPA	1000	0.21	1276	2	0	20	0.36

EXHIBIT DSM-6

Cost of Direct Load Control of Residential Electric Water Heaters

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct Program Labor		6,062	6,065	6,067	6,069	6,072	6,074	6,077	3,040	3,041	3,042	3,044
Office Supplies & Expenses		500	500	500	500	500	500	500	250	250	250	250
Data Processing		2,000	2,000	2,000	2,000	2,000	2,000	2,000	500	500	500	500
Advertising		3,441	56,063	78,162	78,239	78,008	71,545	61,169	2,000	2,000	2,000	2,000
Outside Services/Install		10,889	180,667	256,863	265,340	274,627	258,399	227,326	41,480	42,891	41,352	42,717
Equipment		13,781	225,570	319,153	330,962	344,531	326,052	287,952	0	0	0	0
Maintenance of Equipment		635	11,198	26,562	42,917	60,439	77,627	93,605	94,368	95,074	95,800	96,469
Rebates/Incentives		2,618	44,498	102,083	159,668	217,253	269,603	314,100	306,248	298,395	291,066	283,737
Market Research		5,000	0	1,000	1,000	1,000	1,000	1,000	0	0	0	0
Program Evaluation		0	2,000	0	1,000	1,000	1,000	1,000	0	0	0	1,000
Total Program Expenses		44,926	528,560	792,390	887,693	985,429	1,013,799	994,729	447,885	442,151	434,010	429,717
Program Costs less Incentives less Equipment		28,528	258,493	371,154	397,064	423,645	418,145	392,677	141,638	143,756	142,944	145,980

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	175	175
2001	2,792	2,967
2002	3,839	6,806
2003	3,839	10,645
2004	3,839	14,484
2005	3,490	17,974
2006	2,967	20,940
2007	(524)	20,417
2008	(524)	19,893
2009	(489)	19,404
2010	(489)	18,916

Program Labor assumes 0.1 FTE 2000 through 2006, 0.05 FTE after 2006.
Advertising Expense based on $20 per new participant through 2006.
Outside Services based on installation cost of $60/switch.
Equipment expense based on cost of $75/switch.
Maintenance expense based on $35/switch on 10% of cumulative switches per year.
Incentive based on $15 per year.

EXHIBIT DSM-7

Cost of Direct Load Control of Residential Pool Pumps

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct Program Labor		6,062	6,065	6,067	6,069	6,072	6,074	6,077	3,040	3,041	3,042	3,044
Office Supplies & Expenses		500	500	500	500	500	500	500	250	250	250	250
Data Processing		2,000	1,000	1,000	1,000	1,000	1,000	1,000	500	500	500	500
Advertising		572	9,317	12,990	13,002	12,964	11,890	10,166	2,000	2,000	2,000	2,000
Outside Services/Install		1,810	30,025	42,688	44,097	45,640	42,943	37,779	6,894	7,128	6,872	7,099
Equipment		2,290	37,487	53,040	55,002	57,257	54,186	47,855	0	0	0	0
Maintenance of Equipment		106	1,861	4,414	7,132	10,044	12,901	15,556	15,683	15,800	15,921	16,032
Rebates/Incentives		435	7,395	16,965	26,535	36,105	44,805	52,200	50,895	49,590	48,372	47,154
Market Research		5,000	0	1,000	0	1,000	0	1,000	0	0	0	0
Program Evaluation		0	0	2,000	0	1,000	0	1,000	0	0	0	1,000
Total Program Expenses		18,775	93,650	140,664	153,338	171,582	174,299	173,132	79,261	78,309	76,957	77,079
Program Costs less Incentives less Equipment		16,049	48,768	70,659	71,800	78,220	75,308	73,078	28,366	28,719	28,585	29,925

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	29	29
2001	464	493
2002	638	1,131
2003	638	1,769
2004	638	2,407
2005	580	2,987
2006	493	3,480
2007	(87)	3,393
2008	(87)	3,306
2009	(81)	3,225
2010	(81)	3,144

Program Labor assumes 0.1 FTE 2000 through 2006, 0.05 FTE after 2006.
Advertising Expense based on $20 per new participant through 2006.
Outside Services based on installation cost of $60/switch.
Equipment expense based on cost of $75/switch.
Maintenance expense based on $35/switch on 10% of cumulative switches per year.
Incentive based on $15 per year.

EXHIBIT DSM-8

Cost of Direct Load Control of Residential Central Air Conditioners

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct Program Labor	-	93,600	97,063	100,363	103,675	107,304	111,060	114,947	59,427	61,448	63,476	65,570
Office Supplies & Expense	-	2,500	5,000	5,000	5,000	5,000	5,000	5,000	2,500	2,500	2,500	2,500
Data Processing	-	30,000	20,000	20,000	20,000	20,000	20,000	20,000	5,000	5,000	5,000	5,000
Advertising	-	100,000	316,782	443,416	451,841	459,070	427,770	374,876	132,872	133,090	133,326	133,348
Outside Services/Install	-	30,000	1,155,341	1,591,996	1,640,572	1,693,792	1,600,795	1,422,729	357,710	365,792	356,976	364,796
Equipment	-	45,000	1,517,663	1,828,956	1,896,628	1,974,389	1,868,490	1,650,157	-	-	-	-
Maintenance of Equipment	-	-	-	152,218	245,941	346,353	444,855	536,418	540,790	544,839	548,995	552,832
Rebates/Incentives	-	20,000	340,000	780,000	1,220,000	1,660,000	2,060,000	2,400,000	2,340,000	2,280,000	2,224,000	2,168,000
Market Research	-	15,000	5,000	10,000	10,000	10,000	10,000	10,000	-	-	-	5,000
Program Evaluation	-	-	10,000	20,000	20,000	10,000	30,000	30,000	-	-	-	5,000
Total Program Expenses	-	336,100	3,466,849	4,951,949	5,613,656	6,285,908	6,577,970	6,564,127	3,438,298	3,392,668	3,334,273	3,302,047
Program Costs less Incentives less Equipment		271,100	1,609,186	2,342,993	2,497,029	2,651,519	2,649,480	2,513,970	1,098,298	1,112,668	1,110,273	1,134,047

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	1,000	1,000
2001	16,000	17,000
2002	22,000	39,000
2003	22,000	61,000
2004	22,000	83,000
2005	20,000	103,000
2006	17,000	120,000
2007	(3,000)	117,000
2008	(3,000)	114,000
2009	(2,800)	111,200
2010	(2,800)	108,400

Program Labor assumes 1.5 FTE 2000 through 2006, 0.75 FTE after 2006.
Advertising Exp. based on $20 per new part. through 2006, $1 per cumulative part. after 2006.
Outside Services based on installation cost of $60/switch.
Equipment expense based on cost of $75/switch.
Maintenance expense base on $35/switch on 10% of cumulative switches per year.
Incentive based on $20 per year.

EXHIBIT DSM-9

Cost of Water Heater Wrap Up

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		15,156	7,581	7,584	7,586	0	0	0	0
Office Supplies & Expenses		250	250	250	250	0	0	0	0
Data Processing		2,500	0	0	0	0	0	0	0
Advertising		122,857	157,143	196,429	117,857	0	0	0	0
Outside Services/Install		123,750	165,000	206,250	123,750	0	0	0	0
Equipment		0	0	0	0	0	0	0	0
Maintenance of Equipment		0	0	0	0	0	0	0	0
Rebates/Incentives		0	0	0	0	0	0	0	0
Market Research		5,000	0	0	0	0	0	0	0
Program Evaluation		0	0	5,000	0	0	0	0	0
Total Program Expenses		269,513	329,974	415,512	249,444	0	0	0	0

Program Labor assumes 0.25 FTE in 2000 and 0.125 FTE after.
Advertising assumes 7% response rate @$1 each, $5000 development.
Outside services - fulfillment @$25 - 10 from customer
Penetration assumes 3%/year of combined total market of 275,000 res. Elec. WH.
Participation spread equally among KU and LG&E customers.

	Number of Customers Penetration	
	Annual	Cumul.
1999		0
2000	8,250	8,250
2001	11,000	19,250
2002	13,750	33,000
2003	8,250	41,250

EXHIBIT DSM-10

Cost of Residential Outdoor Lighting

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		15,156	7,581	7,584	7,586	0	0	0	0
Office Supplies & Expenses		250	250	250	250	0	0	0	0
Data Processing		2,500	0	0	0	0	0	0	0
Advertising		78,000	73,000	73,000	73,000	0	0	0	0
Outside Services/Install		73,000	73,000	73,000	73,000	0	0	0	0
Equipment		0	0	0	0	0	0	0	0
Maintenance of Equipment		0	0	0	0	0	0	0	0
Rebates/Incentives		365,000	365,000	365,000	365,000	0	0	0	0
Market Research		2,500	0	0	0	0	0	0	0
Program Evaluation		0	0	5,000	0	0	0	0	0
Total Program Expenses		536,406	518,831	523,834	518,836	0	0	0	0
Program Costs less Incentives		171,406	153,831	158,834	153,836	0	0	0	0

Program Labor assumes 0.25 FTE in 2000 and 0.125 FTE after.
Advertising assumes, $5000 development, $5/participant
Outside services - processing rebates & data processing @ $5 per participant.
Incentive includes $25 per participant.
Penetration assumes 2%/year of combined total market of 730,000 res. customers.
Participation spread equally among KU and LG&E customers.
Assumes participants pay $65 for installing HID instead of incandescent fixtures.

	Number of Customers Penetration	
	Annual	Cumul.
1999		0
2000	14,600	14,600
2001	14,600	29,200
2002	14,600	43,800
2003	14,600	58,400

EXHIBIT DSM-11

Cost of Direct Load Control of Commercial Electric Water Heaters

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct Program Labor		6,062	6,065	6,067	6,069	6,072	6,074	6,077	3,040	3,041	3,042	3,044
Office Supplies & Expenses		500	500	500	500	500	500	500	250	250	250	250
Data Processing		2,000	1,000	1,000	1,000	1,000	1,000	1,000	500	100	100	100
Advertising		5,000	1,616	4,040	4,041	4,042	2,830	2,022	1,214	0	0	0
Outside Services/Install		2,496	5,177	13,382	13,823	14,307	10,366	7,663	4,754	0	0	0
Equipment		3,159	6,463	16,627	17,242	17,949	13,079	9,707	6,045	0	0	0
Maintenance of Equipment		146	453	1,249	2,097	3,005	3,714	4,291	4,715	4,875	5,036	5,202
Rebates/Incentives		600	1,800	4,800	7,800	10,800	12,900	14,400	15,300	15,300	15,300	15,300
Market Research		5,000	0	1,000	1,000	1,000	1,000	1,000	0	0	0	0
Program Evaluation		0	2,000	0	1,000	1,000	1,000	1,000	0	0	0	1,000
Total Program Expenses		24,963	25,074	48,665	54,572	59,674	52,463	47,660	35,817	23,566	23,728	24,896
Program Costs less Incentives less Equipment		21,204	16,810	27,238	29,530	30,925	26,484	23,553	14,472	8,266	8,428	9,596

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	40	40
2001	80	120
2002	200	320
2003	200	520
2004	200	720
2005	140	860
2006	100	960
2007	60	1020
2008	0	1020
2009	0	1020
2010	0	1020

Program Labor assumes 0.1 FTE 2000 through 2006, 0.05 FTE after 2006.
Advertising Expense based on $20 per new participant through 2006.
Outside Services based on installation cost of $60/switch.
Equipment expense based on cost of $75/switch.
Maintenance expense based on $35/switch on 10% of cumulative switches per year.
Incentive based on $15 per year.
Participation spread equally among KU and LG&E customers.

EXHIBIT DSM-12

Commercial Standby Generation

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		62,400	64,709	66,909	22,809	23,607	24,433	25,288	26,148
Office Supplies & Expenses		500	500	500	500	500	500	500	500
Data Processing									
Advertising		14,000							
Outside Services/Install		20,000	20,000	20,000	20,000	20,000	10,000	10,000	10,000
Equipment		16,000	16,000	16,000	16,000	16,000	8,000	8,000	8,000
Rebates/Incentives		12,320	24,640	36,960	49,280	61,600	67,760	73,920	80,080
Market Research		2,000	0						0
Program Evaluation		0	2,000	0					0
Total Program Expenses		127,220	127,849	140,369	108,589	121,707	110,693	117,708	124,728
Participant Cost									
Maintenance of Equipment		2,600	2,696	2,788	2,880	2,981	3,085	3,193	3,302
Fuel Expense		9,252	9,539	9,835	10,169	10,504	10,851	11,177	11,512
Credit		158,400	316,800	475,200	633,600	792,000	871,200	950,400	1,029,600

Program Labor assumes 1 FTE 2000 through 2002, 0.33 FTE through 2007
Outside services includes installation cost of $2500 per participant.
Equipment cost is assumed to be $2000 per participant.
Incentive is based on $0.01232/kwh, 500kw, and 250 hours.
Maint. Cost assumes $5/kw/yr, 500 kw
Fuel expense assumes 0.08 gals/kwh, $0.90/gallon, 500kw, 250 hours of operation.
Participation spread equally among KU and LG&E customers.
Demand Credit ($3.3/kw/month)(500 kw)(12 months)

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	8	8
2001	8	16
2002	8	24
2003	8	32
2004	8	40
2005	4	44
2006	4	48
2007	4	52

EXHIBIT DSM-13

Cost of Commercial Lighting

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		30,312	15,162	15,167	15,173	0	0	0	0
Office Supplies & Expenses		250	250	250	250	0	0	0	0
Data Processing		2,500	0	0	0	0	0	0	0
Advertising		10,000	5,000	5,000	5,000	0	0	0	0
Outside Services/Install		203,000	253,750	304,500	406,000	0	0	0	0
Equipment		0	0	0	0	0	0	0	0
Maintenance of Equipment		0	0	0	0	0	0	0	0
Rebates/Incentives		0	0	0	0	0	0	0	0
Market Research		2,500	0	0	0	0	0	0	0
Program Evaluation		0		5,000	0	2,000	0	0	0
Total Program Expenses		248,562	274,162	329,917	426,423	2,000	0	0	0

Program Labor assumes 0.5 FTE in 2000 and 0.25 FTE after.
Advertising assumes, $5000 development, $5000/year.
Outside services - 35% large audits @ $350, 65% small audits @ $800.
Large = 50,000 sq ft
Small = 7,000 sq ft
Assumes 20% implementation.
Participation spread equally among KU and LG&E customers.
Assumes participants pay $50,000 for re-lamping.

	Number of Customers Receiving Audits	
	Annual	Cumul.
1999		0
2000	400	400
2001	500	900
2002	600	1,500
2003	800	2,300

	Number of Customers Implementing Lighting	
	Annual	Cumul.
1999		0
2000	80	80
2001	100	180
2002	120	300
2003	160	460

EXHIBIT DSM-14

Cost of Direct Load Control of Commercial Central Air Conditioners

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Direct Program Labor	-	31,200	32,354	33,454	34,558	35,768	37,020	38,316	19,809	20,483	21,159	21,857
Office Supplies & Expense	-	500	500	500	500	500	500	500	250	250	250	250
Data Processing	-	2,000	2,000	2,000	2,000	2,000	2,000	2,000	500	500	500	500
Advertising	-	10,000	1,616	4,040	4,041	4,042	2,830	2,022	1,214	-	-	-
Outside Services/Install	-	30,000	125,177	13,382	13,823	14,307	10,366	7,663	4,754	-	-	-
Equipment	-	45,000	6,463	16,627	17,242	17,949	13,079	9,707	6,045	-	-	-
Maintenance of Equipment	-	-	-	1,249	2,097	3,005	3,714	4,291	4,715	4,875	5,036	5,202
Rebates/Incentives	-	2,000	6,000	16,000	26,000	36,000	43,000	48,000	51,000	51,000	51,000	51,000
Market Research	-	5,000	-	1,000	1,000	1,000	1,000	1,000	-	-	-	5,000
Program Evaluation	-	-	2,000	-	1,000			1,000	-	-	-	5,000
Total Program Expenses	-	125,700	176,110	88,252	102,262	114,570	113,509	114,499	88,287	77,108	77,944	88,809
Program Costs less Incentives less Equipment		78,700	163,647	55,626	59,019	60,621	57,430	56,792	31,242	26,108	26,944	37,809

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	40	40
2001	80	120
2002	200	320
2003	200	520
2004	200	720
2005	140	860
2006	100	960
2007	60	1,020
2008	0	1,020
2009	0	1,020
2010	0	1,020

Program Labor assumes 0.5 FTE 2000 through 2006, 0.25 FTE after 2006.
Advertising Expense based on $20 per new participant through 2006.
Outside Services based on installation cost of $60/switch.
Equipment expense based on cost of $75/switch.
Maintenance expense based on $35/switch on 10% of cumulative switches per year.
Incentive based on $50 per year.
Participation spread equally among KU and LG&E customers.

EXHIBIT DSM-15

Industrial Standby Generation

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		62,400	64,709	66,909	22,809	23,607	24,433	25,288	26,148
Office Supplies & Expenses		500	500	500	500	500	500	500	500
Data Processing									
Advertising		14,000							
Outside Services/Install		20,000	20,000	20,000	20,000	20,000	10,000	10,000	10,000
Equipment		32,000	32,000	32,000	32,000	32,000	16,000	16,000	16,000
Rebates/Incentives		24,640	49,280	73,920	98,560	123,200	135,520	147,840	160,160
Market Research		2,000	0						0
Program Evaluation		0	2,000	0					0
Total Program Expenses		155,540	168,489	193,329	173,869	199,307	186,453	199,628	212,808
Participant Cost									
Maintenance of Equipment		5,200	5,392	5,576	5,760	5,961	6,170	6,386	6,603
Fuel Expense		18,504	19,078	19,669	20,338	21,009	21,702	22,353	23,024
Credit		316,800	633,600	950,400	1,267,200	1,584,000	1,742,400	1,900,800	2,059,200

Program Labor assumes 1 FTE 2000 through 2002, 0.33 FTE through 2007
Outside services includes installation cost of $2500 per participant.
Equipment cost is assumed to be $4000 per participant.
Incentive is based on $0.01232/kwh, 500kw, and 250 hours.
Maint. Cost assumes $5/kw/yr, 1000 kw
Fuel expense assumes 0.08 gals/kwh, $0.90/gallon, 1000kw, 250 hours of operation.
Participation spread equally among KU and LG&E customers.
Demand Credit ($3.3/kw/month)(1000 kw)(12 months)

	Number of Customers Penetration	
	Annual	Cumul.
1999	0	0
2000	8	8
2001	8	16
2002	8	24
2003	8	32
2004	8	40
2005	4	44
2006	4	48
2007	4	52

EXHIBIT DSM-16

Cost of Industrial Lighting

Program Cost	1999	2000	2001	2002	2003	2004	2005	2006	2007
Direct Program Labor		30,312	15,162	15,167	15,173	0	0	0	0
Office Supplies & Expenses		250	250	250	250	0	0	0	0
Data Processing		2,500	0	0	0	0	0	0	0
Advertising		3,500	1,000	1,000	1,000	0	0	0	0
Outside Services/Install		25,000	50,000	50,000	25,000	0	0	0	0
Equipment		0	0	0	0	0	0	0	0
Maintenance of Equipment		0	0	0	0	0	0	0	0
Rebates/Incentives		0	0	0	0	0	0	0	0
Market Research		1,000	0	0	0	0	0	0	0
Program Evaluation		0	0	2,500	0	2,000	0	0	0
Total Program Expenses		62,562	66,412	68,917	41,423	2,000	0	0	0

Program Labor assumes 0.5 FTE in 2000 and 0.25 FTE after.
Advertising assumes, $2500 development, $1000/year.
Outside services assumes $500 per audit.
Assume 15% implementation.
Average size 100,000 sq ft.
Participation spread equally among KU and LG&E customers.
Assumes participants pay $100,000 for re-lamping.

	Number of Customers Receiving Audits	
	Annual	Cumul.
1999		0
2000	50	50
2001	100	150
2002	100	250
2003	50	300

	Number of Customers Implementing Lighting	
	Annual	Cumul.
1999		0
2000	8	8
2001	15	23
2002	15	38
2003	8	45

EXHIBIT DSM-17

Assumptions and Results of Phase II Quantitative Screening Process

			Per Participant				Phase II B/C Ratio	
Customer Class	Program Description	Program Name in DSManager	Peak kw Reduction	Annual kWh Reduction	% Free Riders	Measure Lifetime	Participants	TRC
R	High Efficiency Outdoor Lighting (new)	99RLITE2	0.02	459	0	20	12.99	3.75
I	Standby Generation (special rate)	99ISTND2	1000	184000	0	20	3.35	2.59
C	Standby Generation (special rate)	99CSTND2	500	92000	0	20	3.92	2.45
R	Direct Load Control of Central Air Conditioning	99RDLAC2	0.96	79.5	0	20	infinite	1.81
I	High Efficiency Lighting	99ILITE2	90	628275	0	20	3.18	1.64
C	Direct Load Control of Central Air Conditioning	99CDLAC2	2.4	199	0	20	infinite	1.61
R	Direct Load Control of Swimming Pool Pumps	99RDLCP2	0.746	131	0	20	infinite	1.59
R	WH wrap up	99RWRAP2	0.02	258	0	20	15.46	1.57
C	High Efficiency Lighting	99CLITE2	45	208328	0	20	2.24	1.21
R	Direct Load Control of Electric Water Heaters	99RDLWH2	0.43	0	0	20	infinite	0.87
C	Direct Load Control of Electric Water Heaters	99CDLWH2	0.3	0	0	20	infinite	0.51

Kentucky Utilities Company
and
Louisville Gas & Electric Company

Analysis of Supply-Side Technology Alternatives

Prepared by

Generation Systems Planning

August 1999

KENTUCKY UTILITIES COMPANY
LOUISVILLE GAS & ELECTRIC COMPANY
ANALYSIS OF
SUPPLY-SIDE TECHNOLOGY ALTERNATIVES

TABLE OF CONTENTS

KENTUCKY UTILITIES COMPANY
LOUISVILLE GAS & ELECTRIC COMPANY
ANALYSIS OF
SUPPLY-SIDE TECHNOLOGY ALTERNATIVES

EXECUTIVE SUMMARY

Kentucky Utilities Company and Louisville Gas and Electric Company ("Companies") conducted a detailed screening analysis of supply-side alternatives in conjunction with the Companies' development of a least-cost generation expansion strategy. The purpose of the screening analysis is to evaluate, compare and suggest the least-cost supply-side technology options for use in subsequent integrated resource optimization analysis.

The TAG Supply program developed by the Electric Power Research Institute (EPRI) is the main source of data for the analysis presented in this study. Adjustments were made to the EPRI data to insure the most accurate estimate of each technology's economic parameters. EPRI based information used in this screening analysis includes technology type, capital cost, operation and maintenance cost, heat rate, level of technological maturity, and the expected commercial operation date. Other alternatives based upon competitive bids, company developed opportunities and IPP proposals were also included.

Alternatives were screened through a levelized screening analysis. In a levelized screening analysis, total costs are calculated for each alternative, at various levels of utilization, over a 30-year period and levelized to reflect uniform payment streams in each year. This method tends to be a more forward-looking method than other methods since it evaluates the economics of owning and operating a unit over a multi-year period. The levelized costs of each alternative at varying capacity factors are then compared and the least-cost technologies for each capacity factor increment throughout the planning period are determined. The screening analysis considered three sensitivity variables; they are capital cost, heat rate and fuel cost. Environmental cost were included in the analysis is several ways. The cost associated with NO_x emission was included in the capital cost of the technology. Environmental cost implications of the current sulfur dioxide emission regulations was considered as part of the base analysis. The impact of potential carbon dioxide emission regulations, although no regulation is currently in place for the emission of this effluent, was also included as an alternative case to the base analysis.

Based on the results of the levelized screening analysis, it is recommended that the technologies listed in Table 1 be retained for further evaluation in integrated resource optimization analysis.

Table 1
Alternative Recommended for further Analysis

Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Combustion Turbine at Brown – 160 MW
Greenfield Site Combustion Turbine – 160 MW
Inlet Air Cooling at existing Brown CT's
IPP Hydro purchase
Pulverized Coal unit at Trimble County – 495 MW

KENTUCKY UTILITIES COMPANY
LOUISVILLE GAS AND ELECTRIC COMPANY
ANALYSIS OF
SUPPLY-SIDE TECHNOLOGY ALTERNATIVES

INTRODUCTION

The purpose of this study is to evaluate various supply-side technology costs and performance estimates for currently available and emerging technologies. Screening of supply-side options is necessary for several reasons. First, each technology is constructed for optimal (least-cost) operation at various levels of utilization. Second, multiple capacity sizes of a particular technology exist from which to choose. Finally, a detailed evaluation (using production costing computer models) of all currently available/emerging technologies is impractical due to the large number of possible alternatives and the significant amount of time required for computer simulation if each were modeled individually. Therefore, it is necessary to reduce the list of possible technology alternatives to a more manageable size. To achieve this, a discussion of the sources for, and adjustments to, the data presented within this analysis and a brief description of each generating technology will be presented. This is followed by a discussion of the levelized screening methodology and associated sensitivities. Finally, the basis for recommending one technology over another and those technologies suggested for additional computer simulation are identified.

DATA SOURCES

The Electric Power Research Institute (EPRI) published their Technical Assessment Guide (TAG) in 1993. Since then, EPRI has developed a computer software package, TAG Supply, that contains the documentation and data in a computer based environment. The latest version of TAG

Supply, TAG Supply for Windows Version 3.08, was utilized as the main source of data. EPRI's April 1999 database release was incorporated into the software package and utilized in the screening analysis. TAG provides data and methods for determining the relative cost and performance of current and advanced electric generation and storage technologies. TAG contains various supply-side technologies, a brief explanation of each technology, facility MW sizes, fuels, and other technology-specific parametric data based on engineering cost studies completed by EPRI, researchers, and manufacturers. EPRI also uses two rating systems to give an overall confidence level to the data associated with each technology. One technology classification system is based on a technology's development status, while the other system is based on the level of effort expended in the design and cost estimate. These rating systems will be discussed later within this document.

TAG Supply is a PC software package that was developed to help tailor the TAG data to a company's specific values as well as organize and store the TAG data. The TAG Supply for Windows Version 3.08 software includes most of the technology specific data from the 1993 published TAG (updated where possible) as well as several new technologies not specifically listed in the 1993 TAG document. It includes the documentation on-line instead of in a published format. EPRI's April 1999 database release used in this analysis contains updated cost, performance and design characteristics for each technology.

DATA ADJUSTMENTS

Adjustments were made to each technology within TAG Supply to insure the most accurate cost and performance estimates for each technology. The following data adjustments were made during the course of this analysis:

(1) regionalized each technology to the East Central region, which includes the Commonwealth of Kentucky

(2) assigned the Companies' specific economic data (cost of capital, inflation rate, income tax rate and property tax rates), labor rates, and limestone cost representative of the Companies' cost to each technology

(3) revised combustion turbine (CT) cost for TAG Supply technologies 15.1, 15.2, and 15.3 to reflect current bid prices for these types and sizes of CTs

(4) adjusted TAG Supply technologies 16.1 and 16.2 to reflect a two (CT) on one (Heat Recovery Steam Generator) design for a combustion turbine combined-cycle (CT-CC) instead of the single shaft CT-CC setup utilized in TAG Supply

The first adjustment, regionalization of each technology to the East Central region, requires further explanation. TAG Supply construction cost estimates are based on technologies constructed across North America. Therefore, EPRI includes "Regionalization Factors" in TAG Supply. Regionalization can be done on a Region-by-Region or State-by-State basis through these regionalization factors. Through regionalization, technologies whose cost estimates were based on construction in other regions and in specific states may be compared on similar economic terms. EPRI divides North America into seven regions and assigns a regionalization factor to each region. Regionalization factors exist in TAG Supply for state to state comparison; however, this detail of an adjustment was not performed for two reasons. First, it is the Companies' opinion that the level of detail represented by the state regionalization factors is not appropriate for a thirty-year analysis. Second, it is not know in which state a selected alternative might be constructed. Therefore, to regionalize to a specific state instead of a region would not be appropriate. Regionalization factors attempt to quantify the cost differences associated with construction of a specific technology in two different regions by inflating or deflating the capital cost of the technology. There are five different cost components of the capital cost to which regionalization factors have been developed (material, labor, productivity, indirects and subcontracts). A regionalization factor greater than 1.0 indicates a cost increase. A listing of the regions within TAG Supply, the associated regionalization factors and a simple example can be found in Exhibit 1 of Appendix A.

Kentucky is in the East Central Region. Therefore, technologies whose construction costs are developed based on being constructed in another region must be regionalized to the East Central (or target) Region. The capital cost adjustment is accomplished through multiplying each component of the capital cost by the appropriate regionalization factor.

Because regionalization alters only the initial capital cost and does not affect the fuel cost or other economic parameters (i.e., inflation rate, property tax rate, etc.), a second adjustment to the TAG Supply database was performed. The second adjustment consists of assigning the Companies' specific economic data to each technology within TAG Supply. Through this adjustment, technology construction and operation costs more closely approximate those costs incurred within the Companies' service territory. The economic parameters utilized in this study are identified within Exhibit 2 of Appendix A.

Recent bids received by the Companies for CTs indicated that the capital cost utilized by TAG Supply was high. Therefore, the capital costs of the CT's were adjusted to reflect the current bid prices for the machines.

A final adjustment was made to the TAG Supply CT-CC technologies 16.1 and 16.2. The CT-CC technologies utilized by TAG Supply assumes a single shaft design with one CT feeding a heat recovery steam generator (HRSG). Lower cost can be achieved by installing two CTs for each HRSG. EPRI provides cost adjustment factors to be applied to the total plant cost, fixed O&M cost and variable O&M cost of the CT-CC technologies in order to approximate the cost of the 2-on-1 systems. One CT-CC technology in TAG Supply was not adjusted for a 2-on-1 design. Technology 16.3 is based upon the larger "G" class combustion turbines that are in the development stages. To create a 2-on-1 system with these machines would create a much larger unit than would be necessary on the Companies' system. Therefore, this technology was left as a single shaft CT-CC.

The result of the aforementioned adjustments is a database of technologies with a better estimate of technology cost and performance. For convenience, the database resulting from both modifications is referred to as the regionalized database. A description of each of the technology groups included in the analysis follows. Exhibit 3 of Appendix A contains a listing of the technologies screened as well as the categories (i.e. Coal-Fueled Technologies) and sub-categories (i.e. Pulverized Coal) each one is listed under in the following section.

TECHNOLOGIES SCREENED

Coal-Fueled Technologies

1. Pulverized Coal

Conventional pulverized coal-fired units are currently used to supply most of the Companies' present generation needs. State and federal emissions control requirements require that coal-fired units control air emissions, water discharge, and solid waste disposal. Examples of air emission requirements include the 1979 New Source Performance Standards (NSPS) requiring new coal-fired units to use flue gas desulfurization (FGD) systems to control SO_2 emissions, combustion modifications to control NO_x emissions, and either electrostatic precipitators (ESPs) or fabric filters to control particulate emissions.

Conventional pulverized coal generation is a mature technology used throughout the utility industry. Typically, coal-fired units have high capital costs, long construction periods (up to 10 years) and are economical for base load duty. Coal-fired unit cycling and load following is detrimental to the economics of coal generation and increases the maintenance requirement. Several designs and capacity sizes of coal units from TAG Supply as well as an alternative for the installation of a second unit at Trimble County were evaluated.

2. *Fluidized - Bed Combustion*

Fluidized bed combustion (FBC) boilers with steam turbine generators have been widely used in the United States, Europe, and Japan since the mid-1980s for independent power/cogeneration and utility power. There are two types of FBC: Atmospheric FBC (AFBC) and Pressurized FBC (PFBC).

Atmospheric fluidized-bed combustion (AFBC) combines crushed coal with limestone particles in a bed that is fluidized by upwardly flowing air. AFBC technology allows units to burn a diversity of fuels and simultaneously satisfy environmental requirements without costly control equipment such as FGDs and NO_x control systems.

Cost and performance estimates for these units are based on small scale (less than 200 MW) or pilot plant facilities. These estimates project high capital and operating costs and long construction lead time (up to 10 years). The complexity and non-modular design of AFBC units decreases their availability to below that of combined cycle and coal gasification units. Although most applications of AFBC technology have been relatively small, the upper size limit for a single AFBC boiler is estimated to be between 250 to 300 MW. AFBC technology is currently classified by EPRI as being in the commercial stage of development and is considered economical for base load duty.

Pressurized Fluidized-Bed Combustion (PFBC) plants have the potential to surpass the efficiency of conventional pulverized coal-fired plants with flue gas desulfurization by as much as 10% and still maintain competitive capital costs. PFBC boilers reduce most of the sulfur emissions from coal combustion by pneumatically injecting crushed coal and dolomite (limestone rich in magnesium carbonate) into the boiler. PFBC plants are similar to AFBC plants except the boiler operates at approximately 10 atmospheres pressure. There are two sub categories of PFBC plants: bubbling fluidized-bed and circulating fluidized-bed. PFBC technology lags AFBC technology by several years.

Advantages of PFBC operation include higher thermal efficiency (in excess of 40%) resulting from the unit's modular makeup, and smaller boiler requirements. The higher thermal efficiency of PFBC technology coupled with its ability to squeeze more generation capacity into limited space make this a desirable technology. High-pressure operation also produces hot gases from the combustor that, after particulate removal, can be used to drive a gas turbine directly, as in a PFBC combined cycle. PFBC operation in combined cycle further improves efficiency. Currently, the leading PFBC technology uses a bubbling fluidized-bed boiler operating at 12 to 16 atm inside a pressure vessel in conjunction with a combined cycle. The capital costs of PFBC plants are eventually expected to be lower than those of other advanced fossil power technologies allowing PFBC to be economical for base load duty.

The screening analysis included a circulating AFBC, several bubbling and circulating PFBC and an advanced design Foster Wheeler PFB technology. In addition to alternatives originating from TAG Supply, the rehabilitation of the retired Cane Run unit 3 with an AFBC boiler was also evaluated.

3. *Integrated Gasification-Combined Cycle (IGCC)*

Integrated Gasification-Combined Cycle (IGCC) is a method of producing a relatively clean, burnable gas from almost any type of coal. The process involves crushing the coal and partially oxidizing the carbon in the coal. Gas produced from the coal is a clean synthesis gas (syngas) and can be burned in a steam boiler or piped directly into a gas turbine to generate electricity. Emissions of SO_2 and NO_x from these plants are minimal.

IGCC technology consists of burning syngas to drive a combustion turbine while producing steam with recaptured heat to drive a steam turbine. A significant advantage of IGCC is that capacity can be added in stages. When natural gas prices are low, a utility can install a combustion turbine and follow it with a steam turbine in a combined-cycle configuration as needed. If the price of natural gas rises, a coal gasification stage can be added. Higher than average availability rates are typically associated with coal gasification because of the absence of pulverizers, flue gas desulfurization systems, and their modular design.

Since clean syngas replaces the fuel used in the gas turbine, the economics of coal gasification are directly related to natural gas and oil prices. High capital and high operating costs associated with coal gasification make natural gas or oil the economical choice in the near future.

Currently, IGCC technology is in the demonstration stages of development. Several types of IGCC were included in the screening analysis as indicated in Exhibit 3.

Liquid/Gas-Fueled Technologies

1. Simple-Cycle Combustion Turbine (CT)

Simple-cycle combustion turbines (CT) typically consist of an air compressor, a combustor, and an expansion turbine. Gaseous or liquid fuels (natural gas or oil) are burned under pressure in the combustor, resulting in hot gases that pass through an expansion turbine, driving the air compressor and the electrical generator. The most significant effluent from combustion turbines is NO_x, which can be controlled with available technology.

Combustion turbine technology is commercially proven with key features such as relatively low capital cost, short construction lead time (1-3 years), and relative ease of siting. These features, combined with operation over a low range of capacity factors, tend to offset the high (compared to coal) price of oil or natural gas making the combustion turbine an economical option for peaking duty.

The screening analysis included three sizes of simple-cycle combustion turbines (80, 110, and 160 MW) along with an advanced 300 MW CT with cascaded humidified advanced turbine from TAG Supply. The capital cost of the 80, 110, and 160 MW CTs were adjusted as discussed above. Five other CT alternatives were included in the screening analysis. These options were based upon recent bids for the installation of combustion turbines at the Companies' Brown Site. The size of these turbines range from 100 MW to approximately 160 MW.

2. *Aeroderivative Combustion Turbines*

The aeroderivative CT consists of a jet engine that has been modified for stationary industrial use. This results in a lightweight package with very attractive efficiencies. They are characterized as smaller units (less than 50 MW) and can be installed in relatively short time frames due to the modular components.

Two aeroderivative options were evaluated in the screening analysis. The first was based upon a 45 MW turbine from TAG Supply and the second was based upon a bid received after the recent request for combustion turbines at the Brown site. The price for the aeroderivative option at the Brown site is only valid for the Brown site. Any other installation will incur additional cost for installation.

3. *Combustion Turbine-Combined Cycle (CT-CC)*

Combustion Turbine-Combined Cycle (CT-CC) plants consist of one or two combustion turbine unit(s) coupled with a Heat Recovery Steam Generator(s) (HRSG). The hot exhaust gases from the combustion turbines are passed through the HRSG, which produces steam to drive a turbine generator. The key features of CT-CC plants are their phased construction (i.e. installing combustion turbines in the first year followed by a steam bottoming cycle in the second year), low capital cost, and high efficiency. The improved efficiency over simple cycle CTs offers a hedge against future fuel cost uncertainties and allows CT-CCs to be utilized for intermediate or base load duty. All components of a CT-CC are commercially available. Two sizes of 2-on-1 CT-CC plants (330 and 470 MW) and one single shaft CT-CC plant (345 MW) were evaluated.

4. *Fuel Cell*

Fuel cells electrochemically convert the chemical energy in a fuel gas to direct current (dc) electricity. Inverters are required to convert the dc power to ac. Fuel cells can be assembled in blocks to make power plants of varying sizes and capabilities tailored to the utility's load growth and the constraints of the plant site.

Each cell consists of an anode, cathode and an electrolyte. Fuel cells oxidize a fuel (usually natural gas, but hydrogen methane and coal gas can also be used) at the anode which releases electrons into an electrical circuit. Simultaneously, water and heat are produced at either the anode or cathode depending on the electrolyte used. Fuel cells, unlike batteries, do not consume their electrodes with use, but only the fuel and oxygen (in the air) supplied to them.

Since fuel cells operate at constant temperature and pressure, regardless of load, the thermal energy liberated by the electrochemical reaction can be used in thermal bottoming cycles or for cogeneration of steam. Emissions from these plants are low, and generating capacity ranges from 10 to 25 MW. The fuel cell component of the plant has an estimated life of 5 years; therefore, an additional replacement cost was added to the fixed O&M of these options. EPRI estimates that the cost of replacement fuel cells will be about two-thirds of the capital cost of the option. An equivalent 30-year levelized cost representing the cost for replacement over a 30-year period was determined and added to the fixed O&M of the option. Exhibit 4 of Appendix A shows the levelized calculation for the fuel cell replacement that was added to each fuel cell options in the screening analysis.

Currently, larger capacity (>100 MW) fuel cell plants are completing their final stages of pilot plant engineering development. Phased construction of generating units, fuel flexibility between natural gas and distillate oil, quiet operation, minimal emissions, low heat rate and very fast transient response capability are some of the attractive features of this intermediate-load technology. Three major types of fuel cells are currently undergoing development: phosphoric acid, molten-carbonate, and solid oxide. The phosphoric acid technology is the most mature, and therefore, nearest to commercial use. All three types of fuel cells were included in the screening analysis.

Renewable Resource Technologies

1. Geothermal

Geothermal energy is an option to fossil and nuclear fuel technologies. Geothermal energy has been used for many years for space heating, but generating electricity from geothermal energy has been done on a relatively limited scale. In general, geothermal resources are classified in three categories: geopressurized systems, hot, dry rock systems and hydrothermal-convection systems. Geopressurized and hot, dry rock systems are still in the demonstration stage. Unlike any other energy resource, geothermal resource production (fuel supply) and the subsequent energy conversion in a power plant are directly connected. As a result, estimated geothermal plant costs are extremely site specific. Resource (fuel) temperature, well depth, and other site-specific factors affect the cost of the plant.

Geopressure systems are hot water systems, which contain dissolved methane under a high subsurface pressure. Hot dry rock systems are hot rock masses that lack fluid content but are sufficiently close to the surface to make heat extraction a possibility. Hydrothermal resources consist of hot water and steam which result from heat transferring from geologically active high-temperature belts to nearby aquifers. Hydrothermal-convection systems are subdivided into vapor-dominated and liquid-dominated resources. Binary-cycle technology employs geothermal brine (water) and a heat transfer fluid in a two-step heat exchange to generate vapor that can be used to drive a turbine. The dual-flash geothermal technology involves pumping geothermal fluid from a well drilled into a naturally occurring underground reservoir to the surface. At the surface, high-pressure steam and liquid brine are separated. The liquid brine is then flashed again at a lower pressure to generate low-pressure steam. The high and low pressure steam is then routed directly to a turbine generator. Kentucky may be a suitable location for this technology type primarily because of the geological faults in the western region of the state. These faults may provide access to steam reservoirs and steam extraction with minimal effort.

2. *Solar*

Solar energy conversion technologies such as solar-thermal and solar-photovoltaic technologies convert the sun's energy to electrical energy. Climatical data of North America reveals a range of solar intensity from an average of 2.8 kwh/m^2 day in the northeast and northwest to over 7.2 kwh/m^2 day in the desert southwest. Kentucky receives approximately 3.3 kwh/m^2 on average of solar energy a day.

Solar thermal power plants convert the solar energy to electricity by first concentrating the incoming sunlight to convert the solar energy to heat and then to electricity. Presently, three solar thermal technologies are under development. These are central receiver systems, two-axis tracking parabolic dish systems, which focus on a receiver to heat air or fluid to drive engine/generator and solar parabolic trough and steam turbine generator systems. To date the solar thermal trough technology is the only solar thermal technology that has achieved commercial operation at a significant scale. Parabolic dish technology has been tested at small scale, but testing of advanced designs has been limited.

Solar-thermal trough technology uses a steam generator heated by hot oil from a natural gas-fired oil heater and/or a solar collector field. The solar collector field provides maximum heat output in the summer. The gas-fired heater is operated to boost output during summer peak hours. This technology has been improved such that an 80 MW plant can operate at a 14% solar to electric net collection efficiency. High capital costs and large land requirements detract from the attractiveness of this technology.

Photovoltaic (PV) power generation differs from solar-thermal technology in that solar energy is converted directly to dc electricity by generating electronic carriers in a semi-conductor material (usually silicon doped with phosphorus and boron). Inverters are then required to convert the dc power to ac. In order of increasing efficiencies, the main PV technologies are thin film, polycrystalline silicon, single-crystal silicon, and concentrator technology. There are two types of photovoltaic generators: flat plate and high concentration. Both the flat plate and high concentration PV generators rely on normal (90° incident angle) radiation. However, high concentration uses optical concentrators to focus the incident radiation on solar cells much smaller in area than the entire module. This provides higher efficiencies but requires additional cost for a two axis solar tracking system. The conversion efficiency of the best commercial photovoltaic modules is about 12% implying a maximum electric power output of 120 W/M^2. Hence, large land areas are required to generate commercially significant quantities of electricity. The advantages of PV units are free fuel, zero emissions, high reliability, low O&M cost, and rapid construction. The main disadvantages are the high capital cost, the low production capacity of the PV industry (about 30 MW per year), and the large amount of required land. Furthermore, PV power output is directly proportional to the incident amount of solar radiation, and like solar energy conversion, cannot be dispatched in the absence of storage.

3. Wind Turbines

Current commercial wind turbines produce electrical power at wind speeds exceeding 10 mph. The energy extractable from the wind is proportional to the cube of the wind speed. Historically, wind-turbine generating units have been shown to be cost effective when located at sites with average annual wind speeds exceeding 12 mph. The majority of wind turbine projects have been constructed in California, where high average wind speeds exist. Most wind turbines installed in the United States range from 100 kW to 300 kW. Capacity factors (CF) of these units approach 35% at sites with good wind availability while sites with poor wind availability produce CFs less than 10%. Therefore, wind technology is considered an intermediate-load technology. Local climatological data reflecting western, central, and mountain regions of Kentucky reveal an average wind speed of less than 8 mph. Hence, this technology does not appear to be a viable option for construction in Kentucky due to the lack of consistently high wind speeds.

4. Municipal Solid Waste

Waste-to-energy technologies consist of either mass burning of unprocessed waste in European waterwall incinerators, refuse-derived fuel (RDF) preparation and firing in semi-suspension stoker-fired fluidized-bed boilers, or scrap tire-fired power plants burned in a sloping grate boiler.

Fuel is usually delivered by truck and stored in a large receiving pit with sufficient capacity to store a three to four day supply. A typical 40 MW mass-burn plant utilizes two identical incinerator trains to consume 1600 tons of refuse per day. This amount of refuse typically contains 4900 Btu/lb with 25% ash content. A typical 40 MW RDF plant is designed to consume approximately 1750 tons of refuse derived fuel per day. This amount of RDF typically contains 28.2% moisture, 12% ash, and 5663 Btu/lb. A typical 30 MW scrap tire facility consumes 375 tons of tires per day. Scrap tires typically contain 11900 Btu/lb.

Most waste facilities installed in the future will utilize mass-burn technology. A minimum of 5 years is required to acquire a permit for constructing any of the above technologies in Kentucky. Furnaces, including utility boilers, are exempt from this regulation if they co-fire up to 20 percent RDF in their boilers. Relatively high capital and operation and maintenance costs are associated with all three technologies. All three types of municipal solid waste facilities were modeled in the screening analysis.

5. Biomass

Currently, wood is the primary biomass resource currently used for energy production. With an estimated conversion efficiency of 17 percent and an assumed capacity factor of 80 percent, a 100 MW plant would use the equivalent of 20,000 acres of wood fuel per year. There are a few plants with capacities in the 50 to 70 MW range; however, biomass units usually have capacities less than 40 MW. The size and scale of biomass power generation is presently limited by the availability of fuel within about a 50 or 75 mile radius of the plant.

Currently EPRI and other sponsors are developing a new direct combustion technology, the Whole Tree Energy™ (WTE) boiler, for application to large-scale power production from woody energy crops. The WTE system involves harvesting of stands of closely-spaced, fast growing whole trees, truck transport, tree storage and drying using air heated by boiler flue gas, combustion of the whole trees in a deep-bed sub-stoichiometric burner at the bottom of the furnace, and burnout of the gases with overfire air in the tall furnace above the fuel bed.

Interest in biomass resources as a source of energy is increasing as a result of environmental concerns. The strengths of natural forest wood as an energy source are the significant environmental advantages that wood offers because it produces substantially lower SO_2 and NO_x emissions when compared with fossil fuels. Furthermore, wood is a renewable energy resource.

Today, biomass fuel is not economical when compared to conventional fossil fuels. Future large-scale expansion of wood power generation depends on development of dedicated energy crop production, efficient power plant technology, and larger unit sizes to achieve economies of scale. The U. S. Department of Energy and various international organizations are supporting development of fast growing species, improved energy crop production improvements, and better harvesting techniques that are eventually expected to produce a long-term supply of low-cost fuel. Major economic factors making biomass fuel an expensive alternative are the amount of land required, low crop yield and expensive, inefficient mass harvesting techniques and transportation. The use of biomass for power generation in the U.S. is still limited but does warrant consideration in the future.

Energy Storage Technologies

1. Battery Energy Storage (BES)

With a battery energy storage unit, off-peak energy is used to charge a battery for use during peak periods. Battery plants have an extremely fast response time - zero to full load in less than about 5 milliseconds. Although environmental emissions of BES plants are virtually nonexistent, off-peak energy used to charge these facilities may require additional SO_2 allowances. Two types of BES technologies are currently being developed. These technologies are the lead-acid battery and the advanced battery. The lead-acid BES plant is based on a 20 MW unit designed for 1-hour storage and light or heavy-duty applications. The advanced BES is based on a 20 MW unit designed for 3 or 5-hour storage applications. The relatively low to moderate capital cost associated with BES is tempered by the substantial cost of battery replacement. The service life of battery modules is not expected to be as long as that of the balance of the battery plant; therefore, periodic battery replacement is required over the life of the technology. Costs associated with battery replacement and the frequency at which the batteries must be replaced can be significant and are a function of shelf life, duty cycle and depth of discharge, among other factors.

The cost of battery replacement was included in the capital cost of the option. For the lead acid battery option, it was assumed that the unit would operate at a 50 duty cycle level per year in order to get the maximum life out of the batteries. According EPRI data, this type of operation would result in an additional $257/kw cost added to the capital cost of the project. Similarly, the 3-hour and 5-hour storage advanced battery options would have an additional cost of $109/kw and $157/kw, respectively added to the capital cost of the project. This is based upon a 250 cycle/year operating level.

2. *Pumped Hydro Energy Storage (PHES)*

Conventional pumped hydro energy storage plants typically use an upper and lower reservoir. Off-peak electric energy is used to pump water from the lower to upper reservoir. Water is then discharged from the upper reservoir through a reversible turbine to produce electricity. The reservoirs are typically sized for 10 hours of generation. On average, hydro facilities are more efficient than conventional and renewable energy sources. Special terrain is required for pumped hydro and their construction costs can vary by as much as 40% from site to site. While emissions from pumped hydro plants are virtually zero when generating, emissions will be released during the off-peak filling of the reservoir if coal-fired generators are used for pumping. One advantage of PHES plants is they can reach nameplate rating generation in two minutes. For the PHES unit used in this screening analysis the nameplate rating corresponds to 1050 MW. Pumped hydro is considered a viable option to serve intermediate load levels.

3. Compressed Air Energy Storage (CAES)

CAES uses an electric motor-driven compressor to pressurize an underground cavern or reservoir (rock, salt, or aquifer) with air during off-peak periods. When the energy is needed, the compressed air is released through a combustion turbine/generator that is fired with natural gas or distillate fuel. With available control equipment, the emissions from CAES plants while generating are one-third the amount generated by oil or gas fired CT units. However, as with the charging of other storage technologies, an increase in emissions is expected when charging. Long construction time, average capital cost, and low operating costs are expected characteristics of these units.

The first U.S. CAES facility was Alabama Electric Cooperative's 110 MW, 26 hour capacity plant. The facility began operation on June 1, 1991. EPRI's machinery cost data was based on this site, whereas the cost for the underground cavern is based on preliminary EPRI studies. Geologic formations in Kentucky are mainly rock and aquifer, both suitable for CAES sites. This intermediate-load technology is currently in the commercial stage.

4. Compressed Air Energy Storage with Humid Air Turbine (CASH)

The integration of a humid air turbine with CAES technology is expected to lower the relative capital cost. However, key technological needs such as the verification of both saturator and combustor performance must be addressed prior to acquiring the full benefits offered by CASH technology. This technology is currently in the pilot stage of development.

5. *Super Conducting Magnetic Energy Storage (SMES)*

Super Conducting Magnetic Energy Storage (SMES) consists of a doughnut-shaped electromagnetic coil made from low-temperature niobium titanium alloy. It is built in a trench supported by compact soil walls with a diameter and height of 1000 ft and 100 ft respectively. The coil, kept superconductive by a refrigeration system, would generate a magnetic field that would store electric energy without losses. The magnetic field would be discharged to produce electricity, as needed, at almost any power level.

There have been several different types and sizes of SMES systems proposed for utility applications. Currently the development of the technology is mainly for small units, the largest of which can provide about 50MW for 30 seconds. The main advantages of the SMES system are the ability to change power output in less than one 60 Hz ac cycle, the rapid discharge capability, and the expected long life. The difficulty is that in order to maintain the superconducting properties, the coil needs to be maintained at a temperature of –269° C.

Hydroelectric Technologies

1. *Ohio Falls Expansion*

Expansion of the Ohio Falls station by the additions of units 9 and 10 into existing empty bays was considered as an option in the screening analysis. This expansion included two 209.2" diameter propeller units housed in an extension of the existing powerhouse. These units would rotate at 149 rpm and have a maximum turbine output of 16.8 MW each. Based upon historical river flow, the expected energy from the expansion units would be approximately 88 GWH annually. Therefore, the maximum capacity factor would be approximately 30%.

2. *IPP Hydro*

IPP Hydro is a run-of-river, hydroelectric facility with a design rating of 180 MW (108 MW expected summer capacity) of intermediate load serving capacity. There is no fuel associated with this option since it is a run-of-river facility and not a pumped storage facility. The entire cost to the Companies of this option is approximated with an energy charge only. Based upon projected energy output and fact that the project is run-of-the river, the capacity factor was limited to 60%.

Other Technologies

1. *Cane Run Rehabilitation with Natural Gas*

In addition to the AFBC option mentioned above for the renovation of the retired Cane Run Unit 3, a second alternative included in the screening analysis was based upon the construction of a new gas-fired boiler designed for low NO_x emissions. The option would be equipped with a Selective Noncatalytic Reduction (SNR) system. Other existing generating equipment would be refurbished.

2. *Inlet Air Cooling on Brown CTs*

The Brown generating station includes 4 ABB 11N2 combustion turbines that have been in operation since the middle 1990's. The available capacity of a combustion turbine is a function of the ambient temperature of the turbine inlet air. The higher the air temperature, the lower the expected capacity of the combustion turbine. During summer days when most combustion turbines operate to meet the peak demand created by the higher temperatures, cooling the air flowing into the turbine could increase the capacity of the combustion turbine. A Thermal Energy Storage (TES) system, in which a refrigeration system produces ice to be stored in a tank, is used to cool the inlet air to the turbines. Water is circulated around the ice and circulated through coils at the turbine inlets to cool the inlet air of the combustion turbine. The ice can be made and stored in the tank using off-peak power.

The Companies have been working with a local vendor of TES systems to evaluate the cost effectiveness of installation at the Brown CT site. A current proposal would utilize two 2.3 million gallon ice harvesting tanks and create an additional net 20 MW from each CT on a 95° day. Utilization of the TES would also improve the heat rate of the units by about 4.5%.

Nuclear-Fueled Technologies

Nuclear-fueled technologies in general have lost most of their appeal in the electric utility industry because of the negative public attitudes and the uncertainties of obtaining necessary construction and operating licenses. The negative attitude toward nuclear power facilities is evidenced by KRS 278.600-278.610, which prohibits nuclear construction in Kentucky until there is a proven technology for the disposal of high level nuclear waste. Advanced nuclear technology holds promise for the future but until the question of disposing of nuclear waste is resolved, advanced nuclear-fueled technology will not be considered for construction by the Companies.

SENSITIVITY ANALYSIS

Large differences between original cost estimates and actual cost estimates are possible and have occurred on occasion. Some of these differences have resulted from the type of estimate made, such as a "goal" type estimate, without explicit consideration of the likelihood of achievement. Quantifying uncertainties should be an explicit part of developing cost estimates in order to reduce such occurrences. To address this issue, a sensitivity analysis has been implemented into the screening process. The sensitivities address three variables that alter the perceived benefit of each technology. The sensitivities incorporated into the analysis do not exhaust all possible sensitivity variables; however, they do provide valuable information about how well a technology performs under different combinations of economic and operating conditions. The three variables identified for sensitivity analysis in the screening study are capital cost, technology operating efficiency (as measured by heat rate), and fuel cost.

Two cases were analyzed in the screening analysis to evaluate the impact of environmental legislation. Each case included the cost of mitigating NO_x emissions through technology included in the capital cost of the alternative evaluated in TAG Supply. The first case, referred to as the base analysis, includes the impact that the emission of SO_2 can have on the selection of technologies. Current Clean Air Act regulations limit the emission of sulfur dioxide from certain plants. As discussed below, the cost adder is applied to the fuel utilized by the technology. The emission cost is based upon the June 1999 SO_2 allowance price of $210/ton according to Cantor-Fitzgerald.

The second case, which also includes the cost of SO_2 emissions, evaluates the potential additional cost of carbon dioxide emissions. Due to the possibility that rising concentrations of greenhouse gases might cause undesirable climate change, policies to restrict carbon dioxide emissions, a greenhouse gas, have been *proposed.* One proposed solution is implementation of a carbon tax. A carbon tax could substantially impact the least-cost option resulting from this screening analysis.

The magnitude of proposed carbon taxes varies significantly. EPRI has evaluated the impact of taxes of $50, $100 and $250 per ton of carbon emitted. The International Energy Agency has analyzed the impacts of $100 per ton of carbon emitted while a NatWest Washington Analysis has documented proposals for a $50 - $100 per ton of carbon tax. In this analysis it was assumed that carbon emissions are taxed at the lesser of these values ($50 per ton). As with the case for SO_2, the cost adder was added to the fuel cost of the technology as discussed below.

1. *Capital Cost Sensitivity*

EPRI utilizes two rating systems that can be used to adjust the capital cost for each technology type and size in TAG Supply. The first is a "Design and Cost Estimate Rating" and the second is a "Technology Development Rating". Both rating systems center on the issue of uncertainty in cost and performance data. The first rating, summarized in Table 2, is EPRI's a confidence rating measurement, based on design and cost estimates. Through this rating a better understanding of the level of effort expended in the design and cost estimate determination is acquired.

Table 2
Confidence Ratings Based on Design and Cost Estimates[1]

Confidence Rating	Design Information	Cost Estimate Basis		
		Major Equipment	Other Materials	Labor
Actual	Data on detailed process and mechanical designs or historical data from existing units.			
Detailed	A complete process design exists. Engineering design 20-40 % complete. Project construction schedule. Contractual conditions and local labor conditions known.	Firm quotations adjusted for possible price escalation with some critical items committed. Pertinent taxes & freight included	Firm unit cost quotes (or current billing costs) based on detailed quantity take-off. Pertinent taxes & freight included	Estimated man-hour units (including assessment) using expected labor rate for each job classification. Pertinent taxes & freight included
Preliminary	Simplified plus engineering specifics, e.g.: Major equipment specifications. Preliminary piping & instrumentation flow diagrams.	Recent purchase costs (including freight) adjusted to current cost index.	By ratio to major equipment costs on plant parameters.	Labor/material ratios for similar work, adjusted for site conditions and using expected average labor rates.
Simplified	General site conditions, geographic location & plant layout. Process flow/operation diagram Product output capacities	By overall project or section-by-section based on capacity/cost graphs, ratio methods, and comparison with similar work completed by the contractor, with material adjusted to current cost indices and labor adjusted to site conditions.		
Goal	Technical design and cost goal developed from literature data.			

The second rating on which to measure the confidence associated with a particular technology estimate is based on technological development. Table 3 describes EPRI's ratings

---

[1] 1993 Technical Assessment Guide, Volume 1: Revision 7; Pg. 8-15 Table 8-9 and Pg. 5-5 Table 5-2.

associated with each stage of development. Technology development begins as an idea and progresses through a commercially viable phase before finally becoming a mature technology.

Table 3
Confidence Rating Based on Technology Development Status[2]

Rating	Description
Mature	Significant commercial experience (several operating commercial units)
Commercial	Nascent commercial experience
Demonstration	Concept verified by integrated demonstration unit
Pilot	Concept verified by small pilot facility
Laboratory	Concept verified by laboratory studies and initial hardware development
Idea	No system hardware development

Based on these two confidence ratings, EPRI formulates overall cost accuracy ranges. The accuracy ranges, shown in Table 4, indicate that the overall cost of a particular technology is a function of two independent items: the level of cost-estimating effort and the degree of technical development of the technology.

---

[2] 1993 Technical Assessment Guide, Volume 1: Revision 7; Pg. 8-15 Table 8-8.

Table 4
Accuracy Range Estimates for TAG Cost Data[3]
(Ranges in Percent)

Design & Cost	**Technology Development Ratings**				
	Mature*	Commercial*	Demo	Pilot	Lab and Idea
Actual*	-5 to +5	-5 to +5	-	-	-
Detailed	-5 to+5	-10 to +10	-15 to +20	-	-
Preliminary	-10 to +10	-15 to +15	-20 to +20	-25 to +30	-30 to +60
Simplified	-15 to +15	-20 to +20	-25 to +25	-30 to +30	-30 to +80
Goal	-	-30 to +70	-30 to +80	-30 to +100	-30 to +200

*It is the Companies' opinion that even mature/actual and commercial/actual technologies are subject to at least a 5% swing in capital cost.

Applying the appropriate accuracy ranges from Table 4 to each regionalized technology in TAG Supply allows a capital cost sensitivity to be performed in the screening analysis. For this analysis the accuracy ranges (or capital cost adjustments) were applied only to the process capital, general facilities and engineering fee portions of a technologies total capital cost. An example, using the regionalized technology 1.1B, is summarized in Table 5.

To represent a capital cost adjustment for those technologies not from TAG Supply, a 5% to 10% adjustment was made to the capital cost of these technologies based upon the Companies' confidence of the estimate. The only option that did not include a adjustment was the IPP Hydro proposal.

Table 5
Capital Cost Sensitivity
Using Regionalized Technology 1.1B

Technical Development Rating:	Mature
Design & Cost Estimating Rating:	Preliminary
Implied Accuracy Range*:	-10 to +10

Applicable Capital Cost Components	Base Capital Est.	Low Capital Est.	High Capital Est.
Process Capital	860	860 x 0.90 = 774	860 x 1.10 = 946
General Facilities	0	0 x 0.90 = 0	0 x 1.10 = 0
Engineering Fee	54	54 x 0.90 = 49	54 x 1.10 = 59

*From Table 4

Three capital cost estimates, base, low, and high can be determined can be determined for each technology. Each cost estimate takes into account the amount of effort expended in the design and cost estimate, and the maturity level of the technology itself.

2. *Technology Operating Efficiency*

The second sensitivity conducted in the screening analysis involved the technology heat rate, referred to as the base heat rate, specified by TAG Supply. Decreasing or increasing the base heat rate represents a better (or worse) than expected efficiency of the operating facility over that expected during the design phase. EPRI does not provide any information as to the minimum or maximum

---

[3] 1993 Technical Assessment Guide, Volume 1: Revision 7; Pg. 8-16

achievable heat rate for each technology. Therefore, for each technology a ± 5% adjustment to the heat rate specified by TAG Supply was applied. This adjustment was also applied to the technologies not taken from TAG Supply.

3. Fuel Cost

The third sensitivity conducted in the screening analysis considered the cost of fuel consumed by each technology. The Companies develop 30-year base fuel forecasts for various fuels that are either used, or could be used, at existing plants. In addition, sensitivity fuel forecasts are developed depicting high and low fuel cost scenarios. Representative fuel costs for each technology screened were obtained from the base and sensitivity fuel forecasts and are shown in Exhibit 5(a).

As previously discussed, in an effort to include the impact of SO_2 emissions in the screening study, an adder was applied to the coal prices of Exhibit 5(a). The adder represents, on a cents/MBtu basis, the annual cost of SO_2 allowances. Only technologies whose primary fuel is coal have the adder. The sulfur content of the Low and High Fuel Forecasts was assumed to be equal to that of the Base Fuel Forecast. Therefore, once the adder was determined for the Base Fuel Forecast it could be applied to both the Low and High Forecasts without any further adjustments. Exhibit 5(b) details the calculation of the SO_2 adder. No sensitivity was developed for the SO_2 adder, i.e., no 30-year cost profile for SO_2 per ton was used other than the one in Exhibit 5(b). Inclusion of the SO_2 adder increases the fuel cost from 1 to 9 Cents/MBtu depending on the year and sulfur content. The small impact of the SO_2 adder is due to the fact that all technologies being considered in the analysis have very low SO_2 emissions resulting from either pre/post combustion removal processes. Addition of the SO_2 adder to the Base, Low and High Fuel Forecasts results in the fuel costs used in this analysis. The specific fuels utilized by each technology evaluated in this analysis are identified in Exhibit 5(c).

The second case was conducted to evaluate the impact of carbon emissions. Carbon emission costs were added to the fuel costs of each technology affected by a carbon tax in a similar manner as was done for SO_2. Technologies that utilized coal or natural gas were the only technologies to which the carbon tax was added. Biomass facilities were assumed to have a net zero carbon dioxide emission rate. The cost of this tax on a cents/MBtu basis is substantial. Bituminous coal prices are increased by $1.38 per MBtu. Natural gas prices are increased by $0.79 per MBtu. These estimates were assumed to represent 1999 costs and no escalation was applied to these values throughout the 30 years included in this study.

Resulting Scenarios

The sensitivity analysis would not be as strong as possible if all combinations of sensitivity variables were not analyzed. In other words, because there are three variables in which a sensitivity analysis is being performed (capital cost, heat rate, fuel cost) and each variable has three possible values (base, low or high) - 27 total combinations of sensitivity cases must be evaluated. A separate analysis was performed utilizing the CO_2 cost adder as discussed above. This analysis produced an additional 27 combination of cases to be evaluated.

Page 1 of Exhibit 6 shows the latest available base cost and base heat rate information associated with each of the previously described technologies. All technologies evaluated in this analysis are shown in this exhibit. In addition, pages 2 through 9 of Exhibit 6 illustrates the effects of the accuracy range adjustments on the base capital cost of and the heat rate adjustments on the base heat rate. These exhibits represent 9 of the 27 possible cases. Applying the Base, Low, and High Fuel cost scenarios of Exhibit 5(a) to these 9 creates the remaining cases.

Screening Analysis

The least-cost operation of the technologies presented in this study occurs over significantly different capacity factors. Therefore, an analysis that compares the total cost for each technology as a function of capacity factor is required. As previously discussed the cost data for all the technologies in this analysis originate from EPRI's TAG Supply or were derived based on information and/or cost estimates received by the Companies.

Each technology on page 1 of Exhibit 6, regardless of viability or technical maturity, was evaluated over a 30-year planning period in all 27 cases. In other words, no technology was excluded from the screening analysis based solely on its technical maturity, practicality, or feasibility. For example, even though climatical information for Kentucky suggests wind turbine technology would not be a practical supply-side option in Kentucky, wind turbine technology was not excluded from the analysis.

Several of the technologies were limited to maximum capacity factors based upon the design characteristics of the option and their application to the Companies service territory. The three battery storage options were limited to a 10% capacity factor based upon the design characteristics of the technology in TAG Supply. Also, in developing the replacement cost estimates previously discussed a maximum duty cycle was assumed in order to limit the replacement cost. SMES was also limited to a 10% capacity factor due to the design characteristic of this option. For Compressed Air Energy Storage (CAES) and Pumped Hydro Energy Storage (PHES) a maximum capacity factor of 30% was used. This maximum was determined based on the assumption that, at most, the technology would be utilized 5 days a week for the designed 10 hours of storage capability per day for the entire year.

$$[(10\text{hrs/day} \times 5 \text{ days/wk} \times 52 \text{ wks/yr}) / 8760 \text{ hrs/yr}] = 29.7\% \approx 30\%$$

Two renewable resources were also limited with maximum capacity factors. Solar and Wind power were limited to 20% and 30%, respectively. For solar power, most of the installations have been in the western part of the United States where solar radiation level enable economic installation. For the Midwest, solar radiation levels are not ideal for solar technology. TAG Supply indicates that capacity factors for solar technology located in Nashville, Tennessee would be in the 17-18% range. Assuming the Companies' service territory would be similar to Nashville, a 20% maximum would be conservative. Most of the wind turbine sites are located in California with capacity factors in the 20-35% range. Kentucky wind speeds are significantly lower than those in California; therefore a maximum capacity factor of 30% for wind technologies would also be conservative.

The two hydro options, IPP Hydro and expansion of the Ohio Falls station, were limited to 60% and 30%, respectively. These limitations were based on the projected energy received from these run-of-the river projects.

One other option, inlet air cooling for the Brown CTs, was limited to a maximum 10% capacity factor. The design of this option is based upon a 4 hour per day, 5 days per week operation scenario. Given the fact that this alternative is used to lower the inlet air temperature of the combustion turbine when ambient air temperatures are in the 90 degree range, the system would not be utilized during the cooler winter, spring and fall periods. Therefore a 10% capacity factor would be conservative.

Levelized Screening Methodology and Results

1. Base Analysis with SO_2 Impact

A 30-year levelized cost methodology was used in this analysis. In this screening analysis, an annual total cost, comprised of capital, fixed O&M, variable O&M, fuel and other costs, is determined for each technology over a range of capacity factors from 0-100% in 10% increments. For each technology, the levelized costs in $/kW at varying capacity factors were then compared and the least-cost technologies at each capacity factor increment were determined. Levelization allows for the cost of each technology to be compared over the 30-year life of each project. A non-levelized analysis considers the costs of owning and operating the unit for only a single year. Comparison of cost over the life of each technology is more accurate because of the differing annual escalation rates for fuel, O&M and capital associated with determining the total annual cost of each technology. Exhibits 7 and 8 include relevant information, which when utilized in conjunction with Exhibits 5 and 6, allow replication of the results presented here. Exhibit 7 provides a complete source of equations used in the levelization process. Exhibit 8 provides the Adjusted 30-year Levelization Factor (Adj. L_N) for the Base Fuel Forecast and other miscellaneous information referred to within the equations of Exhibit 7. Adjusted L_{NS} for the Low and High Fuel Forecasts can be determined in a similar manner.

Using the equations of Exhibit 7 and the data contained within Exhibits 5(a)-5(c), page 1-9 of Exhibit 6, and Exhibit 7, the total 30-year levelized cost ($/kw-yr in 1999 dollars) of each technology was calculated for each capacity factor increment. The results of this process are shown in page 1 through 27 of Exhibit 9. The least-costly technologies over all ranges of capacity factors have been identified at the bottom of each case exhibit and are shaded in the tables. Technology capacity factors shown in page 1 through 27 of Exhibit 9 were limited to the maximum allowed by the technology and/or environment in which they operate as discussed above. For easy reference, technologies that have been identified as the least costly technology over any range of capacity factors in at least one of the 27 cases have been summarized below in Table 6.

Table 6
Least-Costly Technologies
In At-Least One Sensitivity Case

Brown 5 CT 159MW
Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Compressed Air Energy w/ Humid Air Turbine – 350 MW
Inlet Air Cooling at existing Brown CT's
IPP Hydro purchase
Pulverized Coal unit at Trimble County
Wind Turbines – Class 4 Speed

Exhibit 10 is a graphical representation of the least-cost information associated with technologies of the base case (base capital cost, base heat rate, base fuel prices) only. The intersection of the lines with the vertical axis represents the fixed expenditures (carrying charges and fixed O&M) associated with the technology. The slope of the line is a function of the variable costs (fuel and variable O&M) that increase in direct proportion to the energy produced. In comparing the technologies identified in Exhibit 10 to those identified in Table 6, it can be seen that Compressed Air Energy with Humid Air Turbine, the un-phased Combined Cycle CT, and the Wind Turbines options became a least cost alternative in one of the remaining sensitivity cases.

Identifying not only the least cost technologies, but also the second least cost and even the third least cost would further enhance the results of this analysis. First, second and third least-cost technology identification is justified by the fact that the $/kW-yr difference between them may be only several dollars over any increment of capacity factors. The second and third least-cost technologies for at least one capacity factor increment in any of the 27 cases are summarized in Table 7.

Table 7
Second and Third Least-Costly Technologies In At-Least One Sensitivity Case

Aeroderivative CT
Brown 5 CT 159MW
Brown 5 CT 149 MW
Brown 5 CT 164 MW
Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Combustion Turbine with CHAT – 300 MW
Compressed Air Energy w/ Humid Air Turbine – 350 MW
IPP Hydro purchase
Pressurized Fluidized Bed (Circulating, with Reheat) – 360 MW
Pressurized Fluidized Bed (Circulating, Supercritical) – 360 MW
Pulverized Coal unit at Trimble County
Pulverized Coal at Greenfield site – 500 MW
Wind Turbines – Class 4 Speed

The 15 different technology types (inlet air cooling at Brown CT is the only technology that does not show up in Table 7) and sizes specified between Tables 6 and 7 are those which at first glance, appear to deserve consideration in detailed computer models. However, this list needs to be examined further before selecting technologies to pass onto the detailed analysis. There are 891 "opportunities" for each technology to be identified as one of the first three least cost options (i.e., 27 cases x 11 Capacity Factor ranges x 3 = 891). Table 8, below, identifies how many times a technology appeared as either the first, second or third least cost option over any capacity factor range. All technologies not identified within Table 8 failed to appear as one of the top three least-cost options in any of the cases identified.

Table 8
The Frequency of Occurrence of Each Technology as First, Second or Third Least Cost

# Occur				
1st	**2nd**	**3rd**	**Total**	**Technology Name**
21	70	111	202	CT Combined Cycle Un-Phased - 345MW
38	121	37	196	CT Combined Cycle Phased - 470MW
93	2	2	97	IPP Hydro
54	11	28	93	Trimble County 2
20	52	14	86	Brown 5 CT 159MW
54	0	0	54	IAC at Brown 8-11
0	8	33	41	Brown 5 CT 149MW
0	6	25	31	CT with Cascaded Humidified Advanced Turbine-300MW
9	10	4	23	Compressed Air Energy w/ Humid Air Turbine-350MW
0	8	13	21	Brown 5 CT 164MW
0	0	18	18	Aeroderivative CT
0	7	5	12	Press Fluidized Bed (Circulating, Supercritical)-360MW
8	1	1	10	Wind Turbines-Class 4 Speed-50x750kw
0	0	5	5	Press Fluidized Bed (Circulating, with Reheat)-360MW
0	1	1	2	Pulverized Coal (LSFO)-500MW

Table 8 shows that the 345 MW Un-Phased Combined Cycle unit was selected 202 times as the first, second or third least-cost technology while the Pulverized Coal (LSFO) 500 MW was selected 2 times. Table 8 provides a good starting point for further reducing the list of technologies identified in Tables 6 and 7.

The wind turbine technology for example, appeared in the levelized analysis as one of the least-costly technologies, but historically wind turbines have been cost effective only when located at sites with average wind speeds exceeding 12 mph. Climatological data for Kentucky reveals an average wind speed of less than 8 mph, therefore wind turbine technology may be justifiably removed from the initial list of 15 technologies.

Compressed Air Energy Storage (CAES) with Humid Air Turbine (CASH) is a second technology that should be closely examined. The CASH technology utilized in this analysis is based on salt caverns as the fundamental geologic formation for air storage. Salt cavern based CAES technology is the least capital intensive CAES technology. However, this geologic formation does not exist within Kentucky. Kentucky is geologically located over predominantly rock and porous media. Although these two types of geologic formation are suitable for air storage, the capital cost associated with a CAES facility at these sites would exceed that of storage based on salt caverns. Furthermore, CASH appears as the least cost option only in the low capital cost scenario. Since the technology has only a Pilot/Preliminary rating (according to EPRI's development and design rating system), it has a fairly large capital cost adjustment (-25% in the low scenario). Therefore, since this option is in the pilot development stage and for the reasons previously mentioned the CASH technology identified in Table 7 may be excluded.

A comparison of Table 6 and Table 7 reveals that four different coal-fired technologies have been identified. They are Trimble County Unit 2, a 360 MW supercritical PFBC unit, a 360 MW PFBC unit with reheat and a 500 MW Pulverized Coal (LSFO) unit. Further analysis will show that the 500 MW Pulverized Coal unit only appears as a second and third least cost option in two scenarios and then only at the 100% capacity factor level. Since this option is so similar to the lower cost Trimble County Unit, this option can be eliminated. Likewise, the 360 MW supercritical PFBC unit was only identified as a second and third least-cost option seven and five times, respectively. Each of these occurred in the 80-100% capacity factor range. Also the 360 MW PFBC unit only showed up five times as a third least-cost option at the 90-100% capacity factor level. For these reasons, these options also can be eliminated.

A final adjustment can be made to the CT technologies listed in Table 8. Of the technologies included in the screening analysis, 5 CT (159 MW, 149 MW, and the 164 MW Brown 5 CT, CT with CHAT, and the Aeroderivative CT at the Brown Site) based alternatives showed upon on the list in Table 8. In looking at the alternatives studied for the final unit at the Brown site, the 159 MW unit shows up as the least cost alternative. The remaining two sizes of CTs only show up as the second and third least cost alternatives and the aeroderivative CT shows up only as a third least-cost option. Based on this analysis, the fact that the bids for these alternative are only valid at the Brown Site, and the fact that detailed bids will be received for multiple sizes and types of CTs at the time installation would occur, only the 159 MW (approximately 160 MW) Brown 5 CT will be passed to the detailed analysis. The other CT alternative can also be eliminated. The CT with CHAT is in the demonstration stage of development according to EPRI. Further analysis will show that this technology showed up mainly as a third least-cost alternative.

Since this base analysis identified 5 CTs (4 of which are only valid at the Brown Site) and 4 coal-based technologies as potential options listed in Table 8, a second analysis eliminating these multiple alternatives was performed to verify that the screening analysis results would not be biased by the inclusion of these multiple options. Table 9 below identifies how many times a technology appeared as either the first, second or third least-cost option over any capacity factor range with the multiple size CTs and coal based units eliminated prior to the analysis. In comparing Table 8 and Table 9, it can be seen that there are four additional alternatives in the list (160 MW Greenfield CT, Advanced Integration Coal Gasification, 340 MW bubbling PFBC, and Cane Run 3 rehabilitation with AFBC). Three of the four alternatives are again coal-based technologies. The Advanced Integration Coal Gasification is in the pilot stages of development according to EPRI. Therefore it could be eliminated. The bubbling PFBC unit could be eliminated for the same reasons as the circulating PFBC. The Cane Run 3 rehabilitation only showed up in a single third-least cost option and therefore could be eliminated. The final option is the Greenfield Combustion Turbine. Since the other CTs evaluated were only for the Brown site, any additional CTs evaluated would have to be placed at a Greenfield site. Since this Greenfield CT is a least-cost alternative after the Brown CT options, it should be passed onto the integrated analysis for further consideration.

Table 9
The Frequency of Occurrence of Each Technology as First, Second or Third Least Cost with multiple size CTs and CT-CC eliminated

# Occur				
1st	**2nd**	**3rd**	**Total**	**Technology Name**
38	129	54	221	CT Combined Cycle Phased – 470MW
21	73	112	206	CT Combined Cycle Un-Phased – 345MW
93	2	3	98	IPP Hydro
54	11	28	93	Trimble County 2
20	52	14	86	Brown 5 CT 159MW
54	0	0	54	IAC at Brown 8-11
9	17	15	41	Compressed Air Energy w/ Humid Air Turbine-350MW
0	2	37	39	Greenfield Combustion Turbine – 160 MW
0	6	29	35	CT with Cascaded Humidified Advanced Turbine-300MW
8	1	1	10	Wind Turbines-Class 4 Speed-50x750kw
0	4	1	5	Advanced Int. Coal Gas – 460 MW
0	0	2	2	Press Fluidized Bed (Bubbling, Supercritical)-340MW
0	0	1	1	Advanced Int. Coal Gas – 460 MW

2. *Alternative Analysis with CO_2 Impact*

As previously discussed, a separate analysis was performed to evaluate the impact of a carbon tax on the outcome of the screening analysis. The same sensitivities (inclusion of the impact of SO_2, variability of capital cost, heat rate and fuel cost) were performed in this analysis as was performed in the base analysis. After implementing a tax of $50 per ton of carbon emitted, the least-cost technologies in at least one sensitivity case over any capacity factor range were determined just as in the analysis previously presented. For reference, these technologies are listed in Table 10.

Table 10
Least-Costly Technologies
In At-Least One Sensitivity Case

Brown 5 CT 159MW
Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Compressed Air Energy w/ Humid Air Turbine – 350 MW
Inlet Air Cooling at existing Brown CT's
IPP Hydro purchase
Wind Turbines – Class 4 Speed

A comparison of Table 10 and Table 6 from above shows that the Trimble County coal unit is no longer a least-cost technology when carbon is taxed at $50 per ton. Table 11 below identifies those technologies that were either identified as a second or third least-costly technology in the 27 scenarios. A comparison of Table 11 and Table 7 from above shows that the four coal-based technologies (Trimble County unit, 500 MW Pulverized Coal, and the two 360 MW PFBC unit) are no longer included in the list of options. Four additional technologies (Ohio Falls 9 & 10, CAES with Salt Cavern, 3 hr Advanced Battery, and Variable Speed Wind Turbine) show up as a second or third least-costly alternative when the carbon tax is included.

Table 11
Second and Third Least-Costly Technologies In At-Least One Sensitivity Case

Advanced Battery (3 hr) – 20 MW
Aeroderivative CT
Brown 5 CT 159MW
Brown 5 CT 149 MW
Brown 5 CT 164 MW
Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Combustion Turbine with CHAT – 300 MW
Compressed Air Energy w/ Humid Air Turbine
Compressed Air Energy (Salt Cavern)
IPP Hydro purchase
Ohio Falls 9 & 10
Wind Turbines – Class 4 Speed
Wind Turbines – Variable Speed

Table 12 identifies how many times a technology appeared as either the first, second or third least-cost option over any capacity factor range. This table is a good starting point for a more detailed review of the four technologies that show up as a result of a carbon tax of $50/ton. The CAES plant and variable speed wind turbines can be eliminated for the same reasons as were discussed above under the base analysis. Further evaluation of the Ohio Falls expansion would indicate that it is second least cost option four times and third least cost option eight times; all at the 30% capacity factor level. This is at the high end of the potential for this option to operate. Since there are numerous lower cost options below this capacity factor and the fact that the option is a run-of-river hydro subject to the availability of water, this option would also be eliminated. The final option that can be eliminated is the Advanced Battery option. It was third least cost option in 4 of the scenarios at the 10% capacity factor level. The design of the option included in the screening analysis had a maximum duty cycle of 250 cycles/year resulting in a maximum potential capacity factor of 8.5% at a 3-hr storage level. To operate at a higher level of duty cycle would incur additional cost for replacement batteries. With this additional cost and the relatively low number of occurrences, this option can be eliminated.

Table 12
The Frequency of Occurrence of Each Technology as First, Second or Third Least Cost

# Occur				
1st	2nd	3rd	Total	Technology Name
64	114	39	217	CT Combined Cycle Phased – 470MW
44	92	64	200	CT Combined Cycle Un-Phased – 345MW
0	5	116	121	CT with Cascaded Humidified Advanced Turbine-300MW
101	8	1	110	IPP Hydro
8	47	8	63	Brown 5 CT 159MW
54	0	0	54	IAC at Brown 8-11
17	9	5	31	Compressed Air Energy w/ Humid Air Turbine-350MW
0	0	23	23	Brown 5 CT 149MW
9	11	1	21	Wind Turbines-Class 4 Speed-50x750kw
0	0	18	18	Aeroderivative CT
0	4	8	12	Ohio Falls 9 & 10
0	6	5	11	Brown 5 CT 164MW
0	0	5	5	Wind Turbines-Class Variable Speed-50x750kw
0	0	4	4	Advanced Battery (3hr) - 20 MW
0	1	0	1	Compressed Air Energy (Salt Cavern) – 350 MW

The technologies suggested by a levelized screening analysis which includes a $50 tax on each ton of carbon emitted are not greatly different from those suggested without a carbon tax when the first, second and third least-cost options are considered. Overall, the carbon tax would make fossil fuel options (i.e., pulverized coal facilities) much less economically attractive and consequently would favor supply-side options that are based on renewable resources. In the future, the status of environmental legislation surrounding a carbon tax and other issues will be monitored closely and their effects on the selection of supply-side options used in the development of the Companies generation expansion strategy will be evaluated.

Recommendations

The technologies remaining comprise the final list of technologies suggested for detailed analysis using PROSCREEN II. Table 13 lists these technologies. The technologies identified will provide a diverse set of alternatives to be evaluated in production and capital costing computer models.

Table 13
Technologies Suggested for Analysis
Within PROSCREEN II

Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Combustion Turbine at Brown – 160 MW
Greenfield Site Combustion Turbine – 160 MW
Inlet Air Cooling at existing Brown CT's
IPP Hydro purchase
Pulverized Coal unit at Trimble County – 495 MW

Therefore, based on the results of the levelized screening analysis it is recommended that the technologies shown in Table 13 be retained and utilized in developing an optimal generation expansion strategy.

Exhibit 1

GLOBAL REGIONALIZATION FACTORS
of TAG SUPPLY for Windows, Version 3.08

	Regionalization Factor				
Region Name	**Material**	**Labor**	**Productivity**	**Indirects**	**Subcontracts**
East/West Central	0.98	0.93	0.98	1.00	1.00
Northeast	1.00	1.00	1.00	1.00	1.00
Southeast	0.99	0.72	0.88	1.00	1.00
*East Central	1.00	0.96	0.92	1.00	1.00
South Central	1.00	0.69	0.83	1.00	1.00
West Central	0.97	0.95	1.12	1.00	1.00
West	1.00	0.82	0.95	1.00	1.00

*The Commonwealth of Kentucky lies within the East Central Region.

The new cost of the regionalized technology is determined from the equation below.

$$New\ Region\ Cost = Old\ Region\ Cost \times \frac{New\ Region\ Regionalization\ Factor}{Old\ Region\ Regionalization\ Factor}$$

Exhibit 2

Economic Parameter Data

Economic Record ID	1000.0
Owner Costs:	
Fixed Operating Cost, Months	1
Variable Operating Cost, Months	1
Full Capacity Fuel	25%
For Number of Months	1
Spare Parts, % of Total Plant Cost	0.5%
Production Costs, % of TPI	2.0%
Fixed Charge Rate	
Base	11.94%
Intermediate	12.13%
Peak	12.09%
Inlet Air Cooling	13.48%
Land Prices, $/Acre	
Urban	8,500
Rural	1,600
Nonproductive	450
Consumables & Disposal	
Sorbent Prices, $/Ton	
Limestone	6.00
Labor Rates	
Fixed O&M	
Operating Labor Rate, $/Hr	22.00
Operating Labor Overhead Rate	54.3%
Maintenance	
Labor Rate, $/Hr	22.00
Labor Overhead Rate	54.3%

Exhibit 3

Technologies Screened

Tech. ID	Technology Description	Category	Sub-Category
1.1B	Pulverized Coal (LSFO)-500MW	Coal	Pulverized Coal
1.1C	Pulverized Coal (LSFO)-400MW	Coal	Pulverized Coal
1.1E	Pulverized Coal (LSFO)-300MW	Coal	Pulverized Coal
1.1G	Pulverized Coal (LSFO)-200MW	Coal	Pulverized Coal
1.1H	Pulverized Coal (LSFO)-300MW X 2	Coal	Pulverized Coal
1.2G	Pulverized Coal Compliance (LSD)- 300MW	Coal	Pulverized Coal
1.5B	Pulverized Coal Supercritical (LSD)- 300MW	Coal	Pulverized Coal
1.5C	Pulverized Coal (Advanced LSFO)- 400MW	Coal	Pulverized Coal
5.4A	Atmosph Fluidized Bed (Circulating)-200MW	Coal	Fluidized Bed Combustion
6.2	Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	Coal	Fluidized Bed Combustion
6.7	Press Fluidized Bed (Bubbling)-350MW	Coal	Fluidized Bed Combustion
6.9	Press Fluidized Bed (Bubbling, Supercritic)-340MW	Coal	Fluidized Bed Combustion
7.2	Press Fluidized Bed (Circulating, with Reheat)-160MW	Coal	Fluidized Bed Combustion
7.3	Press Fluidized Bed (Circulating, with Reheat)-360MW	Coal	Fluidized Bed Combustion
7.8	Press Fluidized Bed (Circulating, Supercritical)-360MW	Coal	Fluidized Bed Combustion
8.1	Foster Wheeler Advanced PFB (Circulating)-688MW	Coal	Fluidized Bed Combustion
10.2B	Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	Coal	Coal Gasification
10.5A	Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	Coal	Coal Gasification
10.5B	Int Coal Gas / CAES with Humid Air Turbine-410MW	Coal	Coal Gasification
10.5C	Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	Coal	Coal Gasification
10.6	Advanced Int. Coal Gas-460MW	Coal	Coal Gasification
15.1	Combustion Turbine Heavy Duty-80MW	Natural Gas	Combustion Turbine
15.2	Combustion Turbine Heavy Duty-110MW	Natural Gas	Combustion Turbine
15.3	Combustion Turbine Heavy Duty-160MW	Natural Gas	Combustion Turbine
15.7	Combustion Turbine Aero- 45MW	Natural Gas	Combustion Turbine - Aeroderivative
16.2	CT Combined Cycle 2on1 - 330MW	Natural Gas	CCCT
16.3	CT Combined Cycle 2on1 - 470MW	Natural Gas	CCCT
16.4	CT Combined Cycle - 345MW	Natural Gas	CCCT
17.2	CT with Cascaded Humidified Advanced Turbine-300MW	Natural Gas	Combustion Turbine
20.1E	Phosphoric Acid Fuel Cell-2.5MW	Natural Gas	Fuel Cell
20.2A	Molten Carbonate Fuel Cell-100MW	Natural Gas	Fuel Cell
20.3D	Solid Oxide Fuel Cell-100MW	Natural Gas	Fuel Cell
21.2	Geothermal: Dual Flash Brine, Air Cooled-24MW	Renewable	Geotherm
22.2C	Solar Photovoltaic:Flat Plate-10x5MW	Renewable	Solar
22.2F	Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	Renewable	Solar
22.3C	Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	Renewable	Solar
23.2	Solar Thermal Trough/Gas Hybrid-200MW	Renewable	Solar
24	Wind Turbines-Variable Speed-50x750kw	Renewable	Wind
24.2	Wind Turbines-High Prod Volume-143x350kw	Renewable	Wind
24.6	Wind Turbines-Class 4 Speed-50x750kw	Renewable	Wind
25.1	Municipal Solid Waste: Mass Burn-40MW	Renewable	MSW
25.2	Municipal Solid Waste: Refuse Der.-40MW	Renewable	MSW
25.3	Municipal Solid Waste: Tire-30MW	Renewable	MSW
26.1	Bio Mass: Wood-Fired Stoker Boiler-50MW	Renewable	BioMass
26.3	Bio Mass: Whole Tree-100MW	Renewable	BioMass
30.2	Lead Acid Battery Storage(1 hr)-20MW	Renewable	Battery
31.1	Advanced Battery (3 hr)-20MW	Storage	Battery
31.2	Advanced Battery (5 hr)-20MW	Storage	Battery
32.1	Pumped Hydro Energy Storage-350MW X 3	Storage	PHES
33.1B	Compressed Air Energy (Salt Cavern) -350MW	Storage	CAES
33.2B	Compressed Air Energy w/ Humid Air Turbine-350MW	Storage	CAES
34.1	Super Conducting Magnetic Energy Storage (2 hr)-500MW	Storage	SMES
1	Cane Run 3 Rehab w/ AFBC	Coal	Fluidized Bed Combustion
2	Cane Run 3 Rehab w/ Natural Gas	Natural Gas	Other
3	Brown 5 CT 110MW	Natural Gas	Combustion Turbine
4	Brown 5 CT 164MW	Natural Gas	Combustion Turbine
5	Brown 5 CT 102MW	Natural Gas	Combustion Turbine
6	Brown 5 CT 159MW	Natural Gas	Combustion Turbine
7	Brown 5 CT 149MW	Natural Gas	Combustion Turbine
8	IPP Hydro	Renewable	Hydro
9	Aeroderivative CT	Natural Gas	Combustion Turbine - Aeroderivative
10	Ohio Falls 9&10	Renewable	Hydro
11	Trimble County 2	Coal	Pulverized Coal
12	IAC at Brown 8-11	Natural Gas	Other

CONFIDENTIAL INFORMATION REDACTED

Exhibit 4

Fuel Cell Replacement

All cost in $/kw

Capital Escalation	2.0%
Fixed O&M Escalation	4.5%

	Phosphoric Acid			Molten Carbonate			Solid Oxide		
	Module Cost	Replacement Cost	Levelized Fixed O&M	Module Cost	Replacement Cost	Levelized Fixed O&M	Module Cost	Replacement Cost	Levelized Fixed O&M
1999	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2026	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2027	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2028	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CONFIDENTIAL INFORMATION REDACTED

Exhibit 5(a)

Fuel Forecast for Screening Analysis

(Cents/MBtu)

	Base Fuel Costs				Low Fuel Costs				High Fuel Costs			
	High SO_2	Med SO_2	Low SO_2	Gas	High SO_2	Med SO_2	Low SO_2	Gas	High SO_2	Med SO_2	Low SO_2	Gas
1999	94	119	120	243	94	119	120	243	94	119	120	243
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2026	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2027	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2028	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CONFIDENTIAL INFORMATION REDACTED **Exhibit 5(b)**

Calculation of SO_2 Adder (Cents/MBtu)

(Post FGD:Assume 95% Removal Eff)

#SO_2/MBTU ---->		0.250		0.055		0.105	
		High SO_2		Low SO_2		Med SO_2	
	SO_2 \$/ton Esc @ VO&M	Base Cost	SO_2 Adder	Base Cost	SO_2 Adder	Base Cost	SO_2 Adder
1999	210	94	3	120	1	119	1
2000	219	[redacted]	3	[redacted]	1	[redacted]	1
2001	229	[redacted]	3	[redacted]	1	[redacted]	1
2002	240	[redacted]	3	[redacted]	1	[redacted]	1
2003	250	[redacted]	3	[redacted]	1	[redacted]	1
2004	262	[redacted]	3	[redacted]	1	[redacted]	1
2005	273	[redacted]	3	[redacted]	1	[redacted]	1
2006	286	[redacted]	4	[redacted]	1	[redacted]	2
2007	299	[redacted]	4	[redacted]	1	[redacted]	2
2008	312	[redacted]	4	[redacted]	1	[redacted]	2
2009	326	[redacted]	4	[redacted]	1	[redacted]	2
2010	341	[redacted]	4	[redacted]	1	[redacted]	2
2011	356	[redacted]	4	[redacted]	1	[redacted]	2
2012	372	[redacted]	5	[redacted]	1	[redacted]	2
2013	389	[redacted]	5	[redacted]	1	[redacted]	2
2014	406	[redacted]	5	[redacted]	1	[redacted]	2
2015	425	[redacted]	5	[redacted]	1	[redacted]	2
2016	444	[redacted]	6	[redacted]	1	[redacted]	2
2017	464	[redacted]	6	[redacted]	1	[redacted]	2
2018	485	[redacted]	6	[redacted]	1	[redacted]	3
2019	506	[redacted]	6	[redacted]	1	[redacted]	3
2020	529	[redacted]	7	[redacted]	1	[redacted]	3
2021	553	[redacted]	7	[redacted]	2	[redacted]	3
2022	578	[redacted]	7	[redacted]	2	[redacted]	3
2023	604	[redacted]	8	[redacted]	2	[redacted]	3
2024	631	[redacted]	8	[redacted]	2	[redacted]	3
2025	660	[redacted]	8	[redacted]	2	[redacted]	3
2026	689	[redacted]	9	[redacted]	2	[redacted]	4
2027	720	[redacted]	9	[redacted]	2	[redacted]	4
2028	753	[redacted]	9	[redacted]	2	[redacted]	4

Example calculation of SO_2 adder:

Using High Sulfur Coal = 5#SO_2/MBtu

1999 SO_2 \$/Ton = \$210

1999 Base Fuel Cost for 5#SO_2/MBtu = 94 cents/MBtu

Scrubber Removal Efficiency = 95% (for each coal burning technology)

$$\textbf{1999 High Sulfur } SO_2 \textbf{ Cost Adder} = \frac{5.0\#SO_2}{\text{MBtu}} \cdot (1-0.95) \cdot \frac{210\ \$}{\text{Ton } SO_2} \cdot \frac{100\ \text{Cents}}{\$} \cdot \frac{1\ \text{ton } SO_2}{2000\ \#}$$

1999 High Sulfur
SO_2 Cost Adder = 3 cents/MBtu

Exhibit 5(c)

Fuels Utilized by Technology in 1999 Screening Analysis

TAG SUPPLY ID	Generating/ Storage Station Options	1999 Screening Study Uses
30.2	Lead Acid Battery Storage(1 hr)-20MW	Charging Only
31.1	Advanced Battery (3 hr)-20MW	Charging Only
31.2	Advanced Battery (5 hr)-20MW	Charging Only
32.1	Pumped Hydro Energy Storage-350MW X 3	Charging Only
33.1B	Compressed Air Energy (Salt Cavern) -350MW	Gas & Charging
33.2B	Compressed Air Energy w/ Humid Air Turbine-350MW	Gas & Charging
34.1	Super Conducting Magnetic Energy Storage (2 hr)-500MW	Charging Only
1.1B	Pulverized Coal (LSFO)-500MW	High Sulfur Coal
1.1C	Pulverized Coal (LSFO)-400MW	High Sulfur Coal
1.1E	Pulverized Coal (LSFO)-300MW	Medium Sulfur Coal
1.1G	Pulverized Coal (LSFO)-200MW	High Sulfur Coal
1.1H	Pulverized Coal (LSFO)-300MW X 2	High Sulfur Coal
1.2G	Pulverized Coal Compliance (LSD)- 300MW	Low Sulfur Coal
1.5B	Pulverized Coal Supercritical (LSD)- 300MW	Low Sulfur Coal
1.5C	Pulverized Coal (Advanced LSFO)- 400MW	High Sulfur Coal
5.4A	Atmosph Fluidized Bed (Circulating)-200MW	Medium Sulfur Coal
6.2	Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	High Sulfur Coal
6.7	Press Fluidized Bed (Bubbling)-350MW	High Sulfur Coal
6.9	Press Fluidized Bed (Bubbling, Supercritic)-340MW	High Sulfur Coal
7.2	Press Fluidized Bed (Circulating, with Reheat)-160MW	High Sulfur Coal
7.3	Press Fluidized Bed (Circulating, with Reheat)-360MW	High Sulfur Coal
7.8	Press Fluidized Bed (Circulating, Supercritical)-360MW	High Sulfur Coal
8.1	Foster Wheeler Advanced PFB (Circulating)-688MW	High Sulfur Coal
10.2B	Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	High Sulfur Coal
10.5A	Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	High Sulfur Coal
10.5B	Int Coal Gas / CAES with Humid Air Turbine-410MW	High Sulfur Coal
10.5C	Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	High Sulfur Coal
10.6	Advanced Int. Coal Gas-460MW	High Sulfur Coal
15.1	Combustion Turbine Heavy Duty-80MW	Gas
15.2	Combustion Turbine Heavy Duty-110MW	Gas
15.3	Combustion Turbine Heavy Duty-160MW	Gas
15.7	Combustion Turbine Aero- 45MW	Gas
16.2	CT Combined Cycle 2on1 - 330MW	Gas
16.3	CT Combined Cycle 2on1 - 470MW	Gas
16.4	CT Combined Cycle - 345MW	Gas
17.2	CT with Cascaded Humidified Advanced Turbine-300MW	Gas
20.1E	Phosphoric Acid Fuel Cell-2.5MW	Gas
20.2A	Molten Carbonate Fuel Cell-100MW	Gas
20.3D	Solid Oxide Fuel Cell-100MW	Gas
21.2	Geothermal: Dual Flash Brine, Air Cooled-24MW	Gas
22.2C	Solar Photovoltaic:Flat Plate-10x5MW	No Fuel
22.2F	Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	No Fuel
22.3C	Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	No Fuel
23.2	Solar Thermal Trough/Gas Hybrid-200MW	No Fuel
24	Wind Turbines-Variable Speed-50x750kw	No Fuel
24.2	Wind Turbines-High Prod Volume-143x350kw	No Fuel
24.6	Wind Turbines-Class 4 Speed-50x750kw	No Fuel
25.1	Municipal Solid Waste: Mass Burn-40MW	No Fuel
25.2	Municipal Solid Waste: Refuse Der.-40MW	No Fuel
25.3	Municipal Solid Waste: Tire-30MW	No Fuel
26.1	Bio Mass: Wood-Fired Stoker Boiler-50MW	Wood Chips
26.3	Bio Mass: Whole Tree-100MW	Tree
1	Cane Run 3 Rehab w/ AFBC	High Sulfur Coal
2	Cane Run 3 Rehab w/ Natural Gas	Gas
3	Brown 5 CT 110MW	Gas
4	Brown 5 CT 164MW	Gas
5	Brown 5 CT 102MW	Gas
6	Brown 5 CT 159MW	Gas
7	Brown 5 CT 149MW	Gas
8	IPP Hydro	No Fuel
9	Aeroderivative CT	Gas
10	Ohio Falls 9&10	No Fuel
11	Trimble County 2	High Sulfur Coal
12	IAC at Brown 8-11	Gas

Most optimistic case is to assume no charge for MSW, RDF and Tires.

CONFIDENTIAL INFORMATION REDACTED

Exhibit 6

1999 Generic Unit Construction Costs
Base Capital Costs, Base HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	**1.1B**	**1.1C**	**1.1E**	**1.1G**	**1.1H**	**1.2G**	**1.5B**	**1.5C**	**5.4A**	**6.2**	**6.7**	**6.9**	**7.2**	**7.3**
Unit Type	**PC LSFO**	**PC LSFO**	**PC LSFO**	**PC LSFO**	**PC LSFO**	**PC LSD**	**PC LSD Sup.**	**PC LSFO Adv.**	**AFBC Circ.**	**PFBC2x80**	**PFBC Bub.**	**PFBC Sup.**	**PFBC Circ.**	**PFBC Circ.**
Size (MW)	**500**	**400**	**300**	**200**	**600**	**300**	**300**	**400**	**200**	**160**	**350**	**350**	**160**	**350**
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9438	9502	9507	9759	9584	9432	9459	8637	10025	9249	8163	8720	9046	8997

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	**7.8**	**8.1**	**10.2B**	**10.5A**	**10.5B**	**10.5C**	**10.6**	**15.1**	**15.2**	**15.3**	**15.7**	**16.2**	**16.3**	**16.4**
Unit Type	**FBC Circ. Su**	**Adv. PFBC**	**Coal GCC**	**IGCHAT**	**IGCASH**	**IGMCFC**	**Adv. GCC**	**CT**	**CT**	**CT**	**CT Aero**	**CT/CC 2on1**	**CT/CC 2on1**	**CT/CC**
Size (MW)	**350**	**687.7**	**601**	**600**	**410.2**	**400**	**460.3**	**80**	**110**	**160**	**45**	**330**	**470**	**345**
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8569	7650	8356	8650	10320	6860	7390	12906	13673	11459	10524	7707	7107	6954

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	**17.2**	**20.1E**	**20.2A**	**20.3D**	**21.2**	**22.2C**	**22.2F**	**22.3C**	**24.2**	**24.6**	**25.1**	**25.2**	**25.3**	**26.1**
Unit Type	**CHAT**	**Phos FC**	**MC FC**	**SolidOX FC**	**Geotherm**	**PV Flat**	**PV Track**	**PV High Conc**	**Wind**	**Wind Cl4**	**MSW Mass**	**MSW RDF**	**MSW Tires**	**Bio Wood**
Size (MW)	**300**	**2.5**	**10**	**25**	**24**	**50**	**50**	**50**	**50.05**	**37.5**	**40**	**40**	**30**	**50**
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	248.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	7140	9350	5600	6172	29050	0	0	0	0	0	16864	16958	12737	14310

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	**26.3**	**30.2**	**31.1**	**31.2**	**32.1**	**33.1B**	**33.2B**	**34.1**						
Unit Type	**Bio Tree**	**LeadBat**	**AdvBat3**	**AdvBat5**	**PHES**	**CAES**	**CASH**	**SMES**			**CR3 AFBC**	**CR3 Gas**	**BR5 110MW**	**BR5 164MW**
Size (MW)	**100**	**20**	**20**	**20**	**1050**	**350**	**350**	**500**			**135**	**135**	**110**	**164**
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10979	0	0	0	0	3991	6156	0			10500	11100	12281	10500

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	**BR5 102MW**	**BR5 159MW**	**BR5 149MW**	**IPP Hydro**	**Aero CT**	**OF 9&10**	**TC 2**	**IAC at BR**
Size (MW)	**102**	**159**	**149**	**160**	**100**	**33.6**	**495**	**86**
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12369	10836	11101	0	10362	0	9900	11651

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 3991
33.2B	CASH		0.46 + 6156
34.1	SMES	1.06	
	IAC at BR		0.775 + 11651

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 6

1999 Generic Unit Construction Costs
Base Capital Costs, High HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9910	9977	9982	10247	10063	9904	9932	9069	10526	9711	9621	9156	9498	9447

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.48	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8997	8033	8774	9083	10836	7203	7760	13551	14357	12032	11050	8092	7462	7302

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	7497	9818	5880	6461	30503	0	0	0	0	0	17707	17806	13374	15026

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	11528	0	0	0	0	4191	6464	0			11025	11655	12895	11025

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12987	11378	11656	0	10880	0	10395	12234

Table A			
Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 4191
33.2B	CASH		0.46 + 6464
34.1	SMES	1.08	
	IAC at BR		0.775 + 12234

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

CONFIDENTIAL INFORMATION REDACTED

Exhibit 6

1999 Generic Unit Construction Costs
Base Capital Costs, Low HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	8966	9027	9032	9271	9105	8960	8986	8205	9524	8787	8705	8284	8594	8547

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8141	7268	7938	8218	9804	6517	7021	12261	12989	10886	9998	7322	6752	6606

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	6783	8883	5320	5863	27598	0	0	0	0	0	16021	16110	12100	13595

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10430	0	0	0	0	3791	5848	0			9975	10545	11667	9975

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	11751	10294	10546	0	9844	0	9405	11068

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 3791
33.2B	CASH		0.46 + 5848
34.1	SMES	1.06	
	IAC at BR		0.775 + 11068

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 6

1999 Generic Unit Construction Costs
High Capital Costs, Base HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.6C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9438	9502	9507	9759	9584	9432	9459	8637	10025	9249	9163	8720	9046	8997

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8569	7650	8356	8650	10320	6860	7390	12906	13673	11459	10524	7707	7107	6954

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	7140	9350	5600	6172	29050	0	0	0	0	0	16864	16958	12737	14310

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10979	0	0	0	0	3991	6156	0			10500	11100	12281	10500

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12369	10836	11101	0	10362	0	9900	11651

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.38	
33.1B	CAES		0.79 + 3991
33.2B	CASH		0.46 + 6156
34.1	SMES	1.08	
	IAC at BR		0.775 + 11651

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 6

1999 Generic Unit Construction Costs
High Capital Costs, High HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9910	9977	9982	10247	10063	9904	9932	9069	10526	9711	9621	9156	9498	9447

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg Heatrate (BTU/kWh)	8997	8033	8774	9083	10836	7203	7760	13551	14357	12032	11050	8092	7462	7302

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg Heatrate (BTU/kWh)	7497	9818	5880	6481	30503	0	0	0	0	0	17707	17806	13374	15026

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	11528	0	0	0	0	4191	6464	0			11025	11655	12895	11025

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12987	11378	11656	0	10880	0	10395	12234

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 4191
33.2B	CASH		0.46 + 6464
34.1	SMES	1.08	
	IAC at BR		0.775 + 12234

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 6

1999 Generic Unit Construction Costs
High Capital Costs, Low HeatRates

(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg Heatrate (BTU/kWh)	8966	9027	9032	9271	9105	8960	8986	8205	9524	6787	8705	8284	8594	8547

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8141	7268	7938	8218	9804	6517	7021	12261	12989	10886	9998	7322	6752	6606

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	6783	8883	5320	5863	27598	0	0	0	0	0	16021	16110	12100	13595

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10430	0	0	0	0	3791	5848	0			9975	10545	11667	9975

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	11751	10294	10546	0	9844	0	9405	11068

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 3791
33.2B	CASH		0.48 + 5848
34.1	SMES	1.08	
	IAC at BR		0.775 + 11068

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

CONFIDENTIAL INFORMATION REDACTED

Exhibit 6

1999 Generic Unit Construction Costs
Low Capital Costs, Base HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9438	9502	9507	9759	9584	9432	9459	8637	10025	9249	9163	8720	9046	8997

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8569	7650	8356	8650	10320	6860	7390	12906	13673	11459	10524	7707	7107	6954

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	7140	9350	5600	6172	29050	0	0	0	0	0	16864	16958	12737	14310

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10979	0	0	0	0	3991	6156	0			10500	11100	12281	10500

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12369	10836	11101	0	10362	0	9900	11651

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 3991
33.2B	CASH		0.46 + 6156
34.1	SMES	1.06	
	IAC at BR		0.775 + 11651

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 6

1999 Generic Unit Construction Costs
Low Capital Costs, High HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	9910	9977	9982	10247	10063	9904	9932	9069	10526	9711	9621	9156	9498	9447

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.82	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8997	8033	8774	9083	10836	7203	7760	13551	14357	12032	11050	8092	7462	7302

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind Cl4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	7497	9818	5880	6481	30503	0	0	0	0	0	17707	17808	13374	15026

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.97	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	11528	0	0	0	0	4191	6464	0			11025	11655	12895	11025

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	12987	11378	11656	0	10880	0	10395	12234

Table A

Tag Supply Id	Tech Name	KWh input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 4191
33.2B	CASH		0.46 + 6464
34.1	SMES	1.08	
	IAC at BR		0.775 + 12234

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

CONFIDENTIAL INFORMATION REDACTED

Exhibit 6

1999 Generic Unit Construction Costs
Low Capital Costs, Low HeatRates
(Source: EPRI's TAG SUPPLY Version 3.08)
All dollars are January 1999$.

Tech. Development Rating	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Mature	Commercial	Demonstration	Pilot	Pilot	Demonstration	Pilot
Design & Cost Estim Rating	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	10%	10%	10%	10%	10%	10%	10%	10%	15%	20%	30%	30%	20%	30%
Minimum Cap Cost Adjustment (%)	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-15%	-20%	-25%	-25%	-20%	-25%
TAG SUPPLY ID	1.1B	1.1C	1.1E	1.1G	1.1H	1.2G	1.5B	1.5C	5.4A	6.2	6.7	6.9	7.2	7.3
Unit Type	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSFO	PC LSD	PC LSD Sup.	PC LSFO Adv.	AFBC Circ.	PFBC2x80	PFBC Bub.	PFBC Sup.	PFBC Circ.	PFBC Circ.
Size (MW)	500	400	300	200	600	300	300	400	200	160	350	350	160	350
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	31.34	38.67	39.51	49.78	31.45	34.87	39.48	37.63	44.03	60.97	37.57	37.26	51.01	36.05
Var. O&M ($/MWh)	1.13	1.02	1.17	1.10	1.08	1.06	1.48	1.38	2.36	2.46	1.56	1.85	1.95	1.91
Avg. Heatrate (BTU/kWh)	8966	9027	9032	9271	9105	8960	8986	8205	9524	8787	8705	8284	8594	8547

Tech. Development Rating	Pilot	Pilot	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Mature	Mature	Mature	Mature	Mature	Mature	Demonstration
Design & Cost Estim Rating	Preliminary	Preliminary	Simplified	Simplified	Preliminary	Simplified	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
Maximum Cap Cost Adjustment (%)	30%	30%	25%	25%	20%	25%	30%	10%	10%	10%	10%	10%	10%	20%
Minimum Cap Cost Adjustment (%)	-25%	-25%	-25%	-25%	-20%	-25%	-25%	-10%	-10%	-10%	-10%	-10%	-10%	-20%
TAG SUPPLY ID	7.8	8.1	10.2B	10.5A	10.5B	10.5C	10.6	15.1	15.2	15.3	15.7	16.2	16.3	16.4
Unit Type	FBC Circ. Su	Adv. PFBC	Coal GCC	IGCHAT	IGCASH	IGMCFC	Adv. GCC	CT	CT	CT	CT Aero	CT/CC 2on1	CT/CC 2on1	CT/CC
Size (MW)	350	687.7	601	600	410.2	400	460.3	80	110	160	45	330	470	345
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	35.85	30.55	45.51	42.67	47.46	61.52	34.28	8.43	6.49	4.97	12.57	15.58	12.23	13.39
Var. O&M ($/MWh)	2.11	4.48	1.08	1.24	0.82	4.92	3.44	1.00	1.00	1.00	1.00	0.62	0.61	0.64
Avg. Heatrate (BTU/kWh)	8141	7268	7938	8218	9804	6517	7021	12261	12989	10886	9998	7322	6752	6606

Tech. Development Rating	Demonstration	Demonstration	Demonstration	Demonstration	Demonstration	Pilot	Pilot	Pilot	Demonstration	Commercial	Commercial	Commercial	Commercial	Commercial
Design & Cost Estim Rating	Preliminary	Simplified	Simplified	Simplified	Preliminary	Goal	Goal	Goal	Simplified	Goal	Simplified	Simplified	Simplified	Simplified
Maximum Cap Cost Adjustment (%)	20%	25%	25%	25%	20%	100%	100%	100%	25%	70%	20%	20%	20%	20%
Minimum Cap Cost Adjustment (%)	-20%	-25%	-25%	-25%	-20%	-30%	-30%	-30%	-25%	-30%	-20%	-20%	-20%	-20%
TAG SUPPLY ID	17.2	20.1E	20.2A	20.3D	21.2	22.2C	22.2F	22.3C	24.2	24.6	25.1	25.2	25.3	26.1
Unit Type	CHAT	Phos FC	MC FC	SolidOX FC	Geotherm	PV Flat	PV Track	PV High Conc	Wind	Wind CI4	MSW Mass	MSW RDF	MSW Tires	Bio Wood
Size (MW)	300	2.5	10	25	24	50	50	50	50.05	37.5	40	40	30	50
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	13.84	538.51	126.80	67.78	45.14	9.07	9.80	42.25	25.91	24.47	208.48	246.51	132.20	69.90
Var. O&M ($/MWh)	2.16	2.38	2.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	25.91	25.80	3.60	2.67
Avg. Heatrate (BTU/kWh)	6783	8883	5320	5863	27598	0	0	0	0	0	16021	16110	12100	13595

Tech. Development Rating	Pilot	Mature	Pilot	Pilot	Mature	Commercial	Pilot	Pilot						
Design & Cost Estim Rating	Goal	Preliminary	Goal	Goal	Actual	Actual	Preliminary	Goal						
Maximum Cap Cost Adjustment (%)	100%	10%	100%	100%	5%	5%	30%	100%			10%	10%	5%	5%
Minimum Cap Cost Adjustment (%)	-30%	-10%	-30%	-30%	-5%	-5%	-25%	-30%			-10%	-10%	-5%	-5%
TAG SUPPLY ID	26.3	30.2	31.1	31.2	32.1	33.1B	33.2B	34.1						
Unit Type	Bio Tree	LeadBat	AdvBat3	AdvBat5	PHES	CAES	CASH	SMES			CR3 AFBC	CR3 Gas	BR5 110MW	BR5 164MW
Size (MW)	100	20	20	20	1050	350	350	500			135	135	110	164
Capital Costs ($/kW)														
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	51.40	1.71	0.49	1.07	4.60	5.73	5.04	5.14			41.17	41.17	6.65	5.00
Var. O&M ($/MWh)	1.75	8.12	7.05	5.13	4.60	0.99	1.00	4.11			0.87	0.00	1.00	1.00
Avg. Heatrate (BTU/kWh)	10430	0	0	0	0	3791	5848	0			9975	10545	11667	9975

Tech. Development Rating								
Design & Cost Estim Rating								
Maximum Cap Cost Adjustment (%)	5%	5%	5%	0%	5%	5%	5%	5%
Minimum Cap Cost Adjustment (%)	-5%	-5%	-5%	0%	-5%	-5%	-5%	-5%
TAG SUPPLY ID								
Unit Type	BR5 102MW	BR5 159MW	BR5 149MW	IPP Hydro	Aero CT	OF 9&10	TC 2	IAC at BR
Size (MW)	102	159	149	160	100	33.6	495	86
Capital Costs ($/kW)								
Process Capital	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
General Facilities	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Engineering Fee	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Process Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Plant Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preprod, Inv, Land	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Generic Unit Cost	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fixed O&M ($/kW-yr)	7.17	5.15	5.50	30.18	0.00	8.91	26.46	0.93
Var. O&M ($/MWh)	1.00	1.00	1.00	0.00	4.00	0.00	0.35	1.48
Avg. Heatrate (BTU/kWh)	11751	10294	10546	0	9844	0	9405	11068

Table A

Tag Supply Id	Tech Name	KWh Input/ KWh Output	1 KWh Out = KWh In + BTU In
30.2	LeadBat	1.31	
31.1	AdvBat3	1.14	
31.2	AdvBat5	1.10	
32.1	PHES	1.36	
33.1B	CAES		0.79 + 3791
33.2B	CASH		0.46 + 5848
34.1	SMES	1.08	
	IAC at BR		0.775 + 11068

Notes:

Techonolgies with TAG Supply ID 30.2, 31.1, 31.2, 32.1, 34.1 require energy from Electric Grid.

Techonolgies with TAG Supply ID 33.1b, 33.2b and IAC at BR require energy from Electric Grid and consume fuel

Capital Cost adjustments and Heat Rate adjustments apply to all above technologies, regardless of data source (ie. TAG or Companies' supplied data).

TAG based technologies have had Capital Cost adjustments applied to Process Capital, General Facilities and Engineering Fee only (Process Contingency and Prep, Inv and Land excluded).

Exhibit 7

LEVELIZATION EQUATIONS
USED IN TECHNOLOGY SCREENING

The total levelized cost of a particular technology in a specific year at a specific capacity factor is comprised of (at most) five separate components. The five possible components are levelized capital cost, levelized fixed cost, levelized variable cost, levelized fuel cost and levelized charging cost. The actual components utilized in calculating total levelized cost vary from technology to technology. For example, some technologies may exclude the charging component while others exclude the fuel component. Basically, technologies fall into four categories: Those that...

I. Burn fuel only (i.e., Pulverized Coal, Gas Turbine)
II. Burn no fuel and utilize no "grid" energy (Solar Photo, Wind)
III. Burn no fuel but utilize "grid" energy for charging (Battery, P-Hydro)
IV. Burn fuel during generation <u>and</u> utilize "grid" energy for charging (CAES)

A levelization factor (L_n) converts a series of payments that are made over "n" periods and subject to a constant apparent escalation rate into an equivalent levelized payment stream and is calculated as follows:

$$L_n = \frac{k\,(1-k^n)}{a_n\,(1-k)}$$ n = number of years = 30

$$k = \frac{1+e_a}{1+i}$$ e_a = apparent esc rate including inflation and real escalation (i.e., VO&M = 4.5%). See Exhibit 8.

$$a_n = \frac{(1+i)^N - 1}{i\,(1+i)^N}$$ i = Discount Rate = Present Value Rate = 9.78%

$$\text{Adj } L_n = L_n/(1+e_a)$$

The screening analysis utilizes the Adj. L_n. The Adj. L_n make adjustments for beginning/ending year dollars to be consistent with the Companies' economic analysis methods. An Adj. L_n is calculated for the fixed, variable, fuel and charging costs only. The capital cost component does not utilize an Adj. L_n for levelization because it is levelized through a Fixed Charge Rate (FCR)

Definition of Variables:

Variable		Definition (Units)	Source
Year	=	Levelized Year - Base Year	Exhibit 8
Inst Cost	=	Installed Cost or Total Generic Unit Cost ($/kW)	Exhibit 6
FCR%	=	Fixed Charge Rate (%)	Exhibit 2
Cap Esc%	=	Capital Escalation Rate (%)	Exhibit 8
FO&M	=	Fixed O&M ($/kW)	Exhibit 6
VO&M	=	Variable O&M ($/MWh)	Exhibit 6
Fix Esc	=	Fixed O&M Escalation Rate (%)	Exhibit 8
Var Esc	=	Variable O&M Escalation Rate (%)	Exhibit 8
Fix Adj L_n	=	Fixed O&M Levelization Factor	Exhibit 8
Var Adj L_n	=	Variable O&M Levelization Factor	Exhibit 8
Fuel Adj L_n	=	Fuel Cost Levelization Factor	Base Fuel Only; Exhibit 8
Charge Adj L_n	=	Charging Cost Levelization Factor	Exhibit 8
CF%	=	Capacity Factor (%)	0-100 %
MW	=	Size of Technology (MW)	Exhibit 6
HR	=	Heat Rate (Btu/KWh)	Exhibit 6
FC	=	Fuel Cost ($/MBtu)	Exhibit 5 (a)
Avg Ld IO	=	Average Load (kWh In/kWh Out)	Table A within Exhibit 6
Charge	=	Charging Cost ($/MWh)	Exhibit 8
SO_2	=	SO_2 Adder (Cents/MBtu)	Exhibit 5(b)

Exhibit 7 (cont.)

Cost Components of Technologies that:

I. Burn Fuel Only

$$Capital \ = Inst \ \ Cost \times FCR \ \% \times (1 + Cap \ \ Esc \ \%)^{\wedge Year}$$

$$Fixed = FO\,\&\,M \times (1 + Fix \ Esc\%)^{\wedge Year} \times Fix \ Adj \ L_n$$

$$Variable = \frac{VO\,\&\,M \times (1 + Var \ Esc\%)^{\wedge Year} \times CF\% \times 8760 \, {}^{Hrs}\!/_{Year} \times MW}{MW \times 1000 \, {}^{KW}\!/_{MW}} \times Var \ Adj \ L_n$$

$$Fuel = \frac{MW \times 1000 \, {}^{KW}\!/_{MW} \times 8760 \, {}^{Hrs}\!/_{Year} \times CF\% \times HR \times (FC + SO_2)}{MW \times 1000 \, {}^{KW}\!/_{MW} \times (10)^6 \, {}^{BTU}\!/_{MBTU}} \times Fuel \ Adj \ L_n$$

II. Burn No Fuel and No Charging Energy

Use Capital, Fixed and Variable Equations from above.

III. Burn No Fuel but Utilize Charging Energy

Use Capital, Fixed and Variable Equations from above and Charging.

$$Charging = \frac{Avg \ Ld \ IO \times Charge \times MW \times 8760 \, {}^{Hrs}\!/_{Year} \times CF\%}{MW \times 1000 \, {}^{KW}\!/_{MW}} \times Charge \ Adj \ L_n$$

IV. Burn Fuel and Utilize Charging Energy

Use Capital, Fixed, Variable, Fuel and Charging equations from above.

Exhibit 8

Adjusted L_n and Other Miscellaneous Data

(All Fuel prices are in Cents/MBtu)

12.60 **Base Yr ($/MWh) charging cost**
6.00% **Charging Esc.**

	4.50%	4.50%	2.00%								
Year	**Cumulative F O&M Esc**	**Cumulative V O&M Esc**	**Cumulative Capital Esc**	**High SO2 Gh1 5.0#**	**Gas**	**Cost Charging**	**No Fuel**	**Low SO2 Gh2-4 1.1#**	**(50% Moist) Wood Chips Esc @ 4.0%**	**Whole Tree Esc @ 4.0%**	**Med SO2 Br1-3 2.1#**
1999	1.000	1.000	1.000	97	243	12.60	0	121	222	160	120
2000	1.045	1.045	1.020	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2001	1.092	1.092	1.040	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2002	1.141	1.141	1.061	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2003	1.193	1.193	1.082	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2004	1.246	1.246	1.104	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2005	1.302	1.302	1.126	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2006	1.361	1.361	1.149	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2007	1.422	1.422	1.172	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2008	1.486	1.486	1.195	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2009	1.553	1.553	1.219	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2010	1.623	1.623	1.243	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2011	1.696	1.696	1.268	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2012	1.772	1.772	1.294	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2013	1.852	1.852	1.319	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2014	1.935	1.935	1.346	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2015	2.022	2.022	1.373	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2016	2.113	2.113	1.400	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2017	2.208	2.208	1.428	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2018	2.308	2.308	1.457	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2019	2.412	2.412	1.486	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2020	2.520	2.520	1.516	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2021	2.634	2.634	1.546	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2022	2.752	2.752	1.577	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2023	2.876	2.876	1.608	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2024	3.005	3.005	1.641	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2025	3.141	3.141	1.673	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2026	3.282	3.282	1.707	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2027	3.430	3.430	1.741	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]
2028	3.584	3.584	1.776	[redacted]	[redacted]	[redacted]	0	[redacted]	[redacted]	[redacted]	[redacted]

Fuel Notes:

When utilized, SO_2 cost adder to High SO2, Low SO2 and Med SO2 Coal assumes 95% FGD removal efficiency.

When utilized, the fuel cost adder representing Carbon Tax was applied to High, Low, & Med Sulfur coals, and Natural Gas.

8-19-99 Fuel Forecast Used. All fuel prices in cents/mmBtu.
Charging cost base upon average cost of off-peak generation.
Tech 26.3 burns Whole Trees whose cost is given in TAG SUPPLY V3.08 as 1.60$/MBtu (Jan 1995$). Assumed cost is constance to 1999.
Tech 26.1 burns Wood Chips whose cost is given in TAG SUPPLY V3.08 as 2.22$/MBtu (Jan 1995$). Assumed cost is constance to 1999.

		Fixed	*Variable*	*Capital*	**High SO2**	**Gas**	**Charging**	**No Fuel**	**Low SO2**	**(50% Moist) Wood Chips**	**Whole Tree**	**Med SO2**
Base Year =	1999										[redacted]	[redacted]
Levelized Year =	1999										[redacted]	[redacted]
Ea =		4.50%	4.50%	2.00%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
PV Rate (i) =	9.78%										[redacted]	[redacted]
k =		0.9519	0.9519	0.9291	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
n =	30										[redacted]	[redacted]
An =	9.6027										[redacted]	[redacted]
L_n =		1.591	1.591	1.215	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Adj L_n =		1.523	1.523	1.191	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

☐ Input
Not an Input
Calculated

Change "Levelized Year" to year desired for "Snapshot" year analysis.
Change "n" to 1 for "Snapshot" year analysis and 30 for levelized analyis.

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate- Base
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	98	125	153	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	87	114	140	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	186	197	208	219	230	240	251	262	273	283
Pulverized Coal (LSFO)-400MW	196	207	217	228	238	249	260	270	281	291	302
Pulverized Coal (LSFO)-300MW	201	215	228	241	255	268	281	295	308	322	335
Pulverized Coal (LSFO)-200MW	245	256	267	278	289	300	311	322	333	344	356
Pulverized Coal (LSFO)-300MW X 2	180	191	201	212	222	233	244	254	265	275	286
Pulverized Coal Compliance (LSD)- 300MW	190	204	217	231	244	258	271	285	298	312	325
Pulverized Coal Supercritical (LSD)- 300MW	228	242	256	271	285	299	313	327	341	356	370
Pulverized Coal (Advanced LSFO)- 400MW	203	213	224	234	244	254	264	274	285	295	305
Atmosph Fluidized Bed (Circulating)-200MW	251	267	282	298	314	330	345	361	377	392	408
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	288	300	312	324	337	349	361	373	385	397
Press Fluidized Bed (Bubbling)-350MW	192	203	214	225	237	248	259	270	281	292	303
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	201	212	223	233	244	255	266	277	288	299
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	246	257	269	280	292	303	314	326	337	349
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	188	200	211	222	234	245	257	268	279	291
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	186	197	208	219	230	241	252	263	274	285
Foster Wheeler Advanced PFB (Circulating)-688MW	163	176	189	203	216	229	243	256	270	283	296
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	255	264	274	283	293	303	312	322	331	341
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	235	245	255	266	276	286	296	306	316	327
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	262	273	284	295	306	317	328	339	350	361
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	351	364	377	391	404	417	430	444	457	470
Advanced Int. Coal Gas-460MW	177	189	201	212	224	236	248	259	271	283	295
Combustion Turbine Heavy Duty-80MW	70	105	140	175	210	245	280	315	350	385	420
Combustion Turbine Heavy Duty-110MW	61	98	135	172	209	246	283	320	357	394	431
Combustion Turbine Heavy Duty-160MW	56	87	118	149	180	211	242	273	304	335	366
Combustion Turbine Aero- 45MW	114	143	172	201	230	259	288	317	346	375	404
CT Combined Cycle 2on1 - 330MW	87	108	129	150	172	193	214	235	257	278	299
CT Combined Cycle 2on1 - 470MW	76	95	115	135	154	174	194	213	233	253	273
CT Combined Cycle - 345MW	79	99	118	138	157	176	196	215	234	254	273
CT with Cascaded Humidified Advanced Turbine-300MW	72	94	116	138	159	181	203	225	247	269	291
Phosphoric Acid Fuel Cell-2.5MW	1203	1231	1260	1288	1316	1345	1373	1401	1430	1458	1486
Molten Carbonate Fuel Cell-100MW	373	391	408	426	444	461	479	497	514	532	550
Solid Oxide Fuel Cell-100MW	187	204	220	236	253	269	285	302	318	334	351
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	297	374	451	528	606	683	760	837	914	991
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	181	192	204	215	227	238	249	261	272	284
Cane Run 3 Rehab w/ Natural Gas	127	156	186	215	245	274	304	333	363	393	422
Brown 5 CT 110MW	54	88	122	156	190	224	258	292	326	360	394
Brown 5 CT 164MW	55	84	113	142	171	200	229	258	287	316	345
Brown 5 CT 102MW	57	91	125	159	193	227	261	295	329	363	397
Brown 5 CT 159MW	51	81	111	141	171	201	231	261	291	321	351
Brown 5 CT 149MW	52	82	112	142	172	202	232	262	292	322	352
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	85	118	151	184	217	250	283	316	349	382
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	163	173	183	193	203	213	223	233	243	253
IAC at Brown 8-11	21	62	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	62	111	134	134	134	134	213	233	243	253

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low *1999 Dollars ($/kW yr)*
Heat Rate-Low
Fuel Forecast-Low

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	93	119	145	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	74	98	122	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	174	184	193	203	212	222	231	241	251	260
Pulverized Coal (LSFO)-400MW	184	193	203	212	221	231	240	250	259	268	278
Pulverized Coal (LSFO)-300MW	189	201	213	225	237	248	260	272	284	296	308
Pulverized Coal (LSFO)-200MW	231	240	250	260	270	279	289	299	308	318	328
Pulverized Coal (LSFO)-300MW X 2	169	178	188	197	206	216	225	235	244	253	263
Pulverized Coal Compliance (LSD)- 300MW	178	190	202	214	225	237	249	261	273	285	297
Pulverized Coal Supercritical (LSD)- 300MW	214	227	239	252	264	276	289	301	314	326	339
Pulverized Coal (Advanced LSFO)- 400MW	191	200	209	219	228	237	246	255	264	273	282
Atmosph Fluidized Bed (Circulating)-200MW	228	242	256	270	283	297	311	325	339	353	367
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	255	266	277	288	299	310	321	332	344	355
Press Fluidized Bed (Bubbling)-350MW	163	173	183	193	203	212	222	232	242	252	262
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	171	180	190	200	210	220	230	240	249	259
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	219	229	240	250	260	271	281	291	301	312
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	162	172	182	193	203	213	223	233	243	253
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	160	170	180	190	200	210	220	230	240	250
Foster Wheeler Advanced PFB (Circulating)-688MW	139	151	163	176	188	201	213	226	238	251	263
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	217	225	234	242	251	259	268	276	284	293
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	201	210	219	228	237	246	254	263	272	281
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	231	241	250	260	270	279	289	299	308	318
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	299	312	324	337	349	361	374	386	399	411
Advanced Int. Coal Gas-460MW	151	162	173	184	195	206	216	227	238	249	260
Combustion Turbine Heavy Duty-80MW	65	95	125	155	185	215	245	275	305	335	365
Combustion Turbine Heavy Duty-110MW	56	88	120	152	184	216	248	280	312	344	376
Combustion Turbine Heavy Duty-160MW	52	79	106	133	160	187	214	241	268	295	322
Combustion Turbine Aero- 45MW	105	130	155	180	205	230	255	280	305	330	355
CT Combined Cycle 2on1 - 330MW	81	99	117	135	153	171	189	207	225	243	261
CT Combined Cycle 2on1 - 470MW	71	87	104	121	138	154	171	188	205	222	238
CT Combined Cycle - 345MW	69	86	102	119	135	152	168	185	201	218	234
CT with Cascaded Humidified Advanced Turbine-300MW	64	83	102	121	140	159	178	197	215	234	253
Phosphoric Acid Fuel Cell-2.5MW	1115	1139	1164	1188	1212	1237	1261	1285	1310	1334	1358
Molten Carbonate Fuel Cell-100MW	332	347	363	378	393	409	424	439	455	470	485
Solid Oxide Fuel Cell-100MW	169	183	197	210	224	238	251	265	279	292	306
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	256	321	386	451	516	581	646	711	776	841
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	169	179	189	199	209	220	230	240	250	260
Cane Run 3 Rehab w/ Natural Gas	120	145	170	194	219	244	269	294	319	344	369
Brown 5 CT 110MW	52	81	110	139	168	197	226	255	284	313	342
Brown 5 CT 164MW	52	77	102	127	152	177	202	227	252	277	302
Brown 5 CT 102MW	55	84	113	142	171	200	229	258	287	316	345
Brown 5 CT 159MW	49	74	99	124	149	174	199	224	249	274	299
Brown 5 CT 149MW	50	76	102	128	154	180	206	232	258	284	310
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	78	106	134	162	190	218	246	274	302	330
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	157	166	175	183	192	201	210	218	227	236
IAC at Brown 8-11	20	56	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	56	98	119	134	134	134	185	201	218	234

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	94	121	148	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	76	102	128	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	175	185	196	206	216	227	237	247	257	268
Pulverized Coal (LSFO)-400MW	184	194	204	214	225	235	245	255	265	275	285
Pulverized Coal (LSFO)-300MW	189	202	215	227	240	253	266	279	291	304	317
Pulverized Coal (LSFO)-200MW	231	241	252	262	273	283	294	304	314	325	335
Pulverized Coal (LSFO)-300MW X 2	169	179	189	199	210	220	230	240	250	260	270
Pulverized Coal Compliance (LSD)- 300MW	178	191	204	217	230	243	256	269	281	294	307
Pulverized Coal Supercritical (LSD)- 300MW	214	228	242	255	269	283	296	310	324	337	351
Pulverized Coal (Advanced LSFO)- 400MW	191	201	211	221	231	241	250	260	270	280	290
Atmosph Fluidized Bed (Circulating)-200MW	228	243	258	273	288	303	318	333	347	362	377
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	256	267	279	291	302	314	326	337	349	361
Press Fluidized Bed (Bubbling)-350MW	163	174	184	195	206	216	227	238	248	259	269
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	171	182	192	203	213	224	234	244	255	265
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	220	231	241	252	263	274	285	296	307	318
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	163	174	185	196	207	217	228	239	250	261
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	160	171	181	192	203	213	224	235	245	256
Foster Wheeler Advanced PFB (Circulating)-688MW	139	152	165	178	191	204	217	230	243	256	269
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	217	226	236	245	254	263	272	281	290	299
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	202	211	221	231	240	250	260	270	279	289
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	232	243	253	264	275	285	296	307	317	328
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	300	313	325	338	351	364	377	390	403	416
Advanced Int. Coal Gas-460MW	151	163	174	185	197	208	219	231	242	254	265
Combustion Turbine Heavy Duty-80MW	65	99	133	167	201	235	269	303	337	371	405
Combustion Turbine Heavy Duty-110MW	56	92	128	164	200	236	272	308	344	380	416
Combustion Turbine Heavy Duty-160MW	52	82	112	142	172	202	232	262	292	322	352
Combustion Turbine Aero- 45MW	105	133	161	189	217	245	273	301	329	357	385
CT Combined Cycle 2on1 - 330MW	81	101	121	141	161	181	202	222	242	262	282
CT Combined Cycle 2on1 - 470MW	71	89	108	127	146	164	183	202	221	240	258
CT Combined Cycle - 345MW	69	88	106	125	143	162	180	199	217	236	254
CT with Cascaded Humidified Advanced Turbine-300MW	64	85	106	127	148	169	190	211	231	252	273
Phosphoric Acid Fuel Cell-2.5MW	1115	1142	1169	1196	1223	1250	1277	1304	1331	1358	1385
Molten Carbonate Fuel Cell-100MW	332	349	365	382	399	415	432	449	465	482	499
Solid Oxide Fuel Cell-100MW	169	185	201	216	232	248	263	279	295	310	326
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	264	337	411	484	557	630	704	777	850	923
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	170	181	191	202	213	224	235	246	257	268
Cane Run 3 Rehab w/ Natural Gas	120	148	176	204	232	260	288	316	344	372	400
Brown 5 CT 110MW	52	84	116	148	180	212	244	276	308	340	372
Brown 5 CT 164MW	52	79	106	133	160	187	214	241	268	295	322
Brown 5 CT 102MW	55	87	119	151	183	215	247	279	311	343	375
Brown 5 CT 159MW	49	77	105	133	161	189	217	245	273	301	329
Brown 5 CT 149MW	50	79	108	137	166	195	224	253	282	311	340
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	81	112	143	174	205	236	267	298	329	360
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	158	167	177	186	196	206	215	225	234	244
IAC at Brown 8-11	20	59	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	59	102	119	134	134	134	199	217	234	244

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	95	123	151	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	77	105	132	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	176	187	198	210	221	232	243	255	266	277
Pulverized Coal (LSFO)-400MW	184	195	206	218	229	240	251	263	274	285	296
Pulverized Coal (LSFO)-300MW	189	203	218	232	246	261	275	289	304	318	332
Pulverized Coal (LSFO)-200MW	231	242	254	266	278	289	301	313	324	336	348
Pulverized Coal (LSFO)-300MW X 2	169	180	191	203	214	225	236	248	259	270	281
Pulverized Coal Compliance (LSD)- 300MW	178	193	207	221	236	250	265	279	294	308	323
Pulverized Coal Supercritical (LSD)- 300MW	214	229	245	260	275	290	306	321	336	351	366
Pulverized Coal (Advanced LSFO)- 400MW	191	202	213	224	234	245	256	267	277	288	299
Atmosph Fluidized Bed (Circulating)-200MW	228	245	261	277	294	310	327	343	360	376	393
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	257	269	282	295	308	320	333	346	359	372
Press Fluidized Bed (Bubbling)-350MW	163	175	187	198	210	222	233	245	257	268	280
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	172	184	195	207	218	230	242	253	265	276
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	221	233	245	257	269	281	293	305	317	329
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	164	176	187	199	211	223	235	247	259	270
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	161	173	185	196	208	220	231	243	255	267
Foster Wheeler Advanced PFB (Circulating)-688MW	139	152	166	180	194	208	222	235	249	263	277
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	218	228	238	248	258	268	278	288	298	308
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	203	213	224	234	245	256	266	277	288	298
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	233	245	256	268	280	291	303	315	326	338
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	300	314	328	341	355	369	383	396	410	424
Advanced Int. Coal Gas-460MW	151	163	176	188	200	212	225	237	249	261	274
Combustion Turbine Heavy Duty-80MW	65	102	139	176	213	250	287	324	361	398	435
Combustion Turbine Heavy Duty-110MW	56	95	134	173	212	251	290	329	368	407	446
Combustion Turbine Heavy Duty-160MW	52	85	118	151	184	217	250	283	316	349	382
Combustion Turbine Aero- 45MW	105	135	165	195	225	255	285	315	345	375	405
CT Combined Cycle 2on1 - 330MW	81	103	125	147	169	191	214	236	258	280	302
CT Combined Cycle 2on1 - 470MW	71	91	112	132	153	174	194	215	236	256	277
CT Combined Cycle - 345MW	69	90	110	130	151	171	191	212	232	252	272
CT with Cascaded Humidified Advanced Turbine-300MW	64	87	110	132	155	178	201	223	246	269	292
Phosphoric Acid Fuel Cell-2.5MW	1115	1144	1174	1203	1232	1262	1291	1320	1350	1379	1408
Molten Carbonate Fuel Cell-100MW	332	350	369	387	405	424	442	460	479	497	515
Solid Oxide Fuel Cell-100MW	169	187	204	221	239	256	273	291	308	325	343
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	272	352	433	514	595	676	757	837	918	999
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	359	401	443	484	526	568	609	651	693	734
Bio Mass: Whole Tree-100MW	227	251	275	299	322	346	370	394	417	441	465
Cane Run 3 Rehab w/ AFBC	159	171	183	195	207	219	232	244	256	268	280
Cane Run 3 Rehab w/ Natural Gas	120	151	182	212	243	274	305	336	367	398	429
Brown 5 CT 110MW	52	87	122	157	192	227	262	297	332	367	402
Brown 5 CT 164MW	52	82	112	142	172	202	232	262	292	322	352
Brown 5 CT 102MW	55	90	125	160	195	230	265	300	335	370	405
Brown 5 CT 159MW	49	80	111	142	173	204	235	266	297	328	359
Brown 5 CT 149MW	50	82	114	146	178	210	242	274	306	338	370
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	84	118	152	186	220	254	288	322	356	390
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	159	170	181	191	202	213	224	234	245	256
IAC at Brown 8-11	20	62	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	62	105	119	134	134	134	212	232	245	256

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	93	120	146	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	75	100	125	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	175	184	194	204	214	224	234	243	253	263
Pulverized Coal (LSFO)-400MW	184	194	204	213	223	233	243	253	263	273	282
Pulverized Coal (LSFO)-300MW	189	201	214	226	238	251	263	275	288	300	312
Pulverized Coal (LSFO)-200MW	231	241	251	261	271	282	292	302	312	322	332
Pulverized Coal (LSFO)-300MW X 2	169	179	189	198	208	218	228	238	248	258	267
Pulverized Coal Compliance (LSD)- 300MW	178	191	203	215	228	240	253	265	278	290	303
Pulverized Coal Supercritical (LSD)- 300MW	214	227	240	253	266	280	293	306	319	332	345
Pulverized Coal (Advanced LSFO)- 400MW	191	201	210	220	229	239	249	258	268	277	287
Atmosph Fluidized Bed (Circulating)-200MW	228	243	257	271	286	300	315	329	344	358	373
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	255	267	278	289	301	312	324	335	346	358
Press Fluidized Bed (Bubbling)-350MW	163	174	184	194	204	215	225	235	246	256	266
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	171	181	191	201	212	222	232	242	252	262
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	219	230	241	251	262	272	283	294	304	315
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	163	173	184	194	205	216	226	237	247	258
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	160	170	181	191	201	211	222	232	242	253
Foster Wheeler Advanced PFB (Circulating)-688MW	139	151	164	177	190	202	215	228	241	253	266
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	217	226	235	243	252	261	270	278	287	296
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	201	211	220	230	239	248	258	267	276	286
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	231	241	251	261	271	281	291	301	311	321
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	299	312	325	338	351	363	376	389	402	414
Advanced Int. Coal Gas-460MW	151	162	173	185	196	207	218	229	240	251	262
Combustion Turbine Heavy Duty-80MW	65	96	127	158	189	220	251	282	313	344	375
Combustion Turbine Heavy Duty-110MW	56	89	122	155	188	221	254	287	320	353	386
Combustion Turbine Heavy Duty-160MW	52	80	108	136	164	192	220	248	276	304	332
Combustion Turbine Aero- 45MW	105	131	157	183	209	235	261	287	313	339	365
CT Combined Cycle 2on1 - 330MW	81	100	119	137	156	175	194	213	232	251	270
CT Combined Cycle 2on1 - 470MW	71	88	106	123	141	158	176	193	211	228	246
CT Combined Cycle - 345MW	69	87	104	122	139	156	174	191	208	226	243
CT with Cascaded Humidified Advanced Turbine-300MW	64	84	103	123	143	163	182	202	222	241	261
Phosphoric Acid Fuel Cell-2.5MW	1115	1140	1166	1191	1216	1242	1267	1292	1318	1343	1368
Molten Carbonate Fuel Cell-100MW	332	348	364	380	396	412	428	444	460	476	492
Solid Oxide Fuel Cell-100MW	169	184	199	213	228	243	257	272	287	301	316
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	259	328	396	465	533	602	670	739	807	876
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	169	180	191	201	212	222	233	244	254	265
Cane Run 3 Rehab w/ Natural Gas	120	146	172	198	224	250	277	303	329	355	381
Brown 5 CT 110MW	52	82	112	142	172	202	232	262	292	322	352
Brown 5 CT 164MW	52	78	104	130	156	182	208	234	260	286	312
Brown 5 CT 102MW	55	85	115	145	175	205	235	265	295	325	355
Brown 5 CT 159MW	49	76	103	130	157	184	211	238	265	292	319
Brown 5 CT 149MW	50	77	104	131	158	185	212	239	266	293	320
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	79	108	137	166	195	224	253	282	311	340
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	158	167	176	185	194	204	213	222	231	241
IAC at Brown 8-11	20	57	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	57	100	119	134	134	134	191	208	226	241

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate- Base
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	95	122	150	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	77	104	130	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	175	186	197	208	219	229	240	251	262	272
Pulverized Coal (LSFO)-400MW	184	195	205	216	226	237	248	258	269	279	290
Pulverized Coal (LSFO)-300MW	189	203	216	229	243	256	269	283	296	310	323
Pulverized Coal (LSFO)-200MW	231	242	253	264	275	286	297	308	319	330	342
Pulverized Coal (LSFO)-300MW X 2	169	180	190	201	211	222	233	243	254	264	275
Pulverized Coal Compliance (LSD)- 300MW	178	192	205	219	232	246	259	273	286	300	313
Pulverized Coal Supercritical (LSD)- 300MW	214	228	242	257	271	285	299	313	327	342	356
Pulverized Coal (Advanced LSFO)- 400MW	191	201	212	222	232	242	252	262	273	283	293
Atmosph Fluidized Bed (Circulating)-200MW	228	244	259	275	291	307	322	338	354	369	385
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	256	268	280	292	305	317	329	341	353	365
Press Fluidized Bed (Bubbling)-350MW	163	174	185	196	208	219	230	241	252	263	274
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	172	183	194	204	215	226	237	248	259	270
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	220	231	243	254	266	277	288	300	311	323
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	163	175	186	197	209	220	232	243	254	266
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	161	172	183	194	205	216	227	238	249	260
Foster Wheeler Advanced PFB (Circulating)-688MW	139	152	165	179	192	205	219	232	246	259	272
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	218	227	237	246	256	266	275	285	294	304
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	202	212	222	233	243	253	263	273	283	294
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	232	243	254	265	276	287	298	309	320	331
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	300	313	326	340	353	366	379	393	406	419
Advanced Int. Coal Gas-460MW	151	163	175	186	198	210	222	233	245	257	269
Combustion Turbine Heavy Duty-80MW	65	100	135	170	205	240	275	310	345	380	415
Combustion Turbine Heavy Duty-110MW	56	93	130	167	204	241	278	315	352	389	426
Combustion Turbine Heavy Duty-160MW	52	83	114	145	176	207	238	269	300	331	362
Combustion Turbine Aero- 45MW	105	134	163	192	221	250	279	308	337	366	395
CT Combined Cycle 2on1 - 330MW	81	102	123	144	166	187	208	229	251	272	293
CT Combined Cycle 2on1 - 470MW	71	90	110	130	149	169	189	208	228	248	268
CT Combined Cycle - 345MW	69	89	108	128	147	166	186	205	224	244	263
CT with Cascaded Humidified Advanced Turbine-300MW	64	86	108	130	151	173	195	217	239	261	283
Phosphoric Acid Fuel Cell-2.5MW	1115	1143	1172	1200	1228	1257	1285	1313	1342	1370	1398
Molten Carbonate Fuel Cell-100MW	332	350	367	385	403	420	438	456	473	491	509
Solid Oxide Fuel Cell-100MW	169	186	202	218	235	251	267	284	300	316	333
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	268	345	422	499	577	654	731	808	885	962
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	170	181	193	204	216	227	238	250	261	273
Cane Run 3 Rehab w/ Natural Gas	120	149	179	208	238	267	297	326	356	386	415
Brown 5 CT 110MW	52	86	120	154	188	222	256	290	324	358	392
Brown 5 CT 164MW	52	81	110	139	168	197	226	255	284	313	342
Brown 5 CT 102MW	55	89	123	157	191	225	259	293	327	361	395
Brown 5 CT 159MW	49	79	109	139	169	199	229	259	289	319	349
Brown 5 CT 149MW	50	80	110	140	170	200	230	260	290	320	350
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	83	116	149	182	215	248	281	314	347	380
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	158	168	178	188	198	208	218	228	238	248
IAC at Brown 8-11	20	61	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	61	104	119	134	134	134	205	224	238	248

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate- Base
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	96	124	153	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	78	107	135	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	177	188	200	212	224	236	248	259	271	283
Pulverized Coal (LSFO)-400MW	184	196	207	219	231	242	254	266	277	289	301
Pulverized Coal (LSFO)-300MW	189	204	219	234	249	264	279	294	309	323	338
Pulverized Coal (LSFO)-200MW	231	243	255	267	279	292	304	316	328	340	352
Pulverized Coal (LSFO)-300MW X 2	169	181	193	204	216	228	240	252	264	276	287
Pulverized Coal Compliance (LSD)- 300MW	178	193	209	224	239	254	269	285	300	315	330
Pulverized Coal Supercritical (LSD)- 300MW	214	230	246	262	278	293	309	325	341	357	373
Pulverized Coal (Advanced LSFO)- 400MW	191	203	214	225	236	247	259	270	281	292	304
Atmosph Fluidized Bed (Circulating)-200MW	228	245	263	280	297	314	331	349	366	383	400
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	257	270	284	297	310	323	336	350	363	376
Press Fluidized Bed (Bubbling)-350MW	163	175	188	200	212	224	236	248	260	273	285
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	173	185	197	209	221	233	245	257	269	281
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	221	234	246	259	271	283	296	308	321	333
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	164	177	189	202	214	227	239	252	264	277
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	162	174	186	198	210	223	235	247	259	271
Foster Wheeler Advanced PFB (Circulating)-688MW	139	153	167	181	196	210	224	239	253	267	282
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	219	229	240	250	261	271	282	292	302	313
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	203	214	225	236	247	258	270	281	292	303
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	234	246	258	271	283	295	308	320	332	345
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	301	315	329	343	357	372	386	400	414	428
Advanced Int. Coal Gas-460MW	151	164	176	189	202	214	227	240	252	265	277
Combustion Turbine Heavy Duty-80MW	65	104	143	182	221	260	299	338	377	416	455
Combustion Turbine Heavy Duty-110MW	56	97	138	179	220	261	302	343	384	425	466
Combustion Turbine Heavy Duty-160MW	52	87	122	157	192	227	262	297	332	367	402
Combustion Turbine Aero- 45MW	105	137	169	201	233	265	297	329	361	393	425
CT Combined Cycle 2on1 - 330MW	81	104	127	151	174	198	221	244	268	291	315
CT Combined Cycle 2on1 - 470MW	71	92	114	135	157	178	200	221	243	264	286
CT Combined Cycle - 345MW	69	91	112	133	154	176	197	218	239	260	282
CT with Cascaded Humidified Advanced Turbine-300MW	64	88	112	136	159	183	207	231	255	279	303
Phosphoric Acid Fuel Cell-2.5MW	1115	1146	1176	1207	1238	1268	1299	1330	1360	1391	1422
Molten Carbonate Fuel Cell-100MW	332	351	370	389	408	427	446	465	484	503	522
Solid Oxide Fuel Cell-100MW	169	187	205	223	241	259	277	295	313	331	349
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	276	361	446	531	617	702	787	872	957	1042
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	361	405	449	493	537	581	624	668	712	756
Bio Mass: Whole Tree-100MW	227	252	277	302	327	352	377	401	426	451	476
Cane Run 3 Rehab w/ AFBC	159	171	184	197	209	222	234	247	260	272	285
Cane Run 3 Rehab w/ Natural Gas	120	152	185	217	250	282	314	347	379	412	444
Brown 5 CT 110MW	52	89	126	163	200	237	274	311	348	385	422
Brown 5 CT 164MW	52	84	116	148	180	212	244	276	308	340	372
Brown 5 CT 102MW	55	92	129	166	203	240	277	314	351	388	425
Brown 5 CT 159MW	49	82	115	148	181	214	247	280	313	346	379
Brown 5 CT 149MW	50	84	118	152	186	220	254	288	322	356	390
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	85	120	155	190	225	260	295	330	365	400
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	160	171	182	193	204	216	227	238	249	261
IAC at Brown 8-11	20	64	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	64	107	119	134	134	134	218	238	249	261

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate- High
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	94	121	148	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	76	102	127	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	175	185	196	206	216	227	237	247	257	268
Pulverized Coal (LSFO)-400MW	184	194	205	215	225	235	246	256	266	277	287
Pulverized Coal (LSFO)-300MW	189	202	215	228	241	254	267	280	293	305	318
Pulverized Coal (LSFO)-200MW	231	241	252	263	273	284	294	305	316	326	337
Pulverized Coal (LSFO)-300MW X 2	169	179	190	200	210	220	231	241	251	262	272
Pulverized Coal Compliance (LSD)- 300MW	178	191	204	217	230	243	256	269	281	294	307
Pulverized Coal Supercritical (LSD)- 300MW	214	228	242	255	269	283	296	310	324	337	351
Pulverized Coal (Advanced LSFO)- 400MW	191	201	211	221	231	241	250	260	270	280	290
Atmosph Fluidized Bed (Circulating)-200MW	228	243	258	273	288	303	319	334	349	364	379
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	256	268	279	291	303	315	327	339	350	362
Press Fluidized Bed (Bubbling)-350MW	163	174	184	195	206	216	227	238	248	259	269
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	171	182	193	203	214	224	235	246	256	267
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	220	231	242	253	264	275	286	297	308	319
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	163	174	185	196	207	217	228	239	250	261
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	160	171	182	193	203	214	225	236	247	257
Foster Wheeler Advanced PFB (Circulating)-688MW	139	152	165	178	191	204	217	230	243	256	269
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	218	227	236	245	254	264	273	282	291	301
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	202	211	221	231	240	250	260	270	279	289
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	232	243	253	264	275	285	296	307	317	328
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	300	313	326	339	352	365	378	391	404	417
Advanced Int. Coal Gas-460MW	151	163	174	186	197	209	220	232	243	255	266
Combustion Turbine Heavy Duty-80MW	65	98	131	164	197	230	263	296	329	362	395
Combustion Turbine Heavy Duty-110MW	56	91	126	161	196	231	266	301	336	371	406
Combustion Turbine Heavy Duty-160MW	52	81	110	139	168	197	226	255	284	313	342
Combustion Turbine Aero- 45MW	105	132	159	186	213	240	267	294	321	348	375
CT Combined Cycle 2on1 - 330MW	81	101	120	140	160	180	200	220	239	259	279
CT Combined Cycle 2on1 - 470MW	71	89	107	126	144	162	180	199	217	235	254
CT Combined Cycle - 345MW	69	88	106	124	142	160	178	196	215	233	251
CT with Cascaded Humidified Advanced Turbine-300MW	64	85	105	126	147	167	188	208	229	250	270
Phosphoric Acid Fuel Cell-2.5MW	1115	1141	1168	1194	1220	1247	1273	1299	1326	1352	1378
Molten Carbonate Fuel Cell-100MW	332	349	365	382	399	415	432	449	465	482	499
Solid Oxide Fuel Cell-100MW	169	185	200	215	231	246	261	277	292	307	323
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	263	335	407	479	551	623	695	767	839	911
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	170	181	192	203	214	225	236	247	258	269
Cane Run 3 Rehab w/ Natural Gas	120	147	175	202	230	257	285	312	340	368	395
Brown 5 CT 110MW	52	83	114	145	176	207	238	269	300	331	362
Brown 5 CT 164MW	52	79	106	133	160	187	214	241	268	295	322
Brown 5 CT 102MW	55	87	119	151	183	215	247	279	311	343	375
Brown 5 CT 159MW	49	77	105	133	161	189	217	245	273	301	329
Brown 5 CT 149MW	50	78	106	134	162	190	218	246	274	302	330
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	81	112	143	174	205	236	267	298	329	360
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	158	168	177	187	197	206	216	226	236	245
IAC at Brown 8-11	20	59	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	59	102	119	134	134	134	196	215	233	245

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	95	123	151	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	78	106	133	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	176	187	198	209	220	231	242	253	264	275
Pulverized Coal (LSFO)-400MW	184	195	206	217	228	239	250	261	273	284	295
Pulverized Coal (LSFO)-300MW	189	203	217	231	245	259	273	287	301	315	329
Pulverized Coal (LSFO)-200MW	231	242	254	265	277	288	300	312	323	335	346
Pulverized Coal (LSFO)-300MW X 2	169	180	191	202	213	224	235	246	258	269	280
Pulverized Coal Compliance (LSD)- 300MW	178	192	206	221	235	249	263	277	291	305	320
Pulverized Coal Supercritical (LSD)- 300MW	214	229	244	258	273	288	303	318	332	347	362
Pulverized Coal (Advanced LSFO)- 400MW	191	202	213	223	234	244	255	266	276	287	297
Atmosph Fluidized Bed (Circulating)-200MW	228	244	261	277	293	310	326	342	359	375	391
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	256	269	282	294	307	320	332	345	357	370
Press Fluidized Bed (Bubbling)-350MW	163	175	186	198	209	221	232	244	256	267	279
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	172	184	195	206	218	229	240	252	263	275
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	221	232	244	256	268	280	292	303	315	327
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	164	176	187	199	211	223	235	247	259	270
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	161	173	184	196	207	219	230	242	253	265
Foster Wheeler Advanced PFB (Circulating)-688MW	139	152	166	180	194	208	222	235	249	263	277
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	218	228	238	248	258	267	277	287	297	307
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	202	213	223	234	244	255	265	276	286	297
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	233	245	256	268	280	291	303	315	326	338
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	300	314	327	341	354	368	381	395	409	422
Advanced Int. Coal Gas-460MW	151	163	175	188	200	212	224	236	248	260	272
Combustion Turbine Heavy Duty-80MW	65	102	139	176	213	250	287	324	361	398	435
Combustion Turbine Heavy Duty-110MW	56	95	134	173	212	251	290	329	368	407	446
Combustion Turbine Heavy Duty-160MW	52	85	118	151	184	217	250	283	316	349	382
Combustion Turbine Aero- 45MW	105	135	165	195	225	255	285	315	345	375	405
CT Combined Cycle 2on1 - 330MW	81	103	125	148	170	192	215	237	259	281	304
CT Combined Cycle 2on1 - 470MW	71	91	112	132	153	174	194	215	236	256	277
CT Combined Cycle - 345MW	69	90	110	130	151	171	191	212	232	252	272
CT with Cascaded Humidified Advanced Turbine-300MW	64	87	110	132	155	178	201	223	246	269	292
Phosphoric Acid Fuel Cell-2.5MW	1115	1144	1174	1203	1232	1262	1291	1320	1350	1379	1408
Molten Carbonate Fuel Cell-100MW	332	350	369	387	405	424	442	460	479	497	515
Solid Oxide Fuel Cell-100MW	169	187	204	221	239	256	273	291	308	325	343
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	272	353	434	515	596	677	758	839	920	1001
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	171	183	195	207	219	231	243	255	267	279
Cane Run 3 Rehab w/ Natural Gas	120	151	182	212	243	274	305	336	367	398	429
Brown 5 CT 110MW	52	87	122	157	192	227	262	297	332	367	402
Brown 5 CT 164MW	52	82	112	142	172	202	232	262	292	322	352
Brown 5 CT 102MW	55	90	125	160	195	230	265	300	335	370	405
Brown 5 CT 159MW	49	80	111	142	173	204	235	266	297	328	359
Brown 5 CT 149MW	50	82	114	146	178	210	242	274	306	338	370
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	84	118	152	186	220	254	288	322	356	390
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	159	170	180	191	201	212	223	233	244	254
IAC at Brown 8-11	20	62	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	62	106	119	134	134	134	212	232	244	254

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost-Low *1999 Dollars ($/kW yr)*
Heat Rate- High
Fuel Forecast- High

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	95	132	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	55	87	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	77	106	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	129	162	195	228	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	67	96	126	155	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	50	79	109	138	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	79	106	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	165	177	189	202	214	226	239	251	263	275	288
Pulverized Coal (LSFO)-400MW	184	196	209	221	233	245	258	270	282	295	307
Pulverized Coal (LSFO)-300MW	189	205	221	236	252	268	283	299	315	330	346
Pulverized Coal (LSFO)-200MW	231	243	256	269	281	294	306	319	332	344	357
Pulverized Coal (LSFO)-300MW X 2	169	181	194	206	218	230	243	255	267	280	292
Pulverized Coal Compliance (LSD)- 300MW	178	194	210	226	241	257	273	289	305	321	337
Pulverized Coal Supercritical (LSD)- 300MW	214	231	247	264	281	297	314	330	347	364	380
Pulverized Coal (Advanced LSFO)- 400MW	191	203	215	226	238	250	261	273	285	297	308
Atmosph Fluidized Bed (Circulating)-200MW	228	246	264	282	300	318	336	354	372	390	408
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	244	258	272	285	299	313	327	341	355	368	382
Press Fluidized Bed (Bubbling)-350MW	163	176	188	201	214	226	239	252	264	277	289
Press Fluidized Bed (Bubbling, Supercritic)-340MW	161	173	186	198	211	223	236	248	260	273	285
Press Fluidized Bed (Circulating, with Reheat)-160MW	209	222	235	247	260	273	286	299	312	325	338
Press Fluidized Bed (Circulating, with Reheat)-360MW	152	165	178	191	204	217	229	242	255	268	281
Press Fluidized Bed (Circulating, Supercritical)-360MW	150	162	175	187	200	213	225	238	251	263	276
Foster Wheeler Advanced PFB (Circulating)-688MW	139	153	168	183	198	212	227	242	257	271	286
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	208	219	230	241	252	263	274	285	296	307	318
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	192	204	215	227	238	250	261	273	284	296	307
Int Coal Gas / CAES with Humid Air Turbine-410MW	221	234	247	259	272	285	297	310	323	335	348
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	287	301	316	330	345	359	373	388	402	417	431
Advanced Int. Coal Gas-460MW	151	164	177	191	204	217	230	243	256	269	282
Combustion Turbine Heavy Duty-80MW	65	106	147	188	229	270	311	352	393	434	475
Combustion Turbine Heavy Duty-110MW	56	99	142	185	228	271	314	357	400	443	486
Combustion Turbine Heavy Duty-160MW	52	88	124	160	196	232	268	304	340	376	412
Combustion Turbine Aero- 45MW	105	138	171	204	237	270	303	336	369	402	435
CT Combined Cycle 2on1 - 330MW	81	105	130	154	179	203	227	252	276	301	325
CT Combined Cycle 2on1 - 470MW	71	93	116	138	161	184	206	229	252	274	297
CT Combined Cycle - 345MW	69	92	114	136	159	181	203	226	248	270	292
CT with Cascaded Humidified Advanced Turbine-300MW	64	89	114	139	164	189	214	239	263	288	313
Phosphoric Acid Fuel Cell-2.5MW	1115	1147	1179	1211	1243	1275	1307	1339	1371	1403	1435
Molten Carbonate Fuel Cell-100MW	332	352	372	392	412	432	452	472	492	512	532
Solid Oxide Fuel Cell-100MW	169	188	207	226	245	264	283	302	321	340	359
Geothermal: Dual Flash Brine, Air Cooled-24MW	191	280	369	459	548	638	727	816	906	995	1084
Solar Photovoltaic:Flat Plate-10x5MW	416	416	416	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	461	461	461	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	440	440	440	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	359	363	367	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	139	139	139	139	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	155	155	155	155	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	119	119	119	119	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	840	875	910	944	979	1014	1048	1083	1117	1152	1187
Municipal Solid Waste: Refuse Der.-40MW	929	964	998	1033	1067	1102	1136	1171	1205	1240	1274
Municipal Solid Waste: Tire-30MW	529	534	539	544	548	553	558	563	567	572	577
Bio Mass: Wood-Fired Stoker Boiler-50MW	317	363	409	455	501	547	593	638	684	730	776
Bio Mass: Whole Tree-100MW	227	253	279	305	331	357	383	409	435	461	487
Cane Run 3 Rehab w/ AFBC	159	172	185	198	212	225	238	251	265	278	291
Cane Run 3 Rehab w/ Natural Gas	120	154	188	222	256	290	325	359	393	427	461
Brown 5 CT 110MW	52	91	130	169	208	247	286	325	364	403	442
Brown 5 CT 164MW	52	85	118	151	184	217	250	283	316	349	382
Brown 5 CT 102MW	55	94	133	172	211	250	289	328	367	406	445
Brown 5 CT 159MW	49	83	117	151	185	219	253	287	321	355	389
Brown 5 CT 149MW	50	85	120	155	190	225	260	295	330	365	400
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	50	87	124	161	198	235	272	309	346	383	420
Ohio Falls 9&10	142	142	142	142	----	----	----	----	----	----	----
Trimble County 2	148	160	172	184	196	208	219	231	243	255	267
IAC at Brown 8-11	20	66	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	20	66	109	119	134	134	134	226	243	255	267

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate-Low
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	96	122	148	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	84	108	132	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	185	195	204	214	223	233	242	252	262	271
Pulverized Coal (LSFO)-400MW	196	205	215	224	233	243	252	262	271	280	290
Pulverized Coal (LSFO)-300MW	201	213	225	237	249	260	272	284	296	308	320
Pulverized Coal (LSFO)-200MW	245	254	264	274	284	293	303	313	322	332	342
Pulverized Coal (LSFO)-300MW X 2	180	189	199	208	217	227	236	246	255	264	274
Pulverized Coal Compliance (LSD)- 300MW	190	202	214	226	237	249	261	273	285	297	309
Pulverized Coal Supercritical (LSD)- 300MW	228	241	253	266	278	290	303	315	328	340	353
Pulverized Coal (Advanced LSFO)- 400MW	203	212	221	231	240	249	258	267	276	285	294
Atmosph Fluidized Bed (Circulating)-200MW	251	265	279	293	306	320	334	348	362	376	390
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	287	298	309	320	331	342	353	364	376	387
Press Fluidized Bed (Bubbling)-350MW	192	202	212	222	232	241	251	261	271	281	291
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	200	209	219	229	239	249	259	269	278	288
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	245	255	266	276	286	297	307	317	327	338
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	187	197	207	218	228	238	248	258	268	278
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	185	195	205	215	225	235	245	255	265	275
Foster Wheeler Advanced PFB (Circulating)-688MW	163	175	187	200	212	225	237	250	262	275	287
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	254	262	271	279	288	296	305	313	321	330
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	234	243	252	261	270	279	287	296	305	314
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	261	271	280	290	300	309	319	329	338	348
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	350	363	375	388	400	412	425	437	450	462
Advanced Int. Coal Gas-460MW	177	188	199	210	221	232	242	253	264	275	286
Combustion Turbine Heavy Duty-80MW	70	100	130	160	190	220	250	280	310	340	370
Combustion Turbine Heavy Duty-110MW	61	93	125	157	189	221	253	285	317	349	381
Combustion Turbine Heavy Duty-160MW	56	83	110	137	164	191	218	245	272	299	326
Combustion Turbine Aero- 45MW	114	139	164	189	214	239	264	289	314	339	364
CT Combined Cycle 2on1 - 330MW	87	105	123	141	159	177	195	213	231	249	267
CT Combined Cycle 2on1 - 470MW	76	92	109	126	143	159	176	193	210	227	243
CT Combined Cycle - 345MW	79	96	112	129	145	162	178	195	211	228	244
CT with Cascaded Humidified Advanced Turbine-300MW	72	91	110	129	148	167	186	205	223	242	261
Phosphoric Acid Fuel Cell-2.5MW	1203	1227	1252	1276	1300	1325	1349	1373	1398	1422	1446
Molten Carbonate Fuel Cell-100MW	373	388	404	419	434	450	465	480	496	511	526
Solid Oxide Fuel Cell-100MW	187	201	215	228	242	256	269	283	297	310	324
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	285	350	415	480	545	610	675	740	805	870
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	180	190	200	210	220	231	241	251	261	271
Cane Run 3 Rehab w/ Natural Gas	127	152	177	201	226	251	276	301	326	351	376
Brown 5 CT 110MW	54	83	112	141	170	199	228	257	286	315	344
Brown 5 CT 164MW	55	80	105	130	155	180	205	230	255	280	305
Brown 5 CT 102MW	57	86	115	144	173	202	231	260	289	318	347
Brown 5 CT 159MW	51	76	101	126	151	176	201	226	251	276	301
Brown 5 CT 149MW	52	78	104	130	156	182	208	234	260	286	312
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	80	108	136	164	192	220	248	276	304	332
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	162	171	180	188	197	206	215	223	232	241
IAC at Brown 8-11	21	57	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	57	101	126	134	134	134	193	210	227	241

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	97	124	151	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	86	112	138	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	186	196	207	217	227	238	248	258	268	279
Pulverized Coal (LSFO)-400MW	196	206	216	226	237	247	257	267	277	287	297
Pulverized Coal (LSFO)-300MW	201	214	227	239	252	265	278	291	303	316	329
Pulverized Coal (LSFO)-200MW	245	255	266	276	287	297	308	318	328	339	349
Pulverized Coal (LSFO)-300MW X 2	180	190	200	210	221	231	241	251	261	271	281
Pulverized Coal Compliance (LSD)- 300MW	190	203	216	229	242	255	268	281	293	306	319
Pulverized Coal Supercritical (LSD)- 300MW	228	242	256	269	283	297	310	324	338	351	365
Pulverized Coal (Advanced LSFO)- 400MW	203	213	223	233	243	253	262	272	282	292	302
Atmosph Fluidized Bed (Circulating)-200MW	251	266	281	296	311	326	341	356	370	385	400
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	288	299	311	323	334	346	358	369	381	393
Press Fluidized Bed (Bubbling)-350MW	192	203	213	224	235	245	256	267	277	288	298
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	200	211	221	232	242	253	263	273	284	294
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	246	257	267	278	289	300	311	322	333	344
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	188	199	210	221	232	242	253	264	275	286
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	185	196	206	217	228	238	249	260	270	281
Foster Wheeler Advanced PFB (Circulating)-688MW	163	176	189	202	215	228	241	254	267	280	293
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	254	263	273	282	291	300	309	318	327	336
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	235	244	254	264	273	283	293	303	312	322
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	262	273	283	294	305	315	326	337	347	358
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	351	364	376	389	402	415	428	441	454	467
Advanced Int. Coal Gas-460MW	177	189	200	211	223	234	245	257	268	280	291
Combustion Turbine Heavy Duty-80MW	70	104	138	172	206	240	274	308	342	376	410
Combustion Turbine Heavy Duty-110MW	61	97	133	169	205	241	277	313	349	385	421
Combustion Turbine Heavy Duty-160MW	56	86	116	146	176	206	236	266	296	326	356
Combustion Turbine Aero- 45MW	114	142	170	198	226	254	282	310	338	366	394
CT Combined Cycle 2on1 - 330MW	87	107	127	147	167	187	208	228	248	268	288
CT Combined Cycle 2on1 - 470MW	76	94	113	132	151	169	188	207	226	245	263
CT Combined Cycle - 345MW	79	98	116	135	153	172	190	209	227	246	264
CT with Cascaded Humidified Advanced Turbine-300MW	72	93	114	135	156	177	198	219	239	260	281
Phosphoric Acid Fuel Cell-2.5MW	1203	1230	1257	1284	1311	1338	1365	1392	1419	1446	1473
Molten Carbonate Fuel Cell-100MW	373	390	406	423	440	456	473	490	506	523	540
Solid Oxide Fuel Cell-100MW	187	203	219	234	250	266	281	297	313	328	344
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	293	366	440	513	586	659	733	806	879	952
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	181	192	202	213	224	235	246	257	268	279
Cane Run 3 Rehab w/ Natural Gas	127	155	183	211	239	267	295	323	351	379	407
Brown 5 CT 110MW	54	86	118	150	182	214	246	278	310	342	374
Brown 5 CT 164MW	55	82	109	136	163	190	217	244	271	298	325
Brown 5 CT 102MW	57	89	121	153	185	217	249	281	313	345	377
Brown 5 CT 159MW	51	79	107	135	163	191	219	247	275	303	331
Brown 5 CT 149MW	52	81	110	139	168	197	226	255	284	313	342
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	83	114	145	176	207	238	269	300	331	362
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	163	172	182	191	201	211	220	230	239	249
IAC at Brown 8-11	21	60	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	60	107	132	134	134	134	207	226	239	249

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	98	126	154	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	87	115	142	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	187	198	209	221	232	243	254	266	277	288
Pulverized Coal (LSFO)-400MW	196	207	218	230	241	252	263	275	286	297	308
Pulverized Coal (LSFO)-300MW	201	215	230	244	258	273	287	301	316	330	344
Pulverized Coal (LSFO)-200MW	245	256	268	280	292	303	315	327	338	350	362
Pulverized Coal (LSFO)-300MW X 2	180	191	202	214	225	236	247	259	270	281	292
Pulverized Coal Compliance (LSD)- 300MW	190	205	219	233	248	262	277	291	306	320	335
Pulverized Coal Supercritical (LSD)- 300MW	228	243	259	274	289	304	320	335	350	365	380
Pulverized Coal (Advanced LSFO)- 400MW	203	214	225	236	246	257	268	279	289	300	311
Atmosph Fluidized Bed (Circulating)-200MW	251	268	284	300	317	333	350	366	383	399	416
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	289	301	314	327	340	352	365	378	391	404
Press Fluidized Bed (Bubbling)-350MW	192	204	216	227	239	251	262	274	286	297	309
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	201	213	224	236	247	259	271	282	294	305
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	247	259	271	283	295	307	319	331	343	355
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	189	201	212	224	236	248	260	272	284	295
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	186	198	210	221	233	245	256	268	280	292
Foster Wheeler Advanced PFB (Circulating)-688MW	163	176	190	204	218	232	246	259	273	287	301
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	255	265	275	285	295	305	315	325	335	345
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	236	246	257	267	278	289	299	310	321	331
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	263	275	286	298	310	321	333	345	356	368
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	351	365	379	392	406	420	434	447	461	475
Advanced Int. Coal Gas-460MW	177	189	202	214	226	238	251	263	275	287	300
Combustion Turbine Heavy Duty-80MW	70	107	144	181	218	255	292	329	366	403	440
Combustion Turbine Heavy Duty-110MW	61	100	139	178	217	256	295	334	373	412	451
Combustion Turbine Heavy Duty-160MW	56	89	122	155	188	221	254	287	320	353	386
Combustion Turbine Aero- 45MW	114	144	174	204	234	264	294	324	354	384	414
CT Combined Cycle 2on1 - 330MW	87	109	131	153	175	197	220	242	264	286	308
CT Combined Cycle 2on1 - 470MW	76	96	117	137	158	179	199	220	241	261	282
CT Combined Cycle - 345MW	79	100	120	140	161	181	201	222	242	262	282
CT with Cascaded Humidified Advanced Turbine-300MW	72	95	118	140	163	186	209	231	254	277	300
Phosphoric Acid Fuel Cell-2.5MW	1203	1232	1262	1291	1320	1350	1379	1408	1438	1467	1496
Molten Carbonate Fuel Cell-100MW	373	391	410	428	446	465	483	501	520	538	556
Solid Oxide Fuel Cell-100MW	187	205	222	239	257	274	291	309	326	343	361
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	301	381	462	543	624	705	786	866	947	1028
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	401	443	485	526	568	610	651	693	735	776
Bio Mass: Whole Tree-100MW	276	300	324	348	371	395	419	443	466	490	514
Cane Run 3 Rehab w/ AFBC	170	182	194	206	218	230	243	255	267	279	291
Cane Run 3 Rehab w/ Natural Gas	127	158	189	219	250	281	312	343	374	405	436
Brown 5 CT 110MW	54	89	124	159	194	229	264	299	334	369	404
Brown 5 CT 164MW	55	85	115	145	175	205	235	265	295	325	355
Brown 5 CT 102MW	57	92	127	162	197	232	267	302	337	372	407
Brown 5 CT 159MW	51	82	113	144	175	206	237	268	299	330	361
Brown 5 CT 149MW	52	84	116	148	180	212	244	276	308	340	372
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	86	120	154	188	222	256	290	324	358	392
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	164	175	186	196	207	218	229	239	250	261
IAC at Brown 8-11	21	63	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	63	113	134	134	134	134	220	239	250	261

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	96	123	149	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	85	110	135	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	186	195	205	215	225	235	245	254	264	274
Pulverized Coal (LSFO)-400MW	196	206	216	225	235	245	255	265	275	285	294
Pulverized Coal (LSFO)-300MW	201	213	226	238	250	263	275	287	300	312	324
Pulverized Coal (LSFO)-200MW	245	255	265	275	285	296	306	316	326	336	346
Pulverized Coal (LSFO)-300MW X 2	180	190	200	209	219	229	239	249	259	269	278
Pulverized Coal Compliance (LSD)- 300MW	190	203	215	227	240	252	265	277	290	302	315
Pulverized Coal Supercritical (LSD)- 300MW	228	241	254	267	280	294	307	320	333	346	359
Pulverized Coal (Advanced LSFO)- 400MW	203	213	222	232	241	251	261	270	280	289	299
Atmosph Fluidized Bed (Circulating)-200MW	251	266	280	294	309	323	338	352	367	381	396
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	287	299	310	321	333	344	356	367	378	390
Press Fluidized Bed (Bubbling)-350MW	192	203	213	223	233	244	254	264	275	285	295
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	200	210	220	230	241	251	261	271	281	291
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	245	256	267	277	288	298	309	320	330	341
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	188	198	209	219	230	241	251	262	272	283
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	185	195	206	216	226	236	247	257	267	278
Foster Wheeler Advanced PFB (Circulating)-688MW	163	175	188	201	214	226	239	252	265	277	290
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	254	263	272	280	289	298	307	315	324	333
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	234	244	253	263	272	281	291	300	309	319
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	261	271	281	291	301	311	321	331	341	351
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	350	363	376	389	402	414	427	440	453	465
Advanced Int. Coal Gas-460MW	177	188	199	211	222	233	244	255	266	277	288
Combustion Turbine Heavy Duty-80MW	70	101	132	163	194	225	256	287	318	349	380
Combustion Turbine Heavy Duty-110MW	61	94	127	160	193	226	259	292	325	358	391
Combustion Turbine Heavy Duty-160MW	56	84	112	140	168	196	224	252	280	308	336
Combustion Turbine Aero- 45MW	114	140	166	192	218	244	270	296	322	348	374
CT Combined Cycle 2on1 - 330MW	87	106	125	143	162	181	200	219	238	257	276
CT Combined Cycle 2on1 - 470MW	76	93	111	128	146	163	181	198	216	233	251
CT Combined Cycle - 345MW	79	97	114	132	149	166	184	201	218	236	253
CT with Cascaded Humidified Advanced Turbine-300MW	72	92	111	131	151	171	190	210	230	249	269
Phosphoric Acid Fuel Cell-2.5MW	1203	1228	1254	1279	1304	1330	1355	1380	1406	1431	1456
Molten Carbonate Fuel Cell-100MW	373	389	405	421	437	453	469	485	501	517	533
Solid Oxide Fuel Cell-100MW	187	202	217	231	246	261	275	290	305	319	334
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	288	357	425	494	562	631	699	768	836	905
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	180	191	202	212	223	233	244	255	265	276
Cane Run 3 Rehab w/ Natural Gas	127	153	179	205	231	257	284	310	336	362	388
Brown 5 CT 110MW	54	84	114	144	174	204	234	264	294	324	354
Brown 5 CT 164MW	55	81	107	133	159	185	211	237	263	289	315
Brown 5 CT 102MW	57	87	117	147	177	207	237	267	297	327	357
Brown 5 CT 159MW	51	78	105	132	159	186	213	240	267	294	321
Brown 5 CT 149MW	52	79	106	133	160	187	214	241	268	295	322
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	81	110	139	168	197	226	255	284	313	342
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	163	172	181	190	199	209	218	227	236	246
IAC at Brown 8-11	21	58	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	58	105	128	134	134	134	198	216	233	246

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate- Base
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	99	127	156	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	88	117	145	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	188	199	211	223	235	247	259	270	282	294
Pulverized Coal (LSFO)-400MW	196	208	219	231	243	254	266	278	289	301	313
Pulverized Coal (LSFO)-300MW	201	216	231	246	261	276	291	306	321	335	350
Pulverized Coal (LSFO)-200MW	245	257	269	281	293	306	318	330	342	354	366
Pulverized Coal (LSFO)-300MW X 2	180	192	204	215	227	239	251	263	275	287	298
Pulverized Coal Compliance (LSD)- 300MW	190	205	221	236	251	266	281	297	312	327	342
Pulverized Coal Supercritical (LSD)- 300MW	228	244	260	276	292	307	323	339	355	371	387
Pulverized Coal (Advanced LSFO)- 400MW	203	215	226	237	248	259	271	282	293	304	316
Atmosph Fluidized Bed (Circulating)-200MW	251	268	286	303	320	337	354	372	389	406	423
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	289	302	316	329	342	355	368	382	395	408
Press Fluidized Bed (Bubbling)-350MW	192	204	217	229	241	253	265	277	289	302	314
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	202	214	226	238	250	262	274	286	298	310
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	247	260	272	285	297	309	322	334	347	359
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	189	202	214	227	239	252	264	277	289	302
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	187	199	211	223	235	248	260	272	284	296
Foster Wheeler Advanced PFB (Circulating)-688MW	163	177	191	205	220	234	248	263	277	291	306
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	256	266	277	287	298	308	319	329	339	350
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	236	247	258	269	280	291	303	314	325	336
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	264	276	288	301	313	325	338	350	362	375
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	352	366	380	394	408	423	437	451	465	479
Advanced Int. Coal Gas-460MW	177	190	202	215	228	240	253	266	278	291	303
Combustion Turbine Heavy Duty-80MW	70	109	148	187	226	265	304	343	382	421	460
Combustion Turbine Heavy Duty-110MW	61	102	143	184	225	266	307	348	389	430	471
Combustion Turbine Heavy Duty-160MW	56	91	126	161	196	231	266	301	336	371	406
Combustion Turbine Aero- 45MW	114	146	178	210	242	274	306	338	370	402	434
CT Combined Cycle 2on1 - 330MW	87	110	133	157	180	204	227	250	274	297	321
CT Combined Cycle 2on1 - 470MW	76	97	119	140	162	183	205	226	248	269	291
CT Combined Cycle - 345MW	79	101	122	143	164	186	207	228	249	270	292
CT with Cascaded Humidified Advanced Turbine-300MW	72	96	120	144	167	191	215	239	263	287	311
Phosphoric Acid Fuel Cell-2.5MW	1203	1234	1264	1295	1326	1356	1387	1418	1448	1479	1510
Molten Carbonate Fuel Cell-100MW	373	392	411	430	449	468	487	506	525	544	563
Solid Oxide Fuel Cell-100MW	187	205	223	241	259	277	295	313	331	349	367
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	305	390	475	560	646	731	816	901	986	1071
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	403	447	491	535	579	623	666	710	754	798
Bio Mass: Whole Tree-100MW	276	301	326	351	376	401	426	450	475	500	525
Cane Run 3 Rehab w/ AFBC	170	182	195	208	220	233	245	258	271	283	296
Cane Run 3 Rehab w/ Natural Gas	127	159	192	224	257	289	321	354	386	419	451
Brown 5 CT 110MW	54	91	128	165	202	239	276	313	350	387	424
Brown 5 CT 164MW	55	87	119	151	183	215	247	279	311	343	375
Brown 5 CT 102MW	57	94	131	168	205	242	279	316	353	390	427
Brown 5 CT 159MW	51	84	117	150	183	216	249	282	315	348	381
Brown 5 CT 149MW	52	86	120	154	188	222	256	290	324	358	392
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	87	122	157	192	227	262	297	332	367	402
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	165	176	187	198	209	221	232	243	254	266
IAC at Brown 8-11	21	65	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	65	117	134	134	134	134	226	243	254	266

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base *1999 Dollars ($/kW yr)*
Heat Rate- High
Fuel Forecast-Low

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	97	124	151	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	86	112	137	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	186	196	207	217	227	238	248	258	268	279
Pulverized Coal (LSFO)-400MW	196	206	217	227	237	247	258	268	278	289	299
Pulverized Coal (LSFO)-300MW	201	214	227	240	253	266	279	292	305	317	330
Pulverized Coal (LSFO)-200MW	245	255	266	277	287	298	308	319	330	340	351
Pulverized Coal (LSFO)-300MW X 2	180	190	201	211	221	231	242	252	262	273	283
Pulverized Coal Compliance (LSD)- 300MW	190	203	216	229	242	255	268	281	293	306	319
Pulverized Coal Supercritical (LSD)- 300MW	228	242	256	269	283	297	310	324	338	351	365
Pulverized Coal (Advanced LSFO)- 400MW	203	213	223	233	243	253	262	272	282	292	302
Atmosph Fluidized Bed (Circulating)-200MW	251	266	281	296	311	326	342	357	372	387	402
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	288	300	311	323	335	347	359	371	382	394
Press Fluidized Bed (Bubbling)-350MW	192	203	213	224	235	245	256	267	277	288	298
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	200	211	222	232	243	253	264	275	285	296
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	246	257	268	279	290	301	312	323	334	345
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	188	199	210	221	232	242	253	264	275	286
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	185	196	207	218	228	239	250	261	272	282
Foster Wheeler Advanced PFB (Circulating)-688MW	163	176	189	202	215	228	241	254	267	280	293
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	255	264	273	282	291	301	310	319	328	338
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	235	244	254	264	273	283	293	303	312	322
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	262	273	283	294	305	315	326	337	347	358
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	351	364	377	390	403	416	429	442	455	468
Advanced Int. Coal Gas-460MW	177	189	200	212	223	235	246	258	269	281	292
Combustion Turbine Heavy Duty-80MW	70	103	136	169	202	235	268	301	334	367	400
Combustion Turbine Heavy Duty-110MW	61	96	131	166	201	236	271	306	341	376	411
Combustion Turbine Heavy Duty-160MW	56	85	114	143	172	201	230	259	288	317	346
Combustion Turbine Aero- 45MW	114	141	168	195	222	249	276	303	330	357	384
CT Combined Cycle 2on1 - 330MW	87	107	126	146	166	186	206	226	245	265	285
CT Combined Cycle 2on1 - 470MW	76	94	112	131	149	167	185	204	222	240	259
CT Combined Cycle - 345MW	79	98	116	134	152	170	188	206	225	243	261
CT with Cascaded Humidified Advanced Turbine-300MW	72	93	113	134	155	175	196	216	237	258	278
Phosphoric Acid Fuel Cell-2.5MW	1203	1229	1256	1282	1308	1335	1361	1387	1414	1440	1466
Molten Carbonate Fuel Cell-100MW	373	390	406	423	440	456	473	490	506	523	540
Solid Oxide Fuel Cell-100MW	187	203	218	233	249	264	279	295	310	325	341
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	292	364	436	508	580	652	724	796	868	940
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	181	192	203	214	225	236	247	258	269	280
Cane Run 3 Rehab w/ Natural Gas	127	154	182	209	237	264	292	319	347	375	402
Brown 5 CT 110MW	54	85	116	147	178	209	240	271	302	333	364
Brown 5 CT 164MW	55	82	109	136	163	190	217	244	271	298	325
Brown 5 CT 102MW	57	89	121	153	185	217	249	281	313	345	377
Brown 5 CT 159MW	51	79	107	135	163	191	219	247	275	303	331
Brown 5 CT 149MW	52	80	108	136	164	192	220	248	276	304	332
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	83	114	145	176	207	238	269	300	331	362
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	163	173	182	192	202	211	221	231	241	250
IAC at Brown 8-11	21	60	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	60	107	131	134	134	134	204	222	240	250

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	75	107	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	104	133	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	70	98	126	154	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	60	88	116	143	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	176	187	198	209	220	231	242	253	264	275	286
Pulverized Coal (LSFO)-400MW	196	207	218	229	240	251	262	273	285	296	307
Pulverized Coal (LSFO)-300MW	201	215	229	243	257	271	285	299	313	327	341
Pulverized Coal (LSFO)-200MW	245	256	268	279	291	302	314	326	337	349	360
Pulverized Coal (LSFO)-300MW X 2	180	191	202	213	224	235	246	257	269	280	291
Pulverized Coal Compliance (LSD)- 300MW	190	204	218	233	247	261	275	289	303	317	332
Pulverized Coal Supercritical (LSD)- 300MW	228	243	258	272	287	302	317	332	346	361	376
Pulverized Coal (Advanced LSFO)- 400MW	203	214	225	235	246	256	267	278	288	299	309
Atmosph Fluidized Bed (Circulating)-200MW	251	267	284	300	316	333	349	365	382	398	414
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	288	301	314	326	339	352	364	377	389	402
Press Fluidized Bed (Bubbling)-350MW	192	204	215	227	238	250	261	273	285	296	308
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	201	213	224	235	247	258	269	281	292	304
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	247	258	270	282	294	306	318	329	341	353
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	189	201	212	224	236	248	260	272	284	295
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	186	198	209	221	232	244	255	267	278	290
Foster Wheeler Advanced PFB (Circulating)-688MW	163	176	190	204	218	232	246	259	273	287	301
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	255	265	275	285	295	304	314	324	334	344
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	235	246	256	267	277	288	298	309	319	330
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	263	275	286	298	310	321	333	345	356	368
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	351	365	378	392	405	419	432	446	460	473
Advanced Int. Coal Gas-460MW	177	189	201	214	226	238	250	262	274	286	298
Combustion Turbine Heavy Duty-80MW	70	107	144	181	218	255	292	329	366	403	440
Combustion Turbine Heavy Duty-110MW	61	100	139	178	217	256	295	334	373	412	451
Combustion Turbine Heavy Duty-160MW	56	89	122	155	188	221	254	287	320	353	386
Combustion Turbine Aero- 45MW	114	144	174	204	234	264	294	324	354	384	414
CT Combined Cycle 2on1 - 330MW	87	109	131	154	176	198	221	243	265	287	310
CT Combined Cycle 2on1 - 470MW	76	96	117	137	158	179	199	220	241	261	282
CT Combined Cycle - 345MW	79	100	120	140	161	181	201	222	242	262	282
CT with Cascaded Humidified Advanced Turbine-300MW	72	95	118	140	163	186	209	231	254	277	300
Phosphoric Acid Fuel Cell-2.5MW	1203	1232	1262	1291	1320	1350	1379	1408	1438	1467	1496
Molten Carbonate Fuel Cell-100MW	373	391	410	428	446	465	483	501	520	538	556
Solid Oxide Fuel Cell-100MW	187	205	222	239	257	274	291	309	326	343	361
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	301	382	463	544	625	706	787	868	949	1030
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	182	194	206	218	230	242	254	266	278	290
Cane Run 3 Rehab w/ Natural Gas	127	158	189	219	250	281	312	343	374	405	436
Brown 5 CT 110MW	54	89	124	159	194	229	264	299	334	369	404
Brown 5 CT 164MW	55	85	115	145	175	205	235	265	295	325	355
Brown 5 CT 102MW	57	92	127	162	197	232	267	302	337	372	407
Brown 5 CT 159MW	51	82	113	144	175	206	237	268	299	330	361
Brown 5 CT 149MW	52	84	116	148	180	212	244	276	308	340	372
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	52	86	120	154	188	222	256	290	324	358	392
Ohio Falls 9&10	149	149	149	149	----	----	----	----	----	----	----
Trimble County 2	153	164	175	185	196	206	217	228	238	249	259
IAC at Brown 8-11	21	63	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	21	63	113	134	134	134	134	220	238	249	259

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- Base
Heat Rate- High
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	104	141	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	75	107	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	104	133	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	134	167	200	233	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	70	99	129	158	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	60	89	119	148	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	101	128	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	176	188	200	213	225	237	250	262	274	286	299
Pulverized Coal (LSFO)-400MW	196	208	221	233	245	257	270	282	294	307	319
Pulverized Coal (LSFO)-300MW	201	217	233	248	264	280	295	311	327	342	358
Pulverized Coal (LSFO)-200MW	245	257	270	283	295	308	320	333	346	358	371
Pulverized Coal (LSFO)-300MW X 2	180	192	205	217	229	241	254	266	278	291	303
Pulverized Coal Compliance (LSD)- 300MW	190	206	222	238	253	269	285	301	317	333	349
Pulverized Coal Supercritical (LSD)- 300MW	228	245	261	278	295	311	328	344	361	378	394
Pulverized Coal (Advanced LSFO)- 400MW	203	215	227	238	250	262	273	285	297	309	320
Atmosph Fluidized Bed (Circulating)-200MW	251	269	287	305	323	341	359	377	395	413	431
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	276	290	304	317	331	345	359	373	387	400	414
Press Fluidized Bed (Bubbling)-350MW	192	205	217	230	243	255	268	281	293	306	318
Press Fluidized Bed (Bubbling, Supercritic)-340MW	190	202	215	227	240	252	265	277	289	302	314
Press Fluidized Bed (Circulating, with Reheat)-160MW	235	248	261	273	286	299	312	325	338	351	364
Press Fluidized Bed (Circulating, with Reheat)-360MW	177	190	203	216	229	242	254	267	280	293	306
Press Fluidized Bed (Circulating, Supercritical)-360MW	175	187	200	212	225	238	250	263	276	288	301
Foster Wheeler Advanced PFB (Circulating)-688MW	163	177	192	207	222	236	251	266	281	295	310
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	245	256	267	278	289	300	311	322	333	344	355
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	225	237	248	260	271	283	294	306	317	329	340
Int Coal Gas / CAES with Humid Air Turbine-410MW	251	264	277	289	302	315	327	340	353	365	378
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	338	352	367	381	396	410	424	439	453	468	482
Advanced Int. Coal Gas-460MW	177	190	203	217	230	243	256	269	282	295	308
Combustion Turbine Heavy Duty-80MW	70	111	152	193	234	275	316	357	398	439	480
Combustion Turbine Heavy Duty-110MW	61	104	147	190	233	276	319	362	405	448	491
Combustion Turbine Heavy Duty-160MW	56	92	128	164	200	236	272	308	344	380	416
Combustion Turbine Aero- 45MW	114	147	180	213	246	279	312	345	378	411	444
CT Combined Cycle 2on1 - 330MW	87	111	136	160	185	209	233	258	282	307	331
CT Combined Cycle 2on1 - 470MW	76	98	121	143	166	189	211	234	257	279	302
CT Combined Cycle - 345MW	79	102	124	146	169	191	213	236	258	280	302
CT with Cascaded Humidified Advanced Turbine-300MW	72	97	122	147	172	197	222	247	271	296	321
Phosphoric Acid Fuel Cell-2.5MW	1203	1235	1267	1299	1331	1363	1395	1427	1459	1491	1523
Molten Carbonate Fuel Cell-100MW	373	393	413	433	453	473	493	513	533	553	573
Solid Oxide Fuel Cell-100MW	187	206	225	244	263	282	301	320	339	358	377
Geothermal: Dual Flash Brine, Air Cooled-24MW	220	309	398	488	577	667	756	845	935	1024	1113
Solar Photovoltaic:Flat Plate-10x5MW	563	563	563	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	623	623	623	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	578	578	578	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	390	394	398	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	171	171	171	171	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	186	186	186	186	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	145	145	145	145	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	945	980	1015	1049	1084	1119	1153	1188	1222	1257	1292
Municipal Solid Waste: Refuse Der.-40MW	1040	1075	1109	1144	1178	1213	1247	1282	1316	1351	1385
Municipal Solid Waste: Tire-30MW	595	600	605	610	614	619	624	629	633	638	643
Bio Mass: Wood-Fired Stoker Boiler-50MW	359	405	451	497	543	589	635	680	726	772	818
Bio Mass: Whole Tree-100MW	276	302	328	354	380	406	432	458	484	510	536
Cane Run 3 Rehab w/ AFBC	170	183	196	209	223	236	249	262	276	289	302
Cane Run 3 Rehab w/ Natural Gas	127	161	195	229	263	297	332	366	400	434	468
Brown 5 CT 110MW	54	93	132	171	210	249	288	327	366	405	444
Brown 5 CT 164MW	55	88	121	154	187	220	253	286	319	352	385
Brown 5 CT 102MW	57	96	135	174	213	252	291	330	369	408	447
Brown 5 CT 159MW	51	85	119	153	187	221	255	289	323	357	391
Brown 5 CT 149MW	52	87	122	157	192	227	262	297	332	367	402
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	52	89	126	163	200	237	274	311	348	385	422
Ohio Falls 9&10	149	149	149	149	—	—	—	—	—	—	—
Trimble County 2	153	165	177	189	201	213	224	236	248	260	272
IAC at Brown 8-11	21	67	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	21	67	119	134	134	134	134	234	248	260	272

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate-Low
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	98	124	150	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	96	120	144	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	196	206	215	225	234	244	253	263	273	282
Pulverized Coal (LSFO)-400MW	207	216	226	235	244	254	263	273	282	291	301
Pulverized Coal (LSFO)-300MW	214	226	238	250	262	273	285	297	309	321	333
Pulverized Coal (LSFO)-200MW	260	269	279	289	299	308	318	328	337	347	357
Pulverized Coal (LSFO)-300MW X 2	191	200	210	219	228	238	247	257	266	275	285
Pulverized Coal Compliance (LSD)- 300MW	202	214	226	238	249	261	273	285	297	309	321
Pulverized Coal Supercritical (LSD)- 300MW	242	255	267	280	292	304	317	329	342	354	367
Pulverized Coal (Advanced LSFO)- 400MW	215	224	233	243	252	261	270	279	288	297	306
Atmosph Fluidized Bed (Circulating)-200MW	275	289	303	317	330	344	358	372	386	400	414
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	319	330	341	352	363	374	385	396	408	419
Press Fluidized Bed (Bubbling)-350MW	227	237	247	257	267	276	286	296	306	316	326
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	234	243	253	263	273	283	293	303	312	322
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	271	281	292	302	312	323	333	343	353	364
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	217	227	237	248	258	268	278	288	298	308
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	215	225	235	245	255	265	275	285	295	305
Foster Wheeler Advanced PFB (Circulating)-688MW	193	205	217	230	242	255	267	280	292	305	317
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	291	299	308	316	325	333	342	350	358	367
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	267	276	285	294	303	312	320	329	338	347
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	292	302	311	321	331	340	350	360	369	379
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	400	413	425	438	450	462	475	487	500	512
Advanced Int. Coal Gas-460MW	208	219	230	241	252	263	273	284	295	306	317
Combustion Turbine Heavy Duty-80MW	75	105	135	165	195	225	255	285	315	345	375
Combustion Turbine Heavy Duty-110MW	66	98	130	162	194	226	258	290	322	354	386
Combustion Turbine Heavy Duty-160MW	60	87	114	141	168	195	222	249	276	303	330
Combustion Turbine Aero- 45MW	122	147	172	197	222	247	272	297	322	347	372
CT Combined Cycle 2on1 - 330MW	92	110	128	146	164	182	200	218	236	254	272
CT Combined Cycle 2on1 - 470MW	81	97	114	131	148	164	181	198	215	232	248
CT Combined Cycle - 345MW	89	106	122	139	155	172	188	205	221	238	254
CT with Cascaded Humidified Advanced Turbine-300MW	80	99	118	137	156	175	194	213	231	250	269
Phosphoric Acid Fuel Cell-2.5MW	1291	1315	1340	1364	1388	1413	1437	1461	1486	1510	1534
Molten Carbonate Fuel Cell-100MW	415	430	446	461	476	492	507	522	538	553	568
Solid Oxide Fuel Cell-100MW	206	220	234	247	261	275	288	302	316	329	343
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	314	379	444	509	574	639	704	769	834	899
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	191	201	211	221	231	242	252	262	272	282
Cane Run 3 Rehab w/ Natural Gas	133	158	183	207	232	257	282	307	332	357	382
Brown 5 CT 110MW	56	85	114	143	172	201	230	259	288	317	346
Brown 5 CT 164MW	57	82	107	132	157	182	207	232	257	282	307
Brown 5 CT 102MW	59	88	117	146	175	204	233	262	291	320	349
Brown 5 CT 159MW	53	78	103	128	153	178	203	228	253	278	303
Brown 5 CT 149MW	54	80	106	132	158	184	210	236	262	288	314
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	83	111	139	167	195	223	251	279	307	335
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	168	177	186	194	203	212	221	229	238	247
IAC at Brown 8-11	22	58	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	58	103	128	134	134	134	198	215	232	247

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate-Low
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	99	126	153	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	98	124	150	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	197	207	218	228	238	249	259	269	279	290
Pulverized Coal (LSFO)-400MW	207	217	227	237	248	258	268	278	288	298	308
Pulverized Coal (LSFO)-300MW	214	227	240	252	265	278	291	304	316	329	342
Pulverized Coal (LSFO)-200MW	260	270	281	291	302	312	323	333	343	354	364
Pulverized Coal (LSFO)-300MW X 2	191	201	211	221	232	242	252	262	272	282	292
Pulverized Coal Compliance (LSD)- 300MW	202	215	228	241	254	267	280	293	305	318	331
Pulverized Coal Supercritical (LSD)- 300MW	242	256	270	283	297	311	324	338	352	365	379
Pulverized Coal (Advanced LSFO)- 400MW	215	225	235	245	255	265	274	284	294	304	314
Atmosph Fluidized Bed (Circulating)-200MW	275	290	305	320	335	350	365	380	394	409	424
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	320	331	343	355	366	378	390	401	413	425
Press Fluidized Bed (Bubbling)-350MW	227	238	248	259	270	280	291	302	312	323	333
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	234	245	255	266	276	287	297	307	318	328
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	272	283	293	304	315	326	337	348	359	370
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	218	229	240	251	262	272	283	294	305	316
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	215	226	236	247	258	268	279	290	300	311
Foster Wheeler Advanced PFB (Circulating)-688MW	193	206	219	232	245	258	271	284	297	310	323
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	291	300	310	319	328	337	346	355	364	373
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	268	277	287	297	306	316	326	336	345	355
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	293	304	314	325	336	346	357	368	378	389
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	401	414	426	439	452	465	478	491	504	517
Advanced Int. Coal Gas-460MW	208	220	231	242	254	265	276	288	299	311	322
Combustion Turbine Heavy Duty-80MW	75	109	143	177	211	245	279	313	347	381	415
Combustion Turbine Heavy Duty-110MW	66	102	138	174	210	246	282	318	354	390	426
Combustion Turbine Heavy Duty-160MW	60	90	120	150	180	210	240	270	300	330	360
Combustion Turbine Aero- 45MW	122	150	178	206	234	262	290	318	346	374	402
CT Combined Cycle 2on1 - 330MW	92	112	132	152	172	192	213	233	253	273	293
CT Combined Cycle 2on1 - 470MW	81	99	118	137	156	174	193	212	231	250	268
CT Combined Cycle - 345MW	89	108	126	145	163	182	200	219	237	256	274
CT with Cascaded Humidified Advanced Turbine-300MW	80	101	122	143	164	185	206	227	247	268	289
Phosphoric Acid Fuel Cell-2.5MW	1291	1318	1345	1372	1399	1426	1453	1480	1507	1534	1561
Molten Carbonate Fuel Cell-100MW	415	432	448	465	482	498	515	532	548	565	582
Solid Oxide Fuel Cell-100MW	206	222	238	253	269	285	300	316	332	347	363
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	322	395	469	542	615	688	762	835	908	981
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	192	203	213	224	235	246	257	268	279	290
Cane Run 3 Rehab w/ Natural Gas	133	161	189	217	245	273	301	329	357	385	413
Brown 5 CT 110MW	56	88	120	152	184	216	248	280	312	344	376
Brown 5 CT 164MW	57	84	111	138	165	192	219	246	273	300	327
Brown 5 CT 102MW	59	91	123	155	187	219	251	283	315	347	379
Brown 5 CT 159MW	53	81	109	137	165	193	221	249	277	305	333
Brown 5 CT 149MW	54	83	112	141	170	199	228	257	286	315	344
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	86	117	148	179	210	241	272	303	334	365
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	169	178	188	197	207	217	226	236	245	255
IAC at Brown 8-11	22	61	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	61	109	134	134	134	134	212	231	245	255

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate-Low
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavem) -350MW	72	100	128	156	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	99	127	154	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	198	209	220	232	243	254	265	277	288	299
Pulverized Coal (LSFO)-400MW	207	218	229	241	252	263	274	286	297	308	319
Pulverized Coal (LSFO)-300MW	214	228	243	257	271	286	300	314	329	343	357
Pulverized Coal (LSFO)-200MW	260	271	283	295	307	318	330	342	353	365	377
Pulverized Coal (LSFO)-300MW X 2	191	202	213	225	236	247	258	270	281	292	303
Pulverized Coal Compliance (LSD)- 300MW	202	217	231	245	260	274	289	303	318	332	347
Pulverized Coal Supercritical (LSD)- 300MW	242	257	273	288	303	318	334	349	364	379	394
Pulverized Coal (Advanced LSFO)- 400MW	215	226	237	248	258	269	280	291	301	312	323
Atmosph Fluidized Bed (Circulating)-200MW	275	292	308	324	341	357	374	390	407	423	440
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	321	333	346	359	372	384	397	410	423	436
Press Fluidized Bed (Bubbling)-350MW	227	239	251	262	274	286	297	309	321	332	344
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	235	247	258	270	281	293	305	316	328	339
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	273	285	297	309	321	333	345	357	369	381
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	219	231	242	254	266	278	290	302	314	325
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	216	228	240	251	263	275	286	298	310	322
Foster Wheeler Advanced PFB (Circulating)-688MW	193	206	220	234	248	262	276	289	303	317	331
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	292	302	312	322	332	342	352	362	372	382
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	269	279	290	300	311	322	332	343	354	364
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	294	306	317	329	341	352	364	376	387	399
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	401	415	429	442	456	470	484	497	511	525
Advanced Int. Coal Gas-460MW	208	220	233	245	257	269	282	294	306	318	331
Combustion Turbine Heavy Duty-80MW	75	112	149	186	223	260	297	334	371	408	445
Combustion Turbine Heavy Duty-110MW	66	105	144	183	222	261	300	339	378	417	456
Combustion Turbine Heavy Duty-160MW	60	93	126	159	192	225	258	291	324	357	390
Combustion Turbine Aero- 45MW	122	152	182	212	242	272	302	332	362	392	422
CT Combined Cycle 2on1 - 330MW	92	114	136	158	180	202	225	247	269	291	313
CT Combined Cycle 2on1 - 470MW	81	101	122	142	163	184	204	225	246	266	287
CT Combined Cycle - 345MW	89	110	130	150	171	191	211	232	252	272	292
CT with Cascaded Humidified Advanced Turbine-300MW	80	103	126	148	171	194	217	239	262	285	308
Phosphoric Acid Fuel Cell-2.5MW	1291	1320	1350	1379	1408	1438	1467	1496	1526	1555	1584
Molten Carbonate Fuel Cell-100MW	415	433	452	470	488	507	525	543	562	580	598
Solid Oxide Fuel Cell-100MW	206	224	241	258	276	293	310	328	345	362	380
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	330	410	491	572	653	734	815	895	976	1057
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	443	485	527	568	610	652	693	735	777	818
Bio Mass: Whole Tree-100MW	440	464	488	512	535	559	583	607	630	654	678
Cane Run 3 Rehab w/ AFBC	181	193	205	217	229	241	254	266	278	290	302
Cane Run 3 Rehab w/ Natural Gas	133	164	195	225	256	287	318	349	380	411	442
Brown 5 CT 110MW	56	91	126	161	196	231	266	301	336	371	406
Brown 5 CT 164MW	57	87	117	147	177	207	237	267	297	327	357
Brown 5 CT 102MW	59	94	129	164	199	234	269	304	339	374	409
Brown 5 CT 159MW	53	84	115	146	177	208	239	270	301	332	363
Brown 5 CT 149MW	54	86	118	150	182	214	246	278	310	342	374
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	89	123	157	191	225	259	293	327	361	395
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	170	181	192	202	213	224	235	245	256	267
IAC at Brown 8-11	22	64	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	64	115	134	134	134	134	225	245	256	267

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate- Base
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	98	125	151	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	97	122	147	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	197	206	216	226	236	246	256	265	275	285
Pulverized Coal (LSFO)-400MW	207	217	227	236	246	256	266	276	286	296	305
Pulverized Coal (LSFO)-300MW	214	226	239	251	263	276	288	300	313	325	337
Pulverized Coal (LSFO)-200MW	260	270	280	290	300	311	321	331	341	351	361
Pulverized Coal (LSFO)-300MW X 2	191	201	211	220	230	240	250	260	270	280	289
Pulverized Coal Compliance (LSD)- 300MW	202	215	227	239	252	264	277	289	302	314	327
Pulverized Coal Supercritical (LSD)- 300MW	242	255	268	281	294	308	321	334	347	360	373
Pulverized Coal (Advanced LSFO)- 400MW	215	225	234	244	253	263	273	282	292	301	311
Atmosph Fluidized Bed (Circulating)-200MW	275	290	304	318	333	347	362	376	391	405	420
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	319	331	342	353	365	376	388	399	410	422
Press Fluidized Bed (Bubbling)-350MW	227	238	248	258	268	279	289	299	310	320	330
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	234	244	254	264	275	285	295	305	315	325
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	271	282	293	303	314	324	335	346	356	367
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	218	228	239	249	260	271	281	292	302	313
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	215	225	236	246	256	266	277	287	297	308
Foster Wheeler Advanced PFB (Circulating)-688MW	193	205	218	231	244	256	269	282	295	307	320
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	291	300	309	317	326	335	344	352	361	370
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	267	277	286	296	305	314	324	333	342	352
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	292	302	312	322	332	342	352	362	372	382
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	400	413	426	439	452	464	477	490	503	515
Advanced Int. Coal Gas-460MW	208	219	230	242	253	264	275	286	297	308	319
Combustion Turbine Heavy Duty-80MW	75	106	137	168	199	230	261	292	323	354	385
Combustion Turbine Heavy Duty-110MW	66	99	132	165	198	231	264	297	330	363	396
Combustion Turbine Heavy Duty-160MW	60	88	116	144	172	200	228	256	284	312	340
Combustion Turbine Aero- 45MW	122	148	174	200	226	252	278	304	330	356	382
CT Combined Cycle 2on1 - 330MW	92	111	130	148	167	186	205	224	243	262	281
CT Combined Cycle 2on1 - 470MW	81	98	116	133	151	168	186	203	221	238	256
CT Combined Cycle - 345MW	89	107	124	142	159	176	194	211	228	246	263
CT with Cascaded Humidified Advanced Turbine-300MW	80	100	119	139	159	179	198	218	238	257	277
Phosphoric Acid Fuel Cell-2.5MW	1291	1316	1342	1367	1392	1418	1443	1468	1494	1519	1544
Molten Carbonate Fuel Cell-100MW	415	431	447	463	479	495	511	527	543	559	575
Solid Oxide Fuel Cell-100MW	206	221	236	250	265	280	294	309	324	338	353
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	317	386	454	523	591	660	728	797	865	934
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	191	202	213	223	234	244	255	266	276	287
Cane Run 3 Rehab w/ Natural Gas	133	159	185	211	237	263	290	316	342	368	394
Brown 5 CT 110MW	56	86	116	146	176	206	236	266	296	326	356
Brown 5 CT 164MW	57	83	109	135	161	187	213	239	265	291	317
Brown 5 CT 102MW	59	89	119	149	179	209	239	269	299	329	359
Brown 5 CT 159MW	53	80	107	134	161	188	215	242	269	296	323
Brown 5 CT 149MW	54	81	108	135	162	189	216	243	270	297	324
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	84	113	142	171	200	229	258	287	316	345
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	169	178	187	196	205	215	224	233	242	252
IAC at Brown 8-11	22	59	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	59	107	133	134	134	134	203	221	238	252

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High *1999 Dollars ($/kW yr)*
Heat Rate- Base
Fuel Forecast- Base

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	100	127	155	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	99	126	152	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	197	208	219	230	241	251	262	273	284	294
Pulverized Coal (LSFO)-400MW	207	218	228	239	249	260	271	281	292	302	313
Pulverized Coal (LSFO)-300MW	214	228	241	254	268	281	294	308	321	335	348
Pulverized Coal (LSFO)-200MW	260	271	282	293	304	315	326	337	348	359	371
Pulverized Coal (LSFO)-300MW X 2	191	202	212	223	233	244	255	265	276	286	297
Pulverized Coal Compliance (LSD)- 300MW	202	216	229	243	256	270	283	297	310	324	337
Pulverized Coal Supercritical (LSD)- 300MW	242	256	270	285	299	313	327	341	355	370	384
Pulverized Coal (Advanced LSFO)- 400MW	215	225	236	246	256	266	276	286	297	307	317
Atmosph Fluidized Bed (Circulating)-200MW	275	291	306	322	338	354	369	385	401	416	432
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	320	332	344	356	369	381	393	405	417	429
Press Fluidized Bed (Bubbling)-350MW	227	238	249	260	272	283	294	305	316	327	338
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	235	246	257	267	278	289	300	311	322	333
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	272	283	295	306	318	329	340	352	363	375
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	218	230	241	252	264	275	287	298	309	321
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	216	227	238	249	260	271	282	293	304	315
Foster Wheeler Advanced PFB (Circulating)-688MW	193	206	219	233	246	259	273	286	300	313	326
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	292	301	311	320	330	340	349	359	368	378
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	268	278	288	299	309	319	329	339	349	360
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	293	304	315	326	337	348	359	370	381	392
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	401	414	427	441	454	467	480	494	507	520
Advanced Int. Coal Gas-460MW	208	220	232	243	255	267	279	290	302	314	326
Combustion Turbine Heavy Duty-80MW	75	110	145	180	215	250	285	320	355	390	425
Combustion Turbine Heavy Duty-110MW	66	103	140	177	214	251	288	325	362	399	436
Combustion Turbine Heavy Duty-160MW	60	91	122	153	184	215	246	277	308	339	370
Combustion Turbine Aero- 45MW	122	151	180	209	238	267	296	325	354	383	412
CT Combined Cycle 2on1 - 330MW	92	113	134	155	177	198	219	240	262	283	304
CT Combined Cycle 2on1 - 470MW	81	100	120	140	159	179	199	218	238	258	278
CT Combined Cycle - 345MW	89	109	128	148	167	186	206	225	244	264	283
CT with Cascaded Humidified Advanced Turbine-300MW	80	102	124	146	167	189	211	233	255	277	299
Phosphoric Acid Fuel Cell-2.5MW	1291	1319	1348	1376	1404	1433	1461	1489	1518	1546	1574
Molten Carbonate Fuel Cell-100MW	415	433	450	468	486	503	521	539	556	574	592
Solid Oxide Fuel Cell-100MW	206	223	239	255	272	288	304	321	337	353	370
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	326	403	480	557	635	712	789	866	943	1020
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	192	203	215	226	238	249	260	272	283	295
Cane Run 3 Rehab w/ Natural Gas	133	162	192	221	251	280	310	339	369	399	428
Brown 5 CT 110MW	56	90	124	158	192	226	260	294	328	362	396
Brown 5 CT 164MW	57	86	115	144	173	202	231	260	289	318	347
Brown 5 CT 102MW	59	93	127	161	195	229	263	297	331	365	399
Brown 5 CT 159MW	53	83	113	143	173	203	233	263	293	323	353
Brown 5 CT 149MW	54	84	114	144	174	204	234	264	294	324	354
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	88	121	154	187	220	253	286	319	352	385
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	169	179	189	199	209	219	229	239	249	259
IAC at Brown 8-11	22	63	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	63	113	134	134	134	134	218	238	249	259

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate- Base
Fuel Forecast- High

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	101	129	158	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	100	129	157	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	199	210	222	234	246	258	270	281	293	305
Pulverized Coal (LSFO)-400MW	207	219	230	242	254	265	277	289	300	312	324
Pulverized Coal (LSFO)-300MW	214	229	244	259	274	289	304	319	334	348	363
Pulverized Coal (LSFO)-200MW	260	272	284	296	308	321	333	345	357	369	381
Pulverized Coal (LSFO)-300MW X 2	191	203	215	226	238	250	262	274	286	298	309
Pulverized Coal Compliance (LSD)- 300MW	202	217	233	248	263	278	293	309	324	339	354
Pulverized Coal Supercritical (LSD)- 300MW	242	258	274	290	306	321	337	353	369	385	401
Pulverized Coal (Advanced LSFO)- 400MW	215	227	238	249	260	271	283	294	305	316	328
Atmosph Fluidized Bed (Circulating)-200MW	275	292	310	327	344	361	378	396	413	430	447
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	321	334	348	361	374	387	400	414	427	440
Press Fluidized Bed (Bubbling)-350MW	227	239	252	264	276	288	300	312	324	337	349
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	236	248	260	272	284	296	308	320	332	344
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	273	286	298	311	323	335	348	360	373	385
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	219	232	244	257	269	282	294	307	319	332
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	217	229	241	253	265	278	290	302	314	326
Foster Wheeler Advanced PFB (Circulating)-688MW	193	207	221	235	250	264	278	293	307	321	336
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	293	303	314	324	335	345	356	366	376	387
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	269	280	291	302	313	324	336	347	358	369
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	295	307	319	332	344	356	369	381	393	406
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	402	416	430	444	458	473	487	501	515	529
Advanced Int. Coal Gas-460MW	208	221	233	246	259	271	284	297	309	322	334
Combustion Turbine Heavy Duty-80MW	75	114	153	192	231	270	309	348	387	426	465
Combustion Turbine Heavy Duty-110MW	66	107	148	189	230	271	312	353	394	435	476
Combustion Turbine Heavy Duty-160MW	60	95	130	165	200	235	270	305	340	375	410
Combustion Turbine Aero- 45MW	122	154	186	218	250	282	314	346	378	410	442
CT Combined Cycle 2on1 - 330MW	92	115	138	162	185	209	232	255	279	302	326
CT Combined Cycle 2on1 - 470MW	81	102	124	145	167	188	210	231	253	274	296
CT Combined Cycle - 345MW	89	111	132	153	174	196	217	238	259	280	302
CT with Cascaded Humidified Advanced Turbine-300MW	80	104	128	152	175	199	223	247	271	295	319
Phosphoric Acid Fuel Cell-2.5MW	1291	1322	1352	1383	1414	1444	1475	1506	1536	1567	1598
Molten Carbonate Fuel Cell-100MW	415	434	453	472	491	510	529	548	567	586	605
Solid Oxide Fuel Cell-100MW	206	224	242	260	278	296	314	332	350	368	386
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	334	419	504	589	675	760	845	930	1015	1100
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	445	489	533	577	621	665	708	752	796	840
Bio Mass: Whole Tree-100MW	440	465	490	515	540	565	590	614	639	664	689
Cane Run 3 Rehab w/ AFBC	181	193	206	219	231	244	256	269	282	294	307
Cane Run 3 Rehab w/ Natural Gas	133	165	198	230	263	295	327	360	392	425	457
Brown 5 CT 110MW	56	93	130	167	204	241	278	315	352	389	426
Brown 5 CT 164MW	57	89	121	153	185	217	249	281	313	345	377
Brown 5 CT 102MW	59	96	133	170	207	244	281	318	355	392	429
Brown 5 CT 159MW	53	86	119	152	185	218	251	284	317	350	383
Brown 5 CT 149MW	54	88	122	156	190	224	258	292	326	360	394
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	90	125	160	195	230	265	300	335	370	405
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	171	182	193	204	215	227	238	249	260	272
IAC at Brown 8-11	22	66	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	66	119	134	134	134	134	231	249	260	272

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate- High
Fuel Forecast-Low

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	99	126	153	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	98	124	149	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	197	207	218	228	238	249	259	269	279	290
Pulverized Coal (LSFO)-400MW	207	217	228	238	248	258	269	279	289	300	310
Pulverized Coal (LSFO)-300MW	214	227	240	253	266	279	292	305	318	330	343
Pulverized Coal (LSFO)-200MW	260	270	281	292	302	313	323	334	345	355	366
Pulverized Coal (LSFO)-300MW X 2	191	201	212	222	232	242	253	263	273	284	294
Pulverized Coal Compliance (LSD)- 300MW	202	215	228	241	254	267	280	293	305	318	331
Pulverized Coal Supercritical (LSD)- 300MW	242	256	270	283	297	311	324	338	352	365	379
Pulverized Coal (Advanced LSFO)- 400MW	215	225	235	245	255	265	274	284	294	304	314
Atmosph Fluidized Bed (Circulating)-200MW	275	290	305	320	335	350	366	381	396	411	426
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	320	332	343	355	367	379	391	403	414	426
Press Fluidized Bed (Bubbling)-350MW	227	238	248	259	270	280	291	302	312	323	333
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	234	245	256	266	277	287	298	309	319	330
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	272	283	294	305	316	327	338	349	360	371
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	218	229	240	251	262	272	283	294	305	316
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	215	226	237	248	258	269	280	291	302	312
Foster Wheeler Advanced PFB (Circulating)-688MW	193	206	219	232	245	258	271	284	297	310	323
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	292	301	310	319	328	338	347	356	365	375
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	268	277	287	297	306	316	326	336	345	355
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	293	304	314	325	336	346	357	368	378	389
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	401	414	427	440	453	466	479	492	505	518
Advanced Int. Coal Gas-460MW	208	220	231	243	254	266	277	289	300	312	323
Combustion Turbine Heavy Duty-80MW	75	108	141	174	207	240	273	306	339	372	405
Combustion Turbine Heavy Duty-110MW	66	101	136	171	206	241	276	311	346	381	416
Combustion Turbine Heavy Duty-160MW	60	89	118	147	176	205	234	263	292	321	350
Combustion Turbine Aero- 45MW	122	149	176	203	230	257	284	311	338	365	392
CT Combined Cycle 2on1 - 330MW	92	112	131	151	171	191	211	231	250	270	290
CT Combined Cycle 2on1 - 470MW	81	99	117	136	154	172	190	209	227	245	264
CT Combined Cycle - 345MW	89	108	126	144	162	180	198	216	235	253	271
CT with Cascaded Humidified Advanced Turbine-300MW	80	101	121	142	163	183	204	224	245	266	286
Phosphoric Acid Fuel Cell-2.5MW	1291	1317	1344	1370	1396	1423	1449	1475	1502	1528	1554
Molten Carbonate Fuel Cell-100MW	415	432	448	465	482	498	515	532	548	565	582
Solid Oxide Fuel Cell-100MW	206	222	237	252	268	283	298	314	329	344	360
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	321	393	465	537	609	681	753	825	897	969
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw·	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	192	203	214	225	236	247	258	269	280	291
Cane Run 3 Rehab w/ Natural Gas	133	160	188	215	243	270	298	325	353	381	408
Brown 5 CT 110MW	56	87	118	149	180	211	242	273	304	335	366
Brown 5 CT 164MW	57	84	111	138	165	192	219	246	273	300	327
Brown 5 CT 102MW	59	91	123	155	187	219	251	283	315	347	379
Brown 5 CT 159MW	53	81	109	137	165	193	221	249	277	305	333
Brown 5 CT 149MW	54	82	110	138	166	194	222	250	278	306	334
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	86	117	148	179	210	241	272	303	334	365
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	169	179	188	198	208	217	227	237	247	256
IAC at Brown 8-11	22	61	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	61	109	134	134	134	134	209	227	245	256

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate- High
Fuel Forecast- Base

1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	*0*	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Lead Acid Battery Storage(1 hr)-20MW	114	151	—	—	—	—	—	—	—	—	—
Advanced Battery (3 hr)-20MW	143	175	—	—	—	—	—	—	—	—	—
Advanced Battery (5 hr)-20MW	198	227	—	—	—	—	—	—	—	—	—
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	—	—	—	—	—	—	—
Compressed Air Energy (Salt Cavern) -350MW	72	100	128	156	—	—	—	—	—	—	—
Compressed Air Energy w/ Humid Air Turbine-350MW	72	100	128	155	—	—	—	—	—	—	—
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	—	—	—	—	—	—	—	—	—
Pulverized Coal (LSFO)-500MW	187	198	209	220	231	242	253	264	275	286	297
Pulverized Coal (LSFO)-400MW	207	218	229	240	251	262	273	284	296	307	318
Pulverized Coal (LSFO)-300MW	214	228	242	256	270	284	298	312	326	340	354
Pulverized Coal (LSFO)-200MW	260	271	283	294	306	317	329	341	352	364	375
Pulverized Coal (LSFO)-300MW X 2	191	202	213	224	235	246	257	268	280	291	302
Pulverized Coal Compliance (LSD)- 300MW	202	216	230	245	259	273	287	301	315	329	344
Pulverized Coal Supercritical (LSD)- 300MW	242	257	272	286	301	316	331	346	360	375	390
Pulverized Coal (Advanced LSFO)- 400MW	215	226	237	247	258	268	279	290	300	311	321
Atmosph Fluidized Bed (Circulating)-200MW	275	291	308	324	340	357	373	389	406	422	438
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	320	333	346	358	371	384	396	409	421	434
Press Fluidized Bed (Bubbling)-350MW	227	239	250	262	273	285	296	308	320	331	343
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	235	247	258	269	281	292	303	315	326	338
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	273	284	296	308	320	332	344	355	367	379
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	219	231	242	254	266	278	290	302	314	325
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	216	228	239	251	262	274	285	297	308	320
Foster Wheeler Advanced PFB (Circulating)-688MW	193	206	220	234	248	262	276	289	303	317	331
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	292	302	312	322	332	341	351	361	371	381
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	268	279	289	300	310	321	331	342	352	363
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	294	306	317	329	341	352	364	376	387	399
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	401	415	428	442	455	469	482	496	510	523
Advanced Int. Coal Gas-460MW	208	220	232	245	257	269	281	293	305	317	329
Combustion Turbine Heavy Duty-80MW	75	112	149	186	223	260	297	334	371	408	445
Combustion Turbine Heavy Duty-110MW	66	105	144	183	222	261	300	339	378	417	456
Combustion Turbine Heavy Duty-160MW	60	93	126	159	192	225	258	291	324	357	390
Combustion Turbine Aero- 45MW	122	152	182	212	242	272	302	332	362	392	422
CT Combined Cycle 2on1 - 330MW	92	114	136	159	181	203	226	248	270	292	315
CT Combined Cycle 2on1 - 470MW	81	101	122	142	163	184	204	225	246	266	287
CT Combined Cycle - 345MW	89	110	130	150	171	191	211	232	252	272	292
CT with Cascaded Humidified Advanced Turbine-300MW	80	103	126	148	171	194	217	239	262	285	308
Phosphoric Acid Fuel Cell-2.5MW	1291	1320	1350	1379	1408	1438	1467	1496	1526	1555	1584
Molten Carbonate Fuel Cell-100MW	415	433	452	470	488	507	525	543	562	580	598
Solid Oxide Fuel Cell-100MW	206	224	241	258	276	293	310	328	345	362	380
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	330	411	492	573	654	735	816	897	978	1059
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	—	—	—	—	—	—	—	—
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	—	—	—	—	—	—	—	—
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	—	—	—	—	—	—	—	—
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	—	—	—	—	—	—	—	—
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	—	—	—	—	—	—	—
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	—	—	—	—	—	—	—
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	—	—	—	—	—	—	—
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	193	205	217	229	241	253	265	277	289	301
Cane Run 3 Rehab w/ Natural Gas	133	164	195	225	256	287	318	349	380	411	442
Brown 5 CT 110MW	56	91	126	161	196	231	266	301	336	371	406
Brown 5 CT 164MW	57	87	117	147	177	207	237	267	297	327	357
Brown 5 CT 102MW	59	94	129	164	199	234	269	304	339	374	409
Brown 5 CT 159MW	53	84	115	146	177	208	239	270	301	332	363
Brown 5 CT 149MW	54	86	118	150	182	214	246	278	310	342	374
IPP Hydro	134	134	134	134	134	134	134	—	—	—	—
Aeroderivative CT	55	89	123	157	191	225	259	293	327	361	395
Ohio Falls 9&10	156	156	156	156	—	—	—	—	—	—	—
Trimble County 2	159	170	181	191	202	212	223	234	244	255	265
IAC at Brown 8-11	22	64	—	—	—	—	—	—	—	—	—
Minimum Levelized $/kW	22	64	115	134	134	134	134	225	244	255	265

Exhibit 9

Levelized Dollars at Various Capacity Factors with SO2 Adders and without CO2 Adders

Capital Cost- High
Heat Rate- High
Fuel Forecast- High

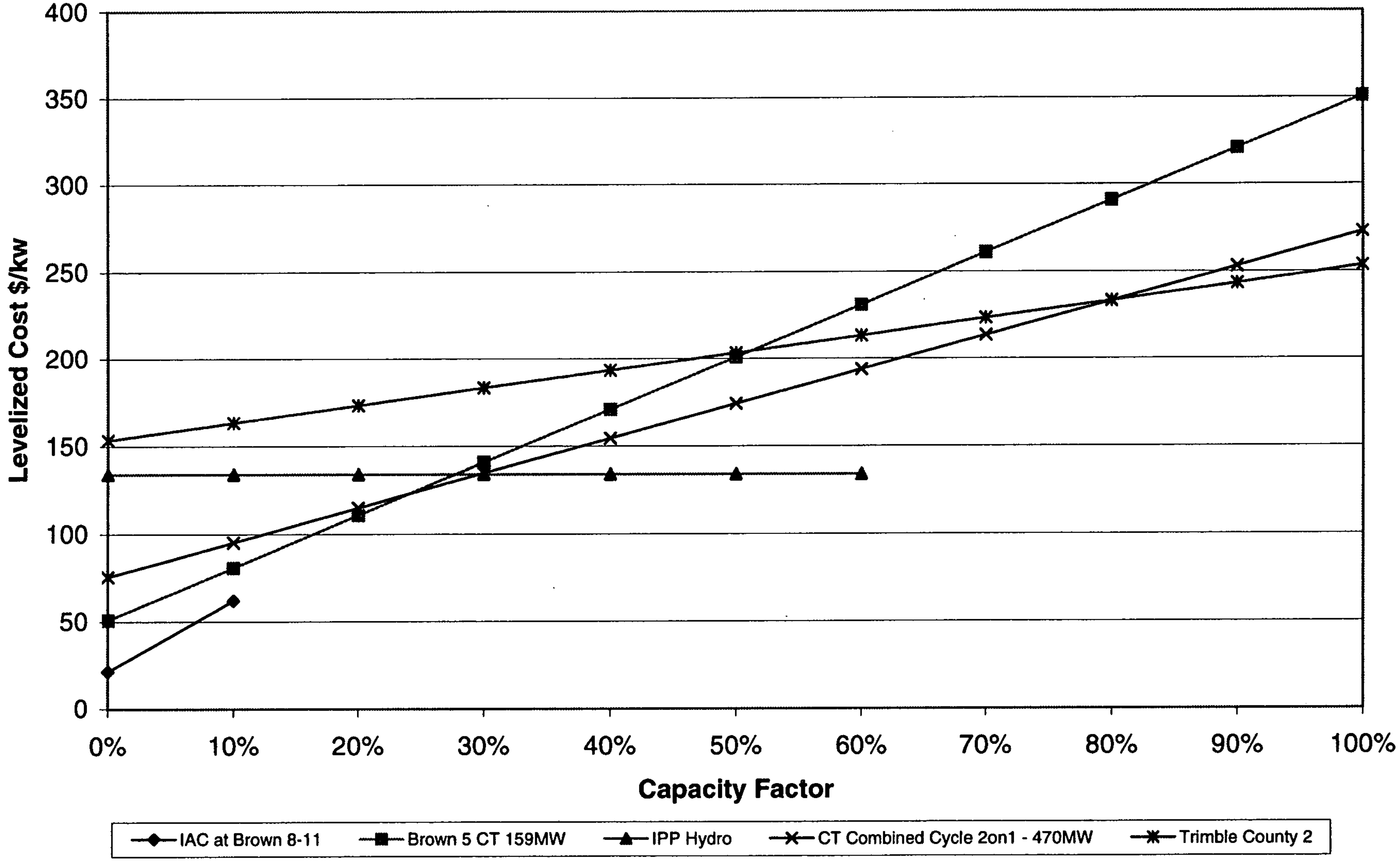
1999 Dollars ($/kW yr)

	Capacity Factors										
Technology	***0***	***10%***	***20%***	***30%***	***40%***	***50%***	***60%***	***70%***	***80%***	***90%***	***100%***
Lead Acid Battery Storage(1 hr)-20MW	114	151	----	----	----	----	----	----	----	----	----
Advanced Battery (3 hr)-20MW	143	175	----	----	----	----	----	----	----	----	----
Advanced Battery (5 hr)-20MW	198	227	----	----	----	----	----	----	----	----	----
Pumped Hydro Energy Storage-350MW X 3	140	173	206	239	----	----	----	----	----	----	----
Compressed Air Energy (Salt Cavern) -350MW	72	101	131	160	----	----	----	----	----	----	----
Compressed Air Energy w/ Humid Air Turbine-350MW	72	101	131	160	----	----	----	----	----	----	----
Super Conducting Magnetic Energy Storage (2 hr)-500MW	175	202	----	----	----	----	----	----	----	----	----
Pulverized Coal (LSFO)-500MW	187	199	211	224	236	248	261	273	285	297	310
Pulverized Coal (LSFO)-400MW	207	219	232	244	256	268	281	293	305	318	330
Pulverized Coal (LSFO)-300MW	214	230	246	261	277	293	308	324	340	355	371
Pulverized Coal (LSFO)-200MW	260	272	285	298	310	323	335	348	361	373	386
Pulverized Coal (LSFO)-300MW X 2	191	203	216	228	240	252	265	277	289	302	314
Pulverized Coal Compliance (LSD)- 300MW	202	218	234	250	265	281	297	313	329	345	361
Pulverized Coal Supercritical (LSD)- 300MW	242	259	275	292	309	325	342	358	375	392	408
Pulverized Coal (Advanced LSFO)- 400MW	215	227	239	250	262	274	285	297	309	321	332
Atmosph Fluidized Bed (Circulating)-200MW	275	293	311	329	347	365	383	401	419	437	455
Press Fluidized Bed (Bubbling, Non-Reheat)-80MW X 2	308	322	336	349	363	377	391	405	419	432	446
Press Fluidized Bed (Bubbling)-350MW	227	240	252	265	278	290	303	316	328	341	353
Press Fluidized Bed (Bubbling, Supercritic)-340MW	224	236	249	261	274	286	299	311	323	336	348
Press Fluidized Bed (Circulating, with Reheat)-160MW	261	274	287	299	312	325	338	351	364	377	390
Press Fluidized Bed (Circulating, with Reheat)-360MW	207	220	233	246	259	272	284	297	310	323	336
Press Fluidized Bed (Circulating, Supercritical)-360MW	205	217	230	242	255	268	280	293	306	318	331
Foster Wheeler Advanced PFB (Circulating)-688MW	193	207	222	237	252	266	281	296	311	325	340
Highly Integrated Coal Gas/Comb Cyc (Entrained)-601MW	282	293	304	315	326	337	348	359	370	381	392
Int Coal Gas w/ Humid Air Turbine (Entrained Flow)-600MW	258	270	281	293	304	316	327	339	350	362	373
Int Coal Gas / CAES with Humid Air Turbine-410MW	282	295	308	320	333	346	358	371	384	396	409
Int Coal Gas/ Molten Carbonate Fuel Cell 400MW	388	402	417	431	446	460	474	489	503	518	532
Advanced Int. Coal Gas-460MW	208	221	234	248	261	274	287	300	313	326	339
Combustion Turbine Heavy Duty-80MW	75	116	157	198	239	280	321	362	403	444	485
Combustion Turbine Heavy Duty-110MW	66	109	152	195	238	281	324	367	410	453	496
Combustion Turbine Heavy Duty-160MW	60	96	132	168	204	240	276	312	348	384	420
Combustion Turbine Aero- 45MW	122	155	188	221	254	287	320	353	386	419	452
CT Combined Cycle 2on1 - 330MW	92	116	141	165	190	214	238	263	287	312	336
CT Combined Cycle 2on1 - 470MW	81	103	126	148	171	194	216	239	262	284	307
CT Combined Cycle - 345MW	89	112	134	156	179	201	223	246	268	290	312
CT with Cascaded Humidified Advanced Turbine-300MW	80	105	130	155	180	205	230	255	279	304	329
Phosphoric Acid Fuel Cell-2.5MW	1291	1323	1355	1387	1419	1451	1483	1515	1547	1579	1611
Molten Carbonate Fuel Cell-100MW	415	435	455	475	495	515	535	555	575	595	615
Solid Oxide Fuel Cell-100MW	206	225	244	263	282	301	320	339	358	377	396
Geothermal: Dual Flash Brine, Air Cooled-24MW	249	338	427	517	606	696	785	874	964	1053	1142
Solar Photovoltaic:Flat Plate-10x5MW	1052	1052	1052	----	----	----	----	----	----	----	----
Solar Photovoltaic:One Axis Tracking Flat Plate-10x5MW	1166	1166	1166	----	----	----	----	----	----	----	----
Solar Photovoltaic:Fresnel Lens High Concen.-10x5MW	1037	1037	1037	----	----	----	----	----	----	----	----
Solar Thermal Trough/Gas Hybrid-200MW	422	426	430	----	----	----	----	----	----	----	----
Wind Turbines-Variable Speed-50x750kw	204	204	204	204	----	----	----	----	----	----	----
Wind Turbines-High Prod Volume-143x350kw	217	217	217	217	----	----	----	----	----	----	----
Wind Turbines-Class 4 Speed-50x750kw	206	206	206	206	----	----	----	----	----	----	----
Municipal Solid Waste: Mass Burn-40MW	1050	1085	1120	1154	1189	1224	1258	1293	1327	1362	1397
Municipal Solid Waste: Refuse Der.-40MW	1152	1187	1221	1256	1290	1325	1359	1394	1428	1463	1497
Municipal Solid Waste: Tire-30MW	661	666	671	676	680	685	690	695	699	704	709
Bio Mass: Wood-Fired Stoker Boiler-50MW	401	447	493	539	585	631	677	722	768	814	860
Bio Mass: Whole Tree-100MW	440	466	492	518	544	570	596	622	648	674	700
Cane Run 3 Rehab w/ AFBC	181	194	207	220	234	247	260	273	287	300	313
Cane Run 3 Rehab w/ Natural Gas	133	167	201	235	269	303	338	372	406	440	474
Brown 5 CT 110MW	56	95	134	173	212	251	290	329	368	407	446
Brown 5 CT 164MW	57	90	123	156	189	222	255	288	321	354	387
Brown 5 CT 102MW	59	98	137	176	215	254	293	332	371	410	449
Brown 5 CT 159MW	53	87	121	155	189	223	257	291	325	359	393
Brown 5 CT 149MW	54	89	124	159	194	229	264	299	334	369	404
IPP Hydro	134	134	134	134	134	134	134	----	----	----	----
Aeroderivative CT	55	92	129	166	203	240	277	314	351	388	425
Ohio Falls 9&10	156	156	156	156	----	----	----	----	----	----	----
Trimble County 2	159	171	183	195	207	219	230	242	254	266	278
IAC at Brown 8-11	22	68	----	----	----	----	----	----	----	----	----
Minimum Levelized $/kW	22	68	121	134	134	134	134	239	254	266	278

Exhibit 10

Least Costly Technologies

Base Capital, Base Heatrate, Base Fuel



VI. CAAA COMPLIANCE ANALYSIS

KENTUCKY UTILITIES

&

LOUISVILLE GAS & ELECTRIC

Clean Air Act Amendments of 1990 Compliance Plan

1999 Environmental Compliance Analysis

Prepared

October 1999

By

GENERATION SYSTEMS PLANNING

October 1999

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Generation Systems Planning has performed an analysis of environmental compliance options for both Kentucky Utilities Company (KU) and Louisville Gas and Electric Company (LGE) to comply with the Clean Air Act Amendments of 1990 using the most current information available. This compliance assessment uses the Demand and Energy Forecast, Fuel Forecast, Allowance Market Price Forecast, Generation Expansion Plan, Generator Unit Ratings, and Financial parameters current as of August, 1999. This report documents the results and recommendations of this assessment.

Consistent with previous studies the installation of a scrubber on Ghent Unit 2 continues to be an economically favorable part of the Companies' overall compliance plan. However, increasing the removal efficiency (overscrubbing) of the existing Flue Gas Desulfurization (FGD or scrubber) systems (Ghent Unit 1, Trimble County, Mill Creek Units 1, 2, 3 and 4, Cane Run Units 4, 5 and 6) would now be the lowest cost means of reducing total SO_2 emissions and the first step of any compliance plan. After overscrubbing, the scrubbing of Ghent Unit 2 is the next lowest cost compliance option and its economics should continue to be evaluated as the fuel price differences between high and low sulfur coal change.

This conclusion was reached after consideration and analysis of all viable compliance options and a comprehensive set of alternative compliance strategies.

The actual costs for overscrubbing and the achieved removal efficiencies should be reviewed throughout the upcoming year (2000) to verify that the estimated removal costs were accurate and that overscrubbing continues to be an economical strategy to reduce emissions. This option is very flexible in that it can be stopped at any time without any capital investment loss.

The option of scrubbing Ghent Unit 2 should continue to be evaluated closely with respect to expected fuel prices. It is recommended that the Companies analyze the capital costs and fuel savings associated with the Ghent Unit 2 scrubber at some point after implementation of Phase II of the CAAA. This will allow the Companies to evaluate the impacts of Phase II on the fuel markets and to gain a better estimate of the costs and benefits of overscrubbing. The analysis presently shows that the Ghent Unit 2 option is only slightly more economical than relying on allowance purchases.

I. Introduction

As part of KU's and LG&E's (Companies') ongoing planning process, a new assessment of the Companies' Environmental Compliance plans in response to the Clean Air Act Amendments of 1990 (CAAA) was initiated in August 1999. The objective of this report is to summarize the results of the continuing analysis and suggest a recommended compliance plan. The major study input items updated for this analysis include the following:

Demand and Energy Forecast
Fuel Forecast
Allowance Market Price Forecast
Generation Expansion Plan
Generator Unit Ratings
Capital Costs
Financial Parameters

The first step of the analysis was to reevaluate all possible compliance options for each unit through a cost screening process. All options for every unit were evaluated with current information. Options that passed the screening process were then combined into compliance strategies and evaluated in detail in the hourly production costing model, PROSYM and a capital cost evaluation using the Capital Expenditure and Recovery (CER) module of PROSCREEN II.

Compliance assessment is a continuing and ongoing endeavor. As such, this document represents a report of the results to date.

II. Background

KU had begun to analyze options to reduce sulfur dioxide emissions prior to passage of the Clean Air Act Amendments of 1990. LG&E had no obligations for sulfur dioxide emissions under Phase I of the CAAA of 1990. Phase I affected units include all units greater than 100 MW with emissions greater than 2.5 lbs/mmBtu. By the fall of 1991, the analysis had proceeded to the point that decisions were needed with respect to Phase I compliance. It was determined that installation of a scrubber at Ghent Unit No. 1, the Companies' single largest source of sulfur dioxide emissions, would be a cost effective component in any overall plan to meet Phase I requirements and provide substantial flexibility in later decisions with respect to compliance options for Phase II. Thus, on January 2, 1992, an application was filed with the Kentucky Public Service Commission (KPSC) for a Certificate of Public Convenience and Necessity (CCN) to construct the scrubber at Ghent Unit No. 1.

With receipt of the CCN, the installation of the Ghent Unit 1 scrubber went forward with completion planned for January 1, 1995. The Commission's order approved the recommendation to install a scrubber at Ghent Unit 1. It is also clear that the Commission's granting of the CCN specifically covered no other decision or actions. At the time of the CCN proceeding and receipt of the order, the Companies had no firm plans with respect to additional actions or compliance options. The analyses that supported the decision to build the scrubber at Ghent Unit 1 necessarily addressed an overall, long-term plan. However, these analyses did not produce, or result in, a firm overall compliance plan. Except for the Ghent Unit 1 scrubber, all other elements in the "optimal" plan were viewed as "best current options under review".

Consistent with the Commission's decision, work on the scrubber was the only major action taken with respect to an overall compliance plan. It was not necessary to make commitments with respect to other compliance plan elements at the time. Additional decisions would be made as necessary and only after full and complete analysis of alternatives with consideration of the best available information and recognition of changing circumstances and conditions. Flexibility in terms of timing and alternatives was viewed as a key benefit of installing a scrubber at Ghent Unit 1. The Companies, as part of their on-going planning process, monitor critical inputs and assumptions, and continue to analyze alternatives.

III. Screening Methodology For Compliance Options

The Companies have been monitoring developments in environmental control technologies for fossil-fueled power plants for many years. Since the emergence of proposed acid rain legislation in 1989, and the actual signing of the Clean Air Act Amendments of 1990 (CAAA), significant attention has been focused on options for controlling SO_2 emissions and meeting the requirements established by the CAAA. The knowledge accumulated through previous and ongoing activities was used to develop a complete list of possible compliance options for each generating unit analyzed. The results of the screening analysis reflect the best information currently available.

Units with existing scrubbers were not considered in the screening process (except for Green River Units 1 and 2 that were considered in a retirement option). The screening methodology involved four distinct steps. The first step identified technically feasible compliance options for each plant as well as system-wide compliance options. In identifying feasible compliance options, the approach was to err on the side of inclusion of candidate options rather than exclusion. The second step developed estimates of the cost per ton of SO_2 removed for each feasible option and the third step determined which options, based on estimated SO_2 removal cost, to consider further as part of a compliance plan. The final step of screening was to combine the options identified by the screening process as economical into various alternative candidate compliance plans. These alternative plans would then be subjected to a more detailed assessment using all the evaluation criteria determined to be significant for compliance planning.

The appropriate measure for ranking technically feasible options for screening purposes is dollars per ton of SO_2 removed. Once again, in developing estimates of the cost per ton removed, a conservative approach was adopted, choosing to err on the side of inclusion. Options were not eliminated based on marginal differences in assumptions.

Cost estimates of technically feasible options were developed for each generating unit, including all applicable cost elements (capital, fuel and O&M). Screening estimates were prepared for a single year of operation. All estimates were in 1999 dollars and capital costs were levelized with a fixed charge rate. The results, in terms of dollars per ton of SO_2 removed, were then compiled in a summary matrix.

The determination of options appropriate for detailed study as part of alternative compliance plans was based primarily on the estimated dollars per ton removal cost in conjunction with the number of tons potentially removable. The first screening limit was set to exclude options that exceeded SO_2 removal cost of $300 per ton. The $300 value represents an estimate of the maximum expected price for allowances purchased for use in 2000. Options with a $300 per ton or greater removal cost are not likely to be beneficial elements of alternative compliance plans and were not considered further.

IV. Potential Compliance Technologies

A key criterion used in identifying feasible options for plants and the combined systems was demonstration of an option's commercial viability; i.e. technologies had to be proven on a commercial scale to be considered feasible.

Four categories of technologies were identified and considered. These included: (1) Flue Gas Desulfurization Systems ("FGD" or "Scrubbers"); (2) Fuel Switching; (3) Repowering; and (4) System Management. The options within each category are delineated below:

(1) Scrubber Options
- Wet Flue Gas Desulfurization Process
- Dry Flue Gas Desulfurization Process
- Overscrub Existing Scrubbed Units

(2) Fuel Switching Options
- Coal Blending
- Coal Switching
- Coal Cleaning
- Co-firing with Natural Gas
- Switching to Natural Gas
- Biomass/Wood

(3) Repowering Options	- Combustion Turbine/Combined Cycle - Fluidized Bed Combustion - Coal Gasification ("IGCC") - Retirement/New Unit
(4) System Management Options	- Bulk Power Transactions - Environmental Dispatch

V. Development of Screening Data and Assumptions

As noted previously, a conservative philosophy was adopted in the development of cost estimates for screening purposes. When there was doubt about an assumption or numerical value, the intent was to use an assumption or select a value that would tend to permit the option to pass the screening test, rather than to result in its exclusion.

Costs were developed in 1999 dollars based on generic information available from EPRI, unless the Companies had access to better values from specific studies concerning its own units. In applying EPRI information, a "small unit" was defined as one having a generating capacity of 200 MW or less.

See Appendix A for specific assumptions used in the development of the screening estimates for options at each unit.

Only non-reheat units (identified in Appendix A) were considered as candidates for early retirement. These units represent the older, less efficient units on the system. Retired capacity would be replaced with natural gas-fired combined-cycle capacity.

The Bulk Power Transaction Option was viewed as being similar to the allowance market and was assigned a similar range of costs ($190 to $300 per ton). Thus, by definition, it passed the screening test. The overscrub option for existing scrubbed units ranged from $50 to $130 per allowance and will be evaluated in subsequent detailed simulations in PROSYM.

The Environmental Dispatch Option does not lend itself easily to the development of a single year screening estimate. The evaluation recognized Environmental Dispatch as an economic dispatch with environmental costs reflected. This option was assumed to pass the screening without specifically developing a dollar per ton removal cost estimate, and will be analyzed as part of all subsequent detailed simulations in PROSYM and PROSCREEN II.

VI. Option Screening By Unit

Appendix B presents screening worksheets for each non-scrubbed unit. The base conditions for each unit, including generating capacity, capacity factor, heat input, heat rate, fuel quality (pounds of SO_2/mmBtu), annual SO_2 emissions, and fuel cost are shown at the top of the individual unit's worksheet. The elements of the screening estimates, including capital costs (capacity), delta fuel costs, fixed O&M, and variable O&M, are then presented for each compliance option. The resultant SO_2 reduction (tons per year) and the estimate of dollars per ton removed are shown for each option.

If a compliance option was determined to be unfeasible for a particular unit, the worksheet indicates "n/a" and adds a summary explanation for the determination.

VII. Results Analysis Of Individual Compliance Options

Appendix C presents the Summary Screening Matrix. For each unit and for each option in the screening analysis, the estimated tons SO_2 removed and estimated dollar per ton removed are indicated. Options that are not feasible are indicated by "n/a". The total tons of SO_2 that would be emitted in the absence of SO_2 restrictions (i.e., without altering operations expected in the absence of the CAAA) are listed by generating unit or plant. The estimated impact, or SO_2 reduction, due to each compliance option is shown in the matrix. The significance of each potential option can be compared to the estimated total SO_2 removal requirements of 100,000 tons/yr during Phase II. All coal units will be affected in Phase II.

A variation of the Summary Screening Matrix is also shown in Appendix C. This exhibit distinguishes between options with removal costs less than $300 per ton and removal costs greater than $300 per ton removed by use of shading.

Bulk power transactions, environmental dispatch, and overscrubbing were all assumed to be deserving of further analysis and consideration in development and study of alternative compliance plans.

Due to their design and present condition, Tyrone Units 1 and 2 (oil- fired units) and Green River Units 1 and 2 (coal-fired units which are already scrubbed) were not specifically considered in the screening analysis except in a retirement option.

Pineville Unit 3 and Tyrone Unit 3 were found to be inappropriate for inclusion in any further analysis. All technically feasible options for these units were too expensive for serious consideration. Even if the capacity factors for the units were substantially increased, none of the options would be economical. In addition, the total available reductions at these units are not significant when compared to other feasible and more economical options. This result is consistent with the previous screening study.

No option at Green River Units 3 and 4 was below the \$300 per ton removed screening value. The two lowest cost options were fuel switching to compliance coal at \$410 per ton of SO_2 removed, and fuel switching to Powder River Basin coal at approximately \$640 per ton of SO_2 removed. Switching to compliance coal at these units could reduce annual SO_2 emissions by 14,567 tons. Switching to Powder River Basin coal could reduce SO_2 emissions by 16,648 tons. These options provide a significant reduction in SO_2 emissions, but the cost per ton removed is considered too costly. The coal market should continue to be monitored and these options considered if there is a significant reduction in compliance or Powder River Basin coal prices.

No options were found below the \$300 per ton removed screening value at Brown Unit 1. Switching to compliance coal was estimated at \$610 per ton removed, potentially reducing SO_2 emissions by 2,836 tons per year. The next lowest cost option was switching to Powder River Basin coal at \$1,120 per ton removed with a lower reduction potential of 3,971 tons per year. If Brown 1 were to be considered as part of an alternative compliance plan, switching to compliance coal would be the most likely option.

No options were found below the \$300 per ton removed screening value at Brown Units 2 & 3. Switching to compliance coal would reduce emissions by 16,264 tons at \$480 per ton. Blending coal had a higher cost of \$700 per ton removed with a lower reduction of 10,734 tons per year. Previous studies had shown fuel switching Brown Plant to compliance coal to be an economical method to reduce emissions. The economics have changed because Brown Plant has gone from burning 3 lbs/mmBtu coal to burning 2.2 lbs/mmBtu without a significant change in cost. Therefore, switching to compliance coal does not achieve as significant an emissions reduction compared to previous studies, which raises the cost in terms of doller per ton removed.

At Ghent Unit 2, the only viable option is to install additional scrubber modules in addition to the three modules for Ghent Unit 1. Ghent Unit 2 currently burns compliance coal. Installing additional scrubber modules would allow Ghent Unit 2 to burn high sulfur coal. The lower cost of high sulfur coal would offset the cost associated with scrubbing. The result is a reduction in SO_2 emissions of 12,340 tons per year, at a cost of \$20 per ton.

Ghent Units 3 & 4 currently burn compliance coal. The only viable option for these units is to install a wet FGD like that on Ghent Unit 1. Analysis indicates this option would reduce emissions by 24,441 tons at a cost of \$210 per ton. This option is the next lowest cost option after scrubbing Ghent Unit 2 and will be considered in the detailed analysis.

Previous studies had shown that fuel switching Ghent Units 3 & 4 to Powder River Basin coal would be the cheapest alternative. However, after a test burn of this coal was completed in 1999, it was determined that additional capital costs would be required than previously projected. The test burn also revealed that burning Powder River Basin coal would result in a more significant heatrate degradation. After the additional capital and operating costs were factored in, the fuel switch to Powder River Basin coal failed to pass the screening requirement maximum of $300 per ton of SO_2 removed.

VIII. Development Of Compliance Strategies

Individual compliance options must be combined into alternative compliance plans, as the individual unit-specific options are insufficient in themselves to bring the Companies into compliance with Phase 2 SO_2 emission limits. The following combinations of compliance options were considered as appropriate for additional analysis by modeling the Companies' production costs through the 15-year planning horizon and deriving a present value of revenue requirements scenario.

1) Overscrub all scrubbed units (except Green River Units 1 and 2), buy allowances

2) Overscrub all scrubbed units (except Green River Units 1 and 2), Scrub Ghent Unit 2, buy allowances

3) Overscrub all scrubbed units (except Green River Units 1 and 2), Scrub Ghent Unit 2, Scrub Ghent Units 3 and 4, buy allowances

4) Scrub Ghent Unit 2 only, buy allowances

5) Scrub Ghent Units 3 and 4 only, buy allowances

6) Buy allowances

IX. Analysis Of Alternative Compliance Plans

Seven alternative compliance plans were developed and evaluated. In addition, selected sensitivity studies were evaluated for the most economical compliance plans. These sensitivities included the analysis of fuel and allowance price fluctuations. Contained below are further descriptions of these specific alternative compliance plans and their results. The plans are based on the concepts listed above. Each of the plans is modeled in a case with high generation levels on all coal-fired units. This was done to provide a conservative estimate for the timing of compliance projects. The timing of compliance options can be impacted by operational deviations due to unplanned outages and changes in expected generation requirements.

Each alternative compliance plan presented below allows for compliance with the SO_2 emissions limitations imposed by the CAAA. These plans, however, do not include the additional costs that are expected to be required for compliance with the new NO_x limits. Appendix G contains a summary of all of the plans.

Case 01 - is a case where no additional compliance measures are implemented except for the continuing use of an emissions dispatch adder. An environmental dispatch with an SO_2 adder is applied to Phase I units (Ghent Unit 1, Brown Units 1, 2 and 3, and Green River Unit 4) in 1999 and applied to Phase II units (all units greater than 25 MW) in 2000 and beyond. Ultimately, as the allowance bank is depleted, additional allowances must be purchased beginning in 2004. This case reveals that without any further compliance action, the Companies would be out of compliance beginning in the year 2004.

The 15-year PVRR is $5,695,886,000 and consists of $4,979,007,000 in production costs, $638,799,000 in capital costs for anticipated unit additions to meet increasing capacity needs, and $78,080,000 for purchased allowances. As with the other compliance plans that follow, these are not incremental production and capital costs due only to compliance options, but rather the total required system capital and production costs for system expansion.

Appendix E presents annual emissions of SO_2 by plant for Case 01 and all other cases that were analyzed. The total tonnage of SO_2 listed is for the aggregate of the Phase I units through 1999 and for Phase I and Phase II units in the year 2000 and beyond. This Appendix includes the corresponding sulfur content of the fuel used, as well as scrubber removal efficiency. Zero removal efficiency indicates the absence of scrubbing capability. Also included are annual available allowances, and the resulting allowance bank. The allowances available are base EPA allowances, extension allowances, allowances associated with the OMU purchase power agreement, allowances purchased in the EPA auction, and all additional purchased allowances. The allowance bank is the net number of allowances after the annual reduction to reflect SO_2 emissions in that year. To remain in compliance, the bank must not become negative.

Case 02 - is identical to Case 01 except that the SO_2 adder has been removed. As the allowance bank is depleted, additional allowances must be purchased beginning in 2003. The benefit received from the emissions adder is reduced toward the end of the study period. This results from the coal units reaching their maximum capacity levels and reducing the ability to switch between units with lower sulfur emissions.

The 15-year PVRR is $5,705,949,000 and consists of $4,969,875,000 in production costs, $638,799,000 in capital costs, and $97,275,000 for purchased allowances. The removal of the emissions adder results in production costs decreasing $9,132,000 and allowance costs increasing $19,195,000 over Case 01. The removal of the environmental dispatch also increased the quantity of purchased allowances required from 863,738 to 1,040,844.

The overall economic impact of removing the SO_2 adder was an increase of $10,063,000 over Case 01. The results of this case comparison indicate that the adder is still an economical compliance option that should be part of any overall compliance plan. As a result, all other possible compliance plans to be evaluated will include an SO_2 adder as a means of achieving an environmental dispatch of generating units.

Case 03 - is identical to Case 01 with the addition of increasing the removal efficiency (overscrubbing) of existing scrubbed units (Ghent Unit 1, Trimble County, Mill Creek Units 1, 2, 3 and 4, Cane Run Units 4, 5 and 6) as a compliance alternative. Ultimately, as the allowance bank is depleted, additional allowances must be purchased beginning in 2010.

The 15-year PVRR is $5,663,260,000 and consists of $5,013,129,000 in production costs, $638,799,000 in capital costs, and $11,332,000 for purchased allowances. Overscrubbing results in production costs increasing $34,122,000 and allowance costs decreasing $66,748,000 over Case 01. Overscrubbing also reduced the quantity of purchased allowances required from 863,738 to 158,271.

The overall economic impact of overscrubbing was a decrease of $32,626,000 over Case 01. The results of this case reveal that overscrubbing is a very economical means to reduce emissions. Overscrubbing has many advantages over other options because it requires no additional commitment to capital expenditures. If the price of allowances were to change, the economics of overscrubbing could be reevaluated and stopped or continued as the economics indicated without any loss of capital.

Case 04 - is Case 01 with Ghent Unit 2 scrubbed and fuel switched to 5.5# coal in 2003. The purpose of this case is to determine if the scrubbing of Ghent Unit 2 is a more economical way to comply than simply purchasing any required allowances. While this option reduces overall emissions, the addition of the Ghent Unit 2 scrubber does not achieve a delay in the first year requiring purchased allowances over Case 01.

The 15-year PVRR is $5,692,723,000 and consists of $4,943,822,000 in production costs, $682,862,000 in capital costs, and $66,039,000 for purchased allowances.

The overall economic impact of adding the Ghent Unit 2 scrubber was a decrease of $3,164,000 over Case 01. The addition of the Ghent Unit 2 scrubber increases capital expenditures $44,063,000 and reduces production and purchased allowance costs by $35,185,000 and $12,041,000, respectively. The quantity of purchased allowances required decreased 125,104 to 738,634.

The results of this case comparison indicate that the addition of the Ghent Unit 2 scrubber is a less costly method of complying than relying only on purchased allowances. This plan begins to have annual net savings in 2004 and overcomes the accumulated capital cost in 2012. However, the majority of the savings is due to the forecasted fuel savings between 5.5# and compliance coal. The reliance on projected fuel savings makes the scrubbing of Ghent Unit 2 an option that requires continual review. While the capital costs are dependent on construction issues and become firm at the completion of the project, the premium for compliance coal could vary significantly through time. The forecasted savings associated with scrubbing Ghent Unit 2 would quickly disappear if the premium for compliance coal were to decrease or fail to increase through time as in the current fuel forecast. The risk for this option is greater because the identified benefits of scrubbing Ghent Unit 2 are almost completely reliant upon the fuel forecast.

Case 05 - is Case 01 with Ghent 3 and 4 scrubbed and fuel switched to 5.5# coal in 2003. The purpose of this case is to determine if the scrubbing of Ghent 3 and 4 is a more economical way to comply than simply purchasing any required allowances. The addition of the Ghent 3 and 4 scrubber delays the first year requiring purchased allowances to 2005 from 2004.

The 15-year PVRR is $5,728,286,000 and consists of $4,912,571,000 in production costs, $760,355,000 in capital costs, and $55,360,000 for purchased allowances.

Case 05's total cost is $32,400,000 more than Case 01. The scrubbing of Ghent 3 and 4 increases capital expenditures $121,556,000 and reduces production and purchased allowance costs by $66,436,000 and $22,720,000, respectively. The quantity of purchased allowances required decreased 235,302 to 628,436.

The results of this case comparison indicate that scrubbing and fuel switching Ghent 3 and 4 to 5.5# coal is a more costly method of complying than relying on only purchased allowances. The majority of the production savings associated with this option result from the fuel price difference between compliance coal and 5.5# coal. If the premium for compliance coal decreases, or fails to escalate as projected in the cases, the fuel savings associated with scrubbing Ghent 3 and 4 will become less significant. The risk for this option is greater because the identified benefits of scrubbing Ghent 3 and 4 are almost completely reliant upon the fuel forecast. This option, while having a significant impact on overall emissions, fails to be more economical than relying on purchased allowances.

Case 06 - is Case 03 (overscrub in 2000) with Ghent Unit 2 scrubbed and fuel switched to 5.5# coal in 2003. The purpose of this case is to combine to economical options into one case and determine the combined impact. The combination of overscrubbing existing units and scrubbing Ghent Unit 2 scrubber delays the first year requiring purchased allowances to 2014 from 2004 in Case 01. This delay is four years longer than in Case-03 where overscrubbing was the only option implemented.

The 15-year PVRR is $5,662,901,000 and consists of $4,980,039,000 in production costs, $682,862,000 in capital costs, and $0 for purchased allowances.

Case 06's total cost is $359,000 less than Case 03 and $32,985,000 less than Case 01. The addition of the Ghent Unit 2 scrubber to Case 03 increases capital expenditures by $44,063,000 and reduces production and purchased allowance costs by $33,090,000 and $11,332,000, respectively. The quantity of purchased allowances required decreased from 158,271 in Case 03 to 0 in Case 01.

The results of this case indicate that the combination of overscrubbing existing units and scrubbing Ghent Unit 2 and fuel switching to 5.5# coal is a less costly method of complying than relying on only purchased allowances and better than either of the options individually.

Case 07 - is Case 06 with Ghent 3 and 4 scrubbed and fuel switched to 5.5# coal in 2010. The purpose of this case is to develop a compliance plan with little or no reliance on the SO_2 allowance market. The addition of the Ghent 3 and 4 scrubbers decreases the 2010 emissions by 30,439 tons. This reduction lowers emissions below the EPA allotment for 2010, but the allotment is exceeded in the remaining years. This case shows that the combination of scrubbing Ghent 2, 3, and 4, and overscrubbing would substantially reduce the reliance on an uncertain SO_2 allowance market. However, based on the current allowance price forecast, the scrubbing of Ghent 3 and 4 is uneconomical.

The 15-year PVRR is $5,688,432,000 and consists of $4,959,706,000 in production costs, $728,726,000 in capital costs, and $0 for purchased allowances.

Case 07's total cost is $25,531,000 more than Case 06 and $7,454,000 less than Case 01. The addition of the Ghent 3 and 4 scrubbers to Case 06 increases capital expenditures by $45,864,000 and reduces production costs by $20,333,000. The quantity of purchased allowances remained unchanged in the 15-year period..

The results of this case indicate that while the addition of the Ghent 3 and 4 scrubber increases costs over Case 06, it does identify a plan that would allow the Companies to significantly reduce their reliance on the SO_2 allowance market.

Although scrubbing Ghent 3 and 4 has been identified as more costly than purchasing allowances, this option is the Companies' next best option to reduce overall SO_2 emissions. This option will be shown in 2014 when the depletion of the allowance bank is expected.

X. Sensitivity Analysis

Although the analyses completed above indicate Case 06 as the best compliance plan, a sensitivity analysis was also completed to determine how vulnerable the plan is to changes in forecasted information. Such a sensitivity analysis will provide valuable insight on exposure. All of the cases except Case 02 were subjected to an allowance price sensitivity to determine if a high or low allowance price would change the ultimate decision of each option. The forecast of allowance prices is subject to significant uncertainty, both in the near term and the long term. This sensitivity analysis will identify if the economics will be altered significantly with a change in the expected value of future allowances.

Cases 01, 04, and 05 were subjected to a high and low fuel price sensitivity. Case 01 was chosen to maintain a constant case to compare against and Cases 04 and 05 were selected to isolate the two scrubber options and because the scrubber options are highly impacted by the forecasted fuel prices.

Finally Cases 04 and 05 were analyzed with a high and low scrubber cost sensitivity. This sensitivity was used to determine if a ±10% change in the capital cost assumption would alter the economics of the analysis.

Appendices D and E include the detailed cost and SO_2 summaries of each sensitivity analysis and Appendix F contains a summary of the results.

Allowance Price Sensitivity: Cases 01, 03, 04, 05, 06, and 07 were modeled with an allowance price of $150 and $300, which compares to the base allowance price of $200. As expected, Cases 07 and 06 were the least sensitive to a change since they required no allowance purchases in the fifteen-year study period. The ranking of the plans was the same in the high allowance price scenarios. However, the rankings changed in the low allowance price scenario. In this scenario, Case 03 (overscrub in 2000 only) became less costly (by $2,474,000) than Case 06 (Case 03 with scrubbing Ghent Unit 2 in 2003). The reason is that Case 03 relies more on allowance purchases and gets a benefit from the lower allowance price. However, for the same reason Case 03 receives a larger negative benefit in the high allowance case and becomes $6,025,000 higher than Case 06. Case 06 is the lowest cost alternative in two of the three scenarios and loses to Case 01 by $2,474,000 in the low allowance price scenario.

Fuel Price Sensitivity: The purpose of this sensitivity analysis was to determine the impact of varying the fuel price would have on the economics of the two scrubber options (Case 04 and Case 05). The high fuel price forecast has an increase in the price gap between compliance and 5.5# coal and the low fuel price forecast has a slight decrease in the price gap between compliance and 5.5# coal. The ranking of the cases did not change in either of the fuel price forecast scenarios. Case 04 where Ghent Unit 2 is scrubbed in 2003 remains more economical than purchasing allowances in each of the scenarios.

Scrubber Price Sensitivity: The purpose of this sensitivity analysis was to determine the impact of a 10% variance in the scrubber installation price on the economics of the two scrubber options

(Case 04 and Case 05). A 10% increase in the scrubber installation cost would make Case 04 $1,242,000 more costly than relying on allowance purchases. This case was only $3,164,000 less costly than purchasing allowances in the base case. Reducing the cost of the Ghent Units 3 and 4 scrubbers 10% was not enough to make the option more economic than purchasing allowances. This sensitivity analysis reveals that a less than 10% increase in the cost of the Ghent Unit 2 scrubber could result in this option becoming uneconomical compared to simply purchasing allowances.

XI. Conclusions and Recommendations

The overscrubbing of all scrubbed units (Ghent Unit 1, Trimble County, Mill Creek Units 1, 2, 3 and 4, Cane Run Units 4, 5 and 6) shows to be economically favorable as part of an overall compliance plan. Overscrubbing significantly reduces overall emissions and is more economical than purchasing allowances. In addition to being economically favorable, this compliance option has the additional benefit of flexibility. If the price for allowances purchases were to change or if the estimated cost of overscrubbing changes, the increased scrubbing levels can be adjusted without any stranded capital investment.

The actual costs for overscrubbing and the achieved removal efficiencies should be reviewed throughout the upcoming year (2000) to verify that the estimated removal costs were accurate and that overscrubbing continues to be an economical strategy to reduce emissions. This option is very flexible in that it can be stopped at any time without any capital investment loss.

This analysis continues to show that the scrubbing of Ghent Unit 2 is the Companies' next best compliance option and its economics should be monitored closely as the fuel price differences between high and low sulfur coal change. It is uncertain what effect the mandatory compliance of Phase II units, beginning in 2000, will have on fuel prices. The Ghent Unit 2 option presently shows that it is only slightly more economical than relying on purchased allowances.

This analysis also continues to show that the use of an SO_2 adder is an economical way to reduce annual emissions. The benefit of the adder decreases through time as coal units reach higher capacity factors, reducing the opportunities to switch from higher emitting units to lower emitting units.

Present analyses show that the continued implementation of an SO_2 adder and overscrubbing are economical methods of reducing emissions. The combination of these two compliance options could feasibly delay the need for any additional compliance option implementation until 2010. This conclusion was reached after consideration and analysis of all viable compliance options and a comprehensive set of alternative compliance strategies. Based on current forecasts, assumptions and risk consideration, the combination of overscrubbing and the use of an environmental dispatch adder is the best initial strategy from a least-cost consideration of a CAAA compliance plan which provides the flexibility to meet changing and uncertain conditions in the future.

The option of scrubbing Ghent Unit 2 should continue to be evaluated closely with respect to expected fuel prices. It is recommended that the Companies analyze the capital costs and fuel savings associated with the Ghent Unit 2 scrubber at some point after implementation of Phase II of the CAAA. This will allow the Companies to evaluate the impacts of Phase II on the fuel markets and to gain a better estimate of the costs and benefits of overscrubbing.

Appendix A

Assumptions (1999 $):

Fixed Charge Rate 13.5%

Small Unit : 200 Mw or less

(source: EPRI FGDCOST program)

		Capital ($/kw)	F. O&M ($/kw-yr)	Var. O&M ($/mwh)
Wet FGD:	Large Units:	$230	$10	$0.34
	Small Units:	$460	$20	$0.34
	Green River switch to 6# Coal at			$0.96 /mmBtu
Dry FGD:	Small Units:	$110	$10	$2.87

Blend 50%: Blend current coal with compliance coal using a 50%-50% blend price plus the following blending cost:

Ghent, Pineville:	$0.06 /mmBtu
Brown, Tyrone:	$0.09 /mmBtu
Green River:	$0.28 /mmBtu

Precipitator Rebuild Cost:	$52 /kw	(source: EPRI, S&L)
Precipitator Upgrade Cost:	$25 /kw	(source: EPRI)

Fuel prices reflect the Companies' current fuel purchases for comparable coal as delivered. PRB coal price reflects the estimated price as delivered to the Mississippi River plus barge cost to the Ghent plant.

	High sulfur (5#) coal priced at	$0.94 /mmBtu	
Switch MS:	Switch to medium sulfur (3#) coal priced at	$1.15 /mmBtu	
	Green River has incremental transportation cost of	$0.25 /mmBtu	
Switch LS:	Switch to low sulfur (2#) coal priced at	$1.19 /mmBtu	
	Green River has incremental transportation cost of	$0.25 /mmBtu	
Switch Comp:	Switch to compliance (1.2#) coal priced at	$1.20 /mmBtu	
	Green River has incremental transportation cost of	$0.26 /mmBtu	
	Brown has incremental transportation cost of	$0.17 /mmBtu	
	Tyrone has incremental transportation cost of	$0.18 /mmBtu	
Switch PRB:	Switch to Powder River Basin (0.8#) coal priced at	$1.09 /mmBtu	
	Plus incremental transportation cost as follows:		
	Brown, Tyrone, Pineville	$0.23 /mmBtu	
	Green River	$0.31 /mmBtu	
	Fixed O&M cost:	$6 /kw-yr	
	Boiler and unit upgrades for:		
	Small Units:	$230 /kw	
	Large Units except Ghent 3&4:	$115 /kw +	20% derate.
	Ghent 3&4 :	$50 /kw +	5% derate.
	Ghent 3&4 Heat Rate Penalty:	550 btu/kwh	
	Derate Cost:		
	Capacity Replacement Cost	$40 M	
	Energy Cost:		
	Gas priced at $2.50/mmBtu for	10%	
	Compliance coal priced at $1.20/mmBtu for	90%	

Gas Co-fire:	Co-fire with natural gas priced at	$2.50	/mmBtu
	Percent of heat input	10%	
	Capital upgrade cost	$2	/kw
	+ Pipeline cost	$9	M
	(assumed complete at Brown)		
Switch Gas:	Switch fuel to natural gas priced at	$2.50	/mmBtu
	Capital upgrade cost	$57	/kw
	+ Pipeline cost	$9	M
	(assumed complete at Brown)		
Biomass:	1) Co-fire with wood waste priced at	$1.40	/mmBtu
	(based on $2/ton for sawdust and $10/ton transportation)		
	Percent of heat input from wood waste	5%	
	Capital costs:	$50	/kw
	Fixed O&M cost	$1	/kw-yr
	2) Co-fire with wood waste priced at	$2.07	/mmBtu
	(based on $5/ton for wood chips and $10/ton transportation)		
	Percent of heat input	15%	
	Capital costs:	$50	/kw
	Fixed O&M cost	$1	/kw-yr
CT/CC:	Repower with combustion turbine / combined cycle		
	Capital Cost (EPRI TAG cost less $250/kw credit):	$300	/kw
FBC:	Repower with fluidized bed combustion.		
	Capital Cost (EPRI TAG cost less $250/kw credit):	$1,050	/kw
IGCC:	Repower with integrated coal gasification combined cycle.		
	Capital Cost (EPRI TAG cost less $250/kw credit):	$1,200	/kw

Note: Repower technology applicable to small, older units only.

8/23/99

CAAA Compliance Option Screening

Retirements

Assumption:

Consider non-reheat generation as candidates for retirement.
Replace capacity with gas-fired combined cycle unit.
Combined cycle heatrate assumed 8500 btu/kwh.

Unit	Capability	mmBtu*e6	Tons SO2
Green River 1&2	60	0.5	200
Green River 3	70	5.0	11,500
Tyrone 3	70	1.5	1,000
Tyrone 1&2	60	0.5	100
Pineville 3	32	0.5	500
Total	292 Mw	8.0	13,300

Replacement Cost for 300 Mw CC ($/kw)	$500
Annual Cost (13.5%FCR)	20.3 $M/yr
Fuel Delta @ $2.5/mmBtu (2.5 -1.2)*8.0mmBtu (Heatrate adjusted)	6.3 $M/yr
Total Annual Cost	26.6 $M/yr
$/Ton SO2 Rem.	$1,997

Appendix B

Screening of CAAA Compliance Alternatives

Unit information for: **Ghent 2**

		Average Annual Data			
Mw Capacity	500	Heat Input (mmBtu)	29,039,000	Tons SO2 Emitted	15,970
Capacity Factor	65%	Fuel Cost ($/mmBtu)	1.20		
Heat Rate (Btu/kwh)	10,200	Fuel #SO2/mmBtu	1.1		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	87	5.87	2	1.00	0.34	0.97	-0.26	-7.55	0.29	77%	12,340	20
Dry FGD	N/A - Not mature for large units.											
Blend 50%	N/A - Already using compliance coal.											
Switch MS	N/A - Already using compliance coal.											
Switch LS	N/A - Already using compliance coal.											
Sw. Comp.	N/A - Already using compliance coal.											
Sw. PRB	115	7.76	6	3.00	*Other Fuel* 2.71	7.72	-0.11	-2.56	15.93	24%	3,804	4,190
Co-fire	20	1.35	0	0.00	0	0.00	0.13	3.78	5.13	10%	1,597	3,210
Sw. Gas	75	5.06	0	0.00	0	0.00	1.30	37.75	42.81	100%	15,970	2,680
Biomass	N/A - Not mature for large, baseload units.											
Biomass	N/A - Not applicable to large, newer units.											
CT/CC	N/A - Not applicable to large, newer units.											
FBC	N/A - Not applicable to large, newer units.											
IGCC	N/A - Not applicable to large, newer units.											

Screening of CAAA Compliance Alternatives

Unit information for: **Ghent 3&4**

Average Annual Data

Mw Capacity	1000	Heat Input (mmBtu)	57,509,000	Tons SO2 Emitted	31,630
Capacity Factor	65%	Fuel Cost ($/mmBtu)	1.20		
Heat Rate (Btu/kwh)	10,100	Fuel #SO2/mmBtu	1.1		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	120	16.20	2	2.00	0.34	1.94	-0.26	-14.95	5.18	77%	24,441	210
Dry FGD	N/A - Not mature for large units.											
Blend 50%	N/A - Already using compliance coal.											
Switch MS	N/A - Already using compliance coal.											
Switch LS	N/A - Already using compliance coal.											
Sw. Comp.	N/A - Already using compliance coal.											
Sw. PRB	50	6.75	2.5	2.50	*Other Fuel* 0.67	3.82	-0.11	-2.91	10.16	27%	8,626	1,180
Co-fire	11	1.49	0	0.00	0	0.00	0.13	7.48	8.96	10%	3,163	2,830
Sw. Gas	66	8.91	0	0.00	0	0.00	1.30	74.76	83.67	100%	31,630	2,650
Biomass	N/A - Not mature for large, baseload units.											
Biomass	N/A - Not applicable to large, newer units.											
CT/CC	N/A - Not applicable to large, newer units.											
FBC	N/A - Not applicable to large, newer units.											
IGCC	N/A - Not applicable to large, newer units.											

Screening of CAAA Compliance Alternatives

Unit information for: **Brown 1**

Average Annual Data

Mw Capacity	100	Heat Input (mmBtu)	5,676,000	Tons SO2 Emitted	6,240
Capacity Factor	60%	Fuel Cost ($/mmBtu)	1.19		
Heat Rate (Btu/kwh)	10,800	Fuel #SO2/mmBtu	2.2		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	460	6.21	20	2.00	0.34	0.18	0.00	0.00	8.39	90%	5,616	1,490
Dry FGD	110	1.49	10	1.00	2.87	1.51	0.00	0.00	3.99	50%	3,120	1,280
Blend 50%	52	0.70	0	0.00	0	0.00	0.18	1.02	1.72	23%	1,418	1,220
Switch MS	N/A - Already using 2.2# sulfur coal.											
Switch LS	N/A - Already using 2.2# sulfur coal.											
Sw. Comp.	52	0.70	0	0.00	0	0.00	0.18	1.02	1.72	45%	2,836	610
Sw. PRB	230	3.11	6	0.60	0.00	0.00	0.13	0.74	4.44	64%	3,971	1,120
Co-fire	2	0.03	0	0.00	0	0.00	0.13	0.74	0.77	10%	624	1,230
Sw. Gas	57	0.77	0	0.00	0	0.00	1.31	7.44	8.21	100%	6,240	1,310
Biomass	50	0.68	1	0.10	0	0.00	0.01	0.06	0.83	5%	312	2,670
Biomass	50	0.68	1	0.10	0	0.00	0.13	0.75	1.52	15%	936	1,630
CT/CC	300	4.05	0	0.00	0	0.00	1.31	7.44	11.49	100%	6,240	1,840
FBC	1050	14.18	0	0.00	0	0.00	-0.25	-1.42	12.76	90%	5,616	2,270
IGCC	1200	16.20	0	0.00	0	0.00	-0.25	-1.42	14.78	99%	6,178	2,390

Screening of CAAA Compliance Alternatives

Unit information for: **Brown 2&3**

Average Annual Data

Mw Capacity	560	Heat Input (mmBtu)	32,524,000	Tons SO2 Emitted	35,780
Capacity Factor	65%	Fuel Cost ($/mmBtu)	1.19		
Heat Rate (Btu/kwh)	10,200	Fuel #SO2/mmBtu	2.2		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	230	17.39	10	5.60	0.34	1.08	0.00	0.00	24.07	90%	32,202	750
Dry FGD	N/A - Not mature for large units.											
Blend 50%	22	1.66	0	0.00	0	0.00	0.18	5.85	7.52	30%	10,734	700
Switch MS	N/A - Already using 2.2# sulfur coal.											
Switch LS	N/A - Already using 2.2# sulfur coal.											
Sw. Comp.	25	1.89	0	0.00	0	0.00	0.18	5.85	7.74	45%	16,264	480
Sw. PRB	186	14.09	6	3.36	*Other Fuel* 2.71	8.65	0.13	3.38	29.49	62%	22,151	1,330
Co-fire	2	0.15	0	0.00	0	0.00	0.13	4.26	4.41	10%	3,578	1,230
Sw. Gas	57	4.31	0	0.00	0	0.00	1.31	42.61	46.92	100%	35,780	1,310
Biomass	N/A - Not mature for large, baseload units.											
Biomass	N/A - Not applicable to large, newer units.											
CT/CC	N/A - Not applicable to large, newer units.											
FBC	N/A - Not applicable to large, newer units.											
IGCC	N/A - Not applicable to large, newer units.											

Screening of CAAA Compliance Alternatives

Unit information for: **Green River 3&4**

		Average Annual Data			
Mw Capacity	180	Heat Input (mmBtu)	10,407,000	Tons SO2 Emitted	20,810
Capacity Factor	60%	Fuel Cost ($/mmBtu)	1.01		
Heat Rate (Btu/kwh)	11,000	Fuel #SO2/mmBtu	4		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	460	11.18	20	3.60	0.34	0.32	-0.05	-0.52	14.58	85%	17,689	820
Dry FGD	110	2.67	10	1.80	2.87	2.72	0.00	0.00	7.19	50%	10,405	690
Blend 50%	25	0.61	0	0.00	0	0.00	0.38	3.90	4.51	35%	7,284	620
Switch MS	0	0.00	0	0.00	0	0.00	0.39	4.06	4.06	25%	5,203	780
Switch LS	25	0.61	0	0.00	0	0.00	0.43	4.48	5.08	50%	10,405	490
Sw. Comp.	52	1.26	0	0.00	0	0.00	0.45	4.68	5.95	70%	14,567	410
Sw. PRB	230	5.59	6	1.08	0.00	0.00	0.39	4.06	10.73	80%	16,648	640
Co-fire	52	1.26	0	0.00	0	0.00	0.15	1.55	2.81	10%	2,081	1,350
Sw. Gas	107	2.60	0	0.00	0	0.00	1.49	15.51	18.11	100%	20,810	870
Biomass	50	1.22	1	0.18	0	0.00	0.02	0.20	1.60	5%	1,041	1,540
Biomass	50	1.22	1	0.18	0	0.00	0.16	1.65	3.05	15%	3,122	980
CT/CC	300	7.29	0	0.00	0	0.00	1.49	15.51	22.80	100%	20,810	1,100
FBC	1050	25.52	0	0.00	0	0.00	-0.07	-0.73	24.79	90%	18,729	1,320
IGCC	1200	29.16	20	3.60	2	1.89	-0.07	-0.73	33.92	99%	20,602	1,650

Screening of CAAA Compliance Alternatives

Unit information for: **Tyrone 3**

		Average Annual Data				
Mw Capacity	70	Heat Input (mmBtu)	2,024,000	Tons SO2 Emitted	1,420
Capacity Factor	25%	Fuel Cost ($/mmBtu)	1.29		
Heat Rate (Btu/kwh)	13,200	Fuel #SO2/mmBtu	1.4		

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	460	4.35	20	1.40	0.34	0.05	-0.35	-0.71	5.09	90%	1,278	3,980
Dry FGD	110	1.04	10	0.70	2.87	0.44	-0.35	-0.71	1.47	50%	710	2,070
Blend 50%	25	0.24	0	0.00	0	0.00	0.05	0.09	0.33	7%	101	3,230
Switch MS	N/A - Already using low sulfur coal.											
Switch LS	N/A - Already using low sulfur coal.											
Sw. Comp.	25	0.24	0	0.00	0	0.00	0.09	0.18	0.42	14%	203	2,060
Sw. PRB	230	2.17	6	0.42	0.00	0.00	0.03	0.06	2.65	43%	609	4,360
Co-fire	131	1.23	0	0.00	0	0.00	0.12	0.24	1.48	10%	142	10,410
Sw. Gas	186	1.75	0	0.00	0	0.00	1.21	2.45	4.20	100%	1,420	2,960
Biomass	50	0.47	1	0.07	0	0.00	0.01	0.01	0.55	5%	71	7,800
Biomass	50	0.47	1	0.07	0	0.00	0.12	0.24	0.78	15%	213	3,660
CT/CC	300	2.84	0	0.00	0	0.00	1.21	2.45	5.28	100%	1,420	3,720
FBC	1050	9.92	0	0.00	0	0.00	-0.35	-0.71	9.21	90%	1,278	7,210
IGCC	1200	11.34	20	1.40	2	0.31	-0.35	-0.71	12.34	99%	1,406	8,780

Screening of CAAA Compliance Alternatives

Unit information for: **Pineville 3**

Mw Capacity 32
Capacity Factor 25%
Heat Rate (Btu/kwh) 13,350

Average Annual Data

Heat Input (mmBtu) 936,000
Fuel Cost ($/mmBtu) 1.04
Fuel #SO2/mmBtu 1.4

Tons SO2 Emitted 660

	Capacity		Fixed O&M		Variable O&M		Incremental Fuel Cost		Total	SO2 Removal		
	$/kw	M$/yr	$/kw-yr	M$/yr	$/mwh	M$/yr	$/mmBtu	M$/yr	M$/yr	%	Tons/yr	$/Ton
Wet FGD	460	1.99	20	0.64	0.34	0.02	-0.10	-0.09	2.56	64%	424	6,030
Dry FGD	110	0.48	10	0.32	2.87	0.20	-0.10	-0.09	0.90	50%	330	2,740
Blend 50%	25	0.11	0	0.00	0	0.00	0.14	0.13	0.24	7%	47	5,070
Switch MS	N/A - Already using low sulfur coal.											
Switch LS	N/A - Already using low sulfur coal.											
Sw. Comp.	25	0.11	0	0.00	0	0.00	0.16	0.15	0.26	14%	94	2,730
Sw. PRB	230	0.99	6	0.19	0.00	0.00	0.28	0.26	1.45	43%	283	5,120
Co-fire	283.25	1.22	0	0.00	0	0.00	0.15	0.14	1.36	10%	66	20,610
Sw. Gas	338.25	1.46	0	0.00	0	0.00	1.46	1.37	2.83	100%	660	4,280
Biomass	50	0.22	1	0.03	0	0.00	0.02	0.02	0.26	5%	33	8,030
Biomass	50	0.22	1	0.03	0	0.00	0.15	0.14	0.39	15%	99	3,970
CT/CC	300	1.30	0	0.00	0	0.00	1.46	1.37	2.66	100%	660	4,030
FBC	1050	4.54	0	0.00	0	0.00	-0.10	-0.09	4.44	90%	594	7,480
IGCC	1200	5.18	0	0.00	0	0.00	-0.10	-0.09	5.09	99%	653	7,790

Appendix C

08/23/99

Summary Screening Matrix
CAAA Compliance Options
$/Ton SO2 Removed

Alternative	Pin 3	Tyr 1&2	Tyr 3	GR 1&2	GR 3&4	Br 1	Br 2&3	Gh 2	Gh 3&4
Wet FGD	6,030	Oil Fired	3,980	Already Scrubbed	820	1,490	750	20	210
Dry FGD	2,740	Oil Fired	2,070	Already Scrubbed	690	1,280	n/a	n/a	n/a
Blend Coal	5,070	Oil Fired	3,230	Already Scrubbed	620	1,220	700	n/a	n/a
Switch Coal									
MS	n/a	Oil Fired	n/a	Already Scrubbed	780	n/a	n/a	n/a	n/a
LS	n/a		n/a		490	0	0	n/a	n/a
Comp	2,730		2,060		410	610	480	n/a	n/a
PRB	5,120		4,360		640	1,120	1,330	4,190	1,180
Co-fire Gas	20,610	Oil Fired	10,410	Already Scrubbed	1,350	1,230	1,230	3,210	2,830
Switch Gas	4,280	Oil Fired	2,960	Already Scrubbed	870	1,310	1,310	2,680	2,650
Biomass									
5%	8,030	Oil Fired	7,800	Already Scrubbed	1,540	2,670			
15%	3,970		3,660		980	1,630	n/a	n/a	n/a
CT/CC	4,030	Oil Fired	3,720	Already Scrubbed	1,100	1,840	n/a	n/a	n/a
FBC	7,480	Oil Fired	7,210	Already Scrubbed	1,320	2,270	n/a	n/a	n/a
Gasification	7,790	Oil Fired	8,780	Already Scrubbed	1,650	2,390	n/a	n/a	n/a
Retirement	2,000					n/a	n/a	n/a	n/a

Overscrub Existing Scrubbed Units: $50 - $130 /Ton

Bulk Power Transactions: $190 - $300 /Ton

Environmental Dispatch

08/23/99

Summary Screening Matrix
CAAA Compliance Options
$/Ton SO2 Removed > $300 Shaded

Alternative	Pin 3	Tyr 1&2	Tyr 3	GR 1&2	GR 3&4	Br 1	Br 2&3	Gh 2	Gh 3&4
Wet FGD	6,030	Oil Fired	3,980	Already Scrubbed	820	1,490	750	20	210
Dry FGD	2,740	Oil Fired	2,070	Already Scrubbed	690	1,280	n/a	n/a	n/a
Blend Coal	5,070	Oil Fired	3,230	Already Scrubbed	620	1,220	700	n/a	n/a
Switch Coal									
MS	n/a		n/a		780	n/a	n/a	n/a	n/a
LS	n/a	Oil Fired	n/a	Already Scrubbed	490	0	0	n/a	n/a
Comp	2,730		2,060		410	610	480	n/a	n/a
PRB	5,120		4,360		640	1,120	1,330	4,190	1,180
Co-fire Gas	20,610	Oil Fired	10,410	Already Scrubbed	1,350	1,230	1,230	3,210	2,830
Switch Gas	4,280	Oil Fired	2,960	Already Scrubbed	870	1,310	1,310	2,680	2,650
Biomass									
5%	8,030	Oil Fired	7,800	Already Scrubbed	1,540	2,670			
15%	3,970		3,660		980	1,630	n/a	n/a	n/a
CT/CC	4,030	Oil Fired	3,720	Already Scrubbed	1,100	1,840	n/a	n/a	n/a
FBC	7,480	Oil Fired	7,210	Already Scrubbed	1,320	2,270	n/a	n/a	n/a
Gasification	7,790	Oil Fired	8,780	Already Scrubbed	1,650	2,390	n/a	n/a	n/a
Retirement	2,000					n/a	n/a	n/a	n/a

Overscrub Existing Scrubbed Units: $50 - $130 /Ton

Bulk Power Transactions: $190 - $300 /Ton

Environmental Dispatch

08/23/99

Summary Screening Matrix
CAAA Compliance Options
Tons of SO2 Removed per year

Alternative	Pin 3	Tyr 1&2	Tyr 3	GR 1&2	GR 3&4	Br 1	Br 2&3	Gh 2	Gh 3&4
NOCAAA Tons Emitted	660	Oil Fired	1420	Already Scrubbed	20,810	6,240	35,780	15,970	31,630
Wet FGD	424	Oil Fired	1,278	Already Scrubbed	17,689	5,616	32,202	12,340	24,441
Dry FGD	330	Oil Fired	710	Already Scrubbed	10,405	3,120	n/a	n/a	n/a
Blend Coal	47	Oil Fired	101	Already Scrubbed	7,284	1,418	10,734	n/a	n/a
Switch Coal									
MS	n/a		n/a		5,203	n/a	n/a	n/a	n/a
LS	n/a	Oil	n/a	Already	10,405	0	0	n/a	n/a
Comp	94	Fired	203	Scrubbed	14,567	2,836	16,264	n/a	n/a
PRB	283		609		16,648	3,971	22,151	3,804	8,626
Co-fire Gas	66	Oil Fired	142	Already Scrubbed	2,081	624	3,578	1,597	3,163
Switch Gas	660	Oil Fired	1,420	Already Scrubbed	20,810	6,240	35,780	15,970	31,630
Biomass									
5%	33	Oil	71	Already	1,041	312			
15%	99	Fired	213	Scrubbed	3,122	936	n/a	n/a	n/a
CT/CC	660	Oil Fired	1,420	Already Scrubbed	20,810	6,240	n/a	n/a	n/a
FBC	594	Oil Fired	1,278	Already Scrubbed	18,729	5,616	n/a	n/a	n/a
Gasification	653	Oil Fired	1,406	Already Scrubbed	20,602	6,178	n/a	n/a	n/a
Retirement	13,300					n/a	n/a	n/a	n/a

Overscrub Existing Scrubbed Units: 40,000

Bulk Power Transactions & Allowance Trading

Environmental Dispatch

Appendix D

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-02
No Environmental Dispatch
Scrub:
Fuel Switch:
Purchase: 1,040,844 Allowances

Case: CAAA-01
Scrub:
Fuel Switch:
Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-02				Case: CAAA-01				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	(1,121)	(1,121)
2000	[redacted]	-	228	[redacted]	[redacted]	-	228	[redacted]	(676)	(1,797)
2001	[redacted]	-	7,968	[redacted]	[redacted]	-	7,968	[redacted]	(936)	(2,733)
2002	[redacted]	-	28,557	[redacted]	[redacted]	-	28,557	[redacted]	(769)	(3,502)
2003	[redacted]	3,381	42,224	[redacted]	[redacted]	-	42,224	[redacted]	2,749	(753)
2004	[redacted]	11,476	52,842	[redacted]	[redacted]	4,746	52,842	[redacted]	6,043	5,291
2005	[redacted]	10,983	60,801	[redacted]	[redacted]	9,538	60,801	[redacted]	821	6,111
2006	[redacted]	10,447	62,450	[redacted]	[redacted]	9,107	62,450	[redacted]	762	6,873
2007	[redacted]	10,095	60,783	[redacted]	[redacted]	8,945	60,783	[redacted]	625	7,497
2008	[redacted]	9,221	60,104	[redacted]	[redacted]	8,249	60,104	[redacted]	506	8,003
2009	[redacted]	8,730	58,106	[redacted]	[redacted]	7,754	58,106	[redacted]	520	8,523
2010	[redacted]	8,901	54,427	[redacted]	[redacted]	8,015	54,427	[redacted]	455	8,978
2011	[redacted]	8,563	51,917	[redacted]	[redacted]	7,721	51,917	[redacted]	404	9,382
2012	[redacted]	7,938	50,403	[redacted]	[redacted]	7,169	50,403	[redacted]	362	9,743
2013	[redacted]	7,540	47,989	[redacted]	[redacted]	6,837	47,989	[redacted]	320	10,063
Totals	4,969,875	97,275	638,799	5,705,949	4,979,007	78,080	638,799	5,695,886	10,063	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-03

Scrub: 2000: Overscrub Scrubbed Units

Fuel Switch:

Purchase: 158,271 Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	228	[redacted]	[redacted]	-	228	[redacted]	3,122	3,122
2001	[redacted]	-	7,968	[redacted]	[redacted]	-	7,968	[redacted]	2,819	5,941
2002	[redacted]	-	28,557	[redacted]	[redacted]	-	28,557	[redacted]	2,865	8,806
2003	[redacted]	-	42,224	[redacted]	[redacted]	-	42,224	[redacted]	2,857	11,663
2004	[redacted]	-	52,842	[redacted]	[redacted]	4,746	52,842	[redacted]	(1,966)	9,696
2005	[redacted]	-	60,801	[redacted]	[redacted]	9,538	60,801	[redacted]	(6,944)	2,753
2006	[redacted]	-	62,450	[redacted]	[redacted]	9,107	62,450	[redacted]	(6,572)	(3,819)
2007	[redacted]	-	60,783	[redacted]	[redacted]	8,945	60,783	[redacted]	(6,571)	(10,390)
2008	[redacted]	-	60,104	[redacted]	[redacted]	8,249	60,104	[redacted]	(5,986)	(16,376)
2009	[redacted]	-	58,106	[redacted]	[redacted]	7,754	58,106	[redacted]	(5,571)	(21,947)
2010	[redacted]	565	54,427	[redacted]	[redacted]	8,015	54,427	[redacted]	(5,390)	(27,337)
2011	[redacted]	3,803	51,917	[redacted]	[redacted]	7,721	51,917	[redacted]	(1,945)	(29,281)
2012	[redacted]	3,535	50,403	[redacted]	[redacted]	7,169	50,403	[redacted]	(1,750)	(31,032)
2013	[redacted]	3,429	47,989	[redacted]	[redacted]	6,837	47,989	[redacted]	(1,594)	(32,626)
Totals	5,013,129	11,332	638,799	5,663,260	4,979,007	78,080	638,799	5,695,886	(32,626)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAA A-04

Scrub:
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: 738,634 Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	2,594	11,170
2004	[redacted]	2,045	57,931	[redacted]	[redacted]	4,746	52,842	[redacted]	(1,192)	9,978
2005	[redacted]	8,199	65,241	[redacted]	[redacted]	9,538	60,801	[redacted]	(494)	9,484
2006	[redacted]	7,843	66,324	[redacted]	[redacted]	9,107	62,450	[redacted]	(886)	8,598
2007	[redacted]	7,771	64,163	[redacted]	[redacted]	8,945	60,783	[redacted]	(1,224)	7,373
2008	[redacted]	7,141	63,052	[redacted]	[redacted]	8,249	60,104	[redacted]	(1,482)	5,892
2009	[redacted]	6,830	60,677	[redacted]	[redacted]	7,754	58,106	[redacted]	(1,205)	4,687
2010	[redacted]	7,044	56,668	[redacted]	[redacted]	8,015	54,427	[redacted]	(1,803)	2,884
2011	[redacted]	6,820	53,867	[redacted]	[redacted]	7,721	51,917	[redacted]	(1,922)	962
2012	[redacted]	6,308	52,097	[redacted]	[redacted]	7,169	50,403	[redacted]	(2,035)	(1,073)
2013	[redacted]	6,037	49,456	[redacted]	[redacted]	6,837	47,989	[redacted]	(2,091)	(3,164)
Totals	4,943,822	66,039	682,862	5,692,723	4,979,007	78,080	638,799	5,695,886	(3,164)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05

Scrub:
2003: Scrub Ghent 3 and 4

Fuel Switch:
2003: Ghent 3 and 4 (5.5#)

Purchase: 628,436 Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-05				Case: CAAA-01				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,109	[redacted]	[redacted]	-	228	[redacted]	1,881	1,881
2001	[redacted]	-	17,049	[redacted]	[redacted]	-	7,968	[redacted]	9,081	10,962
2002	[redacted]	-	41,250	[redacted]	[redacted]	-	28,557	[redacted]	12,693	23,655
2003	[redacted]	-	58,316	[redacted]	[redacted]	-	42,224	[redacted]	9,078	32,733
2004	[redacted]	-	66,881	[redacted]	[redacted]	4,746	52,842	[redacted]	2,480	35,212
2005	[redacted]	6,376	73,051	[redacted]	[redacted]	9,538	60,801	[redacted]	2,312	37,524
2006	[redacted]	6,856	73,137	[redacted]	[redacted]	9,107	62,450	[redacted]	2,295	39,819
2007	[redacted]	6,731	70,107	[redacted]	[redacted]	8,945	60,783	[redacted]	663	40,482
2008	[redacted]	6,285	68,237	[redacted]	[redacted]	8,249	60,104	[redacted]	342	40,824
2009	[redacted]	5,830	65,198	[redacted]	[redacted]	7,754	58,106	[redacted]	(788)	40,036
2010	[redacted]	6,208	60,610	[redacted]	[redacted]	8,015	54,427	[redacted]	(1,322)	38,714
2011	[redacted]	6,049	57,298	[redacted]	[redacted]	7,721	51,917	[redacted]	(1,821)	36,893
2012	[redacted]	5,657	55,075	[redacted]	[redacted]	7,169	50,403	[redacted]	(1,892)	35,002
2013	[redacted]	5,367	52,037	[redacted]	[redacted]	6,837	47,989	[redacted]	(2,602)	32,400
Totals	4,912,571	55,360	760,355	5,728,286	4,979,007	78,080	638,799	5,695,886	32,400	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-06

Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: - Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	4,746	52,842	[redacted]	(231)	22,806
2005	[redacted]	-	65,241	[redacted]	[redacted]	9,538	60,801	[redacted]	(5,884)	16,922
2006	[redacted]	-	66,324	[redacted]	[redacted]	9,107	62,450	[redacted]	(5,989)	10,934
2007	[redacted]	-	64,163	[redacted]	[redacted]	8,945	60,783	[redacted]	(6,417)	4,517
2008	[redacted]	-	63,052	[redacted]	[redacted]	8,249	60,104	[redacted]	(6,164)	(1,647)
2009	[redacted]	-	60,677	[redacted]	[redacted]	7,754	58,106	[redacted]	(5,684)	(7,331)
2010	[redacted]	-	56,668	[redacted]	[redacted]	8,015	54,427	[redacted]	(6,606)	(13,937)
2011	[redacted]	-	53,867	[redacted]	[redacted]	7,721	51,917	[redacted]	(6,597)	(20,533)
2012	[redacted]	-	52,097	[redacted]	[redacted]	7,169	50,403	[redacted]	(6,294)	(26,828)
2013	[redacted]	-	49,456	[redacted]	[redacted]	6,837	47,989	[redacted]	(6,157)	(32,985)
Totals	4,980,039	-	682,862	5,662,901	4,979,007	78,080	638,799	5,695,886	(32,985)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-06

Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: - Allowances

Case: CAAA-03

Scrub: 2000: Overscrub Scrubbed Units

Fuel Switch:

Purchase: 158,271 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-06				Case: CAAA-03				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	2,799	11,375
2004	[redacted]	-	57,931	[redacted]	[redacted]	-	52,842	[redacted]	1,735	13,110
2005	[redacted]	-	65,241	[redacted]	[redacted]	-	60,801	[redacted]	1,060	14,170
2006	[redacted]	-	66,324	[redacted]	[redacted]	-	62,450	[redacted]	583	14,753
2007	[redacted]	-	64,163	[redacted]	[redacted]	-	60,783	[redacted]	154	14,907
2008	[redacted]	-	63,052	[redacted]	[redacted]	-	60,104	[redacted]	(178)	14,729
2009	[redacted]	-	60,677	[redacted]	[redacted]	-	58,106	[redacted]	(113)	14,616
2010	[redacted]	-	56,668	[redacted]	[redacted]	565	54,427	[redacted]	(1,217)	13,400
2011	[redacted]	-	53,867	[redacted]	[redacted]	3,803	51,917	[redacted]	(4,652)	8,748
2012	[redacted]	-	52,097	[redacted]	[redacted]	3,535	50,403	[redacted]	(4,544)	4,204
2013	[redacted]	-	49,456	[redacted]	[redacted]	3,429	47,989	[redacted]	(4,563)	(359)
Totals	4,980,039	-	682,862	5,662,901	5,013,129	11,332	638,799	5,663,260	(359)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-07

Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2
2010: Scrub Ghent 3 and 4

Fuel Switch: 2003: Ghent 2 (5.5#)
2010: Ghent 3 and 4 (5.5#)

Purchase: - Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-07				Case: CAAA-01				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	4,746	52,842	[redacted]	(231)	22,806
2005	[redacted]	-	65,241	[redacted]	[redacted]	9,538	60,801	[redacted]	(5,884)	16,922
2006	[redacted]	-	66,324	[redacted]	[redacted]	9,107	62,450	[redacted]	(5,989)	10,934
2007	[redacted]	-	65,287	[redacted]	[redacted]	8,945	60,783	[redacted]	(5,293)	5,641
2008	[redacted]	-	68,480	[redacted]	[redacted]	8,249	60,104	[redacted]	(736)	4,905
2009	[redacted]	-	68,265	[redacted]	[redacted]	7,754	58,106	[redacted]	1,904	6,809
2010	[redacted]	-	66,288	[redacted]	[redacted]	8,015	54,427	[redacted]	(2,376)	4,434
2011	[redacted]	-	62,260	[redacted]	[redacted]	7,721	51,917	[redacted]	(3,450)	984
2012	[redacted]	-	59,419	[redacted]	[redacted]	7,169	50,403	[redacted]	(3,776)	(2,792)
2013	[redacted]	-	55,845	[redacted]	[redacted]	6,837	47,989	[redacted]	(4,661)	(7,454)
Totals	4,959,706	-	728,726	5,688,432	4,979,007	78,080	638,799	5,695,886	(7,454)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans
All Costs in 1999 PV $1000

Case: CAAA-03
Low Allowance Price
Scrub: 2000: Overscrub Scrubbed Units

Fuel Switch:

Purchase: 158,271 Allowances

Case: CAAA-01
Low Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	228	[redacted]	[redacted]	-	228	[redacted]	3,122	3,122
2001	[redacted]	-	7,968	[redacted]	[redacted]	-	7,968	[redacted]	2,819	5,941
2002	[redacted]	-	28,557	[redacted]	[redacted]	-	28,557	[redacted]	2,865	8,806
2003	[redacted]	-	42,224	[redacted]	[redacted]	-	42,224	[redacted]	2,857	11,663
2004	[redacted]	-	52,842	[redacted]	[redacted]	3,559	52,842	[redacted]	(780)	10,883
2005	[redacted]	-	60,801	[redacted]	[redacted]	7,153	60,801	[redacted]	(4,559)	6,324
2006	[redacted]	-	62,450	[redacted]	[redacted]	6,830	62,450	[redacted]	(4,295)	2,029
2007	[redacted]	-	60,783	[redacted]	[redacted]	6,709	60,783	[redacted]	(4,335)	(2,306)
2008	[redacted]	-	60,104	[redacted]	[redacted]	6,187	60,104	[redacted]	(3,924)	(6,230)
2009	[redacted]	-	58,106	[redacted]	[redacted]	5,816	58,106	[redacted]	(3,632)	(9,862)
2010	[redacted]	424	54,427	[redacted]	[redacted]	6,011	54,427	[redacted]	(3,527)	(13,390)
2011	[redacted]	2,852	51,917	[redacted]	[redacted]	5,791	51,917	[redacted]	(965)	(14,355)
2012	[redacted]	2,651	50,403	[redacted]	[redacted]	5,377	50,403	[redacted]	(842)	(15,197)
2013	[redacted]	2,572	47,989	[redacted]	[redacted]	5,128	47,989	[redacted]	(742)	(15,939)
Totals	5,013,129	8,499	638,799	5,660,427	4,979,007	58,560	638,799	5,676,366	(15,939)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-03
High Allowance Price
Scrub: 2000: Overscrub Scrubbed Units

Fuel Switch:

Purchase: 158,271 Allowances

Case: CAAA-01
High Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	228	[redacted]	[redacted]	-	228	[redacted]	3,122	3,122
2001	[redacted]	-	7,968	[redacted]	[redacted]	-	7,968	[redacted]	2,819	5,941
2002	[redacted]	-	28,557	[redacted]	[redacted]	-	28,557	[redacted]	2,865	8,806
2003	[redacted]	-	42,224	[redacted]	[redacted]	-	42,224	[redacted]	2,857	11,663
2004	[redacted]	-	52,842	[redacted]	[redacted]	7,118	52,842	[redacted]	(4,339)	7,324
2005	[redacted]	-	60,801	[redacted]	[redacted]	14,307	60,801	[redacted]	(11,713)	(4,389)
2006	[redacted]	-	62,450	[redacted]	[redacted]	13,661	62,450	[redacted]	(11,125)	(15,514)
2007	[redacted]	-	60,783	[redacted]	[redacted]	13,417	60,783	[redacted]	(11,043)	(26,558)
2008	[redacted]	-	60,104	[redacted]	[redacted]	12,373	60,104	[redacted]	(10,111)	(36,669)
2009	[redacted]	-	58,106	[redacted]	[redacted]	11,632	58,106	[redacted]	(9,448)	(46,116)
2010	[redacted]	848	54,427	[redacted]	[redacted]	12,022	54,427	[redacted]	(9,114)	(55,231)
2011	[redacted]	5,704	51,917	[redacted]	[redacted]	11,581	51,917	[redacted]	(3,904)	(59,134)
2012	[redacted]	5,302	50,403	[redacted]	[redacted]	10,753	50,403	[redacted]	(3,567)	(62,702)
2013	[redacted]	5,144	47,989	[redacted]	[redacted]	10,256	47,989	[redacted]	(3,298)	(66,000)
Totals	5,013,129	16,998	638,799	5,668,926	4,979,007	117,120	638,799	5,734,926	(66,000)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

	Case: CAAA-04 Low Allowance Price Scrub: 2003: Scrub Ghent 2 Fuel Switch: 2003: Ghent 2 (5.5#) Purchase: 738,634 Allowances				Case: CAAA-01 Low Allowance Price Scrub: Fuel Switch: Purchase: 863,738 Allowances				DIFFERENCE CALCULATIONS	
Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	2,594	11,170
2004	[redacted]	1,534	57,931	[redacted]	[redacted]	3,559	52,842	[redacted]	(517)	10,653
2005	[redacted]	6,149	65,241	[redacted]	[redacted]	7,153	60,801	[redacted]	(159)	10,494
2006	[redacted]	5,882	66,324	[redacted]	[redacted]	6,830	62,450	[redacted]	(570)	9,923
2007	[redacted]	5,828	64,163	[redacted]	[redacted]	6,709	60,783	[redacted]	(931)	8,993
2008	[redacted]	5,356	63,052	[redacted]	[redacted]	6,187	60,104	[redacted]	(1,205)	7,788
2009	[redacted]	5,123	60,677	[redacted]	[redacted]	5,816	58,106	[redacted]	(974)	6,814
2010	[redacted]	5,283	56,668	[redacted]	[redacted]	6,011	54,427	[redacted]	(1,560)	5,254
2011	[redacted]	5,115	53,867	[redacted]	[redacted]	5,791	51,917	[redacted]	(1,696)	3,557
2012	[redacted]	4,731	52,097	[redacted]	[redacted]	5,377	50,403	[redacted]	(1,820)	1,738
2013	[redacted]	4,528	49,456	[redacted]	[redacted]	5,128	47,989	[redacted]	(1,891)	(153)
Totals	4,943,822	49,529	682,862	5,676,213	4,979,007	58,560	638,799	5,676,366	(153)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-04
High Allowance Price
Scrub: 2003: Scrub Ghent 2
Fuel Switch: 2003: Ghent 2 (5.5#)
Purchase: 738,634 Allowances

Case: CAAA-01
High Allowance Price
Scrub:
Fuel Switch:
Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	2,594	11,170
2004	[redacted]	3,068	57,931	[redacted]	[redacted]	7,118	52,842	[redacted]	(2,542)	8,628
2005	[redacted]	12,299	65,241	[redacted]	[redacted]	14,307	60,801	[redacted]	(1,164)	7,464
2006	[redacted]	11,764	66,324	[redacted]	[redacted]	13,661	62,450	[redacted]	(1,519)	5,946
2007	[redacted]	11,656	64,163	[redacted]	[redacted]	13,417	60,783	[redacted]	(1,811)	4,135
2008	[redacted]	10,712	63,052	[redacted]	[redacted]	12,373	60,104	[redacted]	(2,035)	2,099
2009	[redacted]	10,246	60,677	[redacted]	[redacted]	11,632	58,106	[redacted]	(1,667)	432
2010	[redacted]	10,566	56,668	[redacted]	[redacted]	12,022	54,427	[redacted]	(2,288)	(1,856)
2011	[redacted]	10,230	53,867	[redacted]	[redacted]	11,581	51,917	[redacted]	(2,372)	(4,228)
2012	[redacted]	9,461	52,097	[redacted]	[redacted]	10,753	50,403	[redacted]	(2,466)	(6,694)
2013	[redacted]	9,056	49,456	[redacted]	[redacted]	10,256	47,989	[redacted]	(2,491)	(9,184)
Totals	4,943,822	99,058	682,862	5,725,742	4,979,007	117,120	638,799	5,734,926	(9,184)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05
Low Allowance Price
Scrub:
2003: Scrub Ghent 3 and 4
Fuel Switch:
2003: Ghent 3 and 4 (5.5#)
Purchase: 628,436 Allowances

Case: CAAA-01
Low Allowance Price
Scrub:
Fuel Switch:
Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,109	[redacted]	[redacted]	-	228	[redacted]	1,881	1,881
2001	[redacted]	-	17,049	[redacted]	[redacted]	-	7,968	[redacted]	9,081	10,962
2002	[redacted]	-	41,250	[redacted]	[redacted]	-	28,557	[redacted]	12,693	23,655
2003	[redacted]	-	58,316	[redacted]	[redacted]	-	42,224	[redacted]	9,078	32,733
2004	[redacted]	-	66,881	[redacted]	[redacted]	3,559	52,842	[redacted]	3,666	36,399
2005	[redacted]	4,782	73,051	[redacted]	[redacted]	7,153	60,801	[redacted]	3,102	39,501
2006	[redacted]	5,142	73,137	[redacted]	[redacted]	6,830	62,450	[redacted]	2,858	42,359
2007	[redacted]	5,049	70,107	[redacted]	[redacted]	6,709	60,783	[redacted]	1,216	43,575
2008	[redacted]	4,714	68,237	[redacted]	[redacted]	6,187	60,104	[redacted]	833	44,408
2009	[redacted]	4,373	65,198	[redacted]	[redacted]	5,816	58,106	[redacted]	(307)	44,101
2010	[redacted]	4,656	60,610	[redacted]	[redacted]	6,011	54,427	[redacted]	(871)	43,231
2011	[redacted]	4,537	57,298	[redacted]	[redacted]	5,791	51,917	[redacted]	(1,403)	41,828
2012	[redacted]	4,243	55,075	[redacted]	[redacted]	5,377	50,403	[redacted]	(1,514)	40,314
2013	[redacted]	4,025	52,037	[redacted]	[redacted]	5,128	47,989	[redacted]	(2,235)	38,080
Totals	4,912,571	41,520	760,355	5,714,446	4,979,007	58,560	638,799	5,676,366	38,080	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05
High Allowance Price
Scrub:
2003: Scrub Ghent 3 and 4
Fuel Switch:
2003: Ghent 3 and 4 (5.5#)
Purchase: 628,436 Allowances

Case: CAAA-01
High Allowance Price
Scrub:
Fuel Switch:
Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,109	[redacted]	[redacted]	-	228	[redacted]	1,881	1,881
2001	[redacted]	-	17,049	[redacted]	[redacted]	-	7,968	[redacted]	9,081	10,962
2002	[redacted]	-	41,250	[redacted]	[redacted]	-	28,557	[redacted]	12,693	23,655
2003	[redacted]	-	58,316	[redacted]	[redacted]	-	42,224	[redacted]	9,078	32,733
2004	[redacted]	-	66,881	[redacted]	[redacted]	7,118	52,842	[redacted]	107	32,839
2005	[redacted]	9,564	73,051	[redacted]	[redacted]	14,307	60,801	[redacted]	731	33,570
2006	[redacted]	10,284	73,137	[redacted]	[redacted]	13,661	62,450	[redacted]	1,170	34,740
2007	[redacted]	10,097	70,107	[redacted]	[redacted]	13,417	60,783	[redacted]	(444)	34,296
2008	[redacted]	9,428	68,237	[redacted]	[redacted]	12,373	60,104	[redacted]	(639)	33,656
2009	[redacted]	8,745	65,198	[redacted]	[redacted]	11,632	58,106	[redacted]	(1,750)	31,906
2010	[redacted]	9,313	60,610	[redacted]	[redacted]	12,022	54,427	[redacted]	(2,225)	29,681
2011	[redacted]	9,073	57,298	[redacted]	[redacted]	11,581	51,917	[redacted]	(2,657)	27,024
2012	[redacted]	8,486	55,075	[redacted]	[redacted]	10,753	50,403	[redacted]	(2,647)	24,377
2013	[redacted]	8,051	52,037	[redacted]	[redacted]	10,256	47,989	[redacted]	(3,337)	21,039
Totals	4,912,571	83,040	760,355	5,755,966	4,979,007	117,120	638,799	5,734,926	21,039	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-06
Low Allowance Price
Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: - Allowances

Case: CAAA-01
Low Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	3,559	52,842	[redacted]	956	23,993
2005	[redacted]	-	65,241	[redacted]	[redacted]	7,153	60,801	[redacted]	(3,500)	20,493
2006	[redacted]	-	66,324	[redacted]	[redacted]	6,830	62,450	[redacted]	(3,712)	16,781
2007	[redacted]	-	64,163	[redacted]	[redacted]	6,709	60,783	[redacted]	(4,181)	12,601
2008	[redacted]	-	63,052	[redacted]	[redacted]	6,187	60,104	[redacted]	(4,102)	8,499
2009	[redacted]	-	60,677	[redacted]	[redacted]	5,816	58,106	[redacted]	(3,745)	4,754
2010	[redacted]	-	56,668	[redacted]	[redacted]	6,011	54,427	[redacted]	(4,602)	151
2011	[redacted]	-	53,867	[redacted]	[redacted]	5,791	51,917	[redacted]	(4,666)	(4,515)
2012	[redacted]	-	52,097	[redacted]	[redacted]	5,377	50,403	[redacted]	(4,502)	(9,017)
2013	[redacted]	-	49,456	[redacted]	[redacted]	5,128	47,989	[redacted]	(4,448)	(13,465)
Totals	4,980,039	-	682,862	5,662,901	4,979,007	58,560	638,799	5,676,366	(13,465)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-06
High Allowance Price
Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: - Allowances

Case: CAAA-01
High Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	7,118	52,842	[redacted]	(2,604)	20,434
2005	[redacted]	-	65,241	[redacted]	[redacted]	14,307	60,801	[redacted]	(10,653)	9,781
2006	[redacted]	-	66,324	[redacted]	[redacted]	13,661	62,450	[redacted]	(10,542)	(761)
2007	[redacted]	-	64,163	[redacted]	[redacted]	13,417	60,783	[redacted]	(10,889)	(11,651)
2008	[redacted]	-	63,052	[redacted]	[redacted]	12,373	60,104	[redacted]	(10,289)	(21,939)
2009	[redacted]	-	60,677	[redacted]	[redacted]	11,632	58,106	[redacted]	(9,561)	(31,500)
2010	[redacted]	-	56,668	[redacted]	[redacted]	12,022	54,427	[redacted]	(10,614)	(42,114)
2011	[redacted]	-	53,867	[redacted]	[redacted]	11,581	51,917	[redacted]	(10,457)	(52,571)
2012	[redacted]	-	52,097	[redacted]	[redacted]	10,753	50,403	[redacted]	(9,879)	(62,449)
2013	[redacted]	-	49,456	[redacted]	[redacted]	10,256	47,989	[redacted]	(9,576)	(72,025)
Totals	4,980,039	-	682,862	5,662,901	4,979,007	117,120	638,799	5,734,926	(72,025)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-07
Low Allowance Price
Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2
2010: Scrub Ghent 3 and 4

Fuel Switch: 2003: Ghent 2 (5.5#)
2010: Ghent 3 and 4 (5.5#)

Purchase: - Allowances

Case: CAAA-01
Low Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	3,559	52,842	[redacted]	956	23,993
2005	[redacted]	-	65,241	[redacted]	[redacted]	7,153	60,801	[redacted]	(3,500)	20,493
2006	[redacted]	-	66,324	[redacted]	[redacted]	6,830	62,450	[redacted]	(3,712)	16,781
2007	[redacted]	-	65,287	[redacted]	[redacted]	6,709	60,783	[redacted]	(3,057)	13,725
2008	[redacted]	-	68,480	[redacted]	[redacted]	6,187	60,104	[redacted]	1,326	15,051
2009	[redacted]	-	68,265	[redacted]	[redacted]	5,816	58,106	[redacted]	3,843	18,894
2010	[redacted]	-	66,288	[redacted]	[redacted]	6,011	54,427	[redacted]	(372)	18,522
2011	[redacted]	-	62,260	[redacted]	[redacted]	5,791	51,917	[redacted]	(1,520)	17,002
2012	[redacted]	-	59,419	[redacted]	[redacted]	5,377	50,403	[redacted]	(1,984)	15,018
2013	[redacted]	-	55,845	[redacted]	[redacted]	5,128	47,989	[redacted]	(2,952)	12,066
Totals	4,959,706	-	728,726	5,688,432	4,979,007	58,560	638,799	5,676,366	12,066	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-07
High Allowance Price
Scrub: 2000: Overscrub Scrubbed Units
2003: Scrub Ghent 2
2010: Scrub Ghent 3 and 4

Fuel Switch: 2003: Ghent 2 (5.5#)
2010: Ghent 3 and 4 (5.5#)

Purchase: - Allowances

Case: CAAA-01
High Allowance Price
Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	3,804	3,804
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	6,111	9,915
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	7,467	17,382
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	5,655	23,037
2004	[redacted]	-	57,931	[redacted]	[redacted]	7,118	52,842	[redacted]	(2,604)	20,434
2005	[redacted]	-	65,241	[redacted]	[redacted]	14,307	60,801	[redacted]	(10,653)	9,781
2006	[redacted]	-	66,324	[redacted]	[redacted]	13,661	62,450	[redacted]	(10,542)	(761)
2007	[redacted]	-	65,287	[redacted]	[redacted]	13,417	60,783	[redacted]	(9,765)	(10,527)
2008	[redacted]	-	68,480	[redacted]	[redacted]	12,373	60,104	[redacted]	(4,861)	(15,387)
2009	[redacted]	-	68,265	[redacted]	[redacted]	11,632	58,106	[redacted]	(1,973)	(17,360)
2010	[redacted]	-	66,288	[redacted]	[redacted]	12,022	54,427	[redacted]	(6,383)	(23,743)
2011	[redacted]	-	62,260	[redacted]	[redacted]	11,581	51,917	[redacted]	(7,310)	(31,053)
2012	[redacted]	-	59,419	[redacted]	[redacted]	10,753	50,403	[redacted]	(7,361)	(38,414)
2013	[redacted]	-	55,845	[redacted]	[redacted]	10,256	47,989	[redacted]	(8,080)	(46,494)
Totals	4,959,706	-	728,726	5,688,432	4,979,007	117,120	638,799	5,734,926	(46,494)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-04HF

Scrub: 2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: 744,635 Allowances

Case: CAAA-01HF

Scrub:

Fuel Switch:

Purchase: 870,740 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-04HF				Case: CAAA-01HF				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	1,791	10,367
2004	[redacted]	2,054	57,931	[redacted]	[redacted]	4,753	52,842	[redacted]	(2,107)	8,260
2005	[redacted]	8,229	65,241	[redacted]	[redacted]	9,569	60,801	[redacted]	(1,408)	6,852
2006	[redacted]	7,882	66,324	[redacted]	[redacted]	9,152	62,450	[redacted]	(1,806)	5,046
2007	[redacted]	7,819	64,163	[redacted]	[redacted]	8,999	60,783	[redacted]	(2,148)	2,899
2008	[redacted]	7,192	63,052	[redacted]	[redacted]	8,306	60,104	[redacted]	(2,424)	474
2009	[redacted]	6,889	60,677	[redacted]	[redacted]	7,821	58,106	[redacted]	(2,050)	(1,576)
2010	[redacted]	7,103	56,668	[redacted]	[redacted]	8,086	54,427	[redacted]	(2,749)	(4,325)
2011	[redacted]	6,885	53,867	[redacted]	[redacted]	7,798	51,917	[redacted]	(2,870)	(7,195)
2012	[redacted]	6,379	52,097	[redacted]	[redacted]	7,255	50,403	[redacted]	(2,992)	(10,187)
2013	[redacted]	6,109	49,456	[redacted]	[redacted]	6,923	47,989	[redacted]	(3,052)	(13,239)
Totals	5,214,831	66,542	682,862	5,964,235	5,260,013	78,663	638,799	5,977,474	(13,239)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-04LF

Scrub: 2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: 730,848 Allowances

Case: CAAA-01LF

Scrub:

Fuel Switch:

Purchase: 851,996 Allowances

DIFFERENCE CALCULATIONS

	Case: CAAA-04LF				Case: CAAA-01LF				DIFFERENCE CALCULATIONS	
Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	910	[redacted]	[redacted]	-	228	[redacted]	682	682
2001	[redacted]	-	11,260	[redacted]	[redacted]	-	7,968	[redacted]	3,292	3,974
2002	[redacted]	-	33,159	[redacted]	[redacted]	-	28,557	[redacted]	4,602	8,576
2003	[redacted]	-	48,057	[redacted]	[redacted]	-	42,224	[redacted]	2,278	10,854
2004	[redacted]	1,824	57,931	[redacted]	[redacted]	4,488	52,842	[redacted]	(1,389)	9,466
2005	[redacted]	8,148	65,241	[redacted]	[redacted]	9,458	60,801	[redacted]	(592)	8,873
2006	[redacted]	7,791	66,324	[redacted]	[redacted]	9,019	62,450	[redacted]	(885)	7,989
2007	[redacted]	7,723	64,163	[redacted]	[redacted]	8,860	60,783	[redacted]	(1,144)	6,845
2008	[redacted]	7,094	63,052	[redacted]	[redacted]	8,164	60,104	[redacted]	(1,329)	5,515
2009	[redacted]	6,778	60,677	[redacted]	[redacted]	7,670	58,106	[redacted]	(1,011)	4,504
2010	[redacted]	6,989	56,668	[redacted]	[redacted]	7,925	54,427	[redacted]	(1,534)	2,970
2011	[redacted]	6,753	53,867	[redacted]	[redacted]	7,619	51,917	[redacted]	(1,605)	1,366
2012	[redacted]	6,237	52,097	[redacted]	[redacted]	7,061	50,403	[redacted]	(1,672)	(306)
2013	[redacted]	5,967	49,456	[redacted]	[redacted]	6,729	47,989	[redacted]	(1,682)	(1,989)
Totals	4,632,104	65,304	682,862	5,380,270	4,666,468	76,992	638,799	5,382,259	(1,989)	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05HF	Case: CAAA-01HF	DIFFERENCE CALCULATIONS
Scrub: 2003: Scrub Ghent 3 and 4 **Fuel Switch:** 2003: Ghent 3 and 4 (5.5#) **Purchase:** 633,216 Allowances	**Scrub:** **Fuel Switch:** **Purchase:** 870,740 Allowances	

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,109	[redacted]	[redacted]	-	228	[redacted]	1,881	1,881
2001	[redacted]	-	17,049	[redacted]	[redacted]	-	7,968	[redacted]	9,081	10,962
2002	[redacted]	-	41,250	[redacted]	[redacted]	-	28,557	[redacted]	12,693	23,655
2003	[redacted]	-	58,316	[redacted]	[redacted]	-	42,224	[redacted]	7,288	30,943
2004	[redacted]	-	66,881	[redacted]	[redacted]	4,753	52,842	[redacted]	669	31,612
2005	[redacted]	6,426	73,051	[redacted]	[redacted]	9,569	60,801	[redacted]	521	32,133
2006	[redacted]	6,894	73,137	[redacted]	[redacted]	9,152	62,450	[redacted]	559	32,692
2007	[redacted]	6,774	70,107	[redacted]	[redacted]	8,999	60,783	[redacted]	(1,198)	31,495
2008	[redacted]	6,330	68,237	[redacted]	[redacted]	8,306	60,104	[redacted]	(1,437)	30,057
2009	[redacted]	5,878	65,198	[redacted]	[redacted]	7,821	58,106	[redacted]	(2,670)	27,388
2010	[redacted]	6,258	60,610	[redacted]	[redacted]	8,086	54,427	[redacted]	(3,215)	24,172
2011	[redacted]	6,096	57,298	[redacted]	[redacted]	7,798	51,917	[redacted]	(3,733)	20,440
2012	[redacted]	5,707	55,075	[redacted]	[redacted]	7,255	50,403	[redacted]	(3,716)	16,724
2013	[redacted]	5,411	52,037	[redacted]	[redacted]	6,923	47,989	[redacted]	(4,553)	12,171
Totals	5,173,516	55,774	760,355	5,989,645	5,260,013	78,663	638,799	5,977,474	12,171	

CONFIDENTIAL INFORMATION REDACTED

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05LF

Scrub:
2003: Scrub Ghent 3 and 4

Fuel Switch:
2003: Ghent 3 and 4 (5.5#)

Purchase: 625,480 Allowances

Case: CAAA-01LF

Scrub:

Fuel Switch:

Purchase: 851,996 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-05LF				Case: CAAA-01LF				DIFFERENCE CALCULATIONS	
Year	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Production**	**Allowance Purchase**	**Capital**	**Total**	**Total**	**Cumulative Total**
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,109	[redacted]	[redacted]	-	228	[redacted]	1,881	1,881
2001	[redacted]	-	17,049	[redacted]	[redacted]	-	7,968	[redacted]	9,081	10,962
2002	[redacted]	-	41,250	[redacted]	[redacted]	-	28,557	[redacted]	12,693	23,655
2003	[redacted]	-	58,316	[redacted]	[redacted]	-	42,224	[redacted]	8,472	32,127
2004	[redacted]	-	66,881	[redacted]	[redacted]	4,488	52,842	[redacted]	2,365	34,492
2005	[redacted]	6,169	73,051	[redacted]	[redacted]	9,458	60,801	[redacted]	2,018	36,510
2006	[redacted]	6,852	73,137	[redacted]	[redacted]	9,019	62,450	[redacted]	2,335	38,845
2007	[redacted]	6,739	70,107	[redacted]	[redacted]	8,860	60,783	[redacted]	861	39,706
2008	[redacted]	6,290	68,237	[redacted]	[redacted]	8,164	60,104	[redacted]	652	40,358
2009	[redacted]	5,842	65,198	[redacted]	[redacted]	7,670	58,106	[redacted]	(352)	40,006
2010	[redacted]	6,204	60,610	[redacted]	[redacted]	7,925	54,427	[redacted]	(782)	39,224
2011	[redacted]	6,033	57,298	[redacted]	[redacted]	7,619	51,917	[redacted]	(1,187)	38,038
2012	[redacted]	5,619	55,075	[redacted]	[redacted]	7,061	50,403	[redacted]	(1,184)	36,854
2013	[redacted]	5,325	52,037	[redacted]	[redacted]	6,729	47,989	[redacted]	(1,775)	35,078
Totals	4,601,909	55,072	760,355	5,417,337	4,666,468	76,992	638,799	5,382,259	35,078	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-04

Scrub: 10% Higher Scrubber Cost
2003: Scrub Ghent 2

Fuel Switch: 2003: Ghent 2 (5.5#)

Purchase: 738,634 Allowances

Case: CAAA-01

Scrub:

Fuel Switch:

Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

	Case: CAAA-04				Case: CAAA-01				DIFFERENCE CALCULATIONS	
Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	978	[redacted]	[redacted]	-	228	[redacted]	750	750
2001	[redacted]	-	11,589	[redacted]	[redacted]	-	7,968	[redacted]	3,621	4,371
2002	[redacted]	-	33,619	[redacted]	[redacted]	-	28,557	[redacted]	5,062	9,433
2003	[redacted]	-	48,641	[redacted]	[redacted]	-	42,224	[redacted]	3,178	12,611
2004	[redacted]	2,045	58,440	[redacted]	[redacted]	4,746	52,842	[redacted]	(683)	11,928
2005	[redacted]	8,199	65,685	[redacted]	[redacted]	9,538	60,801	[redacted]	(50)	11,878
2006	[redacted]	7,843	66,711	[redacted]	[redacted]	9,107	62,450	[redacted]	(499)	11,379
2007	[redacted]	7,771	64,501	[redacted]	[redacted]	8,945	60,783	[redacted]	(886)	10,492
2008	[redacted]	7,141	63,347	[redacted]	[redacted]	8,249	60,104	[redacted]	(1,187)	9,306
2009	[redacted]	6,830	60,934	[redacted]	[redacted]	7,754	58,106	[redacted]	(948)	8,358
2010	[redacted]	7,044	56,892	[redacted]	[redacted]	8,015	54,427	[redacted]	(1,579)	6,779
2011	[redacted]	6,820	54,062	[redacted]	[redacted]	7,721	51,917	[redacted]	(1,727)	5,052
2012	[redacted]	6,308	52,266	[redacted]	[redacted]	7,169	50,403	[redacted]	(1,866)	3,186
2013	[redacted]	6,037	49,603	[redacted]	[redacted]	6,837	47,989	[redacted]	(1,944)	1,242
Totals	4,943,822	66,039	687,268	5,697,129	4,979,007	78,080	638,799	5,695,886	1,242	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-04	Case: CAAA-01	DIFFERENCE CALCULATIONS
Scrub: 10% Lower Scrubber Cost 2003: Scrub Ghent 2	**Scrub:**	
Fuel Switch: 2003: Ghent 2 (5.5#)	**Fuel Switch:**	
Purchase: 738,634 Allowances	**Purchase:** 863,738 Allowances	

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	841	[redacted]	[redacted]	-	228	[redacted]	613	613
2001	[redacted]	-	10,931	[redacted]	[redacted]	-	7,968	[redacted]	2,963	3,576
2002	[redacted]	-	32,698	[redacted]	[redacted]	-	28,557	[redacted]	4,141	7,717
2003	[redacted]	-	47,474	[redacted]	[redacted]	-	42,224	[redacted]	2,011	9,728
2004	[redacted]	2,045	57,422	[redacted]	[redacted]	4,746	52,842	[redacted]	(1,701)	8,027
2005	[redacted]	8,199	64,797	[redacted]	[redacted]	9,538	60,801	[redacted]	(938)	7,089
2006	[redacted]	7,843	65,937	[redacted]	[redacted]	9,107	62,450	[redacted]	(1,273)	5,816
2007	[redacted]	7,771	63,825	[redacted]	[redacted]	8,945	60,783	[redacted]	(1,562)	4,253
2008	[redacted]	7,141	62,757	[redacted]	[redacted]	8,249	60,104	[redacted]	(1,777)	2,477
2009	[redacted]	6,830	60,420	[redacted]	[redacted]	7,754	58,106	[redacted]	(1,462)	1,015
2010	[redacted]	7,044	56,444	[redacted]	[redacted]	8,015	54,427	[redacted]	(2,027)	(1,012)
2011	[redacted]	6,820	53,672	[redacted]	[redacted]	7,721	51,917	[redacted]	(2,117)	(3,129)
2012	[redacted]	6,308	51,927	[redacted]	[redacted]	7,169	50,403	[redacted]	(2,205)	(5,334)
2013	[redacted]	6,037	49,310	[redacted]	[redacted]	6,837	47,989	[redacted]	(2,237)	(7,571)
Totals	4,943,822	66,039	678,455	5,688,316	4,979,007	78,080	638,799	5,695,886	(7,571)	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05 10% High Scrubber Cost **Scrub:** 2003: Scrub Ghent 3 and 4 **Fuel Switch:** 2003: Ghent 3 and 4 (5.5#) **Purchase:** 628,436 Allowances	Case: CAAA-01 **Scrub:** **Fuel Switch:** **Purchase:** 863,738 Allowances	DIFFERENCE CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	2,297	[redacted]	[redacted]	-	228	[redacted]	2,069	2,069
2001	[redacted]	-	17,957	[redacted]	[redacted]	-	7,968	[redacted]	9,989	12,058
2002	[redacted]	-	42,520	[redacted]	[redacted]	-	28,557	[redacted]	13,963	26,021
2003	[redacted]	-	59,925	[redacted]	[redacted]	-	42,224	[redacted]	10,687	36,708
2004	[redacted]	-	68,285	[redacted]	[redacted]	4,746	52,842	[redacted]	3,884	40,591
2005	[redacted]	6,376	74,276	[redacted]	[redacted]	9,538	60,801	[redacted]	3,537	44,128
2006	[redacted]	6,856	74,206	[redacted]	[redacted]	9,107	62,450	[redacted]	3,364	47,492
2007	[redacted]	6,731	71,039	[redacted]	[redacted]	8,945	60,783	[redacted]	1,595	49,087
2008	[redacted]	6,285	69,050	[redacted]	[redacted]	8,249	60,104	[redacted]	1,155	50,242
2009	[redacted]	5,830	65,908	[redacted]	[redacted]	7,754	58,106	[redacted]	(78)	50,164
2010	[redacted]	6,208	61,228	[redacted]	[redacted]	8,015	54,427	[redacted]	(704)	49,460
2011	[redacted]	6,049	57,836	[redacted]	[redacted]	7,721	51,917	[redacted]	(1,283)	48,177
2012	[redacted]	5,657	55,543	[redacted]	[redacted]	7,169	50,403	[redacted]	(1,424)	46,754
2013	[redacted]	5,367	52,442	[redacted]	[redacted]	6,837	47,989	[redacted]	(2,197)	44,557
Totals	4,912,571	55,360	772,512	5,740,443	4,979,007	78,080	638,799	5,695,886	44,557	

Cost Comparison of Alternative Compliance Plans

All Costs in 1999 PV $1000

Case: CAAA-05
10% Lower Scrubber Cost
Scrub:
2003: Scrub Ghent 3 and 4
Fuel Switch:
2003: Ghent 3 and 4 (5.5#)
Purchase: 628,436 Allowances

Case: CAAA-01
Scrub:
Fuel Switch:
Purchase: 863,738 Allowances

DIFFERENCE

CALCULATIONS

Year	Production	Allowance Purchase	Capital	Total	Production	Allowance Purchase	Capital	Total	Total	Cumulative Total
1999	[redacted]	-	-	[redacted]	[redacted]	-	-	[redacted]	-	-
2000	[redacted]	-	1,921	[redacted]	[redacted]	-	228	[redacted]	1,693	1,693
2001	[redacted]	-	16,141	[redacted]	[redacted]	-	7,968	[redacted]	8,173	9,866
2002	[redacted]	-	39,981	[redacted]	[redacted]	-	28,557	[redacted]	11,424	21,290
2003	[redacted]	-	56,707	[redacted]	[redacted]	-	42,224	[redacted]	7,469	28,759
2004	[redacted]	-	65,477	[redacted]	[redacted]	4,746	52,842	[redacted]	1,076	29,834
2005	[redacted]	6,376	71,826	[redacted]	[redacted]	9,538	60,801	[redacted]	1,087	30,921
2006	[redacted]	6,856	72,069	[redacted]	[redacted]	9,107	62,450	[redacted]	1,227	32,148
2007	[redacted]	6,731	69,174	[redacted]	[redacted]	8,945	60,783	[redacted]	(270)	31,878
2008	[redacted]	6,285	67,423	[redacted]	[redacted]	8,249	60,104	[redacted]	(472)	31,406
2009	[redacted]	5,830	64,489	[redacted]	[redacted]	7,754	58,106	[redacted]	(1,497)	29,909
2010	[redacted]	6,208	59,992	[redacted]	[redacted]	8,015	54,427	[redacted]	(1,940)	27,969
2011	[redacted]	6,049	56,759	[redacted]	[redacted]	7,721	51,917	[redacted]	(2,360)	25,609
2012	[redacted]	5,657	54,608	[redacted]	[redacted]	7,169	50,403	[redacted]	(2,359)	23,251
2013	[redacted]	5,367	51,632	[redacted]	[redacted]	6,837	47,989	[redacted]	(3,007)	20,244
Totals	4,912,571	55,360	748,199	5,716,130	4,979,007	78,080	638,799	5,695,886	20,244	

Appendix E

SO2 SUMMARY BY YEAR

CASE: CAAA-01

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5805	6164	6261	6413	6475	6544	6069	7067	7346	7315	7396	7455	7552	6798
Brown 2	8401	9659	8964	10329	10679	10339	10765	11014	11303	10492	11655	11708	11758	11935	12042
Brown 3	20171	23067	24182	25517	26310	23686	26826	27328	28089	28835	28391	26218	28890	29226	29442
Ghent 1	7462	9563	10685	10780	9765	10894	10852	10854	9732	10890	10879	10859	10876	10895	9780
Ghent 2	0	15564	16382	16490	14434	16244	16477	16732	17050	17499	15528	17260	17370	17474	17531
Ghent 3	0	18565	18188	16260	18340	18314	18522	18854	19221	17349	19406	19484	19460	19736	19853
Ghent 4	0	18583	16229	18182	18330	18223	18373	16711	19078	19306	19186	19340	19318	17520	19613
Green River 1	0	500	526	527	527	643	653	695	686	704	665	726	735	674	682
Green River 2	0	326	399	506	542	623	657	742	726	766	690	780	722	694	727
Green River 3	0	8072	8384	7637	8456	8990	8989	9015	9638	8953	9735	9942	9957	10103	10101
Green River 4	8035	10170	10795	12036	10750	11907	12653	12871	13551	14102	12325	14128	14449	14864	15010
Pineville 3	0	1136	1140	1139	1001	1149	1210	1250	1375	1433	1345	1390	1406	1231	1444
Tyrone 3	0	2059	2099	2224	2084	2319	2401	2499	2697	2895	2741	2810	2732	2720	2790
Cane Run 4	0	5671	5841	6106	5971	5768	5637	5934	6341	6100	5803	6181	6148	6452	5584
Cane Run 5	0	5803	5294	6157	6455	6242	6533	6228	5726	6153	6200	6165	6295	6536	6222
Cane Run 6	0	6097	6484	6243	6667	6728	7046	7128	6928	7065	6899	6826	6172	7247	7240
Mill Creek 1	0	10441	9401	10959	10538	10651	10736	10592	11074	9924	10698	11408	10907	11078	11585
Mill Creek 2	0	11183	12372	11823	13042	12567	13040	13823	12751	11926	13374	13281	13056	13940	13372
Mill Creek 3	0	16931	17863	15901	18089	18482	17863	18157	18513	17903	18648	16479	17900	18083	18893
Mill Creek 4	0	20405	22540	22003	22370	23097	20344	22291	22048	22761	22324	22548	23392	20623	22604
Trimble County 1	0	11744	11943	11913	10787	11662	12187	11715	11604	12217	11703	12098	11514	11805	11697
TOTAL TONS SO2 EMITTED	48578	211343	215874	218992	221550	225001	228307	230500	235193	234619	235508	237027	240508	240388	243010
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2565	2354	2337	2315	2287	2272	2350	2222	2236	2133	2082	2032
PURCHASE	0	0	0	0	0	37091	80234	82456	87163	86510	87528	97368	100951	100882	103554
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148323	148113	185187	228307	230500	235193	234619	235508	237027	240508	240388	243010
ALLOWANCES (+/-)	45853	-63023	-67635	-70668	-73437	-39814	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK (1998 Bank of 268724 allowances)	314577	251554	183919	113251	39814	0	0	0	0	0	0	0	0	0	0

SO2 SUMMARY BY YEAR

CASE: CAAA-02

FUEL #/MBTU SO2	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Brown 1	5561	6254	6951	7212	7492	7601	7718	7041	8065	8238	8233	8348	8317	8467	7712
Brown 2	11322	11194	10292	11672	12107	12037	12239	12416	12722	11715	13070	13194	13195	13386	13458
Brown 3	24381	25183	26407	27921	29054	26187	29634	30256	30975	31835	31469	29064	32096	32546	32837
Ghent 1	7469	9536	10650	10748	9731	10870	10833	10838	9720	10880	10874	10854	10872	10893	9779
Ghent 2	0	14222	14837	14999	13120	14707	14936	15104	15566	16022	14207	15788	15955	15952	16106
Ghent 3	0	17052	16681	14868	16591	16528	16836	17103	17585	15985	17737	17860	17821	18063	18210
Ghent 4	0	17171	14933	16631	16634	16496	16689	15178	17478	17718	17449	17758	17683	16046	17983
Green River 1	0	499	528	529	527	643	653	695	686	704	665	726	748	711	733
Green River 2	0	337	402	507	553	623	657	742	726	766	690	780	789	730	798
Green River 3	0	12216	12454	11515	12742	12986	13091	13308	13477	12266	13840	13933	13951	14146	14183
Green River 4	16587	16954	17517	18274	16960	18964	18993	19013	19061	19172	17200	19123	19163	19239	19152
Pineville 3	0	1108	1069	1121	993	1136	1196	1240	1364	1432	1344	1390	1417	1236	1456
Tyrone 3	0	2051	2092	2222	2082	2319	2398	2497	2695	2894	2740	2810	2857	2934	2972
Cane Run 4	0	5989	6027	6277	6195	5983	5768	6125	6519	6280	6013	6383	6312	6626	5756
Cane Run 5	0	5768	5263	6124	6405	6202	6512	6203	5704	6144	6200	6166	6300	6540	6211
Cane Run 6	0	5862	6240	6105	6415	6569	6880	6958	6801	6921	6766	6719	6085	7119	7146
Mill Creek 1	0	10501	9483	11048	10619	10780	10845	10679	11205	10022	10822	11501	11004	11179	11656
Mill Creek 2	0	11862	13051	12345	13900	13293	13757	14589	13359	12466	14072	13864	13670	14520	13929
Mill Creek 3	0	17309	18261	16246	18430	18906	18183	18519	18895	18232	18980	16757	18226	18370	19156
Mill Creek 4	0	20809	22936	22367	22759	23602	20726	22707	22482	23144	22716	22881	23784	20914	22913
Trimble County 1	0	11687	11841	11793	10670	11514	12047	11549	11435	12088	11557	11991	11387	11681	11590
TOTAL TONS SO2 EMITTED	65320	223564	227915	230523	233976	237944	240588	242760	246519	244923	246640	247887	251630	251298	253735

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11156	2734	2627	2681	2499	2487	2440	2413	2389	2454	2340	2335	2240	2173	2117
PURCHASE	0	0	0	0	24551	89699	92390	94588	98371	96711	98542	108129	111966	111701	114194
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94447	148493	148386	148439	172809	237944	240588	242760	246519	244923	246640	247887	251630	251298	253735
ALLOWANCES (+/-)	29127	-75071	-79529	-82084	-61168	0	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	297851	222780	143251	61168	0	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-03

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 5	80.8%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 6	82.4%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 1	81.7%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 2	77.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 3	78.3%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 4	77.8%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Trimble County 1	87.4%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5803	6160	6251	6411	6474	6543	6068	7066	7345	7314	7396	7455	7552	6798
Brown 2	8401	9655	8956	10322	10672	10336	10762	11011	11301	10491	11655	11708	11758	11933	12042
Brown 3	20171	23060	24164	25506	26297	23680	26820	27323	28087	28833	28390	26217	28889	29224	29441
Ghent 1	7462	4780	5341	5388	4881	5446	5425	5426	4865	5444	5439	5430	5438	5447	4890
Ghent 2	0	15522	16350	16476	14421	16236	16471	16729	17048	17498	15527	17260	17369	17472	17531
Ghent 3	0	18500	18137	16243	18320	18302	18513	18850	19218	17346	19405	19483	19459	19734	19852
Ghent 4	0	18508	16178	18159	18305	18208	18363	16706	19076	19304	19185	19339	19317	17519	19613
Green River 1	0	500	526	527	527	643	653	695	686	704	665	726	735	674	682
Green River 2	0	326	394	506	542	623	657	742	726	766	690	780	722	694	727
Green River 3	0	8072	8380	7632	8456	8990	8989	9015	9638	8953	9735	9942	9957	10103	10101
Green River 4	8035	10170	10793	12034	10750	11905	12652	12869	13550	14102	12325	14128	14449	14864	15010
Pineville 3	0	1136	1138	1138	1001	1149	1210	1250	1375	1433	1345	1390	1406	1231	1444
Tyrone 3	0	2059	2095	2221	2084	2319	2401	2499	2697	2895	2741	2810	2732	2720	2790
Cane Run 4	0	3725	3879	4029	3940	3795	3709	3911	4176	4018	3832	4082	4063	4270	3693
Cane Run 5	0	4281	4000	4684	4852	4721	4965	4758	4417	4740	4776	4765	4886	5084	4847
Cane Run 6	0	3428	3685	3542	3771	3804	4000	4042	3929	4013	3910	3872	3502	4111	4108
Mill Creek 1	0	5718	5132	5987	5747	5805	5850	5760	6028	5402	5817	6195	5918	6010	6276
Mill Creek 2	0	5316	5795	5496	6131	5872	6083	6427	5888	5511	6184	6124	6017	6407	6149
Mill Creek 3	0	7900	8306	7386	8374	8559	8255	8394	8556	8268	8603	7603	8257	8340	8703
Mill Creek 4	0	9304	10227	9982	10152	10495	9229	10102	9991	10301	10105	10192	10575	9318	10214
Trimble County 1	0	6518	6624	6605	5986	6469	6761	6498	6439	6782	6496	6719	6394	6557	6496
TOTAL TONS SO2 EMITTED	48578	164279	166258	170115	171619	173829	178311	179073	184755	184150	184138	186161	189297	189264	191406
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2590	2511	2588	2381	2364	2338	2311	2295	2370	2241	2251	2150	2096	2044
PURCHASE	0	0	0	0	0	0	0	0	0	0	0	6865	49723	49744	51939
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148348	148269	148346	148139	148122	148097	148069	148053	148128	148000	146540	189297	189264	191406
ALLOWANCES (+/-)	45853	-15931	-17989	-21769	-23480	-25707	-30214	-31004	-36702	-36022	-36138	-39621	0	0	0
ENDING ALLOWANCE BANK	314577	298647	280657	258888	235408	209701	179487	148483	111781	75759	39621	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-07

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	5.5	5.5	5.5	5.5
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	5.5	5.5	5.5	5.5
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.0%	95.0%	95.0%	95.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	95.0%	95.0%	95.0%	95.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 5	80.8%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 6	82.4%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 1	81.7%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 2	77.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 3	78.3%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 4	77.8%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Trimble County 1	87.4%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5803	6160	6251	6191	6171	6270	5795	6750	7045	7000	6658	6703	6778	6050
Brown 2	8401	9655	8956	10322	10110	9589	10087	10318	10641	9858	10963	10077	10221	10189	10230
Brown 3	20171	23060	24164	25506	25457	22790	25807	26180	27030	27763	27362	24091	26661	26656	26648
Ghent 1	7462	4780	5341	5388	4870	5435	5415	5417	4854	5436	5431	5395	5398	5421	4868
Ghent 2	0	15522	16350	16476	4758	5316	5321	5332	5360	5395	4834	5093	5105	5176	5183
Ghent 3	0	18500	18137	16243	17170	16944	17311	17601	18067	16394	18473	5404	5418	5454	5462
Ghent 4	0	18508	16178	18159	17120	16831	17078	15582	17881	18163	18139	5326	5330	4834	5378
Green River 1	0	500	526	527	541	643	653	705	686	703	665	744	739	687	705
Green River 2	0	326	394	506	529	639	675	742	727	765	690	783	727	702	740
Green River 3	0	8072	8380	7632	8481	9051	9004	9024	9649	8964	9693	10001	10054	10149	10153
Green River 4	8035	10170	10793	12034	10398	11443	12184	12306	13045	13494	11932	12910	13170	13219	13348
Pineville 3	0	1136	1138	1138	998	1165	1223	1254	1375	1428	1352	1411	1419	1241	1463
Tyrone 3	0	2059	2095	2221	2106	2345	2409	2513	2702	2910	2754	2850	2737	2756	2817
Cane Run 4	0	3725	3879	4029	3852	3758	3670	3880	4155	4002	3824	3838	3814	4065	3540
Cane Run 5	0	4281	4000	4684	4806	4690	4931	4744	4398	4733	4772	4523	4680	4904	4694
Cane Run 6	0	3428	3685	3542	3732	3785	3976	4020	3920	3999	3903	3706	3339	3891	3935
Mill Creek 1	0	5718	5132	5987	5689	5762	5804	5735	6011	5384	5806	5908	5660	5814	6073
Mill Creek 2	0	5316	5795	5496	6074	5825	6043	6398	5874	5499	6178	5805	5786	6183	5964
Mill Creek 3	0	7900	8306	7386	8334	8527	8226	8367	8544	8258	8598	7452	8100	8235	8600
Mill Creek 4	0	9304	10227	9982	10123	10472	9198	10089	9983	10293	10097	10031	10420	9229	10123
Trimble County 1	0	6518	6624	6605	5947	6435	6727	6471	6421	6763	6488	6580	6288	6501	6446
TOTAL TONS SO2 EMITTED	48578	164279	166258	170115	157285	157615	162008	162474	168070	167247	168954	138584	141767	142083	142420

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2590	2511	2588	2385	2367	2342	2313	2296	2371	2242	2270	2166	2107	2052
PURCHASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148348	148269	148346	148143	148125	148100	148071	148054	148129	148000	139693	139589	139530	139475
ALLOWANCES (+/-)	45853	-15931	-17989	-21769	-9141	-9490	-13908	-14403	-20016	-19118	-20953	1109	-2178	-2552	-2944
ENDING ALLOWANCE BANK	314577	298647	280657	258888	249747	240257	226349	211946	191930	172812	151859	152967	150789	148237	145293

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-06

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 5	80.8%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%	85.0%
Cane Run 6	82.4%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 1	81.7%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 2	77.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 3	78.3%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Mill Creek 4	77.8%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Trimble County 1	87.4%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%	93.0%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5803	6160	6251	6191	6171	6270	5795	6750	7045	7000	7063	7097	7195	6485
Brown 2	8401	9655	8956	10322	10110	9589	10087	10318	10641	9858	10963	10980	11046	11151	11241
Brown 3	20171	23060	24164	25506	25457	22790	25807	26180	27030	27763	27362	25087	27747	27919	28079
Ghent 1	7462	4780	5341	5388	4870	5435	5415	5417	4854	5436	5431	5423	5433	5445	4888
Ghent 2	0	15522	16350	16476	4758	5316	5321	5332	5360	5395	4834	5409	5411	5444	5443
Ghent 3	0	18500	18137	16243	17170	16944	17311	17601	18067	16394	18473	18313	18328	18610	18802
Ghent 4	0	18508	16178	18159	17120	16831	17078	15582	17881	18163	18139	18182	18186	16493	18526
Green River 1	0	500	526	527	541	643	653	705	686	703	665	731	736	684	700
Green River 2	0	326	394	506	529	639	675	742	727	765	690	780	723	695	724
Green River 3	0	8072	8380	7632	8481	9051	9004	9024	9649	8964	9693	9969	9966	10084	10117
Green River 4	8035	10170	10793	12034	10398	11443	12184	12306	13045	13494	11932	13387	13793	14044	14193
Pineville 3	0	1136	1138	1138	998	1165	1223	1254	1375	1428	1352	1389	1420	1236	1441
Tyrone 3	0	2059	2095	2221	2106	2345	2409	2513	2702	2910	2754	2813	2721	2722	2790
Cane Run 4	0	3725	3879	4029	3852	3758	3670	3880	4155	4002	3824	4074	4050	4252	3689
Cane Run 5	0	4281	4000	4684	4806	4690	4931	4744	4398	4733	4772	4760	4879	5080	4831
Cane Run 6	0	3428	3685	3542	3732	3785	3976	4020	3920	3999	3903	3866	3498	4094	4105
Mill Creek 1	0	5718	5132	5987	5689	5762	5804	5735	6011	5384	5806	6183	5907	6006	6272
Mill Creek 2	0	5316	5795	5496	6074	5825	6043	6398	5874	5499	6178	6116	6012	6401	6146
Mill Creek 3	0	7900	8306	7386	8334	8527	8226	8367	8544	8258	8598	7597	8250	8337	8701
Mill Creek 4	0	9304	10227	9982	10123	10472	9198	10089	9983	10293	10097	10189	10573	9314	10214
Trimble County 1	0	6518	6624	6605	5947	6435	6727	6471	6421	6763	6488	6711	6389	6555	6495
TOTAL TONS SO2 EMITTED	48578	164279	166258	170115	157285	157615	162008	162474	168070	167247	168954	169023	172163	171762	173881
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2590	2511	2588	2385	2367	2342	2313	2296	2371	2242	2251	2151	2097	2044
PURCHASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148348	148269	148346	148143	148125	148100	148071	148054	148129	148000	139675	139574	139520	139467
ALLOWANCES (+/-)	45853	-15931	-17989	-21769	-9141	-9490	-13908	-14403	-20016	-19118	-20953	-29348	-32589	-32242	-34413
ENDING ALLOWANCE BANK	314577	298647	280657	258888	249747	240257	226349	211946	191930	172812	151859	122510	89921	57679	23266

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-04

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5805	6164	6261	6197	6174	6273	5798	6751	7047	7001	7065	7098	7196	6486
Brown 2	8401	9659	8964	10329	10122	9597	10097	10326	10645	9862	10965	10983	11049	11155	11242
Brown 3	20171	23067	24182	25517	25476	22803	25821	26191	27037	27768	27365	25089	27751	27924	28081
Ghent 1	7462	9563	10685	10780	9748	10875	10835	10839	9712	10874	10864	10848	10866	10890	9777
Ghent 2	0	15564	16382	16490	9520	10640	10649	10675	10725	10798	9673	10825	10827	10891	10888
Ghent 3	0	18565	18188	16260	17231	16984	17349	17622	18079	16403	18477	18317	18335	18619	18804
Ghent 4	0	18583	16229	18182	17206	16894	17134	15609	17901	18177	18146	18187	18189	16498	18528
Green River 1	0	500	526	527	541	643	653	705	686	703	665	731	736	684	700
Green River 2	0	326	399	506	529	639	675	742	727	765	690	780	723	695	724
Green River 3	0	8072	8384	7637	8481	9051	9004	9024	9649	8964	9693	9969	9966	10084	10117
Green River 4	8035	10170	10795	12036	10400	11444	12185	12310	13045	13495	11932	13388	13794	14046	14193
Pineville 3	0	1136	1140	1139	998	1165	1223	1254	1375	1428	1352	1389	1420	1236	1441
Tyrone 3	0	2059	2099	2224	2106	2345	2409	2513	2702	2910	2754	2813	2721	2722	2790
Cane Run 4	0	5671	5841	6106	5826	5688	5554	5874	6296	6066	5773	6158	6120	6416	5572
Cane Run 5	0	5803	5294	6157	6364	6190	6484	6205	5696	6138	6196	6158	6285	6531	6210
Cane Run 6	0	6097	6484	6243	6584	6684	6991	7080	6905	7036	6885	6814	6162	7211	7233
Mill Creek 1	0	10441	9401	10959	10412	10556	10640	10533	11039	9889	10680	11385	10883	11071	11574
Mill Creek 2	0	11183	12372	11823	12902	12438	12895	13745	12713	11892	13346	13251	13042	13917	13360
Mill Creek 3	0	16931	17863	15901	17982	18402	17781	18100	18481	17875	18628	16467	17881	18073	18887
Mill Creek 4	0	20405	22540	22003	22277	23029	20276	22251	22022	22738	22310	22535	23383	20613	22601
Trimble County 1	0	11744	11943	11913	10715	11597	12122	11661	11569	12179	11684	12081	11499	11797	11694
TOTAL TONS SO2 EMITTED	48578	211343	215874	218992	211614	213837	217048	219056	223754	223005	225080	225233	228727	228270	230899

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2565	2358	2340	2318	2289	2273	2351	2222	2236	2133	2082	2033
PURCHASE	0	0	0	0	0	15985	68972	71009	75723	74895	77100	85573	89170	88764	91443
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148323	148116	164084	217048	219056	223754	223005	225080	225233	228727	228270	230899
ALLOWANCES (+/-)	45853	-63023	-67635	-70668	-63498	-49753	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251554	183919	113251	49753	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-05

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 4	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5805	6164	6261	6213	6183	6321	5842	6810	7067	7011	7074	7121	7232	6502
Brown 2	8401	9659	8964	10329	10108	9632	10156	10378	10644	9968	10972	10959	11036	11132	11213
Brown 3	20171	23067	24182	25517	25614	22983	26106	26530	27296	28057	27456	25334	27941	28200	28307
Ghent 1	7462	9563	10685	10780	9697	10812	10780	10787	9662	10815	10807	10813	10826	10863	9757
Ghent 2	0	15564	16382	16490	13419	14938	15371	15647	15966	16554	14621	16200	16323	16461	16547
Ghent 3	0	18565	18188	16260	10789	10689	10723	10748	10774	9717	10810	10859	10860	10941	10953
Ghent 4	0	18583	16229	18182	10640	10561	10562	9515	10620	10678	10636	10692	10676	9679	10765
Green River 1	0	500	526	527	516	639	674	705	687	707	674	738	736	685	701
Green River 2	0	326	399	506	543	653	695	742	708	766	689	781	724	699	728
Green River 3	0	8072	8384	7637	8500	9128	9023	9036	9673	8997	9741	9999	10059	10131	10164
Green River 4	8035	10170	10795	12036	10594	11671	12448	12586	13217	13754	12033	13722	13970	14226	14365
Pineville 3	0	1136	1140	1139	1022	1197	1232	1252	1383	1440	1369	1399	1426	1234	1454
Tyrone 3	0	2059	2099	2224	2115	2349	2418	2547	2738	2922	2763	2825	2747	2732	2806
Cane Run 4	0	5671	5841	6106	5565	5522	5417	5785	6236	5968	5715	6104	6058	6360	5539
Cane Run 5	0	5803	5294	6157	6268	6085	6363	6125	5649	6085	6127	6101	6240	6487	6169
Cane Run 6	0	6097	6484	6243	6431	6564	6881	7014	6850	6991	6843	6775	6122	7159	7197
Mill Creek 1	0	10441	9401	10959	10014	10250	10317	10270	10819	9708	10444	11172	10697	10936	11442
Mill Creek 2	0	11183	12372	11823	12421	12046	12481	13413	12440	11623	13053	12953	12821	13711	13176
Mill Creek 3	0	16931	17863	15901	17530	18106	17481	17849	18273	17687	18435	16311	17709	17982	18783
Mill Creek 4	0	20405	22540	22003	21889	22654	19938	21980	21826	22543	22125	22346	23210	20522	22514
Trimble County 1	0	11744	11943	11913	10336	11219	11736	11379	11362	11988	11472	11933	11351	11752	11666

TOTAL TONS SO2 EMITTED	48578	211343	215874	218992	200224	203876	207125	210129	213633	214032	213796	215090	218650	219124	220746
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2565	2376	2355	2333	2300	2281	2359	2231	2243	2139	2086	2035
PURCHASE	0	0	0	0	0	0	53635	62071	65593	65915	65807	75424	79088	79615	81288
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148323	148134	148114	201726	210129	213633	214032	213796	215090	218650	219124	220746
ALLOWANCES (+/-)	45853	-63023	-67635	-70668	-52090	-55763	-5399	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251554	183919	113251	61162	5399	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-01HF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5806	6151	6183	6243	6226	6381	5946	6929	7183	7117	7281	7344	7510	6770
Brown 2	8401	9658	8926	10153	10394	10038	10503	10788	11110	10344	11504	11581	11651	11852	11983
Brown 3	20171	23065	24116	25224	25818	23250	26390	26890	27716	28487	28102	25977	28684	29040	29303
Ghent 1	7462	9565	10691	10785	9770	10900	10856	10856	9734	10891	10880	10860	10876	10895	9780
Ghent 2	0	15591	16395	16622	14534	16344	16561	16795	17089	17515	15531	17214	17312	17371	17407
Ghent 3	0	18607	18201	16351	18449	18408	18594	18908	19256	17361	19406	19453	19410	19649	19750
Ghent 4	0	18623	16240	18276	18427	18309	18439	16759	19111	19325	19183	19316	19268	17445	19506
Green River 1	0	500	526	529	527	643	653	695	686	704	665	726	735	674	682
Green River 2	0	326	399	507	553	623	657	742	726	766	690	780	722	694	727
Green River 3	0	8073	8385	7636	8493	9051	9038	9067	9724	9040	9813	10073	10072	10298	10360
Green River 4	8035	10223	10864	12028	11187	12573	13346	13685	14419	15075	13468	15309	15751	16302	16496
Pineville 3	0	1140	1142	1140	1008	1153	1211	1250	1367	1433	1345	1391	1406	1227	1445
Tyrone 3	0	2061	2099	2224	2082	2319	2401	2499	2696	2894	2740	2810	2727	2704	2752
Cane Run 4	0	5530	5878	6129	5998	5783	5657	5946	6354	6116	5816	6196	6159	6471	5588
Cane Run 5	0	5608	5347	6200	6439	6240	6542	6246	5741	6179	6250	6232	6348	6582	6256
Cane Run 6	0	5971	6518	6259	6674	6741	7062	7153	6943	7093	6917	6846	6192	7266	7260
Mill Creek 1	0	10529	9362	10913	10562	10660	10743	10588	11072	9908	10672	11360	10873	11045	11545
Mill Creek 2	0	11310	12336	11783	13096	12599	13067	13848	12773	11939	13375	13275	13063	13952	13404
Mill Creek 3	0	17019	17830	15884	18126	18517	17897	18195	18559	17938	18698	16519	17958	18140	18953
Mill Creek 4	0	20468	22530	21995	22402	23138	20375	22327	22095	22806	22376	22596	23454	20680	22658
Trimble County 1	0	11753	11956	11929	10803	11695	12212	11743	11637	12242	11728	12113	11533	11824	11708
TOTAL TONS SO2 EMITTED	48578	211424	215890	218749	221585	225211	228582	230923	235738	235239	236274	237907	241538	241620	244331
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2564	2486	2570	2367	2353	2330	2303	2290	2367	2240	2250	2151	2099	2047
PURCHASE	0	0	0	0	0	37150	80493	82862	87689	87114	88276	98233	101964	102098	104861
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148322	148244	148328	148125	185261	228582	230923	235738	235239	236274	237907	241538	241620	244331
ALLOWANCES (+/-)	45853	-63102	-67646	-70421	-73459	-39950	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251475	183830	113409	39950	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-01LF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5796	6137	6163	6262	6295	6391	5911	6889	7171	7140	7219	7273	7424	6650
Brown 2	8401	9630	8892	10100	10307	9892	10355	10627	10921	10158	11253	11290	11362	11505	11583
Brown 3	20171	23039	24069	25151	25705	23108	26207	26664	27459	28194	27732	25605	28233	28514	28702
Ghent 1	7462	9565	10692	10785	9770	10901	10856	10857	9736	10892	10882	10861	10877	10896	9782
Ghent 2	0	15620	16457	16710	14640	16489	16741	17026	17330	17803	15809	17588	17692	17855	17919
Ghent 3	0	18633	18248	16408	18539	18516	18727	19070	19436	17546	19632	19724	19710	20028	20151
Ghent 4	0	18651	16281	18334	18515	18417	18565	16901	19279	19513	19420	19572	19586	17780	19926
Green River 1	0	500	526	527	527	643	653	695	686	704	665	726	735	674	682
Green River 2	0	326	399	506	553	623	657	742	726	766	690	780	722	694	727
Green River 3	0	8062	8370	7618	8366	8935	8968	8928	9525	8892	9651	9887	9772	9929	9934
Green River 4	8035	10161	10703	11754	10745	11887	12549	12684	13343	13752	11972	13543	13803	14022	14050
Pineville 3	0	1141	1144	1142	1040	1175	1221	1266	1404	1448	1388	1400	1394	1192	1400
Tyrone 3	0	2059	2099	2224	2082	2319	2400	2499	2696	2894	2740	2810	2727	2704	2752
Cane Run 4	0	5508	5842	6076	5904	5723	5588	5898	6309	6074	5788	6164	6136	6446	5587
Cane Run 5	0	5583	5310	6150	6354	6150	6448	6154	5679	6098	6138	6131	6278	6530	6217
Cane Run 6	0	5946	6468	6218	6630	6688	7025	7107	6910	7048	6875	6805	6154	7213	7217
Mill Creek 1	0	10547	9390	10955	10617	10734	10806	10652	11124	9982	10759	11462	10938	11107	11621
Mill Creek 2	0	11320	12345	11806	13139	12632	13101	13876	12784	11964	13412	13296	13060	13929	13363
Mill Creek 3	0	17014	17831	15867	18102	18474	17848	18144	18482	17868	18610	16450	17859	18039	18849
Mill Creek 4	0	20464	22514	21978	22383	23106	20329	22271	22017	22729	22286	22509	23342	20576	22558
Trimble County 1	0	11753	11954	11926	10800	11683	12202	11730	11623	12230	11708	12103	11514	11803	11697
TOTAL TONS SO2 EMITTED	48578	211316	215669	218397	220978	224387	227636	229699	234358	233725	234547	235925	239169	238857	241366
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2563	2356	2338	2314	2283	2267	2346	2215	2230	2125	2074	2026
PURCHASE	0	0	0	0	0	35079	79563	81658	86333	85621	86574	96272	99620	99360	101916
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148322	148114	183175	227636	229699	234358	233725	234547	235925	239169	238857	241366
ALLOWANCES (+/-)	45853	-62996	-67430	-70075	-72864	-41212	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251581	184152	114076	41212	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-04HF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5806	6151	6183	6050	5967	6143	5682	6642	6904	6848	6959	7005	7150	6445
Brown 2	8401	9658	8926	10153	9894	9367	9889	10145	10490	9734	10828	10861	10939	11059	11163
Brown 3	20171	23065	24116	25224	25101	22486	25490	25855	26744	27486	27114	24866	27552	27721	27906
Ghent 1	7462	9565	10691	10785	9759	10886	10844	10846	9719	10879	10868	10849	10867	10890	9776
Ghent 2	0	15591	16395	16622	9597	10700	10699	10710	10746	10817	9684	10833	10832	10894	10888
Ghent 3	0	18607	18201	16351	17309	17059	17400	17669	18105	16401	18470	18269	18268	18499	18676
Ghent 4	0	18623	16240	18276	17259	16949	17162	15638	17915	18180	18138	18153	18127	16402	18402
Green River 1	0	500	526	529	541	643	653	705	686	703	665	731	736	684	700
Green River 2	0	326	399	507	558	639	675	742	727	765	690	780	723	695	724
Green River 3	0	8073	8385	7636	8507	9094	9050	9064	9720	9025	9783	10060	10059	10212	10279
Green River 4	8035	10223	10864	12028	10790	12007	12769	12986	13760	14342	12881	14396	14908	15307	15543
Pineville 3	0	1140	1142	1140	1010	1170	1223	1255	1370	1428	1351	1390	1421	1233	1444
Tyrone 3	0	2061	2099	2224	2104	2345	2408	2513	2702	2909	2754	2813	2717	2706	2753
Cane Run 4	0	5530	5878	6129	5853	5719	5592	5903	6321	6092	5807	6187	6144	6450	5585
Cane Run 5	0	5608	5347	6200	6367	6191	6499	6226	5720	6166	6243	6225	6338	6576	6234
Cane Run 6	0	5971	6518	6259	6600	6706	7023	7115	6930	7068	6906	6838	6185	7249	7260
Mill Creek 1	0	10529	9362	10913	10421	10557	10639	10523	11036	9870	10652	11335	10846	11035	11534
Mill Creek 2	0	11310	12336	11783	12937	12463	12925	13763	12734	11901	13344	13245	13046	13932	13393
Mill Creek 3	0	17019	17830	15884	18003	18424	17803	18129	18521	17908	18675	16502	17936	18125	18944
Mill Creek 4	0	20468	22530	21995	22297	23053	20297	22281	22064	22781	22358	22579	23442	20668	22654
Trimble County 1	0	11753	11956	11929	10716	11615	12135	11678	11590	12198	11704	12090	11511	11808	11696
TOTAL TONS SO2 EMITTED	48578	211424	215890	218749	211672	214040	217317	219428	224239	223555	225763	225961	229600	229296	231998

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2564	2486	2570	2373	2357	2334	2307	2292	2368	2241	2251	2152	2099	2048
PURCHASE	0	0	0	0	0	16056	69224	71363	76189	75429	77764	86286	90025	89773	92527
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148322	148244	148328	148131	164172	217317	219428	224239	223555	225763	225961	229600	229296	231998
ALLOWANCES (+/-)	45853	-63102	-67646	-70421	-63541	-49868	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251475	183830	113409	49868	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-04LF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 3	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 4	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5796	6137	6163	6094	6045	6174	5702	6644	6934	6880	6943	6986	7133	6385
Brown 2	8401	9630	8892	10100	9845	9286	9821	10060	10391	9639	10674	10682	10776	10854	10908
Brown 3	20171	23039	24069	25151	25050	22430	25428	25771	26643	27385	26939	24708	27344	27489	27604
Ghent 1	7462	9565	10692	10785	9761	10887	10846	10851	9729	10888	10878	10859	10876	10895	9781
Ghent 2	0	15620	16457	16710	9607	10705	10709	10723	10766	10841	9714	10869	10883	10947	10939
Ghent 3	0	18633	18248	16408	17429	17190	17556	17868	18315	16620	18733	18599	18622	18986	19176
Ghent 4	0	18651	16281	18334	17380	17088	17333	15811	18119	18422	18415	18461	18498	16815	18931
Green River 1	0	500	526	527	541	643	653	705	686	703	665	731	736	684	700
Green River 2	0	326	399	506	558	639	675	742	727	765	690	780	723	695	724
Green River 3	0	8062	8370	7618	8359	8967	8984	8972	9540	8900	9632	9901	9785	9941	9996
Green River 4	8035	10161	10703	11754	10472	11504	12188	12237	12957	13296	11668	13032	13338	13424	13478
Pineville 3	0	1141	1144	1142	1043	1194	1234	1274	1405	1445	1396	1400	1409	1199	1402
Tyrone 3	0	2059	2099	2224	2104	2344	2408	2512	2701	2909	2754	2813	2717	2706	2753
Cane Run 4	0	5508	5842	6076	5688	5643	5503	5833	6261	6030	5748	6128	6087	6396	5563
Cane Run 5	0	5583	5310	6150	6261	6096	6386	6123	5645	6079	6127	6118	6262	6515	6209
Cane Run 6	0	5946	6468	6218	6544	6640	6960	7048	6873	7005	6859	6784	6132	7156	7190
Mill Creek 1	0	10547	9390	10955	10473	10632	10687	10584	11084	9942	10744	11445	10922	11103	11618
Mill Creek 2	0	11320	12345	11806	12981	12485	12965	13789	12737	11923	13386	13273	13051	13918	13362
Mill Creek 3	0	17014	17831	15867	17975	18376	17748	18064	18454	17845	18598	16439	17851	18045	18848
Mill Creek 4	0	20464	22514	21978	22274	23006	20244	22228	21998	22713	22275	22498	23340	20569	22558
Trimble County 1	0	11753	11954	11926	10712	11599	12121	11687	11602	12219	11706	12098	11513	11802	11694
TOTAL TONS SO2 EMITTED	48578	211316	215669	218397	211151	213398	216619	218586	223278	222504	224481	224561	227846	227272	229817

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2563	2361	2342	2317	2286	2268	2346	2215	2230	2125	2074	2026
PURCHASE	0	0	0	0	0	14255	68544	70542	75252	74400	76508	84907	88298	87774	90368
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148322	148119	162355	216619	218586	223278	222504	224481	224561	227846	227272	229817
ALLOWANCES (+/-)	45853	-62996	-67430	-70075	-63033	-51044	0	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251581	184152	114076	51044	0	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-05HF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ghent 3	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 4	0.0	1.1	1.1	1.1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5806	6151	6183	6073	5983	6199	5721	6710	6941	6862	6973	7044	7182	6455
Brown 2	8401	9658	8926	10153	9964	9472	10008	10238	10527	9852	10856	10840	10924	11023	11110
Brown 3	20171	23065	24116	25224	25340	22736	25836	26233	27046	27801	27240	25133	27724	27972	28101
Ghent 1	7462	9565	10691	10785	9721	10836	10801	10804	9677	10829	10818	10819	10828	10861	9751
Ghent 2	0	15591	16395	16622	13502	15028	15433	15692	15986	16554	14613	16128	16240	16317	16392
Ghent 3	0	18607	18201	16351	10868	10772	10799	10814	10825	9762	10850	10890	10887	10950	10950
Ghent 4	0	18623	16240	18276	10713	10639	10633	9569	10672	10720	10674	10722	10698	9688	10760
Green River 1	0	500	526	529	532	639	674	705	687	707	674	738	736	685	701
Green River 2	0	326	399	507	560	653	695	742	708	766	689	781	724	699	728
Green River 3	0	8073	8385	7636	8529	9175	9073	9087	9758	9078	9864	10120	10181	10293	10385
Green River 4	8035	10223	10864	12028	10997	12228	12998	13242	13844	14498	12811	14580	14884	15242	15400
Pineville 3	0	1140	1142	1140	1032	1194	1233	1253	1378	1439	1368	1399	1427	1236	1459
Tyrone 3	0	2061	2099	2224	2112	2348	2417	2547	2737	2921	2762	2825	2742	2723	2760
Cane Run 4	0	5530	5878	6129	5597	5543	5443	5814	6256	5989	5736	6128	6079	6385	5549
Cane Run 5	0	5608	5347	6200	6253	6087	6374	6145	5664	6110	6173	6162	6290	6535	6192
Cane Run 6	0	5971	6518	6259	6449	6588	6913	7046	6877	7023	6870	6801	6152	7194	7225
Mill Creek 1	0	10529	9362	10913	10006	10234	10297	10246	10799	9676	10403	11113	10644	10889	11382
Mill Creek 2	0	11310	12336	11783	12451	12065	12489	13421	12449	11620	13041	12936	12812	13719	13190
Mill Creek 3	0	17019	17830	15884	17519	18095	17478	17853	18291	17709	18463	16333	17738	18001	18812
Mill Creek 4	0	20468	22530	21995	21876	22636	19933	21987	21848	22568	22152	22376	23242	20557	22542
Trimble County 1	0	11753	11956	11929	10268	11159	11676	11341	11334	11965	11447	11917	11295	11688	11586
TOTAL TONS SO2 EMITTED	48578	211424	215890	218749	200361	204109	207402	210500	214073	214528	214365	215712	219292	219836	221428
ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2564	2486	2570	2396	2379	2356	2323	2305	2380	2254	2263	2163	2107	2054
PURCHASE	0	0	0	0	0	0	54056	62419	66010	66389	66353	76026	79706	80306	81951
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148322	148244	148328	148155	148137	202170	210500	214073	214528	214365	215712	219292	219836	221428
ALLOWANCES (+/-)	45853	-63102	-67646	-70421	-52206	-55971	-5232	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251475	183830	113409	61203	5232	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

SO2 SUMMARY BY YEAR

CASE: CAAA-05LF

FUEL #/MBTU SO2	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Brown 3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Ghent 1	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ghent 2	0.0	1.1	1.1	1.1	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Ghent 3	0.0	1.1	1.1	1.1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Ghent 4	0.0	1.1	1.1	1.1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Green River 1	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 2	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 3	0.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Green River 4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Pineville 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Tyrone 3	0.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cane Run 4	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 5	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Cane Run 6	0.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Mill Creek 1	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 3	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Mill Creek 4	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Trimble County 1	0.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5

SCRUBBER REMOVAL EFF.	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Brown 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 1	92.9%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 2	0.0%	0.0%	0.0%	0.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
Ghent 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ghent 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 1	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 2	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%	80.0%
Green River 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Green River 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pineville 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Tyrone 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane Run 4	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%	77.2%
Cane Run 5	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%	80.8%
Cane Run 6	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%	82.4%
Mill Creek 1	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%	81.7%
Mill Creek 2	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%	77.9%
Mill Creek 3	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%	78.3%
Mill Creek 4	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%	77.8%
Trimble County 1	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%	87.4%

TONS SO2 EMITTED	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brown 1	4509	5796	6137	6163	6140	6095	6246	5760	6726	6990	6927	6994	7043	7179	6474
Brown 2	8401	9630	8892	10100	9949	9437	9988	10213	10501	9821	10820	10805	10910	10986	11048
Brown 3	20171	23039	24069	25151	25329	22715	25815	26206	27018	27773	27204	25088	27696	27907	28036
Ghent 1	7462	9565	10692	10785	9724	10841	10813	10824	9705	10860	10848	10841	10855	10881	9769
Ghent 2	0	15620	16457	16710	13638	15210	15658	15968	16265	16888	14941	16579	16701	16917	17018
Ghent 3	0	18633	18248	16408	10871	10779	10824	10863	10891	9840	10926	10956	10963	11014	11004
Ghent 4	0	18651	16281	18334	10716	10646	10658	9618	10740	10790	10742	10781	10767	9741	10807
Green River 1	0	500	526	527	532	639	674	705	687	707	674	738	736	685	701
Green River 2	0	326	399	506	560	653	695	742	708	766	689	781	724	699	728
Green River 3	0	8062	8370	7618	8435	9021	9004	9029	9603	8923	9670	9913	9888	9963	10013
Green River 4	8035	10161	10703	11754	10669	11735	12441	12518	13166	13574	11864	13378	13601	13726	13790
Pineville 3	0	1141	1144	1142	1062	1241	1246	1266	1406	1459	1409	1409	1414	1209	1414
Tyrone 3	0	2059	2099	2224	2112	2348	2417	2546	2737	2921	2762	2825	2742	2723	2760
Cane Run 4	0	5508	5842	6076	5540	5497	5394	5768	6214	5947	5701	6088	6043	6354	5533
Cane Run 5	0	5583	5310	6150	6175	6010	6290	6056	5601	6032	6071	6062	6217	6480	6168
Cane Run 6	0	5946	6468	6218	6401	6531	6864	6987	6827	6969	6821	6749	6095	7111	7164
Mill Creek 1	0	10547	9390	10955	10038	10290	10338	10321	10877	9789	10550	11288	10789	11008	11527
Mill Creek 2	0	11320	12345	11806	12486	12087	12516	13443	12458	11679	13141	13055	12895	13778	13234
Mill Creek 3	0	17014	17831	15867	17481	18036	17431	17821	18269	17690	18445	16322	17724	17968	18770
Mill Creek 4	0	20464	22514	21978	21836	22573	19889	21964	21819	22559	22131	22365	23216	20502	22494
Trimble County 1	0	11753	11954	11926	10250	11134	11666	11471	11475	12096	11581	12012	11415	11746	11648
TOTAL TONS SO2 EMITTED	48578	211316	215669	218397	199943	203514	206867	210088	213695	214071	213917	215029	218434	218577	220098

ALLOWANCES															
KU/LGE BASE	78235	145758	145758	145758	145758	145758	145758	145758	145758	145758	145758	137423	137423	137423	137423
KU/LGE EXTENSION	5056	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OMU EXTRA	11140	2562	2481	2563	2382	2360	2333	2295	2274	2350	2219	2233	2128	2075	2027
PURCHASE	0	0	0	0	0	0	51897	62035	65663	65962	65940	75373	78883	79079	80648
SELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ALLOWANCES	94431	148320	148239	148322	148140	148118	199989	210088	213695	214071	213917	215029	218434	218577	220098
ALLOWANCES (+/-)	45853	-62996	-67430	-70075	-51803	-55395	-6878	0	0	0	0	0	0	0	0
ENDING ALLOWANCE BANK	314577	251581	184152	114076	62273	6878	0	0	0	0	0	0	0	0	0

(1998 Bank of 268724 allowances)

Allowance Price Sensitivity Analysis

(All Costs in 1999 PV $1000)

BASE ALLOWANCE PRICE FORECAST ($200)

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-03	5,013,129	11,332	638,799	5,663,260	(32,626)
Case: CAAA-04	4,943,822	66,039	682,862	5,692,723	(3,164)
Case: CAAA-05	4,912,571	55,360	760,355	5,728,286	32,400
Case: CAAA-06	4,980,039	-	682,862	5,662,901	(32,985)
Case: CAAA-07	4,959,706	-	728,726	5,688,432	(7,454)

HIGH ALLOWANCE PRICE FORECAST ($300)

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	117,120	638,799	5,734,926	Base
Case: CAAA-03	5,013,129	16,998	638,799	5,668,926	(66,000)
Case: CAAA-04	4,943,822	99,058	682,862	5,725,742	(9,184)
Case: CAAA-05	4,912,571	83,040	760,355	5,755,966	21,039
Case: CAAA-06	4,980,039	-	682,862	5,662,901	(72,025)
Case: CAAA-07	4,959,706	-	728,726	5,688,432	(46,494)

LOW ALLOWANCE PRICE FORECAST ($150)

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	58,560	638,799	5,676,366	Base
Case: CAAA-03	5,013,129	8,499	638,799	5,660,427	(15,939)
Case: CAAA-04	4,943,822	49,529	682,862	5,676,213	(153)
Case: CAAA-05	4,912,571	41,520	760,355	5,714,446	38,080
Case: CAAA-06	4,980,039	-	682,862	5,662,901	(13,465)
Case: CAAA-07	4,959,706	-	728,726	5,688,432	12,066

Fuel Price Sensitivity Analysis

(All Costs in 1999 PV $1000)

BASE FUEL PRICE FORECAST

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-04	4,943,822	66,039	682,862	5,692,723	(3,164)
Case: CAAA-05	4,912,571	55,360	760,355	5,728,286	32,400

HIGH FUEL PRICE FORECAST

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01HF	5,260,013	78,663	638,799	5,977,474	Base
Case: CAAA-04HF	5,214,831	66,542	682,862	5,964,235	(13,239)
Case: CAAA-05HF	5,173,516	55,774	760,355	5,989,645	12,171

LOW FUEL PRICE FORECAST

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01LF	4,666,468	76,992	638,799	5,382,259	Base
Case: CAAA-04LF	4,632,104	65,304	682,862	5,380,270	(1,989)
Case: CAAA-05LF	4,601,909	55,072	760,355	5,417,337	35,078

Scrubber Price Sensitivity Analysis

(All Costs in 1999 PV $1000)

BASE SCRUBBER PRICE FORECAST

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-04	4,943,822	66,039	682,862	5,692,723	(3,164)
Case: CAAA-05	4,912,571	55,360	760,355	5,728,286	32,400

BASE SCRUBBER PRICE FORECAST +10%

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-04	4,943,822	66,039	687,268	5,697,129	1,242
Case: CAAA-05	4,912,571	55,360	772,512	5,740,443	44,557

BASE SCRUBBER PRICE FORECAST -10%

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-04	4,943,822	66,039	678,455	5,688,316	(7,571)
Case: CAAA-05	4,912,571	55,360	748,199	5,716,130	20,244

Summary Of All Cases

(All Costs in 1999 PV $1000)

ALL CASES COMPARED TO CAAA-01

Case	Production Cost	Allowance Cost	Capital	Total	Incr over 01
Case: CAAA-01	4,979,007	78,080	638,799	5,695,886	Base
Case: CAAA-01 $150 Allowance	4,979,007	58,560	638,799	5,676,366	(19,520)
Case: CAAA-01 $300 Allowance	4,979,007	117,120	638,799	5,734,926	39,040
Case: CAAA-01HF	5,260,013	78,663	638,799	5,977,474	281,588
Case: CAAA-01LF	4,666,468	76,992	638,799	5,382,259	(313,628)
Case: CAAA-02	4,969,875	97,275	638,799	5,705,949	10,063
Case: CAAA-03	5,013,129	11,332	638,799	5,663,260	(32,626)
Case: CAAA-03 $150 Allowance	5,013,129	8,499	638,799	5,660,427	(35,459)
Case: CAAA-03 $300 Allowance	5,013,129	16,998	638,799	5,668,926	(26,960)
Case: CAAA-04	4,943,822	66,039	682,862	5,692,723	(3,164)
Case: CAAA-04 $150 Allowance	4,943,822	49,529	682,862	5,676,213	(19,673)
Case: CAAA-04 $300 Allowance	4,943,822	99,058	682,862	5,725,742	29,856
Case: CAAA-04HF	5,214,831	66,542	682,862	5,964,235	268,349
Case: CAAA-04LF	4,632,104	65,304	682,862	5,380,270	(315,616)
Case: CAAA-04	4,943,822	66,039	678,455	5,688,316	(7,571)
Case: CAAA-04	4,943,822	66,039	687,268	5,697,129	1,242
Case: CAAA-05	4,912,571	55,360	760,355	5,728,286	32,400
Case: CAAA-05 $150 Allowance	4,912,571	41,520	760,355	5,714,446	18,560
Case: CAAA-05 $300 Allowance	4,912,571	83,040	760,355	5,755,966	60,080
Case: CAAA-05HF	5,173,516	55,774	760,355	5,989,645	293,759
Case: CAAA-05LF	4,601,909	55,072	760,355	5,417,337	(278,549)
Case: CAAA-05	4,912,571	55,360	748,199	5,716,130	20,244
Case: CAAA-05	4,912,571	55,360	772,512	5,740,443	44,557
Case: CAAA-06	4,980,039	-	682,862	5,662,901	(32,985)
Case: CAAA-06 $150 Allowance	4,980,039	-	682,862	5,662,901	(32,985)
Case: CAAA-06 $300 Allowance	4,980,039	-	682,862	5,662,901	(32,985)
Case: CAAA-07	4,959,706	-	728,726	5,688,432	(7,454)
Case: CAAA-07 $150 Allowance	4,959,706	-	728,726	5,688,432	(7,454)
Case: CAAA-07 $300 Allowance	4,959,706	-	728,726	5,688,432	(7,454)

Appendix G

VII. OPTIMAL IRP ANALYSIS

Kentucky Utilities Company
and
Louisville Gas & Electric Company

Optimal Integrated Resource Plan Analysis

Prepared by

Generation Systems Planning

October, 1999

LOUISVILLE GAS AND ELETRIC/KENTUCKY UTILITIES COMPANY OPTIMAL INTEGRATED RESOURCE PLAN ANALYSIS

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Kentucky Utilities and Louisville Gas & Electric (the Companies) develop a joint Optimal Integrated Resource Plan annually. The purpose of this study is to update this ongoing analysis and determine a 30-year optimal resource strategy for the Companies. The optimal strategy is determined based on a minimum expected Present Value of Revenue Requirements (PVRR) criterion over a 30-year planning horizon and subject to certain constraints, including a target reserve margin of 12% and unit operating characteristics.

As precursors to the optimization process, two independent technology screening analyses were conducted, one for supply-side alternatives and the other for demand-side management (DSM) programs. The purpose of the supply-side screening analysis was to evaluate, compare and suggest the least-cost supply-side options to use in PROSCREEN II optimizations. An independent screening analysis was conducted for demand-side management that evaluated and recommended DSM alternatives for evaluation in PROSCREEN II. In order to consider uncertainty in the process, a sensitivity analysis was implemented within optimization study simulations. Three load forecast sensitivities and three fuel price sensitivities were developed along with probabilities of occurrence. The sensitivities were used to develop nine scenarios that in turn were analyzed using PROSCREEN II optimizations.

Because of computer run time and storage limitations, certain logical constraints were implemented in PROSCREEN II. DSM projects tend to be small in nature and would only serve to delay the supply-side expansion strategy and not to change it. Therefore, supply-side optimizations were run and then another set of optimizations was performed in which DSM projects were allowed to compete against the supply-side options that were selected during the supply-side optimizations. This step greatly reduced computer run time without adversely affecting the integrity of the optimization process.

A review of the best plans in each of the nine load / fuel scenarios indicates that there are no major differences between any of the plans, other than the IPP Hydro option appearing in two of the unlikely scenarios. All of the plans suggest completion of the E. W. Brown CT site, implementation of DSM, and several greenfield CTs before the first Combined Cycle unit. Therefore, it is recommended that the resulting optimal integrated resource plan be used as the Companies' 30-year plan with emphasis placed on the completion of the E. W. Brown CT site and implementation of the selected DSM alternatives followed by construction of another CT site as soon as practical.

INTRODUCTION

The purpose of this study is to determine a single 30-year Integrated Resource Plan for Kentucky Utilities Company and Louisville Gas & Electric Company (the Companies). The optimal plan is determined based on a minimum expected Present Value of Revenue Requirements (PVRR) criterion over a 30-year planning horizon and subject to certain constraints, including a target reserve margin of 12% and unit operating characteristics.

This report will first discuss the various modules of the PROSCREEN II computer model used in the analysis. Next, the reserve margin used in this analysis will be discussed briefly. The results of the supply-side screening analysis will then be discussed. An independent screening of Demand-side Management options has also been completed and will be discussed. Based upon these analyses, initial lists of technologies of various types and capacities will be suggested for further analysis within the optimization module of PROSCREEN II. Nine sensitivity scenarios, developed from three load forecasts and three fuel forecasts, will be analyzed in computer optimizations; the least-cost strategies suggested by the optimization module will then be analyzed to develop a 30-year Integrated Resource Plan.

An Overview of the PROSCREEN II Computer Model

The Load Forecast Adjustment (LFA), Generation and Fuel (GAF), Proview (PRV), and Capital Expenditure and Recovery (CER) modules of the PROSCREEN II computer model were used in the study. The PROSCREEN II computer software program can be used to either optimize a set of resource alternatives (determine a least-cost strategy under a prescribed set of constraints and assumptions) or evaluate a single pre-specified a given plan. PROSCREEN II input parameters are described in Appendix A.

The LFA module allows the user to create monthly company load shapes to be transferred to the GAF module for production costing purposes. Inputs to the LFA are the Companies' peak and energy load forecasts (inclusive of energy savings associated with existing DSM), and the Companies' typical load shapes.

The GAF module simulates power system operation using a load-duration curve production costing technique. Production costs including fuel, incremental operation and maintenance (O&M), and purchase power costs are calculated in this module. Inputs to the GAF include generating unit and purchase power characteristics.

PRV is an optimization module that evaluates all combinations of potential options to produce a list of resource plans, subject to user specified constraints, that satisfy the Companies' minimum target reserve margin criterion. PRV uses a production cost analysis together with an analysis of new construction expenditures or costs to implement DSM alternatives to suggest an optimal and several suboptimal resource plans based on the minimum PVRR criterion. PRV receives revenue requirements information associated with capital expenditures from the CER.

Inputs to PRV include generic generating unit characteristics from the GAF, DSM information from the LFA, and construction/implementation parameters.

The CER module calculates revenue requirements associated with capital expenditures for both construction and in-service periods. PRV receives project-specific revenue requirement profiles for possible in-service dates from the CER for use in optimizations. The revenue requirement profiles are combined with the GAF production cost analysis to produce a total system revenue requirement for the study period. The CER contains capital information on resource projects associated with the optimal Integrated Resource Plan. Inputs to the CER include construction cost profiles, depreciation schedules, and various economic assumptions.

Minimum Reserve Margin Target Criterion

A study was performed to determine an optimal reserve margin criterion to be used by the Companies. The base case series (base assumptions) from this study indicates that a 12% target reserve margin represents the greatest system reliability under the given set of assumptions. This study further indicated that an optimal target reserve margin in the range of 11% to 14% would provide an adequate and reliable system to meet customers' demand. In the development of the optimal integrated resource plan, the Companies used a reserve margin target of 12% to represent a base case scenario. Details of this study can be found in the report titled *Analysis of Reserve Margin Planning Criteria* (October 1999) in Volume III, Technical Appendix.

Preliminary Supply-Side Technology Screening Analysis

As a precursor to the optimization process, a technology screening analysis was conducted. The purpose of the screening analysis was to evaluate, compare and suggest the least-cost supply-side options to use in PROSCREEN II optimizations. The following is a summary of the results of this supply-side screening analysis. Details of this report titled ***Analysis of Supply-Side Technology Alternatives*** (August 1999) can be found in Volume III, Technical Appendix. The technologies that were suggested for detailed analysis within the PROSCREEN II production costing model optimizations are shown in Table 1.

Table 1
Supply-Side Technologies Suggested for Analysis
Within PROSCREEN II

Combined Cycle Combustion Turbine Phased – 470 MW
Combined Cycle Combustion Turbine Un-Phased – 345 MW
Combustion Turbine at Brown – 160 MW
Greenfield Site Combustion Turbine – 160 MW
Inlet Air Cooling at existing Brown CTs – 80 MW
IPP Hydro purchase – 114 MW
Pulverized Coal unit at Trimble County – 495 MW

The options listed in Table 1 are the ones that passed the screening. Inlet Air Cooling has been independently evaluated and selected for possible summer 2000 in-service; therefore, this study assumes this option will be completed by summer 2000. The other supply-side options shown in Table 1 were evaluated using PROSCREEN II.

It is important to note here that no purchase power options other than the hydro option were passed from the screening analysis to PROSCREEN II. Purchase power was not considered as an alternative in this analysis because of the current dynamic nature of the wholesale purchase power market. The wholesale market now has very little if any excess generation and peaking purchase opportunities of the type historically available do not exist. What does exist is a highly volatile developing electric energy trading marketplace, which was discussed in depth in the Companies' CCN filing (case number 99-056) for the E. W. Brown units 6 and 7. This new market is making the traditional *Request for Proposal* (RFP) for purchase power process impractical today. However, at this time the Companies continue to pursue possible opportunities through the RFP process and through participation in the wholesale marketplace on a real time basis. Currently, in this process, peaking type purchase opportunities are compared to CT construction alternatives to arrive at an optimal strategy. Peaking type purchase power opportunities in optimizations would serve only to evaluate the delay of CT construction for short periods of time, which is already being considered by the Companies in greater detail. Thus peaking type purchase power need not be considered in optimizations thereby reducing computer run-time and storage needs. Regardless of the method, the Companies will continue to evaluate the benefits of purchase power through participation in the wholesale marketplace on a real time basis as a method to delay generation construction.

Demand-Side Technology Screening Analysis

In addition to the supply-side screening discussed above, a demand-side screening was performed. The demand-side options that passed the screening are small and have been combined into three programs for further analysis within PROSCREEN II optimizations. These three options are shown in Table 2 below.

Table 2
DSM Programs Suggested for Analysis
Within PROSCREEN II

Direct Load Control – 5 phases – total 110.7 MW
Efficient Lighting – 2 phases – total 47.3 MW
Standby Generation – 4 phases – total 82.4 MW

The DSM options in Table 2 were analyzed using PROSCREEN II and allowed to compete with the supply-side options from Table 1. Details of the DSM screening can be found in the report tiled ***Screening of Demand-Side Management (DSM) Options*** (September 1999) in Volume III, Technical Appendix.

Fuel Price and Load Sensitivity Analyses

The supply-side and demand-side screening analyses suggested that the technologies and sizes shown in Table 1 and Table 2 are the technology types and sizes which should be analyzed in detail by PROSCREEN II. The next step in the development of an optimal plan was to evaluate these supply-side and demand-side options in detail beginning with a sensitivity analysis. A sensitivity analysis was conducted using various fuel forecast and load forecast scenarios within optimization study simulations.

The fuel forecast is one of the significant factors influencing the Companies' optimal integrated resource plan. Generating units considered in the Companies' resource planning models (see Table 1) utilize both coal and gas as the primary fuels. The CT and CCCT technologies for example are gas fired while the Trimble County unit is a coal-fired technology. Thus, gas and coal prices may have a significant impact on the selection of an optimal technology type. Therefore, in order to evaluate the effect of gas and coal prices, a fuel sensitivity analysis was incorporated into the Companies' process of determining an optimal integrated resource plan.

In summary, three fuel price forecasts have been developed and were used in optimizations. It should be noted that no fuel sensitivities were considered for the hydro purchase option because it was considered representative of a firm offer.

The load forecast is another significant factor influencing the Companies' integrated resource plan. Each supply-side technology is designed for optimal unit performance at various levels of utilization. CTs, for instance while relatively inexpensive to construct (compared to coal-fired units), are more costly to operate and maintain. Conversely, coal-fired units, while expensive to construct, are relatively inexpensive to operate and maintain. The economics of adding a supply-side option to any generation system is based on the expected costs of operating and maintaining the unit over the full range of loads it is expected to serve. Significant economic penalties (costs higher than expected) may be incurred if the unit is operated above or below the level it was planned to serve. For example, if a CT was added to a system in which load was greater than forecasted, the utilization of the CT may exceed the economical range for which it was planned. In other words, it may have been more economical to install intermediate load serving capacity (such as CCCTs) instead. Thus, load growth scenarios that are different from that which is expected may have a significant impact on the selection of an optimal technology type. Therefore, in order to evaluate the effect of various load forecasts, a load sensitivity analysis was incorporated into the process of determining an optimal resource plan.

In summary, the load sensitivity analysis consists of evaluating the effect of three load forecasts on the selection of resource alternatives. The three forecasts depict an expected system load growth case, a case where system load growth exceeds expected growth and a case in which system load growth is less than expected. For reference, the resulting forecasts are termed the *base*, *high* and *low*. The details of and the basis for the various load forecasts are described in Volume II, Technical Appendix.

The load forecasts together with the fuel forecasts result in the nine sensitivity scenarios used in the determination of the Companies' optimal integrated resource plan. "Scenario" is used to describe a particular load forecast/fuel forecast combination. There are nine possible combinations of load/fuel scenarios that were used in optimizations.

With the development of the three load forecast sensitivities and the three fuel price sensitivities, probabilities of occurrence were also developed. These probabilities are based on the same WEFA data that was used in development of the forecasts and are shown in Table 3.

Table 3
Probability of Sensitivity Occurring

Fuel Price		**Load**	
Scenario	**Probability**	**Scenario**	**Probability**
High	15%	High	15%
Base	70%	Base	70%
Low	15%	Low	15%

From the probabilities of occurrence shown in Table 3, the probability of each of the nine possible combinations occurring can be determined. This is done by multiplying the probability of the fuel price sensitivity occurring by the probability of the load forecast sensitivity occurring for each of the nine scenarios. The resulting probabilities of occurrence are shown in Table 4.

Table 4
Probability of Scenario Occurring

Scenario	Load Sensitivity	Fuel Sensitivity	Probability
1	High	High	2.25%
2	High	Base	10.50%
3	High	Low	2.25%
4	Base	High	10.50%
5	Base	Base	49.00%
6	Base	Low	10.50%
7	Low	High	2.25%
8	Low	Base	10.50%
9	Low	Low	2.25%
		Total	100.00%

As can be seen from Tables 3, there is an 70.0% probability that the base load forecast will occur, and only a 30.0% probability that either the high or low load forecast will occur. Additionally, the probabilities on the fuel side are heavily weighted toward the Base forecast. Therefore, as should be expected, the Base forecasts are significantly more likely to occur than either the High or Low forecasts.

PROSCREEN II Optimizations

Computer run-time and storage limitations make it impractical to include all of the units which passed the supply-side screening analysis (those listed in Table 1) and those that passed the demand-side screening (those listed in Table 2) in a single **unrestricted** computer optimization run. Therefore, to facilitate the analysis and ensure that accurate results were obtained, additional steps were taken before optimizations were performed.

The first step was to separate the supply-side optimizations from the demand-side optimization runs. DSM projects tend to be small in nature and would only serve to delay the supply-side expansion strategy and not to change it. Therefore, supply-side optimizations were run and then another set of optimizations was performed in which DSM projects were allowed to compete against the supply-side options that were selected during the supply-side optimizations. This step greatly reduced computer run time without adversely affecting the integrity of the optimization process.

Next, a review of Table 1 was conducted to determine if any technologies could be logically eliminated from the supply-side computer optimizations. As has already been mentioned, inlet air cooling at the existing Brown CTs has already been studied and the Companies believe it will be implemented by summer 2000. As a result, it was not evaluated in these optimization runs, as it would only extend run time and disk storage needs. The only other logical elimination that might be made involves the two different combined cycle units in Table 1. One is a phased construction project and the other is un-phased. It would seem that because of the Companies' annual load growth and the fact that the phased unit is less costly on a dollar per kW basis (see ***Analysis of***

Supply-Side Technology Alternatives (August 1999), Volume III, Technical Appendix) that the un-phased unit could be eliminated. However, the un-phased unit is a newer technology with a better heatrate (more efficient), thus it remained an alternative through the supply-side optimizations.

Next, any constraints that would limit the evaluation of unreasonable combinations of units in PRV optimizations were imposed. One user-specified constraint in relation to new generating unit options is the earliest possible in-service date for each unit considered. The first year a technology is allowed to be considered as an alternative (the in-service date) by PRV does not unjustly restrict the technologies but simply excludes years in which installation would not be feasible (i.e. a coal-fired unit could not be permitted, constructed and operational within 5 years). Table 5 lists the units considered in the optimization study runs (i.e. those suggested by the screening analysis) and their associated earliest in-service date.

Table 5
First Year Available for Each Unit Included in Optimization Study Runs

Unit	First Year Available
Combined Cycle Combustion Turbine Phased – 470 MW, Phase 1	2002
Combined Cycle Combustion Turbine Phased – 470 MW, Phase 2	2002
Combined Cycle Combustion Turbine Phased – 470 MW, Phase 3	2003
Combined Cycle Combustion Turbine Un-Phased – 345 MW	2002
Combustion Turbine at Brown – 160 MW	2001
Greenfield Site Combustion Turbine – 160 MW	2001
IPP Hydro purchase – 114 MW	2001
Pulverized Coal unit at Trimble County – 495 MW	2005

Although single cycle combustion turbines were modeled as available for in-service in 2001, there is a very high probability that none will be available that soon. By allowing PROSCREEN II to install CTs as early as 2001, it clearly demonstrates the Companies' need for peaking capacity as soon as possible. Recent CT market information indicates that CTs may not be available for in-service until 2004. Therefore, unless something becomes available the Companies may be forced to buy peaking power until physical capacity can be constructed.

In addition to the modeling constraints in Table 5, other constraints can also reduce computer run-time and potential storage limitations. Some of these constraints were used in the PRV optimizations and are discussed below.

1) There is only one CT available for installation at the E. W. Brown site. This site was originally designed to support and had the necessary permits, including air permits for the construction of eight 110 MW nominally rated CTs. However, when Brown 7 and 6 (164 MW summer rated units) were added, the permits and site design will now only support the addition of one unit up to approximately 160 MW.

2) The construction of a phased Greenfield Combined Cycle unit was limited so that the individual units are installed in the correct order (Phase 1 (CT), Phase 2 (CT), and then Phase 3 (HSRG)). Another restriction is that the first Combined Cycle unit must be completed before a second one is started.

3) The Hydro based purchase option was modeled available for in-service between 2001 and 2003, and limited to one installation. The desire to evaluate the economics of a hydro-based purchase within the next few years, leads to the limited in-service time period. The purchase was limited to one installation due to the limited availability of hydro-based purchase power options.

With the above-mentioned constraints in place, the supply-side optimizations can be performed. As discussed earlier, PRV analyzes all possible combinations of alternatives using the GAF to determine operation costs and using information from the CER to determine capital costs. PRV then rank orders the expansion plans by PVRR. The order of unit installation for the best plan for each of the nine optimizations (one optimization for each scenario in Table 4) is shown in Table 6. The plans are shown here without dates in order to show how the ordering of units changes with the different scenarios; the installation dates are not as important in this stage of the analysis as is expansion strategy. However, the plans are shown with dates in Appendix B.

Table 6
Results of supply-side PRV Optimization Runs

Load	BASE			HIGH			LOW		
Fuel	Base	High	Low	Base	High	Low	Base	High	Low
Scenario	5	4	6	2	1	3	8	7	9
	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT
	10 160 GRCT	9 160 GRCT	11 160 GRCT	10 160 GRCT	5 160 GRCT	14 160 GRCT	9 160 GRCT	2 160 GRCT	13 160 GRCT
	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 114 HYDRO	1 470 CCCT	1 470 CCCT	1 114 HYDRO	1 470 CCCT
	1 160 GRCT	1 160 GRCT	15 160 GRCT	1 160 GRCT	7 160 GRCT	1 160 GRCT	4 160 GRCT	6 160 GRCT	8 160 GRCT
	1 470 CCCT	1 470 CCCT		1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	
	2 160 GRCT	1 160 GRCT		5 160 GRCT	2 160 GRCT	1 160 GRCT	5 160 GRCT	2 160 GRCT	
	1 470 CCCT	1 470 CCCT		1 470 CCCT	2 470 CCCT	1 470 CCCT		1 470 CCCT	
	7 160 GRCT	9 160 GRCT		1 160 GRCT	1 160 GRCT	13 160 GRCT		8 160 GRCT	
				1 470 CCCT	1 470 CCCT				
				9 160 GRCT	2 160 GRCT				
					1 470 CCCT				
					5 160 GRCT				
Probability	49.00%	10.50%	10.50%	10.50%	2.25%	2.25%	10.50%	2.25%	2.25%

Notes to Table 6:

1) 160 BRCT is a 160 MW CT at E. W. Brown
2) 160 GRCT is a 160 MW Greenfield CT
3) 470 CCCT is a 470 MW Greenfield Phased Combined Cycle Combustion Turbine
4) 114 HYDRO is the 114 MW IPP hydro facility

Several observations and conclusions can be drawn from Table 6.

1) The un-phased combined cycle unit was not selected in any scenario. This is reasonable due to its higher cost and large size.

2) The Trimble County coal unit was not selected in any of the scenarios.

3) The IPP hydro option is in the least cost plan for only two of the nine scenarios with a combined 4.50% probability of occurrence.

4) The E. W. Brown CT site is completed as the first option in all nine scenarios.

5) At least eight additional CTs are built before the first combined cycle unit in all scenarios.

6) The high fuel cases tend to favor combined cycle units more than the low fuel cases. This makes sense because the combined cycle units are more efficient than the simple cycle combustion turbines.

7) The optimal plan in each scenario uses 160 MW Greenfield CTs to complete construction at the end of the study period.

The next step was to let the DSM options from Table 2 compete with the supply-side plans from Table 6. This was accomplished by fixing the ordering of the simple cycle combustion turbine units and the combined cycle combustion turbine units and letting PROSCREEN II determine if it is economical to use any of the DSM options to delay the supply-side expansion plan. In the plans where the IPP Hydro option was chosen, its order was not fixed with the other supply-side options; it's in-service date was allowed to float. The reason it was allowed to float was because of its limited in-service dates and the desire to let DSM options delay construction of supply-side options. For example, if the Hydro unit installation order was fixed with the other options, it would limit the ability of the DSM options to delay the other supply-side options. The DSM options from Table 2 that were analyzed are shown in Table 7 along with their first year available.

Table 7
First Year Available for Each DSM Program Included in Optimization Study Runs

Unit	Year first phase available
Direct Load Control – 5 phases – total 110.7 MW	2001
Efficient Lighting – 2 phases – total 47.3 MW	2002
Standby Generation – 4 phases – total 82.4 MW	2001

The optimizations can install only one phase of a DSM program per year. This is to simulate the penetration that is anticipated with each type of DSM program. In order to equalize competition between the programs, each phase of all DSM alternatives was made approximately 20 MW. The lighting program is smaller and thus 20 MW would not be achievable by 2001, therefore, it's first phase was modeled available beginning in 2002. However if the option is selected, the program itself can be started earlier than 2002. The results of the optimizations with DSM are shown below in Table 8.

Table 8
Results of Optimization Runs with DSM

Load	BASE			HIGH			LOW		
Fuel	Base	High	Low	Base	High	Low	Base	High	Low
Scenario	5	4	6	2	1	3	8	7	9
	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT	1 160 BRCT
	5 DLC	5 DLC	5 DLC	4 DLC	4 DLC	3 DLC	5 DLC	5 DLC	4 DLC
	2 LGHT	2 LGHT	2 LGHT	2 LGHT	2 LGHT	2 LGHT	2 LGHT	2 LGHT	2 LGHT
	3 STDBY	3 STDBY	4 STDBY	3 STDBY	3 STDBY	3 STDBY	4 STDBY	4 STDBY	2 STDBY
	10 160 GRCT	9 160 GRCT	11 160 GRCT	10 160 GRCT	2 160 GRCT	14 160 GRCT	9 160 GRCT	2 160 GRCT	13 160 GRCT
	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 114 HYDRO	1 470 CCCT	1 470 CCCT	1 114 HYDRO	1 470 CCCT
	1 160 GRCT	1 160 GRCT	14 160 GRCT	1 160 GRCT	10 160 GRCT	1 160 GRCT	4 160 GRCT	6 160 GRCT	7 160 GRCT
	1 470 CCCT	1 470 CCCT		1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	1 470 CCCT	
	2 160 GRCT	1 160 GRCT		5 160 GRCT	2 160 GRCT	1 160 GRCT	4 160 GRCT	2 160 GRCT	
	1 470 CCCT	1 470 CCCT		1 470 CCCT	2 470 CCCT	1 470 CCCT		1 470 CCCT	
	6 160 GRCT	8 160 GRCT		1 160 GRCT	1 160 GRCT	11 160 GRCT		6 160 GRCT	
				1 470 CCCT	1 470 CCCT				
				7 160 GRCT	2 160 GRCT				
					1 470 CCCT				
					4 160 GRCT				
Probability	49.00%	10.50%	10.50%	10.50%	2.25%	2.25%	10.50%	2.25%	2.25%

Notes to Table 8:

1) 160 BRCT is a 160 MW CT at E. W. Brown
2) 160 GRCT is a 160 MW Greenfield CT
3) 470 CCCT is a 470 MW Greenfield Phased Combined Cycle Combustion Turbine
4) 114 HYDRO is the 114 MW IPP hydro facility
5) DLC is one phase of the Direct Load Control DSM program
6) LGHT is one phase of the Efficient Lighting DSM program
7) STDBY is one phase of the Standby Generation DSM program
8) The DSM programs are installed in phases, but are shown together in the table for simplicity.
9) Occasionally, other alternatives are installed during implementation of the multiple phases of the various DSM programs, but are shown after the DSM in the table for simplicity.

The results of the nine scenario optimizations with DSM shown in Table 8, confirm the observations and conclusions mentioned after Table 6. Additionally, all scenarios utilized at least two phases of each of the DSM options available in the optimization to delay the supply-side options selected in the previous optimizations.

Table 8 represents optimal resource plans the Companies should follow given the occurrence of the nine defined scenarios. The purpose of this analysis is to recommend a single strategy for the Companies to follow, which is most optimal given the nine possible scenarios (future outcomes). The most straight-forward analysis would be to evaluate how each of the nine optimal plans in Table 8 perform (calculate 30 year PVRR) in the other eight remaining scenarios. For example, what is the PVRR of the optimal base fuel, base load plan (Scenario 5) given the high load, high fuel scenario? However this analysis would be impractical for the following reasons:

1) The large difference in resource needs between the different load scenarios make it impossible to model the high load plans in the low load scenarios (there isn't enough load to fully implement the suggested resource plan). Likewise, the resource plan does not suggest enough generation resources in the low load scenarios to model in the base and high load scenarios.

2) Conducting the 81 (9 optimal plans x 9 scenarios) computer runs necessary for this type of analysis is possible. However, considering that the results would be only approximations (comment 1 above), the time and computer storage requirements involved are not justified.

3) There is a 70.0% probability that the base load will occur, leaving only a relatively small probability that the high or low forecasts will occur (see Table 3).

4) There are no major differences in optimal plans for any of the scenarios other than the number of DSM options selected in each plan and the IPP Hydro option appearing in two unlikely scenarios until well into the future.

Furthermore, as time progresses and the Companies have a better idea of demand needs and fuel prices, the Companies would adjust and therefore, running the various plans through the other scenarios would not be an accurate representation of the future. Still, the goal of this study is to recommend the 30-year optimal resource plan for use in developing long-term plans for the Companies. Given that there are no major differences between the plans and the fact that most future studies will use at least the base load and base fuel forecast (some will consider load and/or fuel sensitivities), the plan that this study recommends is the one from Scenario 5. This strategy will be re-evaluated annually and modified as necessary. The Base Case plan by year for the forecasted base load is shown in Table 9.

Table 9
Thirty Year Least Cost Integrated Resource Plan on the Base Load Forecast

Year	Resource	Year	Resource
1999		2014	160 MW Greenfield CT Unit 11
2000		2015	160 MW Combined Cycle CT 2 P1
2001	160 MW Brown CT Unit 5 160 MW Greenfield CT Unit 1 160 MW Greenfield CT Unit 2 22.1 MW DLC program	2016	160 MW Combined Cycle CT 2 P2 150 MW Combined Cycle CT 2 P3
2002	160 MW Greenfield CT Unit 3 22.1 MW DLC program 20.6 MW Standby Generation program 23.2 MW Efficient Lighting program	2017	160 MW Greenfield CT Unit 12
2003	22.1 MW DLC program 20.6 MW Standby Generation program 23.2 MW Efficient Lighting program	2018	160 MW Greenfield CT Unit 13
2004	160 MW Greenfield CT Unit 4 22.1 MW DLC program 20.6 MW Standby Generation program	2019	160 MW Combined Cycle CT 3 P1
2005	160 MW Greenfield CT Unit 5 22.1 MW DLC program	2020	160 MW Combined Cycle CT 3 P2
2006	160 MW Greenfield CT Unit 6	2021	150 MW Combined Cycle CT 3 P3
2007	160 MW Greenfield CT Unit 7	2022	160 MW Greenfield CT Unit 14
2008	160 MW Greenfield CT Unit 8	2023	160 MW Greenfield CT Unit 15
2009	160 MW Greenfield CT Unit 9	2024	
2010	160 MW Greenfield CT Unit 10	2025	160 MW Greenfield CT Unit 16
2011	160 MW Combined Cycle CT 1 P1	2026	160 MW Greenfield CT Unit 17
2012	150 MW Combined Cycle CT 1 P2	2027	160 MW Greenfield CT Unit 18
2013	160 MW Combined Cycle CT 1 P3	2028	160 MW Greenfield CT Unit 19

Conclusion and Recommendation

As a result of the above analysis, it is recommended that the strategy shown in Table 9 be used as the Companies' 30-year integrated resource plan. Emphasis should be placed on the completion of the E. W. Brown CT site, development of a Greenfield CT site, and implementation of the selected DSM initiatives. There is currently a shortage of viable combustion turbine options available due to today's market conditions. Therefore, it is recommended that the Companies begin implementation of the each DSM alternative as soon as possible, while continuing to pursue CT construction options. As the DSM pilot (first phase) programs are phased in and their benefits are quantified, the Companies' resource plan should be re-evaluated considering the results of the DSM initiatives. It is further recommended that purchase power continue to be reviewed as an option to delay generation construction. Should a hydro based option become available and economical, the expansion strategy should be re-evaluated with that consideration. Finally, it is recommended that the integrated resource planning process continue to be conducted on an annual basis.

DATA ITEMS USED IN OPTIMAL INTEGRATED RESOURCE PLAN ANALYSIS

Existing System Data

The PROSCREEN-II computer program is used to model Louisville Gas & Electric's (LG&E) and Kentucky Utilities Company's (KU) generating systems. These models simulate the dispatch of both companies generating units and other purchases to serve load, and of Owensboro Municipal Utilities' (OMU) generating units and purchases to serve OMU's load and maintain their reserve requirements. The remaining generation available from OMU's units after meeting their requirements is economically dispatched by the Companies. The following sections outline the information and the sources of the information used in the programs to model KU, LG&E and OMU generating systems.

A) General Data Items

1. Base Year – 1999

2. Study Period - 1999 to 2028

3. Economic Assumptions

   Revenue requirements are determined on an annual basis and discounted to the base year giving a present worth of revenue requirements. Discounting is performed using a discount rate, which is assumed to remain constant for all years.

4. Financial Parameters:

a. Discount Rate:	9.78%
b. Capital/O&M costs Escalation Rates:	2.0%/4.50%
c. Combined Federal and State tax rate:	40.36%

5. Retirements

   The operating life of all existing units is extended beyond the end of the study period. (no retirements)

6. Unserved Energy Cost
   400 $/MWh in 1999, escalated at 2.0% annually.

7. Load Forecast - The details of and the basis for the various load forecasts are described in Volume II, Technical Appendix.

8. KU/LG&E Unit Data

a. Installed Capacity - See Appendix A Table 1

Based on revised May 20, 1998 Unit Test Results.

b. Equivalent Forced Outage Rate - See Appendix-A Table 1

KU historical GADS data using 5 years of historical data (1993-1998). Five year averages have been increased for inclusion of maintenance outage hours (MOHs) to better reflect actual unit availability of each unit. EFOR's have been trended to reflect the Companies' targets.

c. Heat Rates - See Appendix-A Table 1

1997-1998 adjusted unit heat rate curves.

d. Fuel Cost - See Appendix-A Table 2,3,4

Fuel forecast approved by Fuels Management (August, 1999)

e. Maintenance Schedule

The Companies' most recent maintenance schedule as of the time of this analysis was performed.

9. OMU Unit Data

a. Installed Capacity - (OMU 8/16/97 test data)

OMU (Smith Unit 1): 140
OMU (Smith Unit 2): 274

b. Equivalent Forced Outage Rate

OMU (Smith Unit 1): 10.09%
OMU (Smith Unit 2): 6.69%
Based on OMU historical GADS data (1995-1996)

c. Heat Rates

OMU (Smith Unit 1): 10299 Btu/kWh
OMU (Smith Unit 2): 10798 Btu/kWh

d. Maintenance Schedules

Planned outage inputs were determined by reviewing OMU's seven year planned outage schedule and historical data.

e. Contract Demand Sale to KU - See Appendix-A Table 5 (Based on OMU Fax: 7/2/98)

f. Fuel Cost - See Appendix-A Tables 2,3,4

Based on fuel information received from Fuel Procurement. Fuel costs include associated costs for fuel handling and limestone.

g. OMU Scrubber O&M (Smith Units 1 & 2)
   i. Variable O&M: Limestone charges included in fuel cost.
   ii. Removal Efficiency: 96%

10. Purchases

a. Contract Demand - See Appendix-A Table 5

EEInc. (Firm): 200 MW each year

OVEC (Economy/Non-Firm):
KU - 9MW Jan-Dec
LG&E- 35.4MW July (Varies by month)

b. Equivalent Forced Outage Rate

EEInc.: - 6.39%; Note: KU owns 20% of six units at Joppa. A single purchase unit was used to model KU's portion of the six units. Each unit was assumed to have the same FOR and the probability of KU's 20% being available was assigned to the purchase unit.

c. Full Load Heat Rate (BTU/KWH)

EEInc.: 10500

OVEC:
Not applicable because purchase was not modeled as a unit but a specified MW/MWH monthly profile

d. Heat Content of Fuel (BTU/LB)

EEInc.: 10800

OVEC:

Not applicable because purchase was not modeled as a unit but a specified MW/MWH monthly profile

e. Fuel Cost

See Appendix-A Tables 2,3,4

f. Demand Cost

See Appendix-A Table 5

g. Maintenance

EEInc: A 33 MW derate for 13 weeks in the spring and fall (derived from EEInc. Joppa Historical Data).

OVEC: None

APPENDIX B

Appendix A-Table 1
Louisville Gas and Electric/ Kentucky Utilities Generator Data

Unit	Installed Year	Summer Rating (MW)	Equivalent Forced Outage Rate (%)					Full Load Heat Rate (Mbtu/MWh)
			1999	2000	2001	2002	2003-2028	
Brown 1	1957	104	4.65%	4.47%	4.29%	4.12%	3.94%	10.427
Brown 2	1963	168	4.40%	4.63%	4.87%	5.10%	5.34%	9.940
Brown 3	1971	439	14.15%	11.87%	9.58%	7.30%	5.02%	10.095
Brown 6	1999	164	6.00%	6.00%	6.00%	6.00%	6.00%	10.500
Brown 7	1999	164	6.00%	6.00%	6.00%	6.00%	6.00%	10.500
Brown 8	1995	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 9	1994	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 10	1995	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 11	1996	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Cane Run 4	1962	155	12.04%	10.02%	7.99%	5.96%	3.94%	10.441
Cane Run 5	1966	168	20.05%	16.02%	11.99%	7.97%	3.94%	10.151
Cane Run 6	1969	240	21.36%	17.36%	13.35%	9.34%	5.34%	9.992
Cane Run 11	1968	16	53.00%	53.00%	53.00%	53.00%	53.00%	18.000
Dix Dam 1-3	1925	24	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Ghent 1	1974	483	8.17%	7.38%	6.59%	5.80%	5.02%	10.138
Ghent 2	1977	492	3.96%	4.23%	4.49%	4.75%	5.02%	10.008
Ghent 3	1981	493	4.80%	4.85%	4.91%	4.96%	5.02%	10.150
Ghent 4	1984	494	4.66%	4.75%	4.84%	4.93%	5.02%	9.984
Green River 1	1950	26	27.00%	22.95%	18.90%	14.85%	10.80%	18.000
Green River 2	1950	27	66.27%	52.40%	38.53%	24.67%	10.80%	18.000
Green River 3	1954	71	7.69%	6.75%	5.81%	4.88%	3.94%	11.633
Green River 4	1959	103	16.80%	13.58%	10.37%	7.15%	3.94%	10.539
Haefling 1-3	1970	45	13.10%	13.10%	13.10%	13.10%	13.10%	18.000
Lock 7	1927	2**	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Mill Creek 1	1972	303	12.19%	10.48%	8.77%	7.05%	5.34%	10.434
Mill Creek 2	1974	301	12.98%	11.07%	9.16%	7.25%	5.34%	10.583
Mill Creek 3	1978	386	12.80%	10.93%	9.07%	7.20%	5.34%	10.270
Mill Creek 4	1982	480	11.39%	9.79%	8.20%	6.61%	5.02%	10.124
Ohio Falls	1928	48	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Paddys Run 11	1968	17	19.00%	19.00%	19.00%	19.00%	19.00%	18.000
Paddys Run 12	1968	26	19.00%	19.00%	19.00%	19.00%	19.00%	18.000
Pineville 3	1951	34	4.23%	5.44%	6.64%	7.85%	9.05%	13.742
Trimble (75%)	1990	371	6.22%	5.92%	5.62%	5.32%	5.02%	10.041
Tyrone 1	1947	27	4.63%	5.74%	4.96%	6.84%	9.05%	18.000
Tyrone 2	1948	31	59.24%	46.69%	34.14%	21.60%	9.05%	18.000
Tyrone 3	1953	71	6.50%	5.86%	5.22%	4.58%	3.94%	12.931
Waterside 7	1964	17	55.00%	55.00%	55.00%	55.00%	55.00%	17.000
Waterside 8	1964	16	48.00%	48.00%	48.00%	48.00%	48.00%	18.000
Zorn 1	1969	16	23.00%	23.00%	23.00%	23.00%	23.00%	N/A

Notes:

1) * = Brown 8-11 are modeled as 110 MW in 1999 and 130 from 2000 on, due to inlet air cooling
2) ** = Not counted as Firm Capacity for Reserve Margin Calculations

Appendix A-Table 1
Louisville Gas and Electric/ Kentucky Utilities Generator Data

Unit	Installed Year	Summer Rating (MW)	Equivalent Forced Outage Rate (%)					Full Load Heat Rate (Mbtu/MWh)
			1999	2000	2001	2002	2003-2028	
Brown 1	1957	104	4.65%	4.47%	4.29%	4.12%	3.94%	10.427
Brown 2	1963	168	4.40%	4.63%	4.87%	5.10%	5.34%	9.940
Brown 3	1971	439	14.15%	11.87%	9.58%	7.30%	5.02%	10.095
Brown 6	1999	164	6.00%	6.00%	6.00%	6.00%	6.00%	10.500
Brown 7	1999	164	6.00%	6.00%	6.00%	6.00%	6.00%	10.500
Brown 8	1995	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 9	1994	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 10	1995	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Brown 11	1996	130*	6.00%	6.00%	6.00%	6.00%	6.00%	12.163
Cane Run 4	1962	155	12.04%	10.02%	7.99%	5.96%	3.94%	10.441
Cane Run 5	1966	168	20.05%	16.02%	11.99%	7.97%	3.94%	10.151
Cane Run 6	1969	240	21.36%	17.36%	13.35%	9.34%	5.34%	9.992
Cane Run 11	1968	16	53.00%	53.00%	53.00%	53.00%	53.00%	18.000
Dix Dam 1-3	1925	24	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Ghent 1	1974	483	8.17%	7.38%	6.59%	5.80%	5.02%	10.138
Ghent 2	1977	492	3.96%	4.23%	4.49%	4.75%	5.02%	10.008
Ghent 3	1981	493	4.80%	4.85%	4.91%	4.96%	5.02%	10.150
Ghent 4	1984	494	4.66%	4.75%	4.84%	4.93%	5.02%	9.984
Green River 1	1950	26	27.00%	22.95%	18.90%	14.85%	10.80%	18.000
Green River 2	1950	27	66.27%	52.40%	38.53%	24.67%	10.80%	18.000
Green River 3	1954	71	7.69%	6.75%	5.81%	4.88%	3.94%	11.633
Green River 4	1959	103	16.80%	13.58%	10.37%	7.15%	3.94%	10.539
Haefling 1-3	1970	45	13.10%	13.10%	13.10%	13.10%	13.10%	18.000
Lock 7	1927	2**	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Mill Creek 1	1972	303	12.19%	10.48%	8.77%	7.05%	5.34%	10.434
Mill Creek 2	1974	301	12.98%	11.07%	9.16%	7.25%	5.34%	10.583
Mill Creek 3	1978	386	12.80%	10.93%	9.07%	7.20%	5.34%	10.270
Mill Creek 4	1982	480	11.39%	9.79%	8.20%	6.61%	5.02%	10.124
Ohio Falls	1928	48	0.00%	0.00%	0.00%	0.00%	0.00%	N/A
Paddys Run 11	1968	17	19.00%	19.00%	19.00%	19.00%	19.00%	18.000
Paddys Run 12	1968	26	19.00%	19.00%	19.00%	19.00%	19.00%	18.000
Pineville 3	1951	34	4.23%	5.44%	6.64%	7.85%	9.05%	13.742
Trimble (75%)	1990	371	6.22%	5.92%	5.62%	5.32%	5.02%	10.041
Tyrone 1	1947	27	4.63%	5.74%	4.96%	6.84%	9.05%	18.000
Tyrone 2	1948	31	59.24%	46.69%	34.14%	21.60%	9.05%	18.000
Tyrone 3	1953	71	6.50%	5.86%	5.22%	4.58%	3.94%	12.931
Waterside 7	1964	17	55.00%	55.00%	55.00%	55.00%	55.00%	17.000
Waterside 8	1964	16	48.00%	48.00%	48.00%	48.00%	48.00%	18.000
Zorn 1	1969	16	23.00%	23.00%	23.00%	23.00%	23.00%	N/A

Notes:

1) * = Brown 8-11 are modeled as 110 MW in 1999 and 130 from 2000 on, due to inlet air cooling
2) ** = Not counted as Firm Capacity for Reserve Margin Calculations

CONFIDENTIAL INFORMATION REDACTED

Appendix A - Table 2
Base Fuel Forecast - August 1999
(Cents/MBTU)

	Brown	Ghent		G Rvr	TY 3	PN 3	Smith	EEInc.	Oil	Gas	HAEF	Smith	CR	MC	TC
Year	2.2#	5.5#	1.1#	4.3#	1.4#	1.4#	6.#	0.8.#			Gas	Oil	6.#	5.7#	6.5#
1999	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2026	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2027	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2028	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CONFIDENTIAL INFORMATION REDACTED

Appendix A - Table 3
High Fuel Forecast - August 1999
(Cents/MBTU)

Year	Brown	Ghent		G Rvr	TY 3	PN 3	Smith	EEInc.	Oil	Gas	HAEF	Smith	CR	MC	TC
	2.2#	5.5#	1.1#	4.3#	1.4#	1.4#	6.#	0.8.#			Gas	Oil	6.#	5.7#	6.5#
1999	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2026	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2027	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2028	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CONFIDENTIAL INFORMATION REDACTED

Appendix A - Table 4
Low Fuel Forecast - August 1999
(Cents/MBTU)

	Brown	Ghent		G Rvr	TY 3	PN 3	Smith	EEInc.	Oil	Gas	HAEF	Smith	CR	MC	TC
Year	2.2#	5.5#	1.1#	4.3#	1.4#	1.4#	6.#	0.8.#			Gas	Oil	6.#	5.7#	6.5#
1999	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2000	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2001	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2002	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2003	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2004	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2005	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2006	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2007	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2008	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2009	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2010	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2011	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2012	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2013	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2014	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2015	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2016	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2017	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2018	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2019	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2020	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2021	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2022	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2023	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2024	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2025	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2026	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2027	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2028	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

CONFIDENTIAL INFORMATION REDACTED

Appendix A-Table 5

Modeled Fuel Costs Associated with Purchase Alternatives ($/Mbtu)

Year	EEI (Firm)	OMU (Firm)
1999	[redacted]	[redacted]
2000	[redacted]	[redacted]
2001	[redacted]	[redacted]
2002	[redacted]	[redacted]
2003	[redacted]	[redacted]
2004	[redacted]	[redacted]
2005	[redacted]	[redacted]
2006	[redacted]	[redacted]
2007	[redacted]	[redacted]
2008	[redacted]	[redacted]
2009	[redacted]	[redacted]
2010	[redacted]	[redacted]
2011	[redacted]	[redacted]
2012	[redacted]	[redacted]
2013	[redacted]	[redacted]
2014	[redacted]	[redacted]
2015	[redacted]	[redacted]
2016	[redacted]	[redacted]
2017	[redacted]	[redacted]
2018	[redacted]	[redacted]
2019	[redacted]	[redacted]
2020	[redacted]	[redacted]
2021	[redacted]	[redacted]
2022	[redacted]	[redacted]
2023	[redacted]	[redacted]
2024	[redacted]	[redacted]
2025	[redacted]	[redacted]
2026	[redacted]	[redacted]
2027	[redacted]	[redacted]
2028	[redacted]	[redacted]

Appendix B-Table 1
Results of Supply-Side Optimizations

Load	BASE			HIGH			LOW		
Fuel	Base	High	Low	Base	High	Low	Base	High	Low
Scenario	5	4	6	2	1	3	8	7	9
1999									
2000									
2001	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT
	2 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT	3 - 160 GRCT	3 - 160 GRCT	3 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT
2002	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 114 HYDR	1 - 160 GRCT
2003	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
					1 - 114 HYDR				
2004	2 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2005	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2006	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2007	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT	
2008	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT
				1 - 160 CCPH2					
2009	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2010	1 - 160 CCPH2	1 - 150 CCPH3	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH1	1 - 160 GRCT
2011	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 CCPH2	1 - 160 GRCT
				1 - 160 CCPH2	1 - 150 CCPH3				
2012	1 - 160 GRCT	1 - 160 CCPH1	1 - 150 CCPH3	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 CCPH2	1 - 150 CCPH3	1 - 150 CCPH3	1 - 160 GRCT
						1 - 150 CCPH3			
2013	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2014	1 - 160 CCPH2	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1
2015	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH1	
					1 - 150 CCPH3	1 - 150 CCPH3			
2016	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH2
									1 - 150 CCPH3
2017	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 CCPH1		1 - 150 CCPH3	
					1 - 150 CCPH3				
2018	1 - 160 CCPH1	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH1		1 - 160 GRCT
				1 - 150 CCPH3		1 - 150 CCPH3			
2019	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT
2020	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT
					1 - 150 CCPH3				
2021	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	2 - 160 GRCT		1 - 160 GRCT	
				1 - 150 CCPH3					
2022	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2023	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT
					1 - 160 CCPH2				
2024	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 150 CCPH3	1 - 160 GRCT		1 - 160 GRCT	
2025	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT
2026	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2027	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT	
2028			1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
Probability	49.00%	10.50%	10.50%	10.50%	2.25%	2.25%	10.50%	2.25%	2.25%

Appendix B-Table 2
Results of Optimizations with DSM

Load	BASE			HIGH			LOW		
Fuel	Base	High	Low	Base	High	Low	Base	High	Low
Scenario	5	4	6	2	1	3	8	7	9
1999									
2000									
2001	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT	1 - 160 BRCT
	2 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT	3 - 160 GRCT	2 - 160 GRCT	3 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT	2 - 160 GRCT
	1 - DLC	1 - DLC	1 - DLC, STD	1 - DLC, STD	1 - 114 HYDR	1 - DLC, STD	1 - DLC, STD	1 - DLC, STD	
2002	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT
	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT			
2003	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD	1 - DLC, LIT, STD
					1 - 160 GRCT		1 - 160 GRCT	1 - 114 HYDR	1 - 160 GRCT
2004	1 - DLC, STD	1 - DLC, STD	1 - DLC, STD	2 - 160 GRCT	1 - DLC, STD	2 - 160 GRCT	1 - DLC, STD	1 - DLC, STD	1 - DLC, STD
	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT			1 - 160 GRCT	1 - 160 GRCT
2005	1 - DLC	1 - DLC	1 - DLC	1 - DLC	1 - DLC	1 - 160 GRCT	1 - DLC	1 - DLC	1 - DLC
	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT		
2006	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2007	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2008	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2009	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	2 - 160 GRCT		1 - 160 GRCT	1 - 160 GRCT
2010	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
				1 - 150 CCPH3					
2011	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT		1 - 160 CCPH1	1 - 160 GRCT
2012	1 - 160 CCPH2	1 - 150 CCPH3	1 - 160 CCPH1	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 CCPH1	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT
					1 - 150 CCPH3				
2013	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH2		
				1 - 150 CCPH3		1 - 150 CCPH3			
2014	1 - 160 GRCT	1 - 160 CCPH1	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 150 CCPH3	1 - 150 CCPH3	1 - 160 GRCT
2015	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2016	1 - 160 CCPH2	1 - 150 CCPH3	2 - 160 GRCT	2 - 160 GRCT	1 - 160 CCPH2	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1
	1 - 150 CCPH3	1 - 160 GRCT			1 - 150 CCPH3	1 - 150 CCPH3			
2017	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH2
2018	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH2	1 - 150 CCPH3
					1 - 150 CCPH3				
2019	1 - 160 CCPH1	1 - 150 CCPH3		1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH2			1 - 160 GRCT
				1 - 150 CCPH3		1 - 150 CCPH3			
2020	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 CCPH1	1 - 150 CCPH3	
2021	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	1 - 160 GRCT
					1 - 150 CCPH3				
2022	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT	2 - 160 GRCT	1 - 150 CCPH3	1 - 160 GRCT	1 - 160 GRCT
				1 - 150 CCPH3					
2023	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT		1 - 160 GRCT	1 - 160 GRCT
2024			1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH1	1 - 160 GRCT	1 - 160 GRCT		
2025	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 CCPH2	1 - 160 GRCT		1 - 160 GRCT	1 - 160 GRCT
					1 - 150 CCPH3				
2026	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT		
2027	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
2028	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	2 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT	1 - 160 GRCT
Probability	49.00%	10.50%	10.50%	10.50%	2.25%	2.25%	10.50%	2.25%	2.25%

VIII. TRANSMISSION ANALYSIS

Kentucky Utilities Company/ Louisville Gas and Electric Company
Transmission Construction Projects

Project No.	DESCRIPTION	Expected Completion Date
1.	Reconductor the Brown Plant to Danville North Tap section of the Brown Plant to Lebanon 138 kV line with 954 kcm ACSR.	Mar-2000
2.	Add 138 kV terminal facilities at Fawkes for retermination of EKPC's Fawkes - JK Smith 138 kV line	May-2000
3.	Add a second 345 kV circuit between Middletown and Trimble Co on the existing towers.	May-2000
4.	Construct 2.7 miles of 69 kV line from Algonquin to Seminole using 795 kcm ACSR (or AA) conductor.	May-2000
5.	Construct a 138 kV line from Brown CT's to Brown North using bundled 954 kcm ACSR.	May-2000
6.	Construct a 138 kV line from circuit 3823 to International for conversion from 69 kV to 138 kV.	May-2000
7.	Install a 138/69 kV, 83 MVA transformer at West Cliff and install two 138 kV breakers.	May-2000
8.	Install a 34.5 kV, 6.9 MVAR capacitor at TipTop #1.	May-2000
9.	Install a 69 kV, 14.4 MVAR capacitor at Campbellsburg EK.	May-2000
10.	Install a 69 kV, 16.2 MVAR capacitor at Barlow.	May-2000
11.	Install a 69 kV, 81.0 MVAR capacitor at Canal.	May-2000
12.	Install a third 345-138 kV, 448 MVA transformer at Middletown.	May-2000
13.	Reconductor both Brown Plant to West Cliff 138 kV lines with 795 kcm ACSR conductor.	May-2000
14.	Replace the 138/69 kV, 50 MVA transformer at Ohio Co with an 83 MVA transformer.	May-2000
15.	Install a 69 kV, 10.8 MVAR capacitor at St. Paul.	Nov-2000
16.	Install a second 138-69 kV, 133 MVA transformer at Fawkes.	Nov-2000

Kentucky Utilities Company/ Louisville Gas and Electric Company
Transmission Construction Projects

Project No.	DESCRIPTION	Expected Completion Date
17.	Rebuild the 397.5 kcm ACSR portion of the Fawkes to Richmond 69 kV line using 795 kcm ACSR.	Nov-2000
18.	Construct 6 miles of 138 kV line from Middletown to Collins using 795 kcm ACSR and construct a 138-69 kV, 112 MVA substation at Collins.	May-2001
19.	Install a 69 kV line exit at Lebanon and construct 1.2 miles of 69 kV line from Lebanon to Lebanon Industrial using 397 kcm ACSR.	May-2001
20.	Install a 69 kV, 40.5 MVAR capacitor at Collins.	May-2001
21.	Reconductor the Tyrone to Florida Tile sections of the Bonds Mill to Tyrone 69 kV line with 795 kcm ACSR and increase the maximum operating temperature of the Florida Tile to Lawrenceburg section to 100C.	May-2001
22.	Replace the 2/0 Cu conductor in the Parker Seal to Winchester section of the Clark County to Winchester 69 kV line with 397 kcm ACSR.	May-2001
23.	Replace the Boonesboro North 138/69 kV 83 MVA transformer with a 100 MVA transformer.	May-2001
24.	Install a 69 kV, 13.2 MVAR capacitor at Pineville #722.	Nov-2001
25.	Construct a 138-69 kV, 100 MVA substation in Bourbon County near the intersection of EKPC's Avon - Renaker 138 kV line and KU's Lexington Plant - Millersburg 69 kV line.	May-2002
26.	Install 138 kV breakers on the Lebanon 138-69 kV transformers.	May-2002
27.	Install a 69 kV, 54.0 MVAR capacitor at East Frankfort.	May-2002
28.	Install a 69 kV, 81.0 MVAR capacitor at Middletown.	May-2002
29.	Install a third 138/69 kV, 100 MVA at East Frankfort and reconfigure the bus such that two transformers and two lines to Frankfort City stay in service for any contingency.	May-2002
30.	Reconductor the 795 kcm ACSR portion of the Loudon Avenue to Avon 138 kV line with 954 kcm ACSR.	May-2002

Kentucky Utilities Company/ Louisville Gas and Electric Company
Transmission Construction Projects

Project No.	DESCRIPTION	Expected Completion Date
31.	Install a second 500/161 kV, 400 MVA transformer at Pocket North.	Nov-2002
32.	Replace the Lake Reba Tap 161/138 kV, 100 MVA transformer with a 120 MVA transformer.	Nov-2002
33.	Construct a 138-69 kV, 100 MVA substation Blue Lick and construct 2 miles of 69 kV line to circuit 6676.	May-2003
34.	Install a 345/138 kV, 400 MVA transformer at Brown North.	May-2003
35.	Install a 69 kV, 9.1 MVAR capacitor at Science Hill.	May-2003
36.	Install a second 161/69 kV, 50 MVA transformer at Taylor County.	May-2003
37.	Reconductor the Brown Plant to Fawkes 138 kV line with 795 kcm ACSR.	May-2003
38.	Construct a 138/69 kV, 83MVA substation near Centerfield, Ky connecting LG&E's Middletown - Trimble Co 138 kV line to KU's Eminence - LaGrange Penal 69 kV line.	May-2004
39.	Replace the 138/69 kV, 83 MVA transformer at Bardstown with a 100 MVA transformer.	May-2004
40.	Construct 22 miles of 161 kV line from Grahamville to Wickliffe using 556 kcm ACSR (operate at 69 kV) and add one 69 kV line exit at Grahamville and Wickliffe.	Oct-2004
41.	Energize the second Brown-Pineville 345 kV circuit.	Nov-2004
42.	Establish a 345 kV interconnection with Cinergy near New Albany by connecting LGEE's Paddys West to Northside 345 kV line and Cinergy's Ramsey to Speed 345 kV line.	May-2005
43.	Reconductor the West Frankfort-Clay Village Tap-Shelbyville East sections of the West Frankfort-Shelyville 69 kV line using 397 kcm ACSR conductor.	May-2005
44.	Construct 2 miles of 69 kV double circuit line from Bond to the Dorchester-St. Paul line using 397 kcm ACSR and add two 69 kV line exits at Bond.	Nov-2005

Kentucky Utilities Company/ Louisville Gas and Electric Company
Transmission Construction Projects

Project No.	DESCRIPTION	Expected Completion Date
45.	Install a second 161-69 kV, 112 MVA transformer at Pittsburg.	Nov-2005
46.	Install a third 161/69 kV, 112 MVA transformer at Elihu.	Nov-2005
47.	Reconductor the 266 kcm ACSR conductor in the Green County EKPC-Greensburg KU section of the Green County EKPC-Taylor County 69 kV line using 397 kcm ACSR conductor.	May-2007
48.	Replace the 161-69 kV, 56 MVA transformer at Beattyville with a 93 MVA unit.	Nov-2007
49.	Replace the Pineville 161/69 kV, 93 MVA transformer with a 149 MVA unit.	Nov-2007
50.	Construct 4 miles of 161kV line from Taylor County to EKPC's Green County-Marion County 161kV line using 556 kcm ACSR conductor and install four 161kV breakers at Taylor County.	May-2009
51.	Replace the Adams 138/69 kV, 83 MVA transformer with a 100 MVA transformer.	May-2009
52.	Replace the Loudon Ave 138/69 kV, 100 MVA transformer (T-359) with a 133 MVA transformer.	May-2009
53.	Install a third 161/69 kV, 83 MVA transformer at Dorchester.	Nov-2009

IX. PSC
RECOMMENDATIONS

Recommendations in PSC Staff Reports on Past IRP Filings

The Companies reviewed the *Staff Report on the 1993 Integrated Resource Plan of the Louisville Gas & Electric Company* dated March 1995 and the *Staff Report on the 1996 Integrated Resource Plan of the Kentucky Utilities Company* dated March 1999. As the Staff noted in the latter report, a joint filing does not easily lend itself to responding to specific recommendations based on either previous independent filing. Thus, many of the suggestions were somewhat general in nature. The Companies have made every effort to respond to both the specific and general recommendations that were made in both reports. Responses to the specific suggestions and/or recommendations in both reports are described in the sections that follow.

LG&E 1993 IRP Report

Load Forecasting

- **Expand the peak demand analysis, possibly using additional sectoral or end-use detail.**

  As a result of the May 1998 merger of LG&E and KU, the load forecasting functions of the two utilities have been integrated into a single group (Forecasting and Market Analysis Department). KU has successfully implemented end-use modeling approaches using the REEPS (Residential End-Use Energy Planning System) and COMMEND (Commercial End-Use Model) EPRI developed models. The integration with KU's Forecasting Staff will facilitate the effort to build similar end-use models for the LG&E service area. Therefore, prior efforts to develop a residential hourly load model by using the data compiled from the Southeast End-Use Data Exchange Project and the end-use modeling software called "SHAPES II." have been abandoned. The sectoral end-use models and hourly load shapes will allow LG&E to disaggregate its peak demand forecast for sectoral details. As a next step the HELM (Hourly Electric Load Model) model will be utilized to combine class energy sales forecasts with estimated class load shapes to generate a demand forecast built from class and customer-level data.

- **Explicitly analyze the issue of fuel choice for space heating and cooling, particularly with respect to the competitiveness of heat pumps.**

  LG&E's gas and electricity rates have been stable since the 1991 General Rate Case, with an apparent cost advantage of gas fuel over electricity for space heating. Recent fuel cost studies show a conventional heat pump in LG&E's service territory costs about 30% more than a high-efficiency gas furnace to produce 1,000,000 Btu's of heating output. Therefore, the choice of heat pump for space heating and cooling is mainly driven by non-availability of gas service in the area, not by a competitive advantage of heat pump. This is why the choice of heat pump is much more prevalent in the rural areas where gas utility service is not available.

The residential appliance saturation survey conducted in 1995 shows that about 8.0% of LG&E's residential customers own a heat pump. 18.1% of the residential customers who reside outside of Jefferson County use a heat pump for space heating and air-conditioning, while only 6.9% of Jefferson County residents rely on a heat pump. LG&E's gas service is available to 87.1% of the Jefferson County population, compared to 50.4% of Oldham County, 64.0% of Bullitt County, 19.0% of Nelson County and 14.4% of Hardin County.

As LG&E's gas mains are extended to those rural areas, the percentage of residential electric space heating customers to total residential customers is expected to gradually decline. For residential energy sales forecasts included in this filing, the percentage for electric space heating is assumed to decrease from 12.8% in 1999 to 11.5% in 2014. Historical and projected numbers of total residential customers and electric space heating customers are provided in Volume II, Technical Appendix.

Demand-Side Management

- **LG&E should expand the initial DSM option list, even including options that are not applicable to LG&E or that have load shape impacts that are inconsistent with LG&E's load shape objectives. Clearly inappropriate options can be screened out in the qualitative analysis, but at least there is documentation that LG&E considered the options.**

  The initial list of DSM options was considerably expanded since the 1993 LG&E IRP. The list includes options that may not be applicable to the Companies. Details are provided in Exhibit DSM-3 in the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix.

- **LG&E should reconsider the criteria used in the qualitative screen. Specifically, LG&E should eliminate the criteria of "effect on summer peak," "implementation cost," "cost recovery required," "need for incentives/rebates," and "technological and administrative obstacles." Instead, LG&E may wish to consider "inconsistent with load shape objectives," "insufficient eligible market," "poor customer acceptance," "highly negative utility experience," and "immature/unavailable technology" as reasons for eliminating options in this initial screen. For each rejection, LG&E should document the source(s) of the information on which the assessment was based.**

  The Companies have incorporated the Staff Recommendations concerning the criteria for qualitative screening. Details are provided in Exhibit DSM-2 in the report titled

Screening of Demand-Side Management (DSM) Options (September 1999) in Volume III, Technical Appendix.

- **In the next IRP filing, LG&E should provide concise and organized data sheets for each DSM program screened in the quantitative analysis.**

  The Companies have provided detailed summary sheets for each program evaluated in Phase II of the quantitative analysis. (See Exhibit DSM-6 through Exhibit DSM-16 in the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix.) The Companies also provide a high-level screening summary of the programs in each phase of the quantitative screening process. (See Exhibit DSM-5 and Exhibit DSM-17 in the aforementioned report.)

Supply-Side Resource Assessment

- **Include key supporting data and calculations in the filing, rather than in workpapers.**

  Throughout this IRP, key supporting data and calculations are either included directly in the appropriate paragraph(s) of the section, or included in the standalone reports found in the filing in Volume III, Technical Appendix. Specifically in reference to the data contained in the supply-side screening analysis, the detailed data and calculations can be found in the report titled *Analysis of Supply-Side Technology Alternatives* (August 1999) in Volume III, Technical Appendix.

- **Expand the scope of "plant costs" to include land, inventory, and associated costs.**

  The scope of the "plant costs" has been expanded. Details on the plant costs can be found in the report titled *Analysis of Supply-Side Technology Alternatives* (August 1999) in Volume III, Technical Appendix. The capital costs have been divided into the various cost categories as defined by EPRI in their TAG Supply database. The cost categories include process capital, general facilities, engineering fee, project contingency, process contingency, and pre-production, inventory, and land.

- **Where appropriate, supplement TAG data with more local and current information.**

  The TAG database utilized in the screening analysis was EPRI's April 1999 database release. Appropriate adjustments were made to the combustion turbine capital costs based upon recent bid prices for combustion turbines. Details of the supply-side screening analysis can be found in the report titled *Analysis of Supply-Side Technology Alternatives* (August 1999) in Volume III, Technical Appendix.

- **Expand the analysis of the Ohio Falls rehabilitation to screen discrete options that might be cost-effective if implemented separately.**

  LG&E's 1993 Integrated Resource Plan indicated that a rehabilitation of the Ohio Falls Station was a least cost option. A more in-depth evaluation of the condition of the Ohio Falls station is currently underway within the Companies. Details of this evaluation have not been completed and were not included in the Companies 1999 Integrated Resource Plan. However, the results of the evaluation when completed will be utilized in the Companies on-going planning process.

Option Integration and Plan Optimization

- **Is the current end-year-mix-optimization step a reliable screening method? Is LG&E relying on this step to capture end-effects? Does it accurately capture these effects?**

  Yes, the end-year-mix-optimization step referred to in the LG&E 1993 IRP is a reliable method for screening supply-side resource options. However, this step was not required in the 1999 IRP since the number of options considered in the integrated analysis was more manageable with the current version of PROSCREEN II and the computing power available today.

- **Unexpectedly low or high gas and oil prices could conceivably affect the selection and timing of resources.**

  The fuel price sensitivity performed in the 1999 IRP allows for the optimization of the selection and timing of resources.

- **Complete re-optimization of the resource plan under alternative future scenarios may not be the most meaningful approach. LG&E should consider revising the methodology to focus on assessing the risk-weighted costs associated with several possible next steps the utility could take.**

  The 1999 IRP sensitivity analysis on fuel price and load forecast indicates that the type of resource does not vary over the first 10 years of the plan; only the timing of the resources changes. The Companies view the filed IRP as a snapshot of an on-going process. Therefore, the Companies will be able to adjust the plan according to forces that would affect the plan.

KU 1996 IRP Report

Future Electricity Requirements

- **KU should continue the development of its demand forecast using EPRI's HELM model to better enable it to account for changing end uses in its various sales sectors.**

  KU continued to develop its database for the HELM model as stated above with regard to the separation of commercial and industrial sales into their own unique load shapes. KU has used its load research data to update the shapes of the other classes and major customers so that the derived system load shaped remains reflective of current load conditions. In order to capture the effect of changing end-uses over time in an efficient manner in the future we will focus on accurate modeling of the class and customer level load shapes as they change over time. In addition, examination of the value of a hybrid econometric/HELM demand forecasting process that would capture the strengths of both methodologies will be considered.

  LG&E's projected system demand and load shape is now read into HELM as a separate class in order to create the combined company forecast. KU/LG&E will be developing a class-level demand forecast for LG&E using the knowledge gained from modeling the KU system.

- **KU should report on its work to develop a service area demographic and economic forecast that will produce region specific forecasts of model drivers.**

  KU successfully implemented the Kentucky Utilities Service Territory Model (KUSTEM) as documented above and in Section 5. The model's value in capturing the economic growth of the territory is reflected in the fact that upon its implementation KU's energy forecast showed increases which were later supported by actual sales.

  A new region for the LG&E service territory has been developed for the model, and was used in the establishment of the customer forecast for the LG&E system. KU/LG&E intend to increase the application of the model to the LG&E territory. KU/LG&E is also working to introduce a housing starts forecast module to the model that will enable the household forecast to be separated into forecasts by housing type such as single family, multi-family and mobile homes.

- **KU should, to the extent possible, report on and reflect in its forecasts, the impacts of increasing competition in the electric industry.**

  Integrated resource planning and regulatory reviews are based on the assumption that the electric utility will continue to have a monopoly on providing electric service and will require extensive amounts of capital to generate power over the next 20 to 30 years. The use of competition in place of regulation clearly will change this basic assumption supporting integrated resource planning and regulatory review. The application of integrated resource planning and regulatory review to a competitive industry provides only questionable benefits. While KU agrees that the introduction of competition into the electric utility industry is likely to occur, KU does not agree that consideration of the issue of a fully competitive industry is appropriate within the context of an IRP regulatory scheme.

- **KU should attempt, either in the body of its forecasts, or in its uncertainty analysis, to incorporate the impacts of potential environmental costs such as those associated with EPA's recent decision to impose NOx reductions on sources in the eastern United States.**

  The issue of environmental costs with regard to the forecast concerns the final price of electricity as seen by the consumer and the consumer's responsiveness to changes in price. As a consequence of the merger with LG&E, the combined companies have instituted a one percent merger sur-credit and committed to a five year freeze on base rates, which effectively work to lower real electric price. KU includes the price of electricity as an explanatory variable in it's forecasting models where it appears to be of reasonable statistical significance. However, the usage of electricity in KU territory appears to be fairly price inelastic, and it would require price increases which significantly offset the factors constraining price increases in order to experience a measureable reduction in load. KU's internal price forecast reflects expected environmental costs and optimistic/pessimistic price forecasts are a component of the uncertainty analysis developed for the forecast.

Demand-Side Management

- **KU should not conduct judgmental screening after the detailed cost-effectiveness screening.**

  The Companies did not conduct judgmental screening after the detailed cost-effectiveness screening in the 1999 IRP.

- **KU should clarify its DSM objectives and specify DSM screening criteria at every stage that are consistent with meeting its objectives.**

  The DSM objective is stated in the Introduction of the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix. The DSM screening criteria at each stage is highlighted in the report.

- **At each stage of DSM screening KU should specifically outline how the established criteria were used to eliminate or pass each DSM alternative.**

  See Exhibit DSM-2 in the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix.

- **KU should continue to develop DSM assumptions that are specific to its service territory.**

  The Companies' assumptions regarding DSM are specific to the service territories of KU and LG&E.

- **KU should consider fully incorporating DSM resource options into its expansion plan in a true integrated analysis where the planning model can choose between individual supply and demand options.**

  The DSM resource options that passed the DSM screening were fully incorporated into the integrated analysis. See the report titled *Optimal Integrated Resource Plan* (October 1999) in Volume III, Technical Appendix.

- **KU should report on the findings of DSM research, particularly related to commercial and industrial applications which showed the greatest potential for cost-effectiveness according to the Total Resource Cost test.**

  The Companies have gained considerable experience from LG&E's Commercial Audit program. Efficient lighting is one of the most economical choices of commercial and industrial customers, and is one of several commercial and/or industrial applications that passed the screening analysis. Use of wireless communication/paging technology for Direct Load Control (DLC) applications is another example of a recent development that passed the screening analysis. The cost effective alternatives according to the Total Resource Cost (TRC) test are discussed in further detail in the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix.

- **KU should report on any changes to its DSM activities based on the results of the DSM screening using its new avoided costs.**

  The screening analysis discussed in the report titled *Screening of Demand-Side Management (DSM) Options* (September 1999) in Volume III, Technical Appendix is based on updated avoided costs.

- **KU should provide a detailed discussion of how its DSM objectives, analysis and planning have been impacted due to the merger between LG&E and KU.**

  The impacts on DSM objectives, analysis and planning due to the merger between LG&E and KU are discussed in Volume I, Section 6.

Integration and Plan Optimization

- **To the extent that demand-side resources are reflected in its resource optimizations, KU should strive to fully integrate such resources into its analysis and identify the assumptions used at each step of the development of the optimal expansion plan.**

  Demand and supply-side resources were included in the optimization process and allowed to compete against each other to develop the least cost plan.

- **KU should report on the results of its further analysis of its Clean Air Act compliance plan, particularly with respect to the option of installing a scrubber at Ghent Unit 2 and the timing of such installation.**

  Details on the Companies Clean Air Act compliance plan can be found in the report titled *Clean Air Act Amendments of 1990 Compliance Plan, 1999 Environmental Compliance Analysis* (September 1999) in Volume III, Technical Appendix.

- **In consideration of changes brought about as a result of the merger of KU and LG&E, KU should discuss any changes or re-evaluations of its planning reserve margin for use in future integrated resource plans.**

  Several events have impacted the determination of the reserve margin used in this analysis. The events include not only the merger of KU and LG&E, but also the addition of combustion turbines and changes in the wholesale power marketplace. These events further diversify the resource mix available to the Companies, which suggests that a re-evaluation of the reserve margin criteria is warranted. The details of that evaluation are discussed in detail in the report titled *Analysis of Reserve Margin Planning Criteria* (August 1999) in Volume III, Technical Appendix.