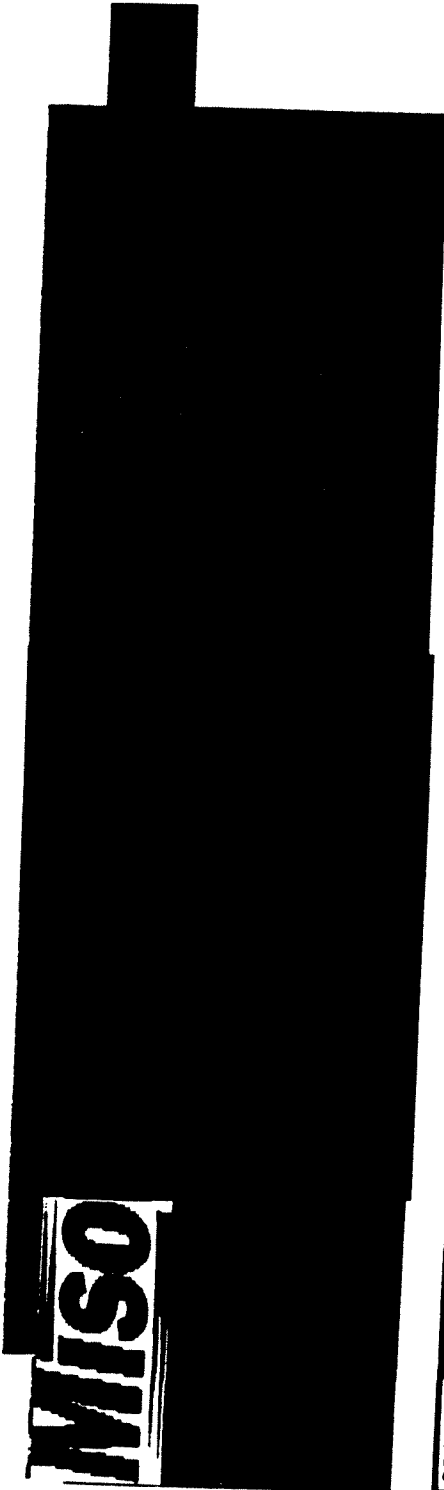


**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

Faults at Blue Lick (#7793) 345 KV Station	8.0269;-48.7786	8.1615;-49.1569	8.5016;-50.1426	8.1276;-49.0575	8.5316;-50.1887
Faults at Buckner (#10003) 345 KV Station	6.3894;-76.3749	6.9616;-79.4670	6.8146;-78.7740	7.0386;-79.8594	7.1445;-80.2977

**APPENDIX F**

**Table**  
**List of Generators Included in the Study**

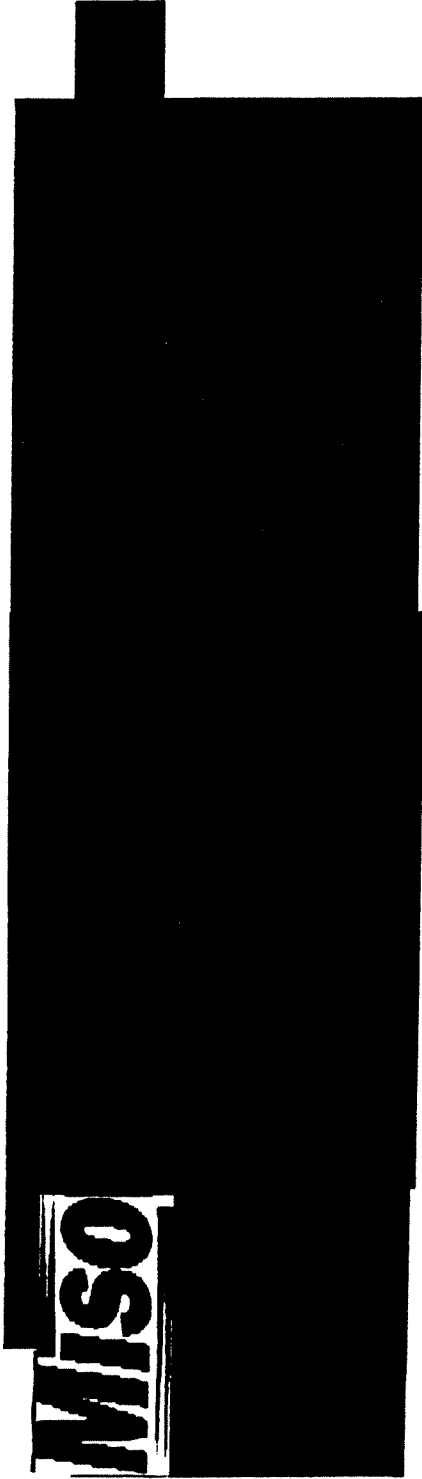


36130-01	12/1/1998	LGEE	11		Trimble	KY	174	6/1/2002	IC/FC	
36130-02	12/1/1998	LGEE	11		Trimble	KY	174	6/1/2002	IC/FC	
36371-01	7/30/1999	CIN	11		Wheatland	IN	640	6/1/2004	IC/FC	IAF/CP
36385-01	8/13/1999	CIN	11		Vigo	IN	500	6/1/2002	IC/FC	IAF/IS

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

	11/22/1999	CIN	11	Bedford	IN	800	#####	IC/FC	IAF/CP
36486-01									
36495-01	12/1/1999	LGEE	11	Trimble	KY	174	6/1/2004	IC/FC	N/A
36495-02	12/1/1999	LGEE	11	Trimble	KY	174	6/1/2004	IC/FC	N/A
36495-03	12/1/1999	LGEE	11	Trimble	KY	174	6/1/2005	IC/FC	N/A
36501-01	12/7/1999	LGEE	11	Oldham	KY	750	4/1/2002	IC/FC	IAF
36508-01	12/14/1999	SIPC	11	Williamson	IL	142	6/1/2003	IC/FC	UC
36508-02	12/14/1999	SIPC	11	Williamson	IL	71	6/1/2007	IC/FC	CP
36530-01	1/5/2000	IPL	11	Marion	IN	189	5/1/2002	IC/FC	UC
36826-01	10/27/2000	CIN	11	Noblesville	IN	210	6/1/2003	IC/FC	UC
36881-01	12/21/2000	LGEE	11	Trimble	KY	174	6/1/2006	IC/FC	N/A

**Table**  
**List of Generators in MISO Queue**



36441-01	10/8/1999	CIN	11		Pike	IN	900	6/1/2003	IC/FC	IAP/C
36586-01	3/1/2000	LGEE	11		Livingston	KY	95	6/1/2003	IC/FC	IAP
36586-02	3/1/2000	LGEE	11		Hancock	KY	95	6/1/2005	IC/FC	IAP
36605-01	3/20/2000	SIGE	11		Posey	IN	260	6/1/2004	IC/FP	IAP

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

36900-01	1/9/2001	CIN	11	Clifton	OH	41	5/1/2003	IC/FP	
36922-02	1/31/2001	CIN	11	Putnam	IN	500	6/1/2002	IC/FC	IAP
36955-01	3/5/2001	CIN	11	Hamilton	OH	600	6/1/2005	IP	
36955-03	3/5/2001	HE	11	Lawrence	IN	320	6/1/2003	IC/FP	
37029-01	5/18/2001	CIN	11	St. Claire Sub	OH	30	6/1/2002	IC/FP	
37077-01	7/5/2001	LGEE	11	Muhlenberg	KY	1500	6/1/2006	IE/FE	
37078-01	7/6/2001	LGEE	11	Henderson	KY	1000	6/1/2006	IP/FP	
37356-01	4/10/2002	LGEE	11	Trimble	KY	750	1/1/2007	IE	
37384-01	8/16/02	LGEE	11	Estill	KY	100	4/1/2006	IP	

**Facility Additions with the Thoroughbred Project**

No.	Line	R (p.u.)	X (p.u.)	Charg- (p.u.)	Rating (MVA)
1	THOROUGHNBRED 345 kV to 14WILSO7 345 kV	0.0003	0.0005	0.0855	1776/2398
2	Line 14WILSO7 345 kV (27561) to 14COLE 7 345 kV (27563) is replaced with the following two lines:				
a	14WILSO7 345 kV (27561) TO 11SMITH 345 kV (27012)	0.0010	0.017	0.2914	1776/2398
b	14COLE 7 345 kV (27563) TO 11SMITH 345 kV (27012)	0.0007	0.0115	0.1966	1776/2398
3	14WILSO5 161 kV (27553) TO 5PARADIS 161 kV (18012)	0.0038	0.0308	0.0307	530/558
4	THOROUGHNBRED 27 kV to 345 kV Step-up on 100 MVA Base	0.003	0.0118		760/950

**Revised ratings of the Existing Facilities**

Branch Circuit	Old Rating		New Rating	
	Normal	Emergency	Normal	Emergency
<i>Big Rivers Electric Corporation</i>				
Wilson to Coleman 345 kV	598	598	956	956
<i>LG&amp;E Energy</i>				
Baker Lane to Brown N 138 kV	205	216	224	277
Earlington N to River Queen Tap 161 kV	184	184	209	257
Eastview to Stephensburg 69 kV	42	42	56	68
Elizabethtown to Tharp 69 kV	72	79	90	111
Green River Steel 138-69 kV Transformer	93	102	93	107
Green River Steel to OMU 69 kV	72	86	146	181
Green River to Ohio County 138 kV ckt 1	143	158	179	220
Green River to Ohio County 138 kV ckt 2	143	158	179	220
Green River to River Queen Tap 69 kV	55	55	89	110
Leitchfield 138-69 kV Transformer	72	79	93	107
Leitchfield to Shrewsbury 138 kV	82	82	179	220
Newtonville to Cloverport 138 kV	143	143	162	199
Ohio County to Shrewsbury 138 kV	165	165	179	220
Smith to Hardin County 345 kV	275	308	1195	1315
Adams to Tyrone 138 kV	97	97	179	220
Arnold to Delvinta 161 kV	113	113	167	201
Artemus to Farley 161 kV	142	142	209	257
Artemus to Pineville 161 kV	129	129	176	201
Delvinta to West Irvine Tap 161 kV	142	142	176	201
Ghent to Owen County Tap 138 kV	227	227	227	280
Green River Steel to Smith 138 kV	241	241	287	287



**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

Lake Reba Tap to West Irvine Tap 161 kV	165	165	167	223
<i>East Kentucky Power Cooperative</i>				
Stephensburg to Upton Junction 69 kV	19	19	45	54

**APPENDIX G**

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately \$90 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately \$4 million.

**Option 2:**

- Construct a 345kV line from West Frankfort to Brown
- Construct a 345kV line from Mill Creek to Hardin County
- Construct a 138kV line from West Lexington to Higby Mill
- Reconductor the 138kV line from Hardin County to Etown
- Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)
- Add a second 345/138 XFMR at Brown

The results from this option are in Appendix A, Table 4. Below is a list of each remaining overloaded facility after the implementation of option 2:

25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27005 11GHENT 345 27014 11W FRNK 345 1 LN
27006 11HARDN 345 27100 11HARDN 138 2 TR
27007 11MIDDLT 345 27013 11TRIMBL 345 2 LN
27007 11MIDDLT 345 27338 11BUCKNR 345 1 LN
27019 11BLUE L 161 29248 20BLIT C 161 1 LN
27075 11CARROL 138 24953 06CLIFTY 138 1 LN
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27085 11ETOWN 138 27124 11NELSON 138 1 LN
27091 11FFERT E 138 27140 11SHADRA 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN

**Study Results**

Tables 1 and 2 located in Appendix A show the initial results of the study using both the peak and off-peak cases. Since the peak upgrades showed the same constrained facilities as the off-peak case with the addition of several others, the task of finding appropriate Four different upgrade schemes were used to try to find the best way to relieve the constraints on the transmission system. These four schemes are listed below:

**Option 1:**

- Construct a 345kV line from Trimble County to West Frankfort
- Construct a 345kV line from West Frankfort to Brown
- Construct a 138kV line from West Lexington to Higby Mill
- Construct a 138kV line from West Frankfort to Tyrone
- Add a second 345/138 XFMR at Brown

The results from this option are in Appendix A, Table 3. Below is a list of each remaining overloaded facility after the implementation of option 1 .

Limiting Circuit
25908 08BUFTN1 138 25909 08BUFTN1 345 1 TR
27007 11MIDDLT 345 27119 11MIDDLT 138 1 TR
27007 11MIDDLT 345 27119 11MIDDLT 138 3 TR
27014 11W FRNK 345 27151 11W FRNK 138 1 TR
27075 11CARROL 138 27112 11LOCKPO 138 1 LN
27091 11FFERT E 138 27140 11SHADRA 138 1 LN
27099 11HARDBG 138 27100 11HARDN 138 1 LN
27112 11LOCKPO 138 27140 11SHADRA 138 1 LN
27113 11LOUDON 138 29202 20AVON 138 1 LN
27148 11TYRONE 138 27151 11W FRNK 138 1 LN

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately \$96 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately \$4 million.

**Option 3:**  
 Loop the existing Ghent (LGEE)-Speed (CIN) 345 kV line through the Trimble County substation.  
 Construct a 345kV line from West Frankfort to Brown  
 Construct a 138kV line from West Lexington to Higby Mill  
 Reconnector the 138kV line from Ghent to Owen County Tap  
 Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)  
 Construct a 138 kV line from Ghent to NAS and serve NAS from this line.  
 Add a second 345/138XFMR at Brown

The results from this option are in Appendix A, Table 5. Below is a list of each remaining overloaded facility after the implementation of option 3.

25908	08BUFTN1	138	25909	08BUFTN1	345	1	TR		
27005	11GHENT	345	27014	11W FRNK	345	1	LN		
27007	11MIDDLT	345	27119	11MIDDLT	138	1	TR		
27015	11W LEXN	345	27153	11W LEXN	138	1	TR		
27019	11BLUJE	L	161	29248	20BLIT	C	161	1	LN
27075	11CARROL	138	27112	11LOCKPO	138	1	LN		
27091	11FFRT	E	138	27140	11SHADRA	138	1	LN	
27092	11GHENT	138	27120	11MIDWAY	138	1	LN		
27099	11HARDBG	138	27100	11HARDN	138	1	LN		
27112	11LOCKPO	138	27140	11SHADRA	138	1	LN		
27113	11LOUDON	138	28202	20AVON	138	1	LN		
27120	11MIDWAY	138	27153	11W LEXN	138	1	LN		
27137	11RODBRN	138	27336	11SHARKE	138	1	LN		

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately \$56 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately \$4 million.

**Option 4:**

- Loop the existing Ghent (LGEE)-Speed (CIN) 345 kV line through the Trimble County substation.
- Construct a 345kV line from Mill Creek to Hardin County
- Construct a 138kV line from West Lexington to Higby Mill
- Construct a 138 kV line from West Frankfort to Tyrone
- Reconductor the 138kV line from Ghent to Owen County Tap
- Reconductor the 138kV line from Hardin County to Etown
- Open the 69kV tie from Shelby County (EKPC) to Shelby County Tap (LGEE)

The results from this option are in Appendix A, Table 6. Below is a list of each remaining overloaded facility after the implementation of option 4.

25908	08BUFTN1	138	25909	08BUFTN1	345	1	TR
27006	11HARDN	345	27100	11HARDN	138	2	TR
27014	11W FRNK	345	27151	11W FRNK	138	1	TR
27015	11W LEXN	345	27153	11W LEXN	138	1	TR
27051	11ADAMS	138	27148	11TYRONE	138	1	LN
27075	11CARROL	138	27112	11LOCKPO	138	1	LN
27085	11ETOWN	138	27124	11NELSON	138	1	LN
27091	11FFRT E	138	27140	11SHADRA	138	1	LN
27092	11GHENT	138	27120	11MIDWAY	138	1	LN
27112	11LOCKPO	138	27140	11SHADRA	138	1	LN
27113	11LOUDON	138	29202	20AVON	138	1	LN
27120	11MIDWAY	138	27153	11W LEXN	138	1	LN
27137	11RODBRN	138	27336	11SHARKE	138	1	LN
27148	11TYRONE	138	27151	11W FRNK	138	1	LN

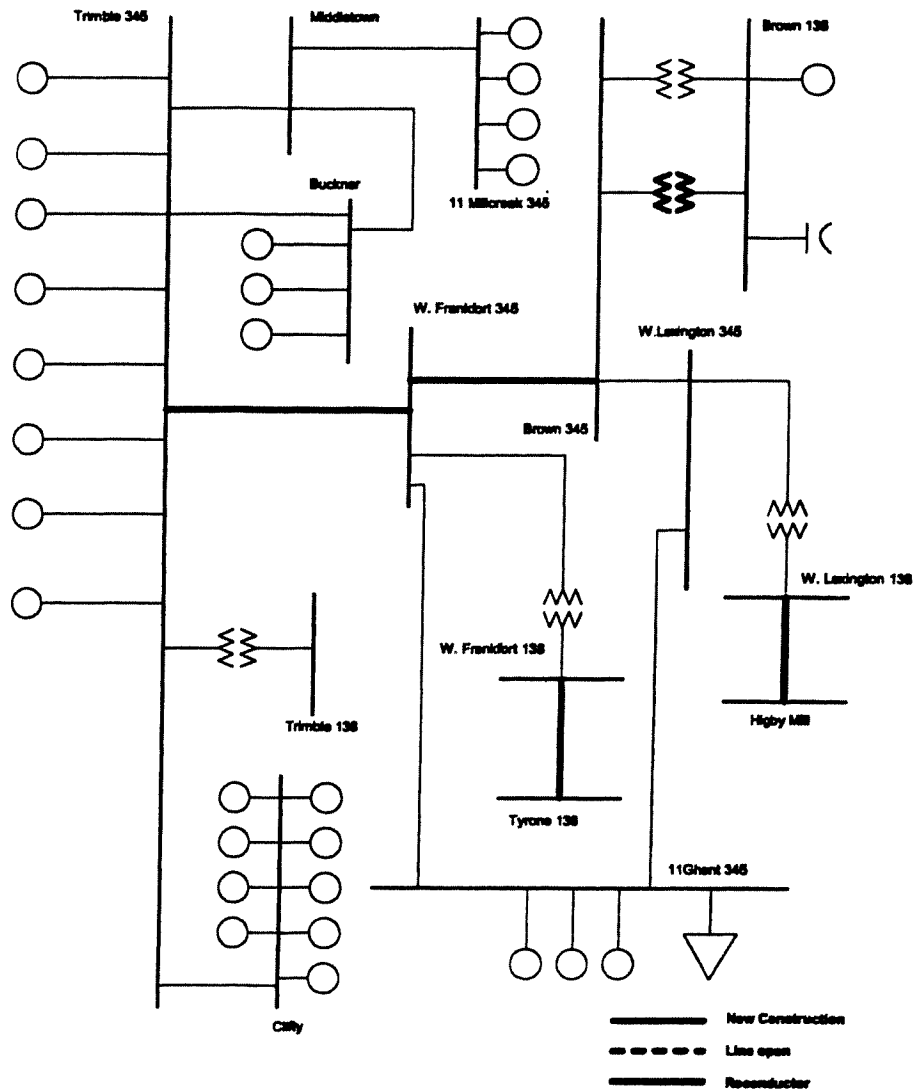
**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

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The estimated cost to construct the identified facilities and eliminate the remaining overloads in LGEE is approximately \$66 million based on rule-of-thumb estimates. The cost to add a second Buffington transformer in Cinergy would cost approximately \$4 million.

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

**OPTION 1 UPGRADES**

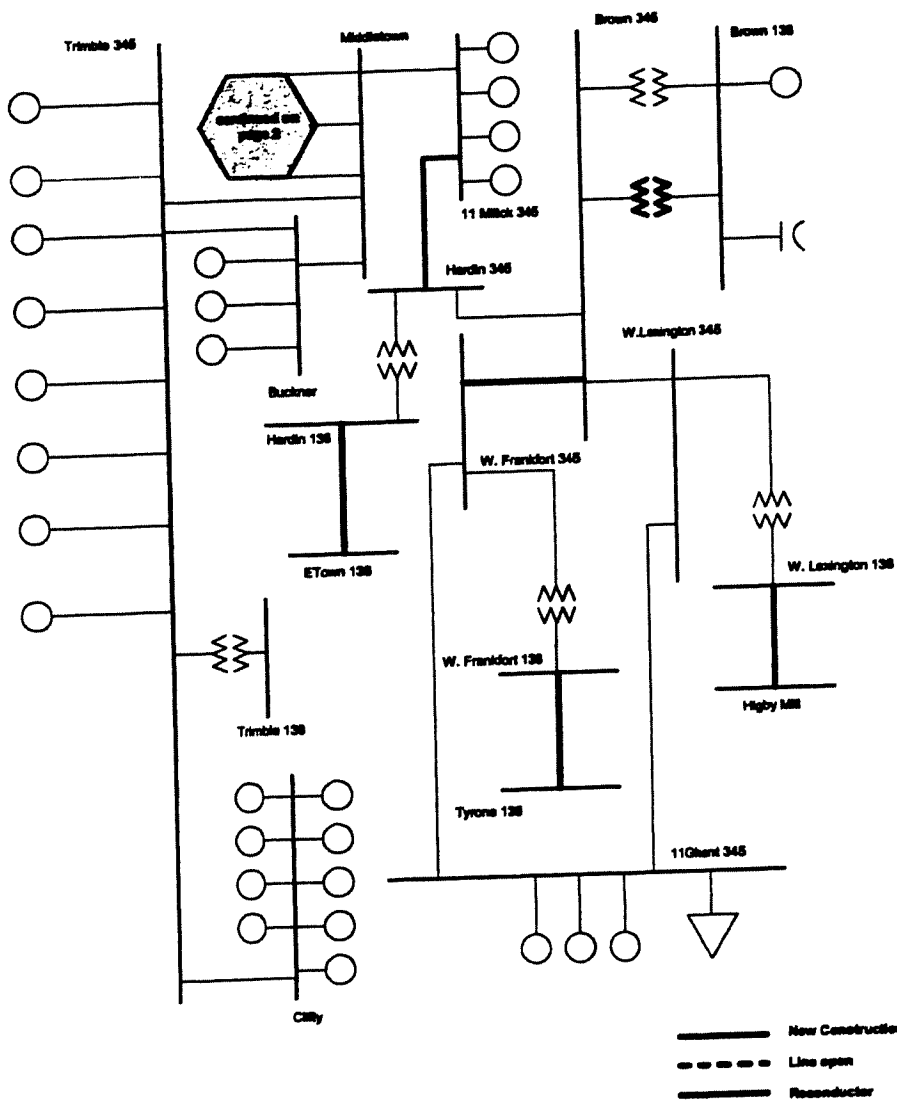


Note: For simplicity, some of the branches have not been shown in the diagram



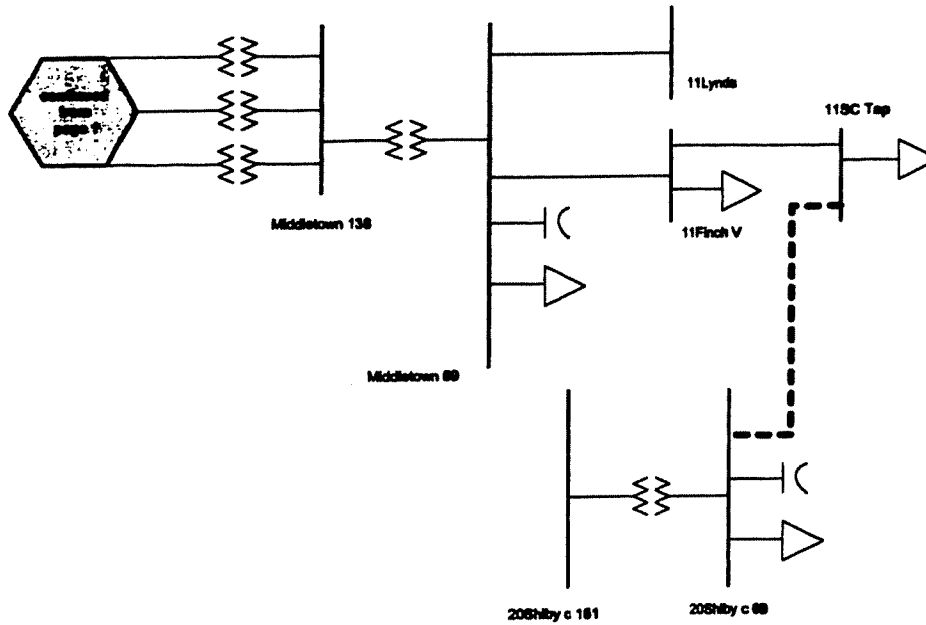
Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

OPTION 2 UPGRADES



Note: For simplicity, some of the branches have not been shown in the diagram

OPTION 2 UPGRADES contd.

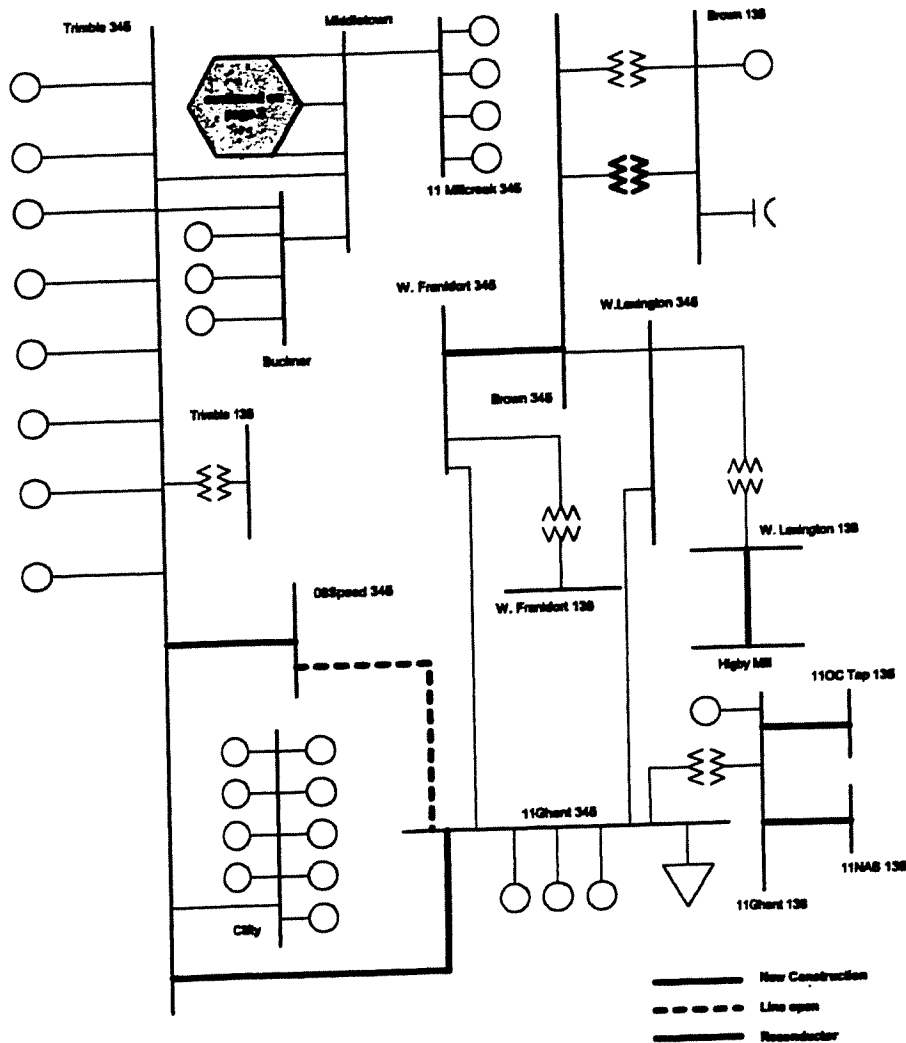


- New Construction
- - - - - Line open
- Reconductor

Note: For simplicity, some of the branches have not been shown in the diagram

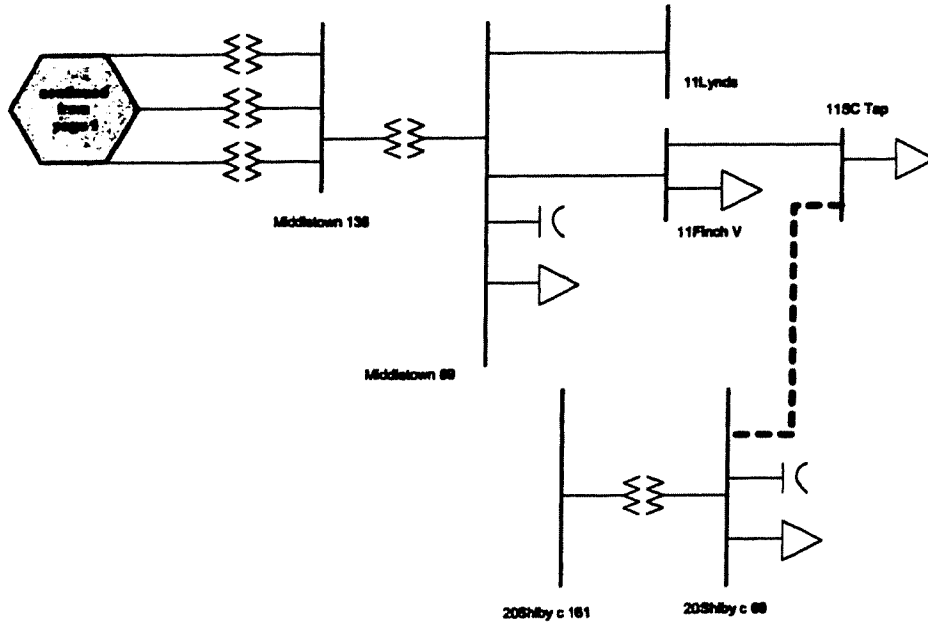
Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

OPTION 3 UPGRADES



Note: For simplicity, some of the branches have not been shown in the diagram

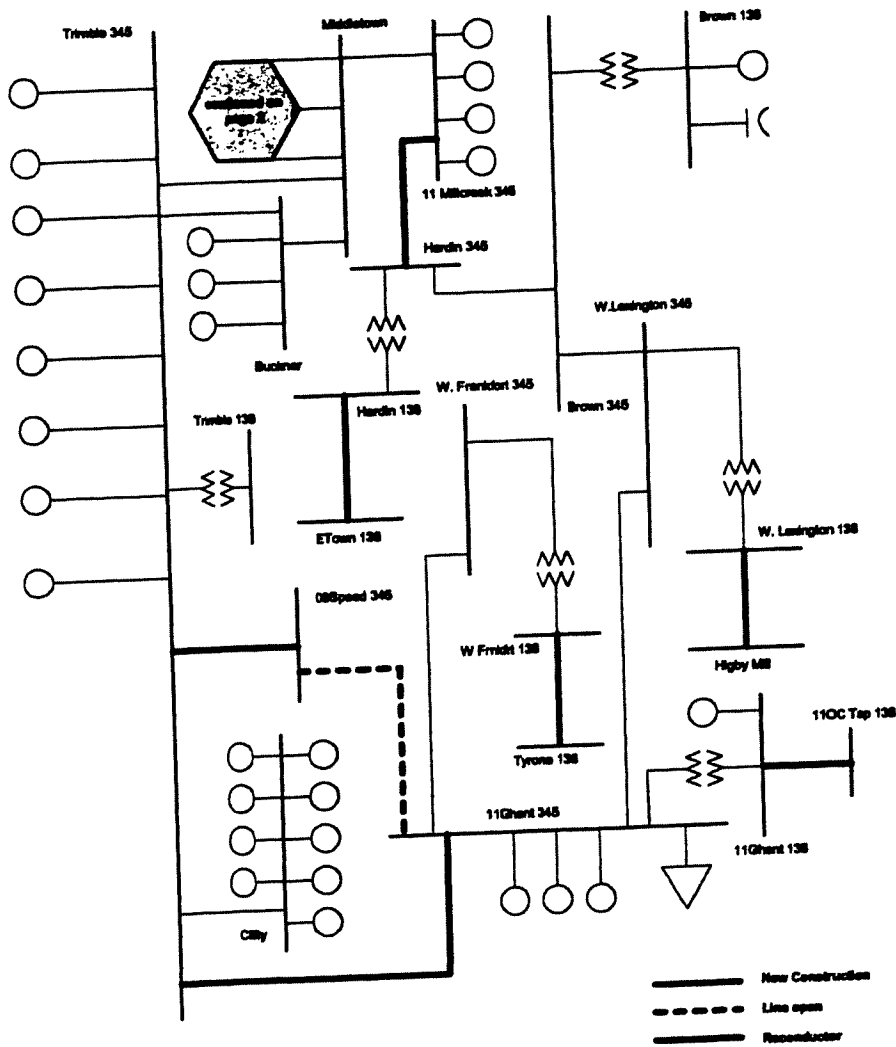
OPTION 3 UPGRADES contd.



Note: For simplicity, some of the branches have not been shown in the diagram

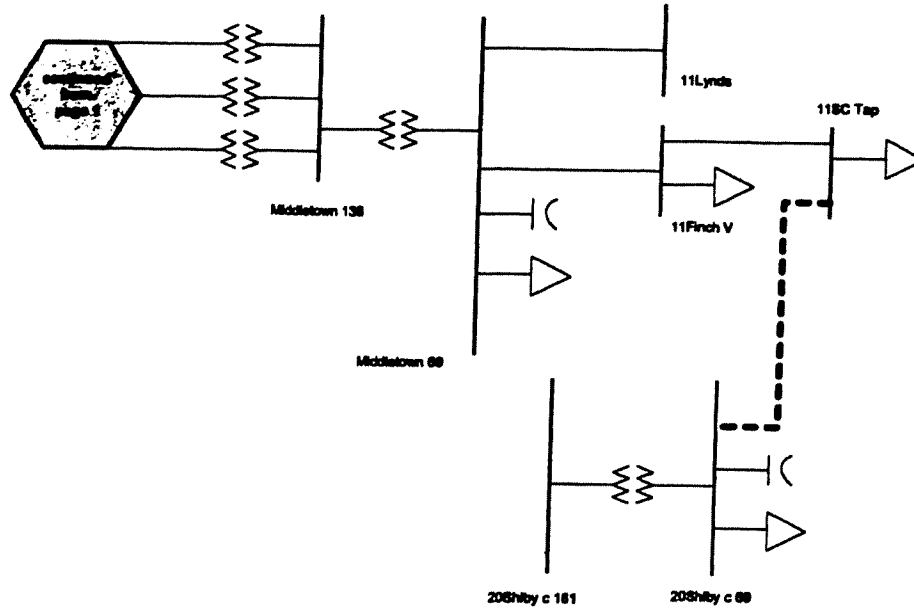
Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

OPTION 4 UPGRADES



Note: For simplicity, some of the branches have not been shown in the diagram

OPTION 4 UPGRADES contd.



————— New Construction  
 - - - - - Line open  
 ———— Reactor

Note: For simplicity, some of the branches have not been shown in the diagram

**APPENDIX H**

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E  
G218 STUDY  
STUDY CASE WITH OPT.1 UPGRADES

THU, FEB 13 2003 11:23

OUTPUT CHANNELS:

CHANL	IPRINT	X-VALUE	-X	X	IDENTIFIER	DESCRIPTION	X	LOCATION
1	1555	55.19			[N3 BFN 20.700]	[1 ] ROTOR ANGLE		BUS 18137 MACH 1
2	163787	1.050			[N3 BFN 20.700]	BUS VOLTAGE		BUS 18137
3	0	0.000				SYSANG VALUE		
4	0	0.000				SYSANG VALUE		
5	0	0.000				SYSANG VALUE		
6	0	0.000				SYSANG VALUE		
7	2183	70.71			[07MEROM5345.00]	[1 ] ROTOR ANGLE		BUS 25143 MACH 1
8	2184	70.19			[07MEROM5345.00]	[2 ] ROTOR ANGLE		BUS 25143 MACH 2
9	2176	47.83			[07RATTS 161.00]	[1 ] ROTOR ANGLE		BUS 25034 MACH 1
10	2178	68.65			[07WORTH8138.00]	[1 ] ROTOR ANGLE		BUS 25044 MACH 1
11	2334	47.36			[11GHENT 345.00]	[2 ] ROTOR ANGLE		BUS 27005 MACH 2
12	2335	47.68			[11GHENT 345.00]	[3 ] ROTOR ANGLE		BUS 27005 MACH 3
13	2336	47.34			[11GHENT 345.00]	[4 ] ROTOR ANGLE		BUS 27005 MACH 4
14	2337	47.29			[11MIL CK345.00]	[1 ] ROTOR ANGLE		BUS 27008 MACH 1
15	2338	46.45			[11MIL CK345.00]	[2 ] ROTOR ANGLE		BUS 27008 MACH 2
16	2339	47.62			[11MIL CK345.00]	[3 ] ROTOR ANGLE		BUS 27008 MACH 3
17	2340	49.41			[11MIL CK345.00]	[4 ] ROTOR ANGLE		BUS 27008 MACH 4
18	2341	66.09			[11TRIMBL345.00]	[1 ] ROTOR ANGLE		BUS 27013 MACH 1
19	2347	68.22			[11TRIMBL345.00]	[10] ROTOR ANGLE		BUS 27013 MACH 10
20	4763	67.49			[11TRIMBL345.00]	[2 ] ROTOR ANGLE		BUS 27013 MACH 2
21	2342	68.22			[11TRIMBL345.00]	[5 ] ROTOR ANGLE		BUS 27013 MACH 5
22	2343	68.22			[11TRIMBL345.00]	[6 ] ROTOR ANGLE		BUS 27013 MACH 6
23	2344	68.22			[11TRIMBL345.00]	[7 ] ROTOR ANGLE		BUS 27013 MACH 7
24	2345	68.22			[11TRIMBL345.00]	[8 ] ROTOR ANGLE		BUS 27013 MACH 8
25	2346	68.22			[11TRIMBL345.00]	[9 ] ROTOR ANGLE		BUS 27013 MACH 9
26	2348	0.000			[11BRWNCT138.00]	[10] ROTOR ANGLE		BUS 27063 MACH 10



Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

27	2349	0.000	ANGL 27063	[11BRWNCT138.00]	[11]	ROTOR ANGLE	BUS 27063	MACH 11
28	2350	0.000	ANGL 27063	[11BRWNCT138.00]	[5]	ROTOR ANGLE	BUS 27063	MACH 5
29	2351	0.000	ANGL 27063	[11BRWNCT138.00]	[6]	ROTOR ANGLE	BUS 27063	MACH 6
30	2352	0.000	ANGL 27063	[11BRWNCT138.00]	[7]	ROTOR ANGLE	BUS 27063	MACH 7
31	2353	0.000	ANGL 27063	[11BRWNCT138.00]	[8]	ROTOR ANGLE	BUS 27063	MACH 8
32	2354	0.000	ANGL 27063	[11BRWNCT138.00]	[9]	ROTOR ANGLE	BUS 27063	MACH 9
33	2355	32.66	ANGL 27064	[11BRWN N138.00]	[3]	ROTOR ANGLE	BUS 27064	MACH 3
34	2356	22.99	ANGL 27065	[11BRWN P138.00]	[1]	ROTOR ANGLE	BUS 27065	MACH 1
35	2357	26.19	ANGL 27065	[11BRWN P138.00]	[2]	ROTOR ANGLE	BUS 27065	MACH 2
36	2358	0.000	ANGL 27071	[11CNE RN138.00]	[11]	ROTOR ANGLE	BUS 27071	MACH 11
37	2359	44.26	ANGL 27071	[11CNE RN138.00]	[4]	ROTOR ANGLE	BUS 27071	MACH 4
38	2360	35.88	ANGL 27071	[11CNE RN138.00]	[5]	ROTOR ANGLE	BUS 27071	MACH 5
39	2361	45.83	ANGL 27072	[11CN RN6138.00]	[6]	ROTOR ANGLE	BUS 27072	MACH 6
40	2362	36.97	ANGL 27092	[11GHENT 138.00]	[1]	ROTOR ANGLE	BUS 27092	MACH 1
41	2363	34.94	ANGL 27095	[11GR RVR138.00]	[3]	ROTOR ANGLE	BUS 27095	MACH 3
42	2364	32.26	ANGL 27095	[11GR RVR138.00]	[4]	ROTOR ANGLE	BUS 27095	MACH 4
43	2365	46.54	ANGL 27130	[11PADDYR138.00]	[13]	ROTOR ANGLE	BUS 27130	MACH 13
44	2366	35.08	ANGL 27142	[11SMITH 138.00]	[1]	ROTOR ANGLE	BUS 27142	MACH 1
45	2367	33.80	ANGL 27142	[11SMITH 138.00]	[2]	ROTOR ANGLE	BUS 27142	MACH 2
46	2368	0.000	ANGL 27154	[11WATRS138.00]	[7]	ROTOR ANGLE	BUS 27154	MACH 7
47	2369	0.000	ANGL 27154	[11WATRS138.00]	[8]	ROTOR ANGLE	BUS 27154	MACH 8
48	2370	23.44	ANGL 27180	[11CANAL 69.000]	[1]	ROTOR ANGLE	BUS 27180	MACH 1
49	2371	23.44	ANGL 27180	[11CANAL 69.000]	[2]	ROTOR ANGLE	BUS 27180	MACH 2
50	2372	23.44	ANGL 27180	[11CANAL 69.000]	[3]	ROTOR ANGLE	BUS 27180	MACH 3
51	2373	23.44	ANGL 27180	[11CANAL 69.000]	[4]	ROTOR ANGLE	BUS 27180	MACH 4
52	2374	23.44	ANGL 27180	[11CANAL 69.000]	[5]	ROTOR ANGLE	BUS 27180	MACH 5
53	2375	23.44	ANGL 27180	[11CANAL 69.000]	[6]	ROTOR ANGLE	BUS 27180	MACH 6
54	2376	20.20	ANGL 27180	[11CANAL 69.000]	[7]	ROTOR ANGLE	BUS 27180	MACH 7
55	2377	20.20	ANGL 27180	[11CANAL 69.000]	[8]	ROTOR ANGLE	BUS 27180	MACH 8
56	2378	0.000	ANGL 27195	[11DIXDAM69.000]	[1]	ROTOR ANGLE	BUS 27195	MACH 1
57	2379	0.000	ANGL 27195	[11DIXDAM69.000]	[2]	ROTOR ANGLE	BUS 27195	MACH 2
58	2380	0.000	ANGL 27195	[11DIXDAM69.000]	[3]	ROTOR ANGLE	BUS 27195	MACH 3
59	2381	28.46	ANGL 27216	[11GR RVR69.000]	[1]	ROTOR ANGLE	BUS 27216	MACH 1
60	2382	29.06	ANGL 27216	[11GR RVR69.000]	[2]	ROTOR ANGLE	BUS 27216	MACH 2
61	2383	0.000	ANGL 27220	[11HAEFLN69.000]	[1]	ROTOR ANGLE	BUS 27220	MACH 1

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

62	2384	0.000	ANGL	27220	[11HAEFLN69.000]	[2 ]	ROTOR ANGLE	BUS	27220	MACH 2
63	2385	0.000	ANGL	27220	[11HAEFLN69.000]	[3 ]	ROTOR ANGLE	BUS	27220	MACH 3
64	2386	0.000	ANGL	27227	[11HLCRST69.000]	[1 ]	ROTOR ANGLE	BUS	27227	MACH 1
65	2387	8.462	ANGL	27235	[11KU PK 69.000]	[3 ]	ROTOR ANGLE	BUS	27235	MACH 3
66	2388	0.000	ANGL	27289	[11TYRONE69.000]	[1 ]	ROTOR ANGLE	BUS	27289	MACH 1
67	2389	0.000	ANGL	27289	[11TYRONE69.000]	[2 ]	ROTOR ANGLE	BUS	27289	MACH 2
68	2390	25.44	ANGL	27289	[11TYRONE69.000]	[3 ]	ROTOR ANGLE	BUS	27289	MACH 3
69	2391	0.000	ANGL	27313	[11PRUN2A14.000]	[1 ]	ROTOR ANGLE	BUS	27313	MACH 1
70	2392	0.000	ANGL	27314	[11PRUN2B14.000]	[2 ]	ROTOR ANGLE	BUS	27314	MACH 2
71	2393	54.91	ANGL	27338	[11BUCKNR345.00]	[1 ]	ROTOR ANGLE	BUS	27338	MACH 1
72	2394	54.92	ANGL	27338	[11BUCKNR345.00]	[2 ]	ROTOR ANGLE	BUS	27338	MACH 2
73	2395	54.92	ANGL	27338	[11BUCKNR345.00]	[3 ]	ROTOR ANGLE	BUS	27338	MACH 3
74	163788	1.029	VOLT	27005	[11GHENT 345.00]		BUS VOLTAGE	BUS	27005	
75	163789	1.015	VOLT	27008	[11MIL CK345.00]		BUS VOLTAGE	BUS	27008	
76	163790	1.020	VOLT	27013	[11TRIMBL345.00]		BUS VOLTAGE	BUS	27013	
77	163791	0.9694	VOLT	27063	[11BRWNCT138.00]		BUS VOLTAGE	BUS	27063	
78	163792	0.9695	VOLT	27064	[11BRWN N138.00]		BUS VOLTAGE	BUS	27064	
79	163793	0.9696	VOLT	27065	[11BRWN P138.00]		BUS VOLTAGE	BUS	27065	
80	163794	1.006	VOLT	27071	[11CNE RN138.00]		BUS VOLTAGE	BUS	27071	
81	163795	1.015	VOLT	27072	[11CN RN6138.00]		BUS VOLTAGE	BUS	27072	
82	163796	1.029	VOLT	27092	[11GHENT 138.00]		BUS VOLTAGE	BUS	27092	
83	163797	1.029	VOLT	27095	[11GR RVR138.00]		BUS VOLTAGE	BUS	27095	
84	163798	1.000	VOLT	27130	[11PADDYR138.00]		BUS VOLTAGE	BUS	27130	
85	163799	1.029	VOLT	27142	[11SMITH 138.00]		BUS VOLTAGE	BUS	27142	
86	163800	0.9748	VOLT	27154	[11WATRS138.00]		BUS VOLTAGE	BUS	27154	
87	163801	0.9790	VOLT	27180	[11CANAL 69.000]		BUS VOLTAGE	BUS	27180	
88	163802	0.9681	VOLT	27195	[11DIXDAM69.000]		BUS VOLTAGE	BUS	27195	
89	163803	1.029	VOLT	27216	[11GR RVR69.000]		BUS VOLTAGE	BUS	27216	
90	163804	0.9188	VOLT	27220	[11HAEFLN69.000]		BUS VOLTAGE	BUS	27220	
91	163805	0.9689	VOLT	27227	[11HLCRST69.000]		BUS VOLTAGE	BUS	27227	
92	163806	0.9815	VOLT	27235	[11KU PK 69.000]		BUS VOLTAGE	BUS	27235	
93	163807	0.9510	VOLT	27289	[11TYRONE69.000]		BUS VOLTAGE	BUS	27289	
94	163808	0.9912	VOLT	27313	[11PRUN2A14.000]		BUS VOLTAGE	BUS	27313	
95	163809	1.005	VOLT	27314	[11PRUN2B14.000]		BUS VOLTAGE	BUS	27314	
96	163810	1.020	VOLT	27338	[11BUCKNR345.00]		BUS VOLTAGE	BUS	27338	

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

97	16618	6.800	POWR 22510	[05ROCK1 26.000]	[A ]	P ELECTRICAL	BUS 22510	MACH A
98	16625	6.930	POWR 22520	[05ROCK2 26.000]	[2 ]	P ELECTRICAL	BUS 22520	MACH 2
99	16626	6.800	POWR 22520	[05ROCK2 26.000]	[B ]	P ELECTRICAL	BUS 22520	MACH B
100	14228	0.8000	POWR 25861	[08KNOXM113.800]	[1 ]	P ELECTRICAL	BUS 25861	MACH 1
101	2201	82.67	ANGL 25834	[08GIB1 24.000]	[1 ]	ROTOR ANGLE	BUS 25834	MACH 1
102	2202	82.61	ANGL 25835	[08GIB2 24.000]	[2 ]	ROTOR ANGLE	BUS 25835	MACH 2
103	2203	85.62	ANGL 25836	[08GIB3 24.000]	[3 ]	ROTOR ANGLE	BUS 25836	MACH 3
104	2204	83.31	ANGL 25837	[08GIB4 24.000]	[4 ]	ROTOR ANGLE	BUS 25837	MACH 4
105	2205	81.87	ANGL 25838	[08GIB5 24.000]	[5 ]	ROTOR ANGLE	BUS 25838	MACH 5
106	2272	67.39	ANGL 26337	[08BED G118.000]	[G1]	ROTOR ANGLE	BUS 26337	MACH G1
107	2273	63.38	ANGL 26338	[08BED S113.800]	[S1]	ROTOR ANGLE	BUS 26338	MACH S1
108	2274	67.39	ANGL 26339	[08BED G218.000]	[G2]	ROTOR ANGLE	BUS 26339	MACH G2
109	2275	63.38	ANGL 26340	[08BED S213.800]	[S2]	ROTOR ANGLE	BUS 26340	MACH S2
110	2276	67.39	ANGL 26341	[08BED G318.000]	[G3]	ROTOR ANGLE	BUS 26341	MACH G3
111	2277	63.38	ANGL 26342	[08BED S313.800]	[S3]	ROTOR ANGLE	BUS 26342	MACH S3
112	2423	74.26	ANGL 27961	[16PETE 120.000]	[1 ]	ROTOR ANGLE	BUS 27961	MACH 1
113	2424	68.28	ANGL 27962	[16PETE 222.000]	[2 ]	ROTOR ANGLE	BUS 27962	MACH 2
114	2425	74.53	ANGL 27963	[16PETE 322.000]	[3 ]	ROTOR ANGLE	BUS 27963	MACH 3
115	2426	74.57	ANGL 27964	[16PETE 422.000]	[4 ]	ROTOR ANGLE	BUS 27964	MACH 4
116	2660	75.71	ANGL 29701	[21WHTLD313.800]	[1 ]	ROTOR ANGLE	BUS 29701	MACH 1
117	2661	75.46	ANGL 29702	[21WHTLD413.800]	[1 ]	ROTOR ANGLE	BUS 29702	MACH 1
118	4760	94.02	ANGL 90036	[GEN1 18.000]	[G1]	ROTOR ANGLE	BUS 90036	MACH G1
119	4761	94.02	ANGL 90037	[GEN2 18.000]	[G2]	ROTOR ANGLE	BUS 90037	MACH G2
120	4762	94.02	ANGL 90038	[GEN3 18.000]	[G3]	ROTOR ANGLE	BUS 90038	MACH G3
121	4759	112.0	ANGL 90039	[GEN4 22.000]	[S1]	ROTOR ANGLE	BUS 90039	MACH S1
122	163811	1.030	VOLT 25834	[08GIB1 24.000]		BUS VOLTAGE	BUS 25834	
123	163812	1.030	VOLT 25835	[08GIB2 24.000]		BUS VOLTAGE	BUS 25835	
124	163813	0.9977	VOLT 25836	[08GIB3 24.000]		BUS VOLTAGE	BUS 25836	
125	163814	1.033	VOLT 25837	[08GIB4 24.000]		BUS VOLTAGE	BUS 25837	
126	163815	1.030	VOLT 25838	[08GIB5 24.000]		BUS VOLTAGE	BUS 25838	
127	163816	1.032	VOLT 26337	[08BED G118.000]		BUS VOLTAGE	BUS 26337	
128	163817	1.035	VOLT 26338	[08BED S113.800]		BUS VOLTAGE	BUS 26338	
129	163818	1.032	VOLT 26339	[08BED G218.000]		BUS VOLTAGE	BUS 26339	
130	163819	1.035	VOLT 26340	[08BED S213.800]		BUS VOLTAGE	BUS 26340	
131	163820	1.032	VOLT 26341	[08BED G318.000]		BUS VOLTAGE	BUS 26341	

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

132	163821	1.035	VOLT 26342	[08BED S313.800]	[8 ]	E	TERMINAL	BUS 26566	MACH 8
133	163822	1.050	VOLT 27961	[16PETE 120.000]	[2 ]	E	TERMINAL	BUS 25143	MACH 2
134	163823	1.057	VOLT 27962	[16PETE 222.000]	[1 ]	E	TERMINAL	BUS 25839	MACH 1
135	163824	1.008	VOLT 27963	[16PETE 322.000]	[5 ]	E	TERMINAL	BUS 25838	MACH 5
136	163825	1.035	VOLT 27964	[16PETE 422.000]	[1 ]	E	TERMINAL	BUS 25839	MACH 1
137	163826	1.095	VOLT 29701	[21WHTLD313.800]	[4 ]	E	TERMINAL	BUS 27964	MACH 4
138	163827	1.095	VOLT 29702	[21WHTLD413.800]	[1 ]	E	TERMINAL	BUS 72869	MACH 1
139	163828	1.040	VOLT 90036	[GEN1 18.000]	[1 ]	E	TERMINAL	BUS 31332	MACH 1
140	163829	1.040	VOLT 90037	[GEN2 18.000]	[1 ]	E	TERMINAL	BUS 29711	MACH 1
141	163830	1.040	VOLT 90038	[GEN3 18.000]	[1 ]	E	TERMINAL	BUS 25847	MACH 1
142	163831	1.040	VOLT 90039	[GEN4 22.000]	[G1]	E	TERMINAL	BUS 26337	MACH G1
143	38285	1.090	ETRM 26566	[23VERML813.800]	[1 ]	E	TERMINAL	BUS 22510	MACH 1
144	38184	1.055	ETRM 25143	[07MEROM5345.00]	[A ]	E	TERMINAL	BUS 22510	MACH A
145	38206	0.9756	ETRM 25839	[08CAY1 17.000]	[2 ]	E	TERMINAL	BUS 22520	MACH 2
146	38205	1.030	ETRM 25838	[08GIB5 24.000]	[B ]	E	TERMINAL	BUS 22520	MACH B
147	38206	0.9756	ETRM 25839	[08CAY1 17.000]	[1 ]	E	TERMINAL	BUS 25861	MACH 1
148	38426	1.035	ETRM 27964	[16PETE 422.000]	[1 ]	E	TERMINAL	BUS 31994	MACH 1
149	39355	1.035	ETRM 72869	[SBRK G1 25.000]	[1 ]	E	TERMINAL	BUS 27008	MACH 1
150	40708	1.012	ETRM 31332	[NEWTON 124.000]	[3 ]	E	TERMINAL	BUS 73563	MACH 3
151	38662	1.073	ETRM 29711	[22WHTLD113.800]	[1 ]	E	TERMINAL	BUS 26892	MACH 1
152	38214	0.9873	ETRM 25847	[08GALL1 18.000]	[1 ]	E	TERMINAL	BUS 18257	MACH 1
153	38272	1.032	ETRM 26337	[08BED G118.000]	[1 ]	E	TERMINAL	BUS 27551	MACH 1
154	40617	1.024	ETRM 22510	[05ROCK1 26.000]	[1 ]	E	TERMINAL	BUS 27553	MACH 1
155	40618	1.024	ETRM 22510	[05ROCK1 26.000]	[1 ]	E	TERMINAL	BUS 26852	MACH 1
156	40625	1.023	ETRM 22520	[05ROCK2 26.000]	[1 ]	E	TERMINAL	BUS 10CUL G322.000]	
157	40626	1.023	ETRM 22520	[05ROCK2 26.000]	[1 ]	E	TERMINAL		
158	38228	1.126	ETRM 25861	[08KNOXM113.800]	[1 ]	E	TERMINAL		
159	40748	1.030	ETRM 31994	[XENIA G113.800]	[1 ]	E	TERMINAL		
160	38337	1.033	ETRM 27008	[11MIL CK345.00]	[1 ]	E	TERMINAL		
161	39359	1.035	ETRM 73563	[MILL#3 24.000]	[3 ]	E	TERMINAL		
162	38328	1.049	ETRM 26892	[10WAR G420.000]	[1 ]	E	TERMINAL		
163	37694	1.048	ETRM 18257	[F2H PARA22.500]	[1 ]	E	TERMINAL		
164	38396	1.070	ETRM 27551	[14REID 5161.00]	[1 ]	E	TERMINAL		
165	38403	1.029	ETRM 27553	[14WILSO5161.00]	[1 ]	E	TERMINAL		
166	38318	1.050	ETRM 26852	[10CUL G322.000]	[1 ]	E	TERMINAL		

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

167	38400	1.080	ETRM 27552	[14COLE 5161.00]	[1 ]	E TERMINAL	BUS 27552	MACH 1
168	38366	1.061	ETRM 27142	[11SMITH 138.00]	[1 ]	E TERMINAL	BUS 27142	MACH 1
169	38319	1.050	ETRM 26860	[10ABB G122.000]	[1 ]	E TERMINAL	BUS 26860	MACH 1
170	38327	1.024	ETRM 26885	[10NE GT12.500]	[1 ]	E TERMINAL	BUS 26885	MACH 1
171	39330	1.050	ETRM 70368	[WF WY #422.000]	[1 ]	E TERMINAL	BUS 70368	MACH 1
172	50285	2.961	EFD 26566	[23VERML813.800]	[8 ]	FIELD VLTAGE	BUS 26566	MACH 8
173	50184	2.366	EFD 25143	[07MEROM5345.00]	[2 ]	FIELD VLTAGE	BUS 25143	MACH 2
174	50206	2.671	EFD 25839	[08CAY1 17.000]	[1 ]	FIELD VLTAGE	BUS 25839	MACH 1
175	50205	2.280	EFD 25838	[08GIB5 24.000]	[5 ]	FIELD VLTAGE	BUS 25838	MACH 5
176	50206	2.671	EFD 25839	[08CAY1 17.000]	[1 ]	FIELD VLTAGE	BUS 25839	MACH 1
177	50426	2.389	EFD 27964	[16PETE 422.000]	[4 ]	FIELD VLTAGE	BUS 27964	MACH 4
178	51355	2.589	EFD 72869	[SBRK G1 25.000]	[1 ]	FIELD VLTAGE	BUS 72869	MACH 1
179	52708	2.153	EFD 31332	[NEWTON 124.000]	[1 ]	FIELD VLTAGE	BUS 31332	MACH 1
180	50662	2.912	EFD 29711	[22WHTID113.800]	[1 ]	FIELD VLTAGE	BUS 29711	MACH 1
181	50214	2.846	EFD 25847	[08GALL1 18.000]	[1 ]	FIELD VLTAGE	BUS 25847	MACH 1
182	50272	2.610	EFD 26337	[08BED G118.000]	[G1]	FIELD VLTAGE	BUS 26337	MACH G1
183	52617	2.593	EFD 22510	[05ROCK1 26.000]	[1 ]	FIELD VLTAGE	BUS 22510	MACH 1
184	52618	2.560	EFD 22510	[05ROCK1 26.000]	[A ]	FIELD VLTAGE	BUS 22510	MACH A
185	52625	2.593	EFD 22520	[05ROCK2 26.000]	[2 ]	FIELD VLTAGE	BUS 22520	MACH 2
186	52626	2.560	EFD 22520	[05ROCK2 26.000]	[B ]	FIELD VLTAGE	BUS 22520	MACH B
187	50228	3.066	EFD 25861	[08KNOXM113.800]	[1 ]	FIELD VLTAGE	BUS 25861	MACH 1
188	52748	2.053	EFD 31994	[XENIA G113.800]	[1 ]	FIELD VLTAGE	BUS 31994	MACH 1
189	50337	2.609	EFD 27008	[11MIL CK345.00]	[1 ]	FIELD VLTAGE	BUS 27008	MACH 1
190	51359	2.453	EFD 73563	[MILL#3 24.000]	[3 ]	FIELD VLTAGE	BUS 73563	MACH 3
191	50328	2.813	EFD 26892	[10WAR G420.000]	[1 ]	FIELD VLTAGE	BUS 26892	MACH 1
192	49694	2.417	EFD 18257	[F2H PARA22.500]	[1 ]	FIELD VLTAGE	BUS 18257	MACH 1
193	50396	2.218	EFD 27551	[14REID 5161.00]	[1 ]	FIELD VLTAGE	BUS 27551	MACH 1
194	50403	1.782	EFD 27553	[14WILSO5161.00]	[1 ]	FIELD VLTAGE	BUS 27553	MACH 1
195	50318	2.355	EFD 26852	[10CUL G322.000]	[1 ]	FIELD VLTAGE	BUS 26852	MACH 1
196	50400	2.258	EFD 27552	[14COLE 5161.00]	[1 ]	FIELD VLTAGE	BUS 27552	MACH 1
197	50366	2.253	EFD 27142	[11SMITH 138.00]	[1 ]	FIELD VLTAGE	BUS 27142	MACH 1
198	50319	1.992	EFD 26860	[10ABB G122.000]	[1 ]	FIELD VLTAGE	BUS 26860	MACH 1
199	50327	2.281	EFD 26885	[10NE GT12.500]	[1 ]	FIELD VLTAGE	BUS 26885	MACH 1
200	51330	2.668	EFD 70368	[WF WY #422.000]	[1 ]	FIELD VLTAGE	BUS 70368	MACH 1
201	2640	29.39	ANGL 29278	[20CPR1 13.800]	[1 ]	ROTOR ANGLE	BUS 29278	MACH 1

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

202	2641	30.97	ANGL	29279	[20CPR2	20.000]	[2 ]	ROTOR	ANGLE	BUS	29279	MACH 2
203	2642	22.42	ANGL	29288	[20DALE1	13.800]	[1 ]	ROTOR	ANGLE	BUS	29288	MACH 1
204	2643	22.48	ANGL	29290	[20DALE2	13.800]	[2 ]	ROTOR	ANGLE	BUS	29290	MACH 2
205	2644	27.47	ANGL	29291	[20DALE3	13.800]	[3 ]	ROTOR	ANGLE	BUS	29291	MACH 3
206	2645	27.41	ANGL	29292	[20DALE4	13.800]	[4 ]	ROTOR	ANGLE	BUS	29292	MACH 4
207	2646	23.33	ANGL	29382	[20JKCT1	13.800]	[1 ]	ROTOR	ANGLE	BUS	29382	MACH 1
208	2647	23.27	ANGL	29383	[20JKCT2	13.800]	[2 ]	ROTOR	ANGLE	BUS	29383	MACH 2
209	2648	23.27	ANGL	29384	[20JKCT3	13.800]	[3 ]	ROTOR	ANGLE	BUS	29384	MACH 3
210	2649	0.000	ANGL	29385	[20JKSMIT345.00]		[6A]	ROTOR	ANGLE	BUS	29385	MACH 6A
211	2650	0.000	ANGL	29385	[20JKSMIT345.00]		[6B]	ROTOR	ANGLE	BUS	29385	MACH 6B
212	2651	27.30	ANGL	29387	[20JKSMIT138.00]		[4 ]	ROTOR	ANGLE	BUS	29387	MACH 4
213	2652	27.30	ANGL	29387	[20JKSMIT138.00]		[5 ]	ROTOR	ANGLE	BUS	29387	MACH 5
214	2654	27.30	ANGL	29387	[20JKSMIT138.00]		[6 ]	ROTOR	ANGLE	BUS	29387	MACH 6
215	2653	0.000	ANGL	29387	[20JKSMIT138.00]		[6C]	ROTOR	ANGLE	BUS	29387	MACH 6C
216	2655	27.30	ANGL	29387	[20JKSMIT138.00]		[7 ]	ROTOR	ANGLE	BUS	29387	MACH 7
217	2656	0.000	ANGL	29396	[20LAURHY13.800]		[1 ]	ROTOR	ANGLE	BUS	29396	MACH 1
218	2657	22.82	ANGL	29414	[20LOVE	138.00]	[1 ]	ROTOR	ANGLE	BUS	29414	MACH 1
219	2658	47.09	ANGL	29560	[20SPLK1	22.000]	[1 ]	ROTOR	ANGLE	BUS	29560	MACH 1
220	2659	50.45	ANGL	29562	[20SPLK2	22.000]	[2 ]	ROTOR	ANGLE	BUS	29562	MACH 2
221	4634	46.62	ANGL	29564	[20SPURLK345.00]		[3 ]	ROTOR	ANGLE	BUS	29564	MACH 3
222	163832	0.9830	VOLT	29278	[20CPR1	13.800]		BUS	VOLTAGE	BUS	29278	
223	163833	0.9765	VOLT	29279	[20CPR2	20.000]		BUS	VOLTAGE	BUS	29279	
224	163834	0.9955	VOLT	29288	[20DALE1	13.800]		BUS	VOLTAGE	BUS	29288	
225	163835	0.9968	VOLT	29290	[20DALE2	13.800]		BUS	VOLTAGE	BUS	29290	
226	163836	0.9981	VOLT	29291	[20DALE3	13.800]		BUS	VOLTAGE	BUS	29291	
227	163837	1.018	VOLT	29292	[20DALE4	13.800]		BUS	VOLTAGE	BUS	29292	
228	163838	1.050	VOLT	29382	[20JKCT1	13.800]		BUS	VOLTAGE	BUS	29382	
229	163839	1.050	VOLT	29383	[20JKCT2	13.800]		BUS	VOLTAGE	BUS	29383	
230	163840	1.050	VOLT	29384	[20JKCT3	13.800]		BUS	VOLTAGE	BUS	29384	
231	163841	0.000	VOLT	29385	[20JKSMIT345.00]			BUS	VOLTAGE	BUS	29385	
232	163842	1.023	VOLT	29387	[20JKSMIT138.00]			BUS	VOLTAGE	BUS	29387	
233	163843	0.9451	VOLT	29396	[20LAURHY13.800]			BUS	VOLTAGE	BUS	29396	
234	163844	1.000	VOLT	29414	[20LOVE	138.00]		BUS	VOLTAGE	BUS	29414	
235	163845	1.009	VOLT	29560	[20SPLK1	22.000]		BUS	VOLTAGE	BUS	29560	
236	163846	1.012	VOLT	29562	[20SPLK2	22.000]		BUS	VOLTAGE	BUS	29562	

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

237	163847	1.039	VOLT	29564	[20SPURLK345.00]	[1 ]	BUS	VOLTAGE	BUS	29564	MACH	XAD	IFD	BUS	29711	MACH	1			
238	86662	2.912	IFD	29711	[22WHTLD113.800]	[1 ]	MACH	XAD	IFD	BUS	29711	MACH	XAD	IFD	BUS	29711	MACH	1		
239	86214	2.846	IFD	25847	[08GALL1 18.000]	[1 ]	MACH	XAD	IFD	BUS	25847	MACH	XAD	IFD	BUS	25847	MACH	1		
240	86272	2.610	IFD	26337	[08BED G118.000]	[G1]	MACH	XAD	IFD	BUS	26337	MACH	XAD	IFD	BUS	26337	MACH	G1		
241	88617	2.593	IFD	22510	[05ROCK1 26.000]	[1 ]	MACH	XAD	IFD	BUS	22510	MACH	XAD	IFD	BUS	22510	MACH	1		
242	88618	2.560	IFD	22510	[05ROCK1 26.000]	[A ]	MACH	XAD	IFD	BUS	22510	MACH	XAD	IFD	BUS	22510	MACH	A		
243	88625	2.593	IFD	22520	[05ROCK2 26.000]	[2 ]	MACH	XAD	IFD	BUS	22520	MACH	XAD	IFD	BUS	22520	MACH	2		
244	88626	2.560	IFD	22520	[05ROCK2 26.000]	[B ]	MACH	XAD	IFD	BUS	22520	MACH	XAD	IFD	BUS	22520	MACH	B		
245	86228	3.066	IFD	25861	[08KNOXM113.800]	[1 ]	MACH	XAD	IFD	BUS	25861	MACH	XAD	IFD	BUS	25861	MACH	1		
246	88748	2.053	IFD	31994	[XENIA G113.800]	[1 ]	MACH	XAD	IFD	BUS	31994	MACH	XAD	IFD	BUS	31994	MACH	1		
247	86337	2.609	IFD	27008	[11MIL CK345.00]	[1 ]	MACH	XAD	IFD	BUS	27008	MACH	XAD	IFD	BUS	27008	MACH	1		
248	87359	2.453	IFD	73563	[MILL#3 24.000]	[3 ]	MACH	XAD	IFD	BUS	73563	MACH	XAD	IFD	BUS	73563	MACH	3		
249	86328	2.813	IFD	26892	[10WAR G420.000]	[1 ]	MACH	XAD	IFD	BUS	26892	MACH	XAD	IFD	BUS	26892	MACH	1		
250	85694	2.417	IFD	18257	[F2H PARA22.500]	[1 ]	MACH	XAD	IFD	BUS	18257	MACH	XAD	IFD	BUS	18257	MACH	1		
251	86396	2.218	IFD	27551	[14REID 5161.00]	[1 ]	MACH	XAD	IFD	BUS	27551	MACH	XAD	IFD	BUS	27551	MACH	1		
252	86403	1.782	IFD	27553	[14WILLS05161.00]	[1 ]	MACH	XAD	IFD	BUS	27553	MACH	XAD	IFD	BUS	27553	MACH	1		
253	86318	2.355	IFD	26852	[10CUL G322.000]	[1 ]	MACH	XAD	IFD	BUS	26852	MACH	XAD	IFD	BUS	26852	MACH	1		
254	86400	2.258	IFD	27552	[14COLE 5161.00]	[1 ]	MACH	XAD	IFD	BUS	27552	MACH	XAD	IFD	BUS	27552	MACH	1		
255	86366	2.253	IFD	27142	[11SMITH 138.00]	[1 ]	MACH	XAD	IFD	BUS	27142	MACH	XAD	IFD	BUS	27142	MACH	1		
256	86319	1.992	IFD	26860	[10ABB G122.000]	[1 ]	MACH	XAD	IFD	BUS	26860	MACH	XAD	IFD	BUS	26860	MACH	1		
257	86327	2.281	IFD	26885	[10NE GT12.500]	[1 ]	MACH	XAD	IFD	BUS	26885	MACH	XAD	IFD	BUS	26885	MACH	1		
258	87330	2.668	IFD	70368	[WF WY #422.000]	[1 ]	MACH	XAD	IFD	BUS	70368	MACH	XAD	IFD	BUS	70368	MACH	1		
259	163374	1.014	VOLT	22653	[05BREED 345.00]	[1 ]	BUS	VOLTAGE	BUS	22653	BUS	VOLTAGE	BUS	22653	BUS	VOLTAGE	BUS	22653		
260	163375	0.9766	VOLT	22667	[05JEFFRS0765.00]	[1 ]	BUS	VOLTAGE	BUS	22667	BUS	VOLTAGE	BUS	22667	BUS	VOLTAGE	BUS	22667		
261	163376	1.005	VOLT	22671	[05ROCKPT765.00]	[1 ]	BUS	VOLTAGE	BUS	22671	BUS	VOLTAGE	BUS	22671	BUS	VOLTAGE	BUS	22671		
262	163377	0.9769	VOLT	22673	[05SULLVA765.00]	[1 ]	BUS	VOLTAGE	BUS	22673	BUS	VOLTAGE	BUS	22673	BUS	VOLTAGE	BUS	22673		
263	163378	1.005	VOLT	22671	[05ROCKPT765.00]	[1 ]	BUS	VOLTAGE	BUS	22671	BUS	VOLTAGE	BUS	22671	BUS	VOLTAGE	BUS	22671		
264	163379	0.9769	VOLT	22673	[05SULLVA765.00]	[1 ]	BUS	VOLTAGE	BUS	22673	BUS	VOLTAGE	BUS	22673	BUS	VOLTAGE	BUS	22673		
265	163380	0.2124	APPR	22671	TO 22673 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	22673	1
266	163381	0.2441	APPR	22671	TO 22673 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	22673	1
267	163382	0.2124	APPR	22671	TO 22673 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	22673	1
268	163383	0.2441	APPR	22671	TO 22673 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	APPARENT	IMP	22671	APPARENT	IMP	22673	1
269	163384	-0.2554	APPR	22653	TO 22534 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	22534	1
270	163385	-0.4653	APPR	22653	TO 22534 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	22534	1
271	163386	-0.2176	APPR	22653	TO 22535 CKT 1	[1 ]	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	APPARENT	IMP	22653	APPARENT	IMP	22535	1

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

272	163387	-0.3924	APPX 22653	TO 22535	CKT 1	APPARENT IMP	22653	22535	1
273	163388	-0.1174	APPR 22653	TO 27823	CKT 1	APPARENT IMP	22653	27823	1
274	163389	0.1153E-01	APPX 22653	TO 27823	CKT 1	APPARENT IMP	22653	27823	1
275	163390	0.3261	APPR 22653	TO 30309	CKT 1	APPARENT IMP	22653	30309	1
276	163391	-0.8127E-01	APPX 22653	TO 30309	CKT 1	APPARENT IMP	22671	22667	1
277	163392	0.4253E-01	APPR 22671	TO 22667	CKT 1	APPARENT IMP	22671	22667	1
278	163393	0.6721E-02	APPX 22671	TO 22667	CKT 1	APPARENT IMP	22667	22671	1
279	163394	-0.4151E-01	APPR 22667	TO 22671	CKT 1	APPARENT IMP	22667	22671	1
280	163395	-0.4257E-03	APPX 22667	TO 22671	CKT 1	APPARENT IMP	22667	22671	1
281	163396	204.9	POWR 22671	TO 22673	CKT 1	MW FLOW	22671	22673	1
282	163397	235.5	VARS 22671	TO 22673	CKT 1	MVAR FLOW	22671	22673	1
283	163398	204.9	POWR 22671	TO 22673	CKT 1	MW FLOW	22671	22673	1
284	163399	235.5	VARS 22671	TO 22673	CKT 1	MVAR FLOW	22671	22673	1
285	163400	-93.19	POWR 22653	TO 22534	CKT 1	MW FLOW	22653	22534	1
286	163401	-169.8	VARS 22653	TO 22534	CKT 1	MVAR FLOW	22653	22534	1
287	163402	-111.1	POWR 22653	TO 22535	CKT 1	MW FLOW	22653	22535	1
288	163403	-200.4	VARS 22653	TO 22535	CKT 1	MVAR FLOW	22653	22535	1
289	163404	-867.8	POWR 22653	TO 27823	CKT 1	MW FLOW	22653	27823	1
290	163405	85.24	VARS 22653	TO 27823	CKT 1	MVAR FLOW	22653	27823	1
291	163406	296.9	POWR 22653	TO 30309	CKT 1	MW FLOW	22653	30309	1
292	163407	-74.00	VARS 22653	TO 30309	CKT 1	MVAR FLOW	22653	30309	1
293	163408	2317.	POWR 22671	TO 22667	CKT 1	MW FLOW	22671	22667	1
294	163409	366.1	VARS 22671	TO 22667	CKT 1	MVAR FLOW	22671	22667	1
295	163410	2317.	POWR 22671	TO 22667	CKT 1	MW FLOW	22671	22667	1
296	163411	366.1	VARS 22671	TO 22667	CKT 1	MVAR FLOW	22671	22667	1
297	290188	0.8417	STATE 54188	CV-ROCKPT UNIT 1		STATE	54188		
298	290189	0.8417	STATE 54189	IV-ROCKPT UNIT 1		STATE	54189		
299	290195	1.204	STATE 54195	CV-ROCKPT UNIT 2		STATE	54195		
300	290196	1.204	STATE 54196	IV-ROCKPT UNIT 2		STATE	54196		
301	2148	51.56	ANGL 24951	[06KYGER 345.00]	[1 ]	ROTOR ANGLE	BUS 24951	MACH 1	
302	2149	51.45	ANGL 24951	[06KYGER 345.00]	[2 ]	ROTOR ANGLE	BUS 24951	MACH 2	
303	2150	51.45	ANGL 24951	[06KYGER 345.00]	[3 ]	ROTOR ANGLE	BUS 24951	MACH 3	
304	2151	50.65	ANGL 24951	[06KYGER 345.00]	[4 ]	ROTOR ANGLE	BUS 24951	MACH 4	
305	2152	51.05	ANGL 24951	[06KYGER 345.00]	[5 ]	ROTOR ANGLE	BUS 24951	MACH 5	
306	2153	71.20	ANGL 24951	[06KYGER 345.00]	[6 ]	ROTOR ANGLE	BUS 24951	MACH 6	



Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

307	2154	67.28	ANGL	24951	[06KYGER 345.00]	[7 ]	ROTOR ANGLE	BUS 24951	MACH 7
308	2155	67.28	ANGL	24951	[06KYGER 345.00]	[8 ]	ROTOR ANGLE	BUS 24951	MACH 8
309	2156	66.73	ANGL	24951	[06KYGER 345.00]	[9 ]	ROTOR ANGLE	BUS 24951	MACH 9
310	2157	67.01	ANGL	24951	[06KYGER 345.00]	[A ]	ROTOR ANGLE	BUS 24951	MACH A
311	2158	43.20	ANGL	24952	[06CLIFTY345.00]	[1 ]	ROTOR ANGLE	BUS 24952	MACH 1
312	2159	43.45	ANGL	24952	[06CLIFTY345.00]	[2 ]	ROTOR ANGLE	BUS 24952	MACH 2
313	2160	43.28	ANGL	24952	[06CLIFTY345.00]	[3 ]	ROTOR ANGLE	BUS 24952	MACH 3
314	2161	43.11	ANGL	24952	[06CLIFTY345.00]	[4 ]	ROTOR ANGLE	BUS 24952	MACH 4
315	2162	44.17	ANGL	24952	[06CLIFTY345.00]	[5 ]	ROTOR ANGLE	BUS 24952	MACH 5
316	2163	42.94	ANGL	24952	[06CLIFTY345.00]	[6 ]	ROTOR ANGLE	BUS 24952	MACH 6
317	2164	53.24	ANGL	24952	[06CLIFTY345.00]	[7 ]	ROTOR ANGLE	BUS 24952	MACH 7
318	2165	53.46	ANGL	24952	[06CLIFTY345.00]	[8 ]	ROTOR ANGLE	BUS 24952	MACH 8
319	2166	53.32	ANGL	24952	[06CLIFTY345.00]	[9 ]	ROTOR ANGLE	BUS 24952	MACH 9
320	2167	53.17	ANGL	24952	[06CLIFTY345.00]	[A ]	ROTOR ANGLE	BUS 24952	MACH A
321	2168	54.09	ANGL	24952	[06CLIFTY345.00]	[B ]	ROTOR ANGLE	BUS 24952	MACH B
322	2169	53.02	ANGL	24952	[06CLIFTY345.00]	[C ]	ROTOR ANGLE	BUS 24952	MACH C
323	2170	0.000	ANGL	24963	[06JACKSN345.00]	[1G]	ROTOR ANGLE	BUS 24963	MACH 1G
324	2171	0.000	ANGL	24963	[06JACKSN345.00]	[1S]	ROTOR ANGLE	BUS 24963	MACH 1S
325	2172	0.000	ANGL	24963	[06JACKSN345.00]	[2G]	ROTOR ANGLE	BUS 24963	MACH 2G
326	2173	0.000	ANGL	24963	[06JACKSN345.00]	[2S]	ROTOR ANGLE	BUS 24963	MACH 2S
327	2174	0.000	ANGL	24963	[06JACKSN345.00]	[3G]	ROTOR ANGLE	BUS 24963	MACH 3G
328	2175	0.000	ANGL	24963	[06JACKSN345.00]	[3S]	ROTOR ANGLE	BUS 24963	MACH 3S
329	163848	1.004	VOLT	24951	[06KYGER 345.00]		BUS VOLTAGE	BUS 24951	
330	163849	1.017	VOLT	24952	[06CLIFTY345.00]		BUS VOLTAGE	BUS 24952	
331	163850	1.010	VOLT	24963	[06JACKSN345.00]		BUS VOLTAGE	BUS 24963	
332	2327	39.41	ANG	26885	[1ONE GT12.500]	[1 ]	ROTOR ANGLE	BUS 26885	MACH 1
333	3330	-11.97	ANG	70368	[WF WY #422.000]	[1 ]	ROTOR ANGLE	BUS 70368	MACH 1
334	0	0.000					SYSANG VALUE		
335	0	0.000					SYSANG VALUE		
336	0	0.000					SYSANG VALUE		
337	0	0.000					SYSANG VALUE		
338	0	0.000					SYSANG VALUE		
339	0	0.000					SYSANG VALUE		
340	0	0.000					SYSANG VALUE		
341	0	0.000					SYSANG VALUE		

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

342	2186	58.74	ANGL 25391	[08SCRK M345.00]	[G1]	ROTOR ANGLE	BUS 25391	MACH G1
343	2201	82.67	ANGL 25834	[08GIB1 24.000]	[1]	ROTOR ANGLE	BUS 25834	MACH 1
344	2206	57.96	ANGL 25839	[08CAY1 17.000]	[1]	ROTOR ANGLE	BUS 25839	MACH 1
345	2207	61.08	ANGL 25840	[08CAY2 17.100]	[2]	ROTOR ANGLE	BUS 25840	MACH 2
346	2213	55.03	ANGL 25846	[08WABR6 24.000]	[6]	ROTOR ANGLE	BUS 25846	MACH 6
347	2227	54.74	ANGL 25860	[08CAYCT413.800]	[4]	ROTOR ANGLE	BUS 25860	MACH 4
348	2272	67.39	ANGL 26337	[08BED G118.000]	[G1]	ROTOR ANGLE	BUS 26337	MACH G1
349	2272	67.39	ANGL 26337	[08BED G118.000]	[G1]	ROTOR ANGLE	BUS 26337	MACH G1
350	2272	67.39	ANGL 26337	[08BED G118.000]	[G1]	ROTOR ANGLE	BUS 26337	MACH G1
351	2278	55.12	ANGL 26559	[23VERML113.800]	[1]	ROTOR ANGLE	BUS 26559	MACH 1
352	2183	70.71	ANGL 25143	[07MEROM5345.00]	[1]	ROTOR ANGLE	BUS 25143	MACH 1
353	2426	74.57	ANGL 27964	[16PETE 422.000]	[4]	ROTOR ANGLE	BUS 27964	MACH 4
354	2660	75.71	ANGL 29701	[21WHTLD313.800]	[1]	ROTOR ANGLE	BUS 29701	MACH 1
355	14186	1.667	POWR 25391	[08SCRK M345.00]	[G1]	P ELECTRICAL	BUS 25391	MACH G1
356	14201	6.500	POWR 25834	[08GIB1 24.000]	[1]	P ELECTRICAL	BUS 25834	MACH 1
357	14206	5.100	POWR 25839	[08CAY1 17.000]	[1]	P ELECTRICAL	BUS 25839	MACH 1
358	14207	5.300	POWR 25840	[08CAY2 17.100]	[2]	P ELECTRICAL	BUS 25840	MACH 2
359	14213	3.180	POWR 25846	[08WABR6 24.000]	[6]	P ELECTRICAL	BUS 25846	MACH 6
360	14227	1.060	POWR 25860	[08CAYCT413.800]	[4]	P ELECTRICAL	BUS 25860	MACH 4
361	14272	1.650	POWR 26337	[08BED G118.000]	[G1]	P ELECTRICAL	BUS 26337	MACH G1
362	14272	1.650	POWR 26337	[08BED G118.000]	[G1]	P ELECTRICAL	BUS 26337	MACH G1
363	14272	1.650	POWR 26337	[08BED G118.000]	[G1]	P ELECTRICAL	BUS 26337	MACH G1
364	14278	0.8000	POWR 26559	[23VERML113.800]	[1]	P ELECTRICAL	BUS 26559	MACH 1
365	14183	5.086	POWR 25143	[07MEROM5345.00]	[1]	P ELECTRICAL	BUS 25143	MACH 1
366	14426	5.200	POWR 27964	[16PETE 422.000]	[4]	P ELECTRICAL	BUS 27964	MACH 4
367	14660	1.340	POWR 29701	[21WHTLD313.800]	[1]	P ELECTRICAL	BUS 29701	MACH 1
368	26186	0.8333	VAR 25391	[08SCRK M345.00]	[G1]	Q ELECTRICAL	BUS 25391	MACH G1
369	26201	1.857	VAR 25834	[08GIB1 24.000]	[1]	Q ELECTRICAL	BUS 25834	MACH 1
370	26206	2.500	VAR 25839	[08CAY1 17.000]	[1]	Q ELECTRICAL	BUS 25839	MACH 1
371	26207	2.500	VAR 25840	[08CAY2 17.100]	[2]	Q ELECTRICAL	BUS 25840	MACH 2
372	26213	1.760	VAR 25846	[08WABR6 24.000]	[6]	Q ELECTRICAL	BUS 25846	MACH 6
373	26227	0.5000	VAR 25860	[08CAYCT413.800]	[4]	Q ELECTRICAL	BUS 25860	MACH 4
374	26272	0.9000	VAR 26337	[08BED G118.000]	[G1]	Q ELECTRICAL	BUS 26337	MACH G1
375	26272	0.9000	VAR 26337	[08BED G118.000]	[G1]	Q ELECTRICAL	BUS 26337	MACH G1
376	26272	0.9000	VAR 26337	[08BED G118.000]	[G1]	Q ELECTRICAL	BUS 26337	MACH G1

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

377	26278	0.5000	VARS 26559	[23VERML113.800]	[1 ]	Q ELECTRICAL	BUS 26559	MACH 1
378	26183	1.103	VARS 25143	[07MEROM5345.00]	[1 ]	Q ELECTRICAL	BUS 25143	MACH 1
379	26426	2.440	VARS 27964	[16PETE 422.000]	[4 ]	Q ELECTRICAL	BUS 27964	MACH 4
380	26660	0.6500	VARS 29701	[21WHTLD313.800]	[1 ]	Q ELECTRICAL	BUS 29701	MACH 1
381	50186	2.745	EFD 25391	[08SCRK M345.00]	[G1]	FIELD VLTAGE	BUS 25391	MACH G1
382	50201	2.361	EFD 25834	[08GIB1 24.000]	[1 ]	FIELD VLTAGE	BUS 25834	MACH 1
383	50206	2.671	EFD 25839	[08CAY1 17.000]	[1 ]	FIELD VLTAGE	BUS 25839	MACH 1
384	50207	2.726	EFD 25840	[08CAY2 17.100]	[2 ]	FIELD VLTAGE	BUS 25840	MACH 2
385	50213	2.599	EFD 25846	[08WABR6 24.000]	[6 ]	FIELD VLTAGE	BUS 25846	MACH 6
386	50227	2.751	EFD 25860	[08CAYCT413.800]	[4 ]	FIELD VLTAGE	BUS 25860	MACH 4
387	50272	2.610	EFD 26337	[08BED G118.000]	[G1]	FIELD VLTAGE	BUS 26337	MACH G1
388	50272	2.610	EFD 26337	[08BED G118.000]	[G1]	FIELD VLTAGE	BUS 26337	MACH G1
389	50272	2.610	EFD 26337	[08BED G118.000]	[G1]	FIELD VLTAGE	BUS 26337	MACH G1
390	50278	2.961	EFD 26559	[23VERML113.800]	[1 ]	FIELD VLTAGE	BUS 26559	MACH 1
391	50183	2.411	EFD 25143	[07MEROM5345.00]	[1 ]	FIELD VLTAGE	BUS 25143	MACH 1
392	50426	2.389	EFD 27964	[16PETE 422.000]	[4 ]	FIELD VLTAGE	BUS 27964	MACH 4
393	50660	2.954	EFD 29701	[21WHTLD313.800]	[1 ]	FIELD VLTAGE	BUS 29701	MACH 1
394	62186	0.6975	PMEC 25391	[08SCRK M345.00]	[G1]	P MECHANICAL	BUS 25391	MACH G1
395	62201	0.8760	PMEC 25834	[08GIB1 24.000]	[1 ]	P MECHANICAL	BUS 25834	MACH 1
396	62206	0.8644	PMEC 25839	[08CAY1 17.000]	[1 ]	P MECHANICAL	BUS 25839	MACH 1
397	62207	0.8983	PMEC 25840	[08CAY2 17.100]	[2 ]	P MECHANICAL	BUS 25840	MACH 2
398	62213	0.7395	PMEC 25846	[08WABR6 24.000]	[6 ]	P MECHANICAL	BUS 25846	MACH 6
399	62227	0.8480	PMEC 25860	[08CAYCT413.800]	[4 ]	P MECHANICAL	BUS 25860	MACH 4
400	62272	0.7562	PMEC 26337	[08BED G118.000]	[G1]	P MECHANICAL	BUS 26337	MACH G1
401	2396	-13.75	ANGL 27551	[14REID 5161.00]	[1 ]	ROTOR ANGLE	BUS 27551	MACH 1
402	2397	-13.61	ANGL 27551	[14REID 5161.00]	[2 ]	ROTOR ANGLE	BUS 27551	MACH 2
403	2398	-13.78	ANGL 27551	[14REID 5161.00]	[3 ]	ROTOR ANGLE	BUS 27551	MACH 3
404	2399	-12.49	ANGL 27551	[14REID 5161.00]	[4 ]	ROTOR ANGLE	BUS 27551	MACH 4
405	2400	19.94	ANGL 27552	[14COLE 5161.00]	[1 ]	ROTOR ANGLE	BUS 27552	MACH 1
406	2401	24.14	ANGL 27552	[14COLE 5161.00]	[2 ]	ROTOR ANGLE	BUS 27552	MACH 2
407	2402	25.30	ANGL 27552	[14COLE 5161.00]	[3 ]	ROTOR ANGLE	BUS 27552	MACH 3
408	2403	47.62	ANGL 27553	[14WILSO5161.00]	[1 ]	ROTOR ANGLE	BUS 27553	MACH 1
409	2404	0.000	ANGL 27554	[14REID 69.000]	[5 ]	ROTOR ANGLE	BUS 27554	MACH 5
410	4764	64.25	ANGL 27601	[THRBRED 27.000]	[1 ]	ROTOR ANGLE	BUS 27601	MACH 1
411	163851	1.029	VOLT 27551	[14REID 5161.00]	[1 ]	BUS VOLTAGE	BUS 27551	

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

412	163852	1.028	VOLT 27552	[14COLE 5161.00]	[1 ]	BUS VOLTAGE	BUS 27552	
413	163853	1.028	VOLT 27553	[14WILSO5161.00]	[1 ]	BUS VOLTAGE	BUS 27553	
414	163854	1.009	VOLT 27554	[14REID 69.000]	[1 ]	BUS VOLTAGE	BUS 27554	
415	163855	1.000	VOLT 27601	[THRBRED 27.000]	[1 ]	BUS VOLTAGE	BUS 27601	
416	74278	0.000	SPD 26559	[23VERML113.800]	[1 ]	SPD DEVIAT'N	BUS 26559	MACH 1
417	74183	0.000	SPD 25143	[07MEROM5345.00]	[1 ]	SPD DEVIAT'N	BUS 25143	MACH 1
418	74426	0.000	SPD 27964	[16PETE 422.000]	[4 ]	SPD DEVIAT'N	BUS 27964	MACH 4
419	74660	0.000	SPD 29701	[21WHTLD313.800]	[1 ]	SPD DEVIAT'N	BUS 29701	MACH 1
420	163412	1.034	VOLT 25391	[08SCRK M345.00]		BUS VOLTAGE	BUS 25391	
421	163413	1.034	VOLT 25391	[08SCRK M345.00]		BUS VOLTAGE	BUS 25391	
422	163414	1.030	VOLT 25834	[08GIB1 24.000]		BUS VOLTAGE	BUS 25834	
423	163415	0.9756	VOLT 25839	[08CAY1 17.000]		BUS VOLTAGE	BUS 25839	
424	163416	0.9871	VOLT 25840	[08CAY2 17.100]		BUS VOLTAGE	BUS 25840	
425	163417	1.034	VOLT 25846	[08WABR6 24.000]		BUS VOLTAGE	BUS 25846	
426	163418	1.039	VOLT 25860	[08CAYCT413.800]		BUS VOLTAGE	BUS 25860	
427	163419	1.126	VOLT 25869	[08KNOX 1999.00]		BUS VOLTAGE	BUS 25869	
428	163420	1.032	VOLT 26337	[08BED G118.000]		BUS VOLTAGE	BUS 26337	
429	163421	1.032	VOLT 26337	[08BED G118.000]		BUS VOLTAGE	BUS 26337	
430	163422	1.032	VOLT 26337	[08BED G118.000]		BUS VOLTAGE	BUS 26337	
431	163423	1.032	VOLT 26337	[08BED G118.000]		BUS VOLTAGE	BUS 26337	
432	163424	1.090	VOLT 26559	[23VERML113.800]		BUS VOLTAGE	BUS 26559	
433	163425	1.005	VOLT 22671	[05ROCKPT765.00]		BUS VOLTAGE	BUS 22671	
434	163426	1.005	VOLT 22671	[05ROCKPT765.00]		BUS VOLTAGE	BUS 22671	
435	163427	1.038	VOLT 25143	[07MEROM5345.00]		BUS VOLTAGE	BUS 25143	
436	163428	1.035	VOLT 27964	[16PETE 422.000]		BUS VOLTAGE	BUS 27964	
437	163429	1.095	VOLT 29701	[21WHTLD313.800]		BUS VOLTAGE	BUS 29701	
438	2334	47.36	ANGL 27005	[11GHENT 345.00]	[2 ]	ROTOR ANGLE	BUS 27005	MACH 2
439	2335	47.68	ANGL 27005	[11GHENT 345.00]	[3 ]	ROTOR ANGLE	BUS 27005	MACH 3
440	2336	47.34	ANGL 27005	[11GHENT 345.00]	[4 ]	ROTOR ANGLE	BUS 27005	MACH 4
441	2337	47.29	ANGL 27008	[11MIL CK345.00]	[1 ]	ROTOR ANGLE	BUS 27008	MACH 1
442	2338	46.45	ANGL 27008	[11MIL CK345.00]	[2 ]	ROTOR ANGLE	BUS 27008	MACH 2
443	2339	47.62	ANGL 27008	[11MIL CK345.00]	[3 ]	ROTOR ANGLE	BUS 27008	MACH 3
444	2340	49.41	ANGL 27008	[11MIL CK345.00]	[4 ]	ROTOR ANGLE	BUS 27008	MACH 4
445	2341	66.09	ANGL 27013	[11TRIMBL345.00]	[1 ]	ROTOR ANGLE	BUS 27013	MACH 1
446	2347	68.22	ANGL 27013	[11TRIMBL345.00]	[10]	ROTOR ANGLE	BUS 27013	MACH 10

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

447	2342	68.22	ANGL 27013	[11TRIMBL345.00]	[5 ]	ROTOR ANGLE	BUS 27013	MACH 5
448	2343	68.22	ANGL 27013	[11TRIMBL345.00]	[6 ]	ROTOR ANGLE	BUS 27013	MACH 6
449	2344	68.22	ANGL 27013	[11TRIMBL345.00]	[7 ]	ROTOR ANGLE	BUS 27013	MACH 7
450	2345	68.22	ANGL 27013	[11TRIMBL345.00]	[8 ]	ROTOR ANGLE	BUS 27013	MACH 8
451	2346	68.22	ANGL 27013	[11TRIMBL345.00]	[9 ]	ROTOR ANGLE	BUS 27013	MACH 9
452	2348	0.000	ANGL 27063	[11BRWNCT138.00]	[10]	ROTOR ANGLE	BUS 27063	MACH 10
453	2349	0.000	ANGL 27063	[11BRWNCT138.00]	[11]	ROTOR ANGLE	BUS 27063	MACH 11
454	2350	0.000	ANGL 27063	[11BRWNCT138.00]	[5 ]	ROTOR ANGLE	BUS 27063	MACH 5
455	2351	0.000	ANGL 27063	[11BRWNCT138.00]	[6 ]	ROTOR ANGLE	BUS 27063	MACH 6
456	2352	0.000	ANGL 27063	[11BRWNCT138.00]	[7 ]	ROTOR ANGLE	BUS 27063	MACH 7
457	2353	0.000	ANGL 27063	[11BRWNCT138.00]	[8 ]	ROTOR ANGLE	BUS 27063	MACH 8
458	2354	0.000	ANGL 27063	[11BRWNCT138.00]	[9 ]	ROTOR ANGLE	BUS 27063	MACH 9
459	2355	32.66	ANGL 27064	[11BRWN N138.00]	[3 ]	ROTOR ANGLE	BUS 27064	MACH 3
460	2356	22.99	ANGL 27065	[11BRWN P138.00]	[1 ]	ROTOR ANGLE	BUS 27065	MACH 1
461	2357	26.19	ANGL 27065	[11BRWN P138.00]	[2 ]	ROTOR ANGLE	BUS 27065	MACH 2
462	2358	0.000	ANGL 27071	[11CNE RN138.00]	[11]	ROTOR ANGLE	BUS 27071	MACH 11
463	2359	44.26	ANGL 27071	[11CNE RN138.00]	[4 ]	ROTOR ANGLE	BUS 27071	MACH 4
464	2360	35.88	ANGL 27071	[11CNE RN138.00]	[5 ]	ROTOR ANGLE	BUS 27071	MACH 5
465	2361	45.83	ANGL 27072	[11CN RN6138.00]	[6 ]	ROTOR ANGLE	BUS 27072	MACH 6
466	2362	36.97	ANGL 27092	[11GHENT 138.00]	[1 ]	ROTOR ANGLE	BUS 27092	MACH 1
467	2363	34.94	ANGL 27095	[11GR RVR138.00]	[3 ]	ROTOR ANGLE	BUS 27095	MACH 3
468	2364	32.26	ANGL 27095	[11GR RVR138.00]	[4 ]	ROTOR ANGLE	BUS 27095	MACH 4
469	2365	46.54	ANGL 27130	[11PADDYR138.00]	[13]	ROTOR ANGLE	BUS 27130	MACH 13
470	2366	35.08	ANGL 27142	[11SMITH 138.00]	[1 ]	ROTOR ANGLE	BUS 27142	MACH 1
471	2367	33.80	ANGL 27142	[11SMITH 138.00]	[2 ]	ROTOR ANGLE	BUS 27142	MACH 2
472	2368	0.000	ANGL 27154	[11WATRS138.00]	[7 ]	ROTOR ANGLE	BUS 27154	MACH 7
473	2369	0.000	ANGL 27154	[11WATRS138.00]	[8 ]	ROTOR ANGLE	BUS 27154	MACH 8
474	2370	23.44	ANGL 27180	[11CANAL 69.000]	[1 ]	ROTOR ANGLE	BUS 27180	MACH 1
475	2371	23.44	ANGL 27180	[11CANAL 69.000]	[2 ]	ROTOR ANGLE	BUS 27180	MACH 2
476	2372	23.44	ANGL 27180	[11CANAL 69.000]	[3 ]	ROTOR ANGLE	BUS 27180	MACH 3
477	2373	23.44	ANGL 27180	[11CANAL 69.000]	[4 ]	ROTOR ANGLE	BUS 27180	MACH 4
478	2374	23.44	ANGL 27180	[11CANAL 69.000]	[5 ]	ROTOR ANGLE	BUS 27180	MACH 5
479	2375	23.44	ANGL 27180	[11CANAL 69.000]	[6 ]	ROTOR ANGLE	BUS 27180	MACH 6
480	2376	20.20	ANGL 27180	[11CANAL 69.000]	[7 ]	ROTOR ANGLE	BUS 27180	MACH 7
481	2377	20.20	ANGL 27180	[11CANAL 69.000]	[8 ]	ROTOR ANGLE	BUS 27180	MACH 8

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

482	2378	0.000	ANGL	27195	[11DIXDAM69.000]	[1 ]	ROTOR	ANGLE	BUS	27195	MACH 1
483	2379	0.000	ANGL	27195	[11DIXDAM69.000]	[2 ]	ROTOR	ANGLE	BUS	27195	MACH 2
484	2380	0.000	ANGL	27195	[11DIXDAM69.000]	[3 ]	ROTOR	ANGLE	BUS	27195	MACH 3
485	2381	28.46	ANGL	27216	[11GR RVR69.000]	[1 ]	ROTOR	ANGLE	BUS	27216	MACH 1
486	2382	29.06	ANGL	27216	[11GR RVR69.000]	[2 ]	ROTOR	ANGLE	BUS	27216	MACH 2
487	2383	0.000	ANGL	27220	[11HAEFLN69.000]	[1 ]	ROTOR	ANGLE	BUS	27220	MACH 1
488	2384	0.000	ANGL	27220	[11HAEFLN69.000]	[2 ]	ROTOR	ANGLE	BUS	27220	MACH 2
489	2385	0.000	ANGL	27220	[11HAEFLN69.000]	[3 ]	ROTOR	ANGLE	BUS	27220	MACH 3
490	2386	0.000	ANGL	27227	[11HLCRST69.000]	[1 ]	ROTOR	ANGLE	BUS	27227	MACH 1
491	2387	8.462	ANGL	27235	[11KU PK 69.000]	[3 ]	ROTOR	ANGLE	BUS	27235	MACH 3
492	2388	0.000	ANGL	27289	[11TYRONE69.000]	[1 ]	ROTOR	ANGLE	BUS	27289	MACH 1
493	2389	0.000	ANGL	27289	[11TYRONE69.000]	[2 ]	ROTOR	ANGLE	BUS	27289	MACH 2
494	2390	25.44	ANGL	27289	[11TYRONE69.000]	[3 ]	ROTOR	ANGLE	BUS	27289	MACH 3
495	2391	0.000	ANGL	27313	[11PRUN2A14.000]	[1 ]	ROTOR	ANGLE	BUS	27313	MACH 1
496	2392	0.000	ANGL	27314	[11PRUN2B14.000]	[2 ]	ROTOR	ANGLE	BUS	27314	MACH 2
497	2393	54.91	ANGL	27338	[11BUCKNR345.00]	[1 ]	ROTOR	ANGLE	BUS	27338	MACH 1
498	2394	54.92	ANGL	27338	[11BUCKNR345.00]	[2 ]	ROTOR	ANGLE	BUS	27338	MACH 2
499	2395	54.92	ANGL	27338	[11BUCKNR345.00]	[3 ]	ROTOR	ANGLE	BUS	27338	MACH 3
500	163430	1.029	VOLT	27005	[11GHENT 345.00]		BUS	VOLTAGE	BUS	27005	
501	163431	1.015	VOLT	27008	[11MIL CK345.00]		BUS	VOLTAGE	BUS	27008	
502	163432	1.020	VOLT	27013	[11TRIMBL345.00]		BUS	VOLTAGE	BUS	27013	
503	163433	0.9694	VOLT	27063	[11BRWNCT138.00]		BUS	VOLTAGE	BUS	27063	
504	163434	0.9695	VOLT	27064	[11BRWN N138.00]		BUS	VOLTAGE	BUS	27064	
505	163435	0.9696	VOLT	27065	[11BRWN P138.00]		BUS	VOLTAGE	BUS	27065	
506	163436	1.006	VOLT	27071	[11CNE RN138.00]		BUS	VOLTAGE	BUS	27071	
507	163437	1.015	VOLT	27072	[11CN RN6138.00]		BUS	VOLTAGE	BUS	27072	
508	163438	1.029	VOLT	27092	[11GHENT 138.00]		BUS	VOLTAGE	BUS	27092	
509	163439	1.029	VOLT	27095	[11GR RVR138.00]		BUS	VOLTAGE	BUS	27095	
510	163440	1.000	VOLT	27130	[11PADDYR138.00]		BUS	VOLTAGE	BUS	27130	
511	163441	1.029	VOLT	27142	[11SMITH 138.00]		BUS	VOLTAGE	BUS	27142	
512	163442	0.9748	VOLT	27154	[11WATRS138.00]		BUS	VOLTAGE	BUS	27154	
513	163443	0.9790	VOLT	27180	[11CANAL 69.000]		BUS	VOLTAGE	BUS	27180	
514	163444	0.9681	VOLT	27195	[11DIXDAM69.000]		BUS	VOLTAGE	BUS	27195	
515	163445	1.029	VOLT	27216	[11GR RVR69.000]		BUS	VOLTAGE	BUS	27216	
516	163446	0.9188	VOLT	27220	[11HAEFLN69.000]		BUS	VOLTAGE	BUS	27220	

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

517	163447	0.9689	VOLT 27227	[11HLCRST69.000]	[1 ]	BUS VOLTAGE	BUS 27227	MACH 1
518	163448	0.9815	VOLT 27235	[11KU PK 69.000]	[1 ]	BUS VOLTAGE	BUS 27235	MACH 1
519	163449	0.9510	VOLT 27289	[11TYRONE69.000]	[1 ]	BUS VOLTAGE	BUS 27289	MACH 1
520	163450	0.9912	VOLT 27313	[11PRUN2A14.000]	[1 ]	BUS VOLTAGE	BUS 27313	MACH 1
521	163451	1.005	VOLT 27314	[11PRUN2B14.000]	[1 ]	BUS VOLTAGE	BUS 27314	MACH 1
522	163452	1.020	VOLT 27338	[11BUCKNR345.00]	[1 ]	BUS VOLTAGE	BUS 27338	MACH 1
523	2318	51.45	ANGL 26852	[10CUL G322.000]	[1 ]	ROTOR ANGLE	BUS 26852	MACH 1
524	2319	40.72	ANGL 26860	[10ABB G122.000]	[1 ]	ROTOR ANGLE	BUS 26860	MACH 1
525	2320	50.00	ANGL 26862	[10ABB G222.000]	[1 ]	ROTOR ANGLE	BUS 26862	MACH 1
526	2321	47.21	ANGL 26863	[10AB GT113.800]	[1 ]	ROTOR ANGLE	BUS 26863	MACH 1
527	2322	44.89	ANGL 26864	[10BG GT113.800]	[1 ]	ROTOR ANGLE	BUS 26864	MACH 1
528	2323	38.48	ANGL 26865	[10BG GT213.800]	[1 ]	ROTOR ANGLE	BUS 26865	MACH 1
529	2324	37.70	ANGL 26870	[10CUL G114.400]	[1 ]	ROTOR ANGLE	BUS 26870	MACH 1
530	2325	33.87	ANGL 26872	[10CUL G214.400]	[1 ]	ROTOR ANGLE	BUS 26872	MACH 1
531	2326	0.000	ANGL 26882	[10JSP G169.000]	[1 ]	ROTOR ANGLE	BUS 26882	MACH 1
532	2327	39.41	ANGL 26885	[10NE GT12.500]	[1 ]	ROTOR ANGLE	BUS 26885	MACH 1
533	2328	39.65	ANGL 26892	[10WAR G420.000]	[1 ]	ROTOR ANGLE	BUS 26892	MACH 1
534	2329	45.67	ANGL 26894	[10WAR G115.000]	[1 ]	ROTOR ANGLE	BUS 26894	MACH 1
535	2330	45.67	ANGL 26895	[10WAR G215.000]	[1 ]	ROTOR ANGLE	BUS 26895	MACH 1
536	2331	45.67	ANGL 26896	[10WAR G315.000]	[1 ]	ROTOR ANGLE	BUS 26896	MACH 1
537	2332	48.48	ANGL 26897	[10AB GT213.800]	[1 ]	ROTOR ANGLE	BUS 26897	MACH 1
538	2333	0.000	ANGL 26898	[10GE G1 13.800]	[1 ]	ROTOR ANGLE	BUS 26898	MACH 1
539	163453	1.050	VOLT 26852	[10CUL G322.000]		BUS VOLTAGE	BUS 26852	
540	163454	1.050	VOLT 26860	[10ABB G122.000]		BUS VOLTAGE	BUS 26860	
541	163455	1.050	VOLT 26862	[10ABB G222.000]		BUS VOLTAGE	BUS 26862	
542	163456	1.029	VOLT 26863	[10AB GT113.800]		BUS VOLTAGE	BUS 26863	
543	163457	1.024	VOLT 26864	[10BG GT113.800]		BUS VOLTAGE	BUS 26864	
544	163458	1.024	VOLT 26865	[10BG GT213.800]		BUS VOLTAGE	BUS 26865	
545	163459	0.9727	VOLT 26870	[10CUL G114.400]		BUS VOLTAGE	BUS 26870	
546	163460	0.9801	VOLT 26872	[10CUL G214.400]		BUS VOLTAGE	BUS 26872	
547	163461	0.9712	VOLT 26882	[10JSP G169.000]		BUS VOLTAGE	BUS 26882	
548	163462	1.024	VOLT 26885	[10NE GT12.500]		BUS VOLTAGE	BUS 26885	
549	163463	1.049	VOLT 26892	[10WAR G420.000]		BUS VOLTAGE	BUS 26892	
550	163464	1.050	VOLT 26894	[10WAR G115.000]		BUS VOLTAGE	BUS 26894	
551	163465	1.050	VOLT 26895	[10WAR G215.000]		BUS VOLTAGE	BUS 26895	

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

552	163466	1.050	VOLT 26896	[10WAR G315.000]	[1 ]	BUS VOLTAGE	BUS 26896
553	163467	1.029	VOLT 26897	[10AB GT213.800]	[2 ]	BUS VOLTAGE	BUS 26897
554	163468	1.015	VOLT 26898	[10GE G1 13.800]	[3 ]	BUS VOLTAGE	BUS 26898
555	2717	58.72	ANGL 33385	[1MRNG1 13.800]	[1 ]	ROTOR ANGLE	BUS 33385 MACH 1
556	2718	58.72	ANGL 33386	[1MRNG2 13.800]	[2 ]	ROTOR ANGLE	BUS 33386 MACH 2
557	2719	58.72	ANGL 33387	[1MRNG3 13.800]	[3 ]	ROTOR ANGLE	BUS 33387 MACH 3
558	2720	28.82	ANGL 33388	[1MRNG4 20.000]	[4 ]	ROTOR ANGLE	BUS 33388 MACH 4
559	2721	56.17	ANGL 33389	[1MRNG5 13.800]	[5 ]	ROTOR ANGLE	BUS 33389 MACH 5
560	2722	56.17	ANGL 33389	[1MRNG5 13.800]	[6 ]	ROTOR ANGLE	BUS 33389 MACH 6
561	2723	56.17	ANGL 33389	[1MRNG5 13.800]	[7 ]	ROTOR ANGLE	BUS 33389 MACH 7
562	163469	1.026	VOLT 33385	[1MRNG1 13.800]		BUS VOLTAGE	BUS 33385
563	163470	1.026	VOLT 33386	[1MRNG2 13.800]		BUS VOLTAGE	BUS 33386
564	163471	1.026	VOLT 33387	[1MRNG3 13.800]		BUS VOLTAGE	BUS 33387
565	163472	1.050	VOLT 33388	[1MRNG4 20.000]		BUS VOLTAGE	BUS 33388
566	163473	1.043	VOLT 33389	[1MRNG5 13.800]		BUS VOLTAGE	BUS 33389
567	2423	74.26	ANGL 27961	[16PETE 120.000]	[1 ]	ROTOR ANGLE	BUS 27961 MACH 1
568	2424	68.28	ANGL 27962	[16PETE 222.000]	[2 ]	ROTOR ANGLE	BUS 27962 MACH 2
569	2425	74.53	ANGL 27963	[16PETE 322.000]	[3 ]	ROTOR ANGLE	BUS 27963 MACH 3
570	2426	74.57	ANGL 27964	[16PETE 422.000]	[4 ]	ROTOR ANGLE	BUS 27964 MACH 4
571	2427	55.93	ANGL 27965	[16GEORG113.800]	[1G]	ROTOR ANGLE	BUS 27965 MACH 1G
572	2428	51.68	ANGL 27966	[16GEORG213.800]	[2G]	ROTOR ANGLE	BUS 27966 MACH 2G
573	2429	51.68	ANGL 27967	[16GEORG313.800]	[3G]	ROTOR ANGLE	BUS 27967 MACH 3G
574	2430	55.97	ANGL 27968	[16GEORG413.800]	[4G]	ROTOR ANGLE	BUS 27968 MACH 4G
575	2431	39.52	ANGL 27971	[16PRITC113.800]	[1 ]	ROTOR ANGLE	BUS 27971 MACH 1
576	2432	39.50	ANGL 27972	[16PRITC213.800]	[2 ]	ROTOR ANGLE	BUS 27972 MACH 2
577	2433	40.60	ANGL 27973	[16PRITC313.800]	[3 ]	ROTOR ANGLE	BUS 27973 MACH 3
578	2434	38.77	ANGL 27974	[16PRITC413.800]	[4 ]	ROTOR ANGLE	BUS 27974 MACH 4
579	2435	40.54	ANGL 27975	[16PRITC513.800]	[5 ]	ROTOR ANGLE	BUS 27975 MACH 5
580	2436	45.66	ANGL 27976	[16PRITC613.800]	[6 ]	ROTOR ANGLE	BUS 27976 MACH 6
581	2437	55.74	ANGL 27981	[16STOCT413.800]	[4G]	ROTOR ANGLE	BUS 27981 MACH 4G
582	2438	58.35	ANGL 27982	[16STOCT513.800]	[5G]	ROTOR ANGLE	BUS 27982 MACH 5G
583	2439	32.86	ANGL 27983	[16STOCT313.800]	[3 ]	ROTOR ANGLE	BUS 27983 MACH 3
584	2440	33.12	ANGL 27984	[16STOCT413.800]	[4 ]	ROTOR ANGLE	BUS 27984 MACH 4
585	2441	41.43	ANGL 27985	[16STOCT513.800]	[5 ]	ROTOR ANGLE	BUS 27985 MACH 5
586	2442	38.71	ANGL 27986	[16STOCT613.800]	[6 ]	ROTOR ANGLE	BUS 27986 MACH 6



Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

587	2443	38.97	ANGL	27987	[16STOUT722.000]	[7 ]	ROTOR	ANGLE	BUS	27987	MACH	7
588	2444	41.63	ANGL	27988	[16STOUGHT13.800]	[1G]	ROTOR	ANGLE	BUS	27988	MACH	1G
589	2445	41.63	ANGL	27988	[16STOUGHT13.800]	[2G]	ROTOR	ANGLE	BUS	27988	MACH	2G
590	2446	41.63	ANGL	27988	[16STOUGHT13.800]	[3G]	ROTOR	ANGLE	BUS	27988	MACH	3G
591	2447	46.44	ANGL	27988	[16STOUGHT13.800]	[6G]	ROTOR	ANGLE	BUS	27988	MACH	6G
592	163474	1.050	VOLT	27961	[16PETE 120.000]		BUS	VOLTAGE	BUS	27961		
593	163475	1.057	VOLT	27962	[16PETE 222.000]		BUS	VOLTAGE	BUS	27962		
594	163476	1.008	VOLT	27963	[16PETE 322.000]		BUS	VOLTAGE	BUS	27963		
595	163477	1.035	VOLT	27964	[16PETE 422.000]		BUS	VOLTAGE	BUS	27964		
596	163478	0.8981	VOLT	27965	[16GEORG113.800]		BUS	VOLTAGE	BUS	27965		
597	163479	0.8988	VOLT	27966	[16GEORG213.800]		BUS	VOLTAGE	BUS	27966		
598	163480	0.8989	VOLT	27967	[16GEORG313.800]		BUS	VOLTAGE	BUS	27967		
599	163481	0.8982	VOLT	27968	[16GEORG413.800]		BUS	VOLTAGE	BUS	27968		
600	163482	0.9719	VOLT	27971	[16PRITC113.800]		BUS	VOLTAGE	BUS	27971		
601	163483	0.9721	VOLT	27972	[16PRITC213.800]		BUS	VOLTAGE	BUS	27972		
602	163484	0.9723	VOLT	27973	[16PRITC313.800]		BUS	VOLTAGE	BUS	27973		
603	163485	0.9644	VOLT	27974	[16PRITC413.800]		BUS	VOLTAGE	BUS	27974		
604	163486	0.9635	VOLT	27975	[16PRITC513.800]		BUS	VOLTAGE	BUS	27975		
605	163487	0.9603	VOLT	27976	[16PRITC613.800]		BUS	VOLTAGE	BUS	27976		
606	163488	0.9319	VOLT	27981	[16STOCT413.800]		BUS	VOLTAGE	BUS	27981		
607	163489	0.9368	VOLT	27982	[16STOCT513.800]		BUS	VOLTAGE	BUS	27982		
608	163490	0.9527	VOLT	27983	[16STOCT313.800]		BUS	VOLTAGE	BUS	27983		
609	163491	0.9525	VOLT	27984	[16STOCT413.800]		BUS	VOLTAGE	BUS	27984		
610	163492	0.9686	VOLT	27985	[16STOCT513.800]		BUS	VOLTAGE	BUS	27985		
611	163493	0.9683	VOLT	27986	[16STOCT613.800]		BUS	VOLTAGE	BUS	27986		
612	163494	1.000	VOLT	27987	[16STOCT722.000]		BUS	VOLTAGE	BUS	27987		
613	163495	1.012	VOLT	27988	[16STOUGHT13.800]		BUS	VOLTAGE	BUS	27988		
614	163496	1.020	VOLT	27989	[16STOCT613.800]		BUS	VOLTAGE	BUS	27989		
615	2640	29.39	ANGL	29278	[20CPR1 13.800]	[1 ]	ROTOR	ANGLE	BUS	29278	MACH	1
616	2641	30.97	ANGL	29279	[20CPR2 20.000]	[2 ]	ROTOR	ANGLE	BUS	29279	MACH	2
617	2642	22.42	ANGL	29288	[20DALE1 13.800]	[1 ]	ROTOR	ANGLE	BUS	29288	MACH	1
618	2643	22.48	ANGL	29290	[20DALE2 13.800]	[2 ]	ROTOR	ANGLE	BUS	29290	MACH	2
619	2644	27.47	ANGL	29291	[20DALE3 13.800]	[3 ]	ROTOR	ANGLE	BUS	29291	MACH	3
620	2645	27.41	ANGL	29292	[20DALE4 13.800]	[4 ]	ROTOR	ANGLE	BUS	29292	MACH	4
621	2646	23.33	ANGL	29382	[20JKCT1 13.800]	[1 ]	ROTOR	ANGLE	BUS	29382	MACH	1

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

622	2647	23.27	ANGL	29383	[20JKCT2 13.800]	[2 ]	ROTOR ANGLE	BUS 29383	MACH 2
623	2648	23.27	ANGL	29384	[20JKCT3 13.800]	[3 ]	ROTOR ANGLE	BUS 29384	MACH 3
624	2649	0.000	ANGL	29385	[20JKSMIT345.00]	[6A]	ROTOR ANGLE	BUS 29385	MACH 6A
625	2650	0.000	ANGL	29385	[20JKSMIT345.00]	[6B]	ROTOR ANGLE	BUS 29385	MACH 6B
626	2651	27.30	ANGL	29387	[20JKSMIT138.00]	[4 ]	ROTOR ANGLE	BUS 29387	MACH 4
627	2652	27.30	ANGL	29387	[20JKSMIT138.00]	[5 ]	ROTOR ANGLE	BUS 29387	MACH 5
628	2654	27.30	ANGL	29387	[20JKSMIT138.00]	[6 ]	ROTOR ANGLE	BUS 29387	MACH 6
629	2653	0.000	ANGL	29387	[20JKSMIT138.00]	[6C]	ROTOR ANGLE	BUS 29387	MACH 6C
630	2655	27.30	ANGL	29387	[20JKSMIT138.00]	[7 ]	ROTOR ANGLE	BUS 29387	MACH 7
631	2656	0.000	ANGL	29396	[20LAURHY13.800]	[1 ]	ROTOR ANGLE	BUS 29396	MACH 1
632	2657	22.82	ANGL	29414	[20LOVE 138.00]	[1 ]	ROTOR ANGLE	BUS 29414	MACH 1
633	2658	47.09	ANGL	29560	[20SPLK1 22.000]	[1 ]	ROTOR ANGLE	BUS 29560	MACH 1
634	2659	50.45	ANGL	29562	[20SPLK2 22.000]	[2 ]	ROTOR ANGLE	BUS 29562	MACH 2
635	4634	46.62	ANGL	29564	[20SPURLK345.00]	[3 ]	ROTOR ANGLE	BUS 29564	MACH 3
636	163497	0.9830	VOLT	29278	[20CPR1 13.800]		BUS VOLTAGE	BUS 29278	
637	163498	0.9765	VOLT	29279	[20CPR2 20.000]		BUS VOLTAGE	BUS 29279	
638	163499	0.9955	VOLT	29288	[20DALE1 13.800]		BUS VOLTAGE	BUS 29288	
639	163500	0.9968	VOLT	29290	[20DALE2 13.800]		BUS VOLTAGE	BUS 29290	
640	163501	0.9981	VOLT	29291	[20DALE3 13.800]		BUS VOLTAGE	BUS 29291	
641	163502	1.018	VOLT	29292	[20DALE4 13.800]		BUS VOLTAGE	BUS 29292	
642	163503	1.050	VOLT	29382	[20JKCT1 13.800]		BUS VOLTAGE	BUS 29382	
643	163504	1.050	VOLT	29383	[20JKCT2 13.800]		BUS VOLTAGE	BUS 29383	
644	163505	1.050	VOLT	29384	[20JKCT3 13.800]		BUS VOLTAGE	BUS 29384	
645	163506	0.000	VOLT	29385	[20JKSMIT345.00]		BUS VOLTAGE	BUS 29385	
646	163507	1.023	VOLT	29387	[20JKSMIT138.00]		BUS VOLTAGE	BUS 29387	
647	163508	0.9451	VOLT	29396	[20LAURHY13.800]		BUS VOLTAGE	BUS 29396	
648	163509	1.000	VOLT	29414	[20LOVE 138.00]		BUS VOLTAGE	BUS 29414	
649	163510	1.009	VOLT	29560	[20SPLK1 22.000]		BUS VOLTAGE	BUS 29560	
650	163511	1.012	VOLT	29562	[20SPLK2 22.000]		BUS VOLTAGE	BUS 29562	
651	163512	1.039	VOLT	29564	[20SPURLK345.00]		BUS VOLTAGE	BUS 29564	
652	4635	49.16	ANGL	30016	[ALSEY 113.800]	[1 ]	ROTOR ANGLE	BUS 30016	MACH 1
653	4637	38.69	ANGL	30017	[ALSEY 213.800]	[3 ]	ROTOR ANGLE	BUS 30017	MACH 3
654	4639	0.000	ANGL	30019	[ALSEY 313.800]	[5 ]	ROTOR ANGLE	BUS 30019	MACH 5
655	4640	0.000	ANGL	30073	[AVENA 69.000]	[1 ]	ROTOR ANGLE	BUS 30073	MACH 1
656	4641	35.07	ANGL	30225	[CAL G125.000]	[1 ]	ROTOR ANGLE	BUS 30225	MACH 1

**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

657	4642	16.86	ANGL	30313	[CEC 1	13.800]	[1 ]	ROTOR	ANGLE	BUS	30313	MACH	1
658	4644	0.000	ANGL	30314	[CEC 2	13.800]	[3 ]	ROTOR	ANGLE	BUS	30314	MACH	3
659	4646	50.61	ANGL	30396	[COFFEN	122.000]	[1 ]	ROTOR	ANGLE	BUS	30396	MACH	1
660	4647	53.59	ANGL	30397	[COFFEN	224.000]	[2 ]	ROTOR	ANGLE	BUS	30397	MACH	2
661	4648	34.38	ANGL	30423	[CONWY 1	34.500]	[1 ]	ROTOR	ANGLE	BUS	30423	MACH	1
662	4649	50.34	ANGL	30612	[GIBSN G113.800]	[1 ]	ROTOR	ANGLE	BUS	30612	MACH	1	
663	4650	50.33	ANGL	30613	[GIBSN G213.800]	[2 ]	ROTOR	ANGLE	BUS	30613	MACH	2	
664	4651	54.77	ANGL	30668	[GRTW 313.800]	[3 ]	ROTOR	ANGLE	BUS	30668	MACH	3	
665	4652	53.95	ANGL	30669	[GRTW 413.800]	[4 ]	ROTOR	ANGLE	BUS	30669	MACH	4	
666	4653	66.71	ANGL	30670	[GRTW 118.000]	[1 ]	ROTOR	ANGLE	BUS	30670	MACH	1	
667	4654	66.70	ANGL	30671	[GRTW 218.000]	[2 ]	ROTOR	ANGLE	BUS	30671	MACH	2	
668	4658	57.67	ANGL	30771	[HUTSNVL313.800]	[3 ]	ROTOR	ANGLE	BUS	30771	MACH	3	
669	4659	57.69	ANGL	30772	[HUTSNVL413.800]	[4 ]	ROTOR	ANGLE	BUS	30772	MACH	4	
670	4660	13.43	ANGL	30805	[JC FAIR 69.000]	[1 ]	ROTOR	ANGLE	BUS	30805	MACH	1	
671	4661	7.057	ANGL	30860	[KEOK 713.800]	[7 ]	ROTOR	ANGLE	BUS	30860	MACH	7	
672	4664	14.47	ANGL	30861	[KEOK 1-413.800]	[1 ]	ROTOR	ANGLE	BUS	30861	MACH	1	
673	4668	14.72	ANGL	30862	[KEOK 5-613.800]	[5 ]	ROTOR	ANGLE	BUS	30862	MACH	5	
674	4670	6.660	ANGL	30863	[KEOK 1013.800]	[10]	ROTOR	ANGLE	BUS	30863	MACH	10	
675	4672	9.695	ANGL	30864	[KEOK 1213.800]	[12]	ROTOR	ANGLE	BUS	30864	MACH	12	
676	4676	60.21	ANGL	30876	[KNMDY G113.800]	[1 ]	ROTOR	ANGLE	BUS	30876	MACH	1	
677	4677	60.27	ANGL	30877	[KNMDY G213.800]	[2 ]	ROTOR	ANGLE	BUS	30877	MACH	2	
678	4678	0.000	ANGL	30882	[KIRKSVL 34.500]	[1 ]	ROTOR	ANGLE	BUS	30882	MACH	1	
679	4679	41.42	ANGL	30894	[LAB G120.000]	[1 ]	ROTOR	ANGLE	BUS	30894	MACH	1	
680	4680	41.14	ANGL	30895	[LAB G220.000]	[2 ]	ROTOR	ANGLE	BUS	30895	MACH	2	
681	4681	41.15	ANGL	30896	[LAB G320.000]	[3 ]	ROTOR	ANGLE	BUS	30896	MACH	3	
682	4682	35.35	ANGL	30897	[LAB G420.000]	[4 ]	ROTOR	ANGLE	BUS	30897	MACH	4	
683	4683	73.52	ANGL	30992	[PEARL 69.000]	[1 ]	ROTOR	ANGLE	BUS	30992	MACH	1	
684	4685	25.83	ANGL	31132	[MER 116.500]	[1 ]	ROTOR	ANGLE	BUS	30992	MACH	1	
685	4686	25.66	ANGL	31140	[MER 216.500]	[2 ]	ROTOR	ANGLE	BUS	31132	MACH	1	
686	4687	24.90	ANGL	31148	[MER 316.000]	[H ]	ROTOR	ANGLE	BUS	31140	MACH	2	
687	4689	24.08	ANGL	31156	[MER 418.000]	[H ]	ROTOR	ANGLE	BUS	31148	MACH	H	
688	4691	0.000	ANGL	31164	[MER 513.800]	[5 ]	ROTOR	ANGLE	BUS	31156	MACH	H	
689	4692	27.70	ANGL	31172	[MER 613.800]	[6 ]	ROTOR	ANGLE	BUS	31164	MACH	5	
690	4693	42.48	ANGL	31182	[MERDSA 113.800]	[1 ]	ROTOR	ANGLE	BUS	31172	MACH	6	
691	4694	42.35	ANGL	31183	[MERDSA 213.800]	[2 ]	ROTOR	ANGLE	BUS	31182	MACH	1	
							[2 ]	ROTOR	ANGLE	BUS	31183	MACH	2

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

692	4695	50.94	ANGL 31184	[MERDSA 320.000]	[3 ]	ROTOR ANGLE	BUS 31184	MACH 3
693	4696	42.67	ANGL 31185	[MERDSA 420.000]	[4 ]	ROTOR ANGLE	BUS 31185	MACH 4
694	4697	0.000	ANGL 31193	[MEXICO 69.000]	[1 ]	ROTOR ANGLE	BUS 31193	MACH 1
695	4698	0.000	ANGL 31222	[MOBERLY 69.000]	[1 ]	ROTOR ANGLE	BUS 31222	MACH 1
696	4699	28.44	ANGL 31240	[MOREAU 69.000]	[1 ]	ROTOR ANGLE	BUS 31240	MACH 1
697	4708	70.41	ANGL 31332	[NEWTON 124.000]	[1 ]	ROTOR ANGLE	BUS 31332	MACH 1
698	4709	70.63	ANGL 31333	[NEWTON 224.000]	[2 ]	ROTOR ANGLE	BUS 31333	MACH 2
699	4710	7.638	ANGL 31400	[OSAGE 138.000]	[1 ]	ROTOR ANGLE	BUS 31400	MACH 1
700	4718	0.000	ANGL 31441	[PENOGEN113.800]	[1 ]	ROTOR ANGLE	BUS 31441	MACH 1
701	4719	0.000	ANGL 31442	[PENOGEN213.800]	[2 ]	ROTOR ANGLE	BUS 31442	MACH 2
702	4720	0.000	ANGL 31443	[PENOGEN313.800]	[3 ]	ROTOR ANGLE	BUS 31443	MACH 3
703	4721	0.000	ANGL 31444	[PENOGEN413.800]	[4 ]	ROTOR ANGLE	BUS 31444	MACH 4
704	4722	0.000	ANGL 31501	[PICKVL 113.800]	[1 ]	ROTOR ANGLE	BUS 31501	MACH 1
705	4723	0.000	ANGL 31502	[PICKVL 213.800]	[2 ]	ROTOR ANGLE	BUS 31502	MACH 2
706	4724	0.000	ANGL 31503	[PICKVL 313.800]	[3 ]	ROTOR ANGLE	BUS 31503	MACH 3
707	4725	0.000	ANGL 31504	[PICKVL 413.800]	[4 ]	ROTOR ANGLE	BUS 31504	MACH 4
708	4726	0.000	ANGL 31505	[PICKVL 513.800]	[5 ]	ROTOR ANGLE	BUS 31505	MACH 5
709	4729	0.000	ANGL 31506	[PICKVL 613.800]	[8 ]	ROTOR ANGLE	BUS 31506	MACH 8
710	4730	40.86	ANGL 31670	[RUSH G118.000]	[1 ]	ROTOR ANGLE	BUS 31670	MACH 1
711	4731	40.76	ANGL 31671	[RUSH G218.000]	[2 ]	ROTOR ANGLE	BUS 31671	MACH 2
712	4732	22.76	ANGL 31756	[SIOUX 118.000]	[H ]	ROTOR ANGLE	BUS 31756	MACH H
713	4734	21.84	ANGL 31765	[SIOUX 218.000]	[H ]	ROTOR ANGLE	BUS 31765	MACH H
714	4736	0.000	ANGL 31826	[TRIGENMO13.800]	[1 ]	ROTOR ANGLE	BUS 31826	MACH 1
715	4739	38.05	ANGL 31832	[TS G113.800]	[1 ]	ROTOR ANGLE	BUS 31832	MACH 1
716	4740	38.31	ANGL 31841	[TS G213.800]	[2 ]	ROTOR ANGLE	BUS 31841	MACH 2
717	4741	0.000	ANGL 31878	[VENICE 69.000]	[7 ]	ROTOR ANGLE	BUS 31878	MACH 7
718	4742	0.000	ANGL 31882	[VENIC 3 13.800]	[3 ]	ROTOR ANGLE	BUS 31882	MACH 3
719	4743	0.000	ANGL 31883	[VENIC 4 13.800]	[4 ]	ROTOR ANGLE	BUS 31883	MACH 4
720	4744	0.000	ANGL 31884	[VEN 5 13.800]	[5 ]	ROTOR ANGLE	BUS 31884	MACH 5
721	4745	0.000	ANGL 31885	[VEN 6 13.800]	[6 ]	ROTOR ANGLE	BUS 31885	MACH 6
722	4746	30.11	ANGL 31886	[VENCTG 13.800]	[8 ]	ROTOR ANGLE	BUS 31886	MACH 8
723	4747	0.000	ANGL 31890	[VIAD 1 34.500]	[1 ]	ROTOR ANGLE	BUS 31890	MACH 1
724	4748	72.33	ANGL 31994	[XENIA G113.800]	[1 ]	ROTOR ANGLE	BUS 31994	MACH 1
725	4749	72.33	ANGL 31995	[XENIA G213.800]	[2 ]	ROTOR ANGLE	BUS 31995	MACH 2
726	4750	72.33	ANGL 31996	[XENIA G313.800]	[3 ]	ROTOR ANGLE	BUS 31996	MACH 3



Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

762	163547	1.010	VOLT 31148	[MER	316.000]	BUS VOLTAGE	BUS 31148
763	163548	1.003	VOLT 31156	[MER	418.000]	BUS VOLTAGE	BUS 31156
764	163549	0.9880	VOLT 31164	[MER	513.800]	BUS VOLTAGE	BUS 31164
765	163550	1.033	VOLT 31172	[MER	613.800]	BUS VOLTAGE	BUS 31172
766	163551	1.022	VOLT 31182	[MERDSA	113.800]	BUS VOLTAGE	BUS 31182
767	163552	1.023	VOLT 31183	[MERDSA	213.800]	BUS VOLTAGE	BUS 31183
768	163553	0.9877	VOLT 31184	[MERDSA	320.000]	BUS VOLTAGE	BUS 31184
769	163554	0.9939	VOLT 31185	[MERDSA	420.000]	BUS VOLTAGE	BUS 31185
770	163555	0.9479	VOLT 31193	[MEXICO	69.000]	BUS VOLTAGE	BUS 31193
771	163556	1.021	VOLT 31222	[MOBERLY	69.000]	BUS VOLTAGE	BUS 31222
772	163557	1.030	VOLT 31240	[MOREAU	69.000]	BUS VOLTAGE	BUS 31240
773	163558	1.020	VOLT 31322	[NEOGA	138.00]	BUS VOLTAGE	BUS 31322
774	163559	1.012	VOLT 31332	[NEWTON	124.000]	BUS VOLTAGE	BUS 31332
775	163560	1.011	VOLT 31333	[NEWTON	224.000]	BUS VOLTAGE	BUS 31333
776	163561	1.018	VOLT 31400	[OSAGE	138.00]	BUS VOLTAGE	BUS 31400
777	163562	0.9766	VOLT 31441	[PENOGEN	113.800]	BUS VOLTAGE	BUS 31441
778	163563	0.9766	VOLT 31442	[PENOGEN	213.800]	BUS VOLTAGE	BUS 31442
779	163564	0.9766	VOLT 31443	[PENOGEN	313.800]	BUS VOLTAGE	BUS 31443
780	163565	0.9766	VOLT 31444	[PENOGEN	413.800]	BUS VOLTAGE	BUS 31444
781	163566	0.9775	VOLT 31501	[PICKVL	113.800]	BUS VOLTAGE	BUS 31501
782	163567	0.9775	VOLT 31502	[PICKVL	213.800]	BUS VOLTAGE	BUS 31502
783	163568	0.9775	VOLT 31503	[PICKVL	313.800]	BUS VOLTAGE	BUS 31503
784	163569	0.9775	VOLT 31504	[PICKVL	413.800]	BUS VOLTAGE	BUS 31504
785	163570	0.9775	VOLT 31505	[PICKVL	513.800]	BUS VOLTAGE	BUS 31505
786	163571	0.9775	VOLT 31506	[PICKVL	613.800]	BUS VOLTAGE	BUS 31506
787	163572	1.014	VOLT 31670	[RUSH	G118.000]	BUS VOLTAGE	BUS 31670
788	163573	1.014	VOLT 31671	[RUSH	G218.000]	BUS VOLTAGE	BUS 31671
789	163574	1.014	VOLT 31756	[SIOUX	118.000]	BUS VOLTAGE	BUS 31756
790	163575	1.016	VOLT 31765	[SIOUX	218.000]	BUS VOLTAGE	BUS 31765
791	163576	0.9871	VOLT 31826	[TRIGEN	M013.800]	BUS VOLTAGE	BUS 31826
792	163577	1.005	VOLT 31832	[TS	G113.800]	BUS VOLTAGE	BUS 31832
793	163578	1.005	VOLT 31841	[TS	G213.800]	BUS VOLTAGE	BUS 31841
794	163579	0.9963	VOLT 31878	[VENICE	69.000]	BUS VOLTAGE	BUS 31878
795	163580	0.9475	VOLT 31882	[VENIC	3 13.800]	BUS VOLTAGE	BUS 31882
796	163581	0.9475	VOLT 31883	[VENIC	4 13.800]	BUS VOLTAGE	BUS 31883

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

797	163582	0.9458	VOLT 31884	[VEN 5	13.800]		BUS VOLTAGE	BUS 31884		
798	163583	0.9475	VOLT 31885	[VEN 6	13.800]		BUS VOLTAGE	BUS 31885		
799	163584	1.012	VOLT 31886	[VENCTG	13.800]		BUS VOLTAGE	BUS 31886		
800	163585	1.008	VOLT 31890	[VIAD 1	34.500]		BUS VOLTAGE	BUS 31890		
801	163586	1.025	VOLT 31991	[HOLLAND	345.00]		BUS VOLTAGE	BUS 31991		
802	163587	1.030	VOLT 31994	[XENIA G113.800]			BUS VOLTAGE	BUS 31994		
803	163588	1.030	VOLT 31995	[XENIA G213.800]			BUS VOLTAGE	BUS 31995		
804	163589	1.030	VOLT 31996	[XENIA G313.800]			BUS VOLTAGE	BUS 31996		
805	163590	1.030	VOLT 31997	[XENIA G413.800]			BUS VOLTAGE	BUS 31997		
806	0	0.000					SYSANG VALUE			
807	0	0.000					SYSANG VALUE			
808	2664	0.000	ANGL 32271	[WOODR SW34.500]		[1 ]	ROTOR ANGLE	BUS 32271	MACH 1	
809	2665	0.000	ANGL 32272	[WOODR NE34.500]		[2 ]	ROTOR ANGLE	BUS 32272	MACH 2	
810	2666	28.97	ANGL 32273	[VERMILON69.000]		[1 ]	ROTOR ANGLE	BUS 32273	MACH 1	
811	2667	41.15	ANGL 32274	[BALDWIN 345.00]		[1 ]	ROTOR ANGLE	BUS 32274	MACH 1	
812	2670	0.000	ANGL 32281	[AVISTON 138.00]		[X ]	ROTOR ANGLE	BUS 32281	MACH X	
813	2671	0.000	ANGL 32287	[WOODR SW138.00]		[3 ]	ROTOR ANGLE	BUS 32287	MACH 3	
814	2673	0.000	ANGL 32306	[DUPOFERY138.00]		[X ]	ROTOR ANGLE	BUS 32306	MACH X	
815	2674	0.000	ANGL 32311	[S BELLV1138.00]		[X ]	ROTOR ANGLE	BUS 32311	MACH X	
816	2675	0.000	ANGL 32324	[MASCOUTA138.00]		[X ]	ROTOR ANGLE	BUS 32324	MACH X	
817	2676	46.19	ANGL 32346	[CLINTON 345.00]		[1 ]	ROTOR ANGLE	BUS 32346	MACH 1	
818	2677	0.000	ANGL 32384	[WEEDMAN 138.00]		[X ]	ROTOR ANGLE	BUS 32384	MACH X	
819	2678	42.03	ANGL 32390	[VERMILON138.00]		[2 ]	ROTOR ANGLE	BUS 32390	MACH 2	
820	2679	0.000	ANGL 32392	[ST FARM2138.00]		[X ]	ROTOR ANGLE	BUS 32392	MACH X	
821	2680	0.000	ANGL 32393	[TILTN EC138.00]		[1 ]	ROTOR ANGLE	BUS 32393	MACH 1	
822	2684	0.000	ANGL 32407	[HAVANA 138.00]		[1 ]	ROTOR ANGLE	BUS 32407	MACH 1	
823	2690	0.000	ANGL 32422	[PRINCTN 138.00]		[X ]	ROTOR ANGLE	BUS 32422	MACH X	
824	2691	0.000	ANGL 32436	[OGLSBY X13.200]		[1 ]	ROTOR ANGLE	BUS 32436	MACH 1	
825	2693	0.000	ANGL 32437	[OGLSBY Y13.200]		[3 ]	ROTOR ANGLE	BUS 32437	MACH 3	
826	2695	0.000	ANGL 32439	[STALNG X13.800]		[1 ]	ROTOR ANGLE	BUS 32439	MACH 1	
827	2697	0.000	ANGL 32440	[STALNG Y13.800]		[3 ]	ROTOR ANGLE	BUS 32440	MACH 3	
828	2699	23.66	ANGL 32441	[WOODR 5 20.000]		[H ]	ROTOR ANGLE	BUS 32441	MACH H	
829	2701	19.68	ANGL 32442	[HENNE 2 15.500]		[H ]	ROTOR ANGLE	BUS 32442	MACH H	
830	2703	18.31	ANGL 32443	[HENNE 1 13.800]		[1 ]	ROTOR ANGLE	BUS 32443	MACH 1	
831	2704	0.000	ANGL 32445	[VERMILG313.800]		[3 ]	ROTOR ANGLE	BUS 32445	MACH 3	

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

832	2705	0.000	ANGL 32571	[HI MUNI 138.00]	[X ]	ROTOR ANGLE	BUS 32571	MACH X
833	2706	0.000	ANGL 32610	[LASALLE 34.500]	[X ]	ROTOR ANGLE	BUS 32610	MACH X
834	2707	0.000	ANGL 32620	[SWCAMPUS69.000]	[X ]	ROTOR ANGLE	BUS 32620	MACH X
835	163591	1.034	VOLT 32271	[WOODR SW34.500]		BUS VOLTAGE	BUS 32271	
836	163592	1.032	VOLT 32272	[WOODR NE34.500]		BUS VOLTAGE	BUS 32272	
837	163593	1.010	VOLT 32273	[VERMILON69.000]		BUS VOLTAGE	BUS 32273	
838	163594	1.040	VOLT 32274	[BALDWIN 345.00]		BUS VOLTAGE	BUS 32274	
839	163595	0.9826	VOLT 32281	[AVISTON 138.00]		BUS VOLTAGE	BUS 32281	
840	163596	1.014	VOLT 32287	[WOODR SW138.00]		BUS VOLTAGE	BUS 32287	
841	163597	0.9859	VOLT 32306	[DUPOFFERY138.00]		BUS VOLTAGE	BUS 32306	
842	163598	0.9940	VOLT 32311	[S BELLVL138.00]		BUS VOLTAGE	BUS 32311	
843	163599	0.9915	VOLT 32324	[MASCOUTA138.00]		BUS VOLTAGE	BUS 32324	
844	163600	1.029	VOLT 32346	[CLINTON 345.00]		BUS VOLTAGE	BUS 32346	
845	163601	0.9932	VOLT 32384	[WEEDMAN 138.00]		BUS VOLTAGE	BUS 32384	
846	163602	1.027	VOLT 32390	[VERMILON138.00]		BUS VOLTAGE	BUS 32390	
847	163603	0.9931	VOLT 32392	[ST FARM2138.00]		BUS VOLTAGE	BUS 32392	
848	163604	1.013	VOLT 32393	[TILTN EC138.00]		BUS VOLTAGE	BUS 32393	
849	163605	1.040	VOLT 32407	[HAVANA 138.00]		BUS VOLTAGE	BUS 32407	
850	163606	0.9954	VOLT 32422	[PRINCIN 138.00]		BUS VOLTAGE	BUS 32422	
851	163607	0.9838	VOLT 32436	[OGLSBY X13.200]		BUS VOLTAGE	BUS 32436	
852	163608	0.9838	VOLT 32437	[OGLSBY Y13.200]		BUS VOLTAGE	BUS 32437	
853	163609	0.9931	VOLT 32439	[STALNG X13.800]		BUS VOLTAGE	BUS 32439	
854	163610	0.9931	VOLT 32440	[STALNG Y13.800]		BUS VOLTAGE	BUS 32440	
855	163611	1.000	VOLT 32441	[WOODR 5 20.000]		BUS VOLTAGE	BUS 32441	
856	163612	1.031	VOLT 32442	[HENNE 2 15.500]		BUS VOLTAGE	BUS 32442	
857	163613	1.033	VOLT 32443	[HENNE 1 13.800]		BUS VOLTAGE	BUS 32443	
858	163614	1.053	VOLT 32445	[VERMILG313.800]		BUS VOLTAGE	BUS 32445	
859	163615	0.9752	VOLT 32571	[HI MUNI 138.00]		BUS VOLTAGE	BUS 32571	
860	163616	1.030	VOLT 32610	[LASALLE 34.500]		BUS VOLTAGE	BUS 32610	
861	163617	1.006	VOLT 32620	[SWCAMPUS69.000]		BUS VOLTAGE	BUS 32620	
862	2148	51.56	ANGL 24951	[06KYGER 345.00]	[1 ]	ROTOR ANGLE	BUS 24951	MACH 1
863	2149	51.45	ANGL 24951	[06KYGER 345.00]	[2 ]	ROTOR ANGLE	BUS 24951	MACH 2
864	2150	51.45	ANGL 24951	[06KYGER 345.00]	[3 ]	ROTOR ANGLE	BUS 24951	MACH 3
865	2151	50.65	ANGL 24951	[06KYGER 345.00]	[4 ]	ROTOR ANGLE	BUS 24951	MACH 4
866	2152	51.05	ANGL 24951	[06KYGER 345.00]	[5 ]	ROTOR ANGLE	BUS 24951	MACH 5



**Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY**

867	2153	71.20	ANGL	24951	[06KYGER	345.00]	[6 ]	ROTOR	ANGLE	BUS	24951	MACH	6
868	2154	67.28	ANGL	24951	[06KYGER	345.00]	[7 ]	ROTOR	ANGLE	BUS	24951	MACH	7
869	2155	67.28	ANGL	24951	[06KYGER	345.00]	[8 ]	ROTOR	ANGLE	BUS	24951	MACH	8
870	2156	66.73	ANGL	24951	[06KYGER	345.00]	[9 ]	ROTOR	ANGLE	BUS	24951	MACH	9
871	2157	67.01	ANGL	24951	[06KYGER	345.00]	[A ]	ROTOR	ANGLE	BUS	24951	MACH	A
872	2158	43.20	ANGL	24952	[06CLIFTY	345.00]	[1 ]	ROTOR	ANGLE	BUS	24952	MACH	1
873	2159	43.45	ANGL	24952	[06CLIFTY	345.00]	[2 ]	ROTOR	ANGLE	BUS	24952	MACH	2
874	2160	43.28	ANGL	24952	[06CLIFTY	345.00]	[3 ]	ROTOR	ANGLE	BUS	24952	MACH	3
875	2161	43.11	ANGL	24952	[06CLIFTY	345.00]	[4 ]	ROTOR	ANGLE	BUS	24952	MACH	4
876	2162	44.17	ANGL	24952	[06CLIFTY	345.00]	[5 ]	ROTOR	ANGLE	BUS	24952	MACH	5
877	2163	42.94	ANGL	24952	[06CLIFTY	345.00]	[6 ]	ROTOR	ANGLE	BUS	24952	MACH	6
878	2164	53.24	ANGL	24952	[06CLIFTY	345.00]	[7 ]	ROTOR	ANGLE	BUS	24952	MACH	7
879	2165	53.46	ANGL	24952	[06CLIFTY	345.00]	[8 ]	ROTOR	ANGLE	BUS	24952	MACH	8
880	2166	53.32	ANGL	24952	[06CLIFTY	345.00]	[9 ]	ROTOR	ANGLE	BUS	24952	MACH	9
881	2167	53.17	ANGL	24952	[06CLIFTY	345.00]	[A ]	ROTOR	ANGLE	BUS	24952	MACH	A
882	2168	54.09	ANGL	24952	[06CLIFTY	345.00]	[B ]	ROTOR	ANGLE	BUS	24952	MACH	B
883	2169	53.02	ANGL	24952	[06CLIFTY	345.00]	[C ]	ROTOR	ANGLE	BUS	24952	MACH	C
884	2170	0.000	ANGL	24963	[06JACKSN	345.00]	[1G]	ROTOR	ANGLE	BUS	24963	MACH	1G
885	2171	0.000	ANGL	24963	[06JACKSN	345.00]	[1S]	ROTOR	ANGLE	BUS	24963	MACH	1S
886	2172	0.000	ANGL	24963	[06JACKSN	345.00]	[2G]	ROTOR	ANGLE	BUS	24963	MACH	2G
887	2173	0.000	ANGL	24963	[06JACKSN	345.00]	[2S]	ROTOR	ANGLE	BUS	24963	MACH	2S
888	2174	0.000	ANGL	24963	[06JACKSN	345.00]	[3G]	ROTOR	ANGLE	BUS	24963	MACH	3G
889	2175	0.000	ANGL	24963	[06JACKSN	345.00]	[3S]	ROTOR	ANGLE	BUS	24963	MACH	3S
890	163618	1.004	VOLT	24951	[06KYGER	345.00]		BUS	VOLTAGE	BUS	24951		
891	163619	1.017	VOLT	24952	[06CLIFTY	345.00]		BUS	VOLTAGE	BUS	24952		
892	163620	1.010	VOLT	24963	[06JACKSN	345.00]		BUS	VOLTAGE	BUS	24963		

**APPENDIX I**

## **Performance Monitoring Criteria**

### **MAPP Transient Stability Guidelines**

Transient response of the system following a disturbance may be deemed unacceptable and warrant further investigation if the following conditions are observed -

- Any unit loses synchronism
- Cascading tripping of the transmission lines or uncontrolled loss of load
- Voltage excursions outside the band of 0.8 pu to 1.2 pu for a time greater than 30 cycles. These should be reported and studied for adverse effect on motors, contactors, and other voltage sensitive loads.
- Voltage excursion below 0.7 pu or voltage instability at any time after the fault has been successfully cleared.
- Poorly damped oscillations.

**APPENDIX J**

Add and Modify Generators

THRRED 27.0 27601 0.0322 0.0161 100 100

	X1	X0	Mva Base
05ANDCT 188	10004	0.8181	0.309 100
05ANDCT 198	0.6181	0.309	100
06BEVERL 345	0.1500	0.075	100
06BEVERL 346	0.1500	0.075	100
06BEVERL 347	0.1142	0.057	100
06CASSAD 345	0.1500	0.075	100
06CASSAD 346	0.1500	0.075	100
06CASSAD 348	0.1142	0.057	100
06DESOTO 188	0.3076	0.154	100
06DESOTO 189	0.3076	0.154	100
06DESOTO 198	0.3076	0.154	100
06DESOTO 199	0.3076	0.154	100
06DESOTO 188	0.3076	0.154	100
06DESOTO 189	0.3076	0.154	100
06DESOTO 198	0.3076	0.154	100
06DESOTO 199	0.3076	0.154	100
05GRNGST 188	0.4188	0.209	100
05GRNGST 189	0.4188	0.209	100
05GRNGST 188	10007	0.4188	0.209 100

SURWG	X1	X0	Mva Base	New bus
08HENRY118.8	0.3222	0.1611	100	
08HENRY218.8	0.3222	0.1611	100	10000
08HENRY318.8	0.3222	0.1611	100	
08KNOX111.34	0.2025	0.1013	100	
08KNOX211.34	0.2025	0.1013	100	
08KNOX311.34	0.2025	0.1013	100	10001
08KNOX411.34	0.2025	0.1013	100	
08KNOX511.34	0.2025	0.1013	100	
08KNOX611.34	0.2025	0.1013	100	
08KNOX711.34	0.2025	0.1013	100	
08KNOX811.34	0.2025	0.1013	100	
08SERRIN1248	0.0897	0.0449	100	
08SERRIN2248	0.0897	0.0449	100	10002
08SERRIN3248	0.0897	0.0449	100	
PIKE				
PIKE				
PIKE				
PIKE				
11BDOCKNR345	0.0746	0.0373	100	

Generation Interconnection Evaluation  
 Of a 750 MW Generating Power Plant  
 At Trimble County, KY

D5GRNGST 188	0.4188	0.2092	100
D5GRNGST 189	0.4188	0.2092	100
D5GRNGST 190	0.4188	0.2092	100
D5GRNGST 191	0.4188	0.2092	100
D5KEYSTN 345	0.4188	0.2092	100
D5KEYSTN 346	0.4188	0.2092	100
D5KEYSTN 347	0.4188	0.2092	100
D5KEYSTN 348	0.4188	0.2092	100
D5KEYSTN 349	0.4188	0.2092	100
D5KEYSTN 350	0.4188	0.2092	100
D5KEYSTN 351	0.4188	0.2092	100
D5KEYSTN 352	0.4188	0.2092	100
D5KEYSTN 353	0.4188	0.2092	100
D5KEYSTN 354	0.4188	0.2092	100
D5KEYSTN 355	0.4188	0.2092	100
D5KEYSTN 356	0.4188	0.2092	100
D5KEYSTN 357	0.4188	0.2092	100
D5KEYSTN 358	0.4188	0.2092	100
D5KEYSTN 359	0.4188	0.2092	100
D5KEYSTN 360	0.4188	0.2092	100
D5LAWRNC 345	0.1612	0.0786	100
D5LAWRNC 346	0.1612	0.0786	100
D5LAWRNC 347	0.1612	0.0786	100
D5LAWRNC 348	0.1612	0.0786	100
D5LAWRNC 349	0.1612	0.0786	100
D5LAWRNC 350	0.1612	0.0786	100
D5LAWRNC 351	0.1612	0.0786	100
D5LAWRNC 352	0.1612	0.0786	100
D5LAWRNC 353	0.1612	0.0786	100
D5LAWRNC 354	0.1612	0.0786	100
D5LAWRNC 355	0.1612	0.0786	100
D5LAWRNC 356	0.1612	0.0786	100
D5LAWRNC 357	0.1612	0.0786	100
D5LAWRNC 358	0.1612	0.0786	100
D5LAWRNC 359	0.1612	0.0786	100
D5LAWRNC 360	0.1612	0.0786	100

T1BUGKVR 345	0.0746	0.0973	100
T1BUGKVR 346	0.0746	0.0973	100
T1TRIMBL 345	0.0373	0.0486	100
T1TRIMBL 346	0.0373	0.0486	100
T1TRIMBL 347	0.0373	0.0486	100
T1TRIMBL 348	0.0373	0.0486	100
T1TRIMBL 349	0.0373	0.0486	100
T1TRIMBL 350	0.0373	0.0486	100
T1TRIMBL 351	0.0373	0.0486	100
T1TRIMBL 352	0.0373	0.0486	100
T1TRIMBL 353	0.0373	0.0486	100
T1TRIMBL 354	0.0373	0.0486	100
T1TRIMBL 355	0.0373	0.0486	100
T1TRIMBL 356	0.0373	0.0486	100
T1TRIMBL 357	0.0373	0.0486	100
T1TRIMBL 358	0.0373	0.0486	100
T1TRIMBL 359	0.0373	0.0486	100
T1TRIMBL 360	0.0373	0.0486	100

The short circuit model for this study was created from the ECAR 2000 series short circuit model. This ECAR model was further enhanced by including the following details –

- ECAR model is a year 2000 vintage. This model did not include many generating units in AEP and CIN area that have a signed interconnection agreement. All the generators identified in APPENDIX J were included in the model.
- Add Foster – Bath 345 tie between CIN and DPL

Generation Interconnection Evaluation  
Of a 750 MW Generating Power Plant  
At Trimble County, KY

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- Delete IPP generators in the ECAR model because they have been either cancelled, withdrawn or delayed -- 05Cassad 345 KV; 05Desoto 138 KV; 05Keystn 345 KV units 5-8; machine at buses 1105, 1106
- Add IPP at Hanging Rock
- Add generators identified in "Dynamic Stability Models" section





**LOUISVILLE GAS AND ELECTRIC COMPANY  
KENTUCKY UTILITIES COMPANY**

**CASE NO. 2005-00142**

**CASE NO. 2005-00154**

**CASE NO. 2005-00155**

**Response to Commission Staff's First Data Request**

**Dated: June 30, 2005**

**Question No. 11**

**Responding Witness: Mark S. Johnson / Michael G. Toll**

- Q-11. Supply all economic evaluations conducted in connection with the three projects including assumptions. Also provide a description of any support payments that are expected to be received from others.
- A-11. Please see Exhibits MSJ-1, MSJ-2 and MSJ-3 attached to the testimony of Mark S. Johnson. Also please see the attached report, TC Unit 2 Transmission Construction Recommendation, and the response to Question No. 10. No support payments are expected to be received from others for the transmission facilities

## TC Unit 2 Transmission Construction Recommendation

### LGEE Screening

LGEE Transmission Planning utilized 2007 Summer power flow models to screen potential transmission construction options associated with the construction of Trimble County Unit 2 in order to appropriately support the MISO in its analysis. The internal study assumed that IMEA and IMPA would be 25% owners of the unit and the corresponding capacity would be scheduled to them. Since this was a screening study, construction was identified to alleviate the major concerns but costs were not developed to resolve all overloads. The construction cost associated with the five options was \$40.6, 59.1, 75.7, 83.3, and 125.6 million.

### MISO Analysis

The MISO analysis for the Transmission Service Request (TSR) was performed utilizing a 2007 Summer power flow model which was modified to simulate all approved TSRs during the period. Also, it was requested that the MISO evaluate delivery of 100% of the output to KU/LG&E. The MISO first performed an analysis without any construction to identify the overloads. We were contacted to assist them in the development of solutions. We provided our screening results and they simulated the four lowest cost options. The MISO analysis was more indepth and included the estimated cost to resolve all overloads. The four options developed by the MISO (major construction only) and their associated costs are:

Option	Construction	Cost 2003\$
1	Construct 345 kV from Trimble Co to West Frankfort Construct 345 kV from West Frankfort to Brown	\$90 million
2	Construct 345 kV from West Frankfort to Brown Construct 345 kV from Mill Creek to Hardin Co	\$96 million
3	Loop Ghent to Speed 345 kV into Trimble Co Construct 345 kV from West Frankfort to Brown	\$56 million
4	Loop Ghent to Speed 345 kV into Trimble Co Construct 345 kV from Mill Creek to Hardin Co	\$66 million

Additionally the MISO identified the need to replace Cinergy's Buffington 345-138 kV transformer at a cost of \$4 million. It is our opinion that this is a pre-existing problem and should not be included in this analysis.

### LGEE Analysis

LGEE Transmission Planning does not believe that an analysis of just the in-service year is adequate for comparing the cost of the options. We expanded the analysis to include a credit for reduced system losses and simulated the construction options in the 2012 Summer power flow model to assess potential long-term impacts. Our focus was on the need to construct West Frankfort to Brown 345 kV and Mill Creek to Hardin Co 345 kV for native load support. We determined the following:

#### West Frankfort to Brown 345 kV

Dispatch of the CTs at Brown is required occasionally to eliminate a first contingency overload of the East Frankfort to Tyrone 138 kV line for an outage of the Ghent – West Lexington – Brown 345 kV line. Option 4 includes the construction of a 138 kV line from West Frankfort to Tyrone. This construction provides a line parallel to the East Frankfort to Tyrone line and eliminates the constraints. Therefore, the need to construct the West Frankfort to Brown 345 KV line is delayed beyond the planning horizon.

**Mill Creek to Hardin Co 345 kV**

The Elizabethtown areas only EHV source is the Brown – Hardin Co – Smith 345 kV line. Upcoming voltage problems have been identified and the installation of a second 345-138 kV transformer and 345 kV breakers at Hardin Co is planned to delay the need for an additional EHV source. Mill Creek and Bullit are the closest EHV stations to the area. Current studies indicate that the construction of the Mill Creek to Hardin Co 345 kV line could be required as early as 2012 and it is unlikely that it can be delayed beyond 2015. Options 1 and 3 will require the subsequent construction of this 345 kV line.

The LGEE analysis of the initial construction and the associated loss credits has results similar to the MISO analysis. These results are shown in the 2007 on the graph with NPVRR as follows:

Option	Construction	NPVRR
3	Loop Ghent to Speed 345 kV into Trimble Co Construct 345 kV from West Frankfort to Brown	\$52.1 million
4	Loop Ghent to Speed 345 kV into Trimble Co Construct 345 kV from Mill Creek to Hardin Co	\$59.1 million
1	Construct 345 kV from Trimble Co to West Frankfort Construct 345 kV from West Frankfort to Brown	\$83.6 million
2	Construct 345 kV from West Frankfort to Brown Construct 345 kV from Mill Creek to Hardin Co	\$89.3 million

It is less costly to Loop the Ghent to Speed 345 kV line into Trimble Co (Options 3 and 4) than to construct a second 345 kV line in the LGEE system. Also, the construction of West Frankfort to Brown 345 kV (Options 1 and 3) in 2007 appears less costly than the construction of Mill Creek to Hardin Co 345 kV (Options 2 and 4). However, Options 1 and 3 require the subsequent construction of the Mill Creek to Hardin Co 345 kV line. The NPVRR of Option 1 is thus \$82-88 million and the NPVRR of Option 3 is thus \$113-119 million.

**Option 4 – Loop Ghent to Speed 345 kV into Trimble Co and Construct 345 kV from Mill Creek to Hardin Co is therefore the recommended construction plan for Trimble Co Unit 2.**

The planned in-service date for TC2 is summer 2009 and the corresponding completion date of the associated transmission would be scheduled for December 2008. Earlier completion of any facility could be achieved at a cost of approximately 10% of the total investment for each year. The Mill Creek to Harding Co 345 kV line and the West Frankfort to Tyrone 138 kV line would mitigate existing system constraints. The Marketing group should evaluate the economics of early completion of these projects.

**Comparison of Proposed Construction Plans for Trimble County Attachment to PSC Question No. 11**

Base Year   # of Years   Inf. Rate   DJE Rate   Johnson / Torr  
 2003            45            3.30%       8.71%       10.55%

**MISO Option #3 (GH-TC-SP, WF-BR)**

<u>Year</u>	<u>Construction</u>	2003 \$'s	Inflated \$'s	Present Value	
2007	Construct 2.8 miles of double-circuit 345 kV from Trimble County to Ghent-Speed	7,200,000.0	8,198,488	6,878,681	
2007	Construct 30.4 miles of 345 kV line between West Frankfort and Brown	36,400,000.0	41,447,913	34,775,555	
2007	Install a second 345/138 kV, 450 MVA transformer at Brown	3,700,000.0	4,213,112	3,534,878	
2007	Construct 11.8 miles of 138 kV line between West Lexington and Higby Mill	2,400,000.0	2,732,829	2,292,894	
2007	Reconductor Ghent-Owen County Tap (12.5 miles) with 954 kcm ACSR	1,900,000.0	2,163,490	1,815,208	
2007	Construct 3.1 miles of 138 kV line between Ghent and NAS	1,800,000.0	2,049,622	1,719,670	
2007	Increase the clearance of the 500 MCM Cu conductor for Blue Lick-Bullitt County 161 kV	1,000,000.0	1,138,679	955,372	
2007	Install two 345 kV breakers at Trimble County for GSU	2,000,000.0	2,277,358	1,910,745	
				<b>Construction PV</b>	<b>53,883,002</b>
				<b>PV Savings of Losses</b>	<b>1,810,232</b>
				<b>Net PVRR</b>	<b>52,072,770</b>

**MISO Option #4 (GH-TC-SP, MC-HC)**

<u>Year</u>	<u>Construction</u>	2002 \$'s	Inflated \$'s	Present Value	
2007	Construct 2.8 miles of double-circuit 345 kV from Trimble County to Ghent-Speed	7,200,000	8,198,488	6,878,681	
2007	Construct 42.9 miles of 345 kV line between Mill Creek and Hardin County	49,900,000	56,820,079	47,673,082	
2007	Construct 10.2 miles of 138 kV line between West Frankfort and Tyrone	2,600,000	2,960,565	2,483,968	
2007	Reconductor Hardin County-Etown 138 kV (1.3 miles) with 954 kcm ACSR	200,000	227,736	191,074	
2007	Construct 11.8 miles of 138 kV line between West Lexington and Higby Mill	2,400,000	2,732,829	2,292,894	
2007	Reconductor Ghent-Owen County Tap (12.5 miles) with 954 kcm ACSR	1,900,000	2,163,490	1,815,208	
2007	Replace 2000A equipment on Buckner-Middletown and Trimble Co.-Middletown 345 kV	700,000.0	797,075	668,761	
2007	Install two 345 kV breakers at Trimble County for GSU	2,000,000	2,277,358	1,910,745	
				<b>Construction PV</b>	<b>63,914,412</b>
				<b>PV Savings of Losses</b>	<b>4,790,814</b>
				<b>Net PVRR</b>	<b>59,123,598</b>

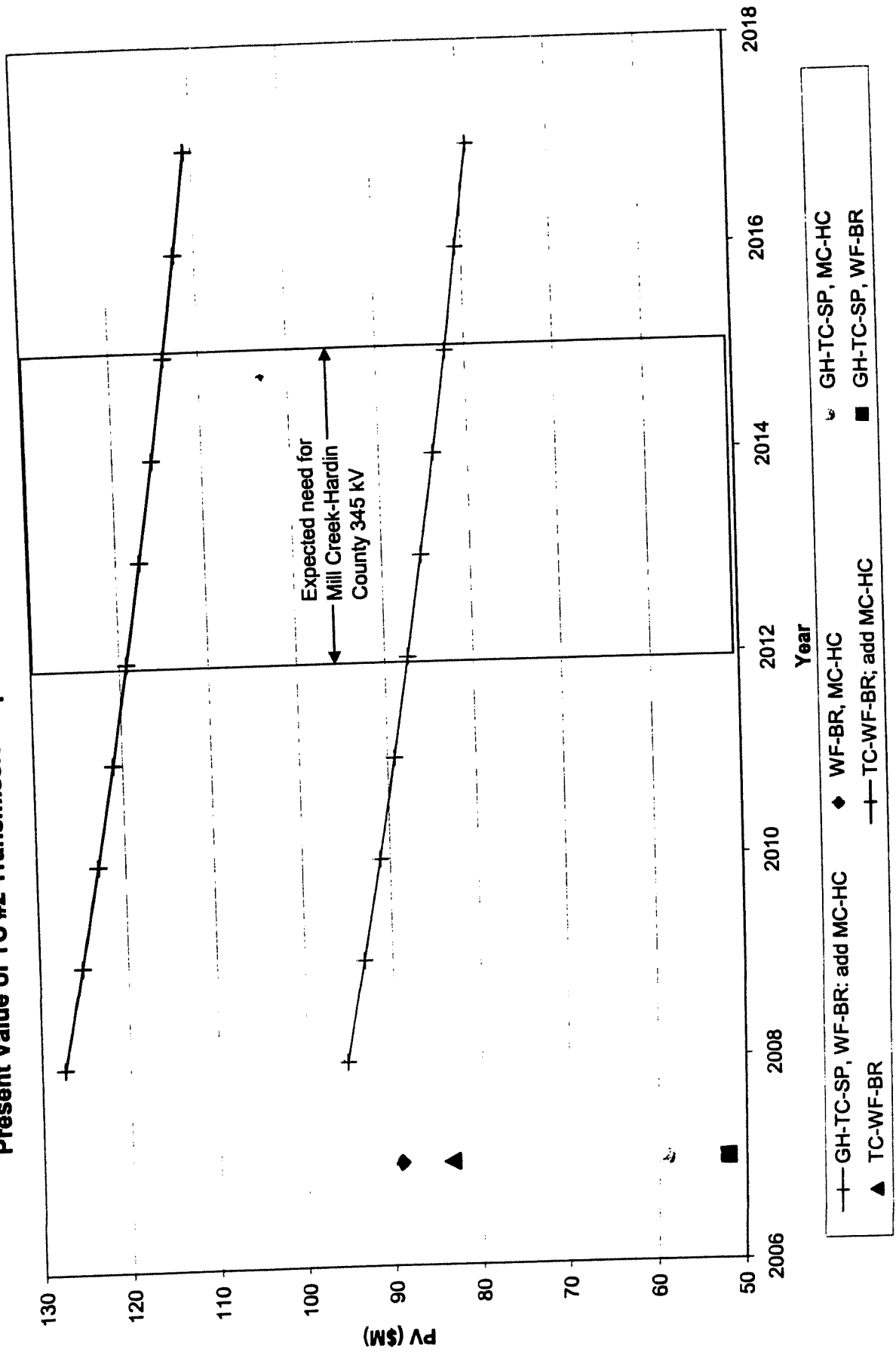
**MISO Option #1 (TC-WF-BR)**

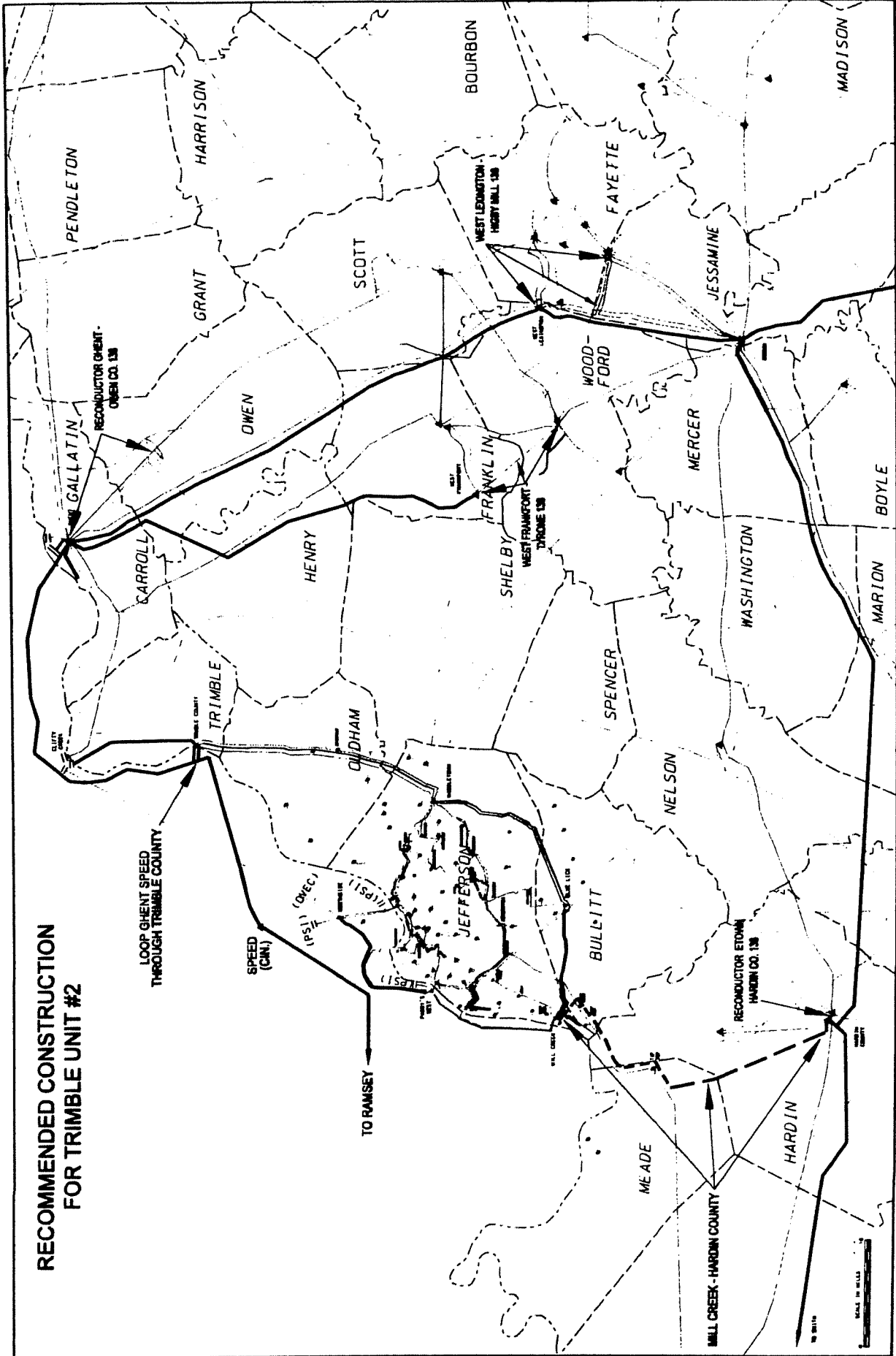
<u>Year</u>	<u>Construction</u>	2003 \$'s	Inflated \$'s	Present Value	
2007	Construct 37.3 miles of 345 kV line between Trimble County and West Frankfort	40,400,000.0	46,002,629	38,597,044	
2007	Construct 30.4 miles of 345 kV line between West Frankfort and Brown	38,400,000.0	43,725,271	36,686,300	
2007	Install a second 345/138 kV, 450 MVA transformer at Brown	3,700,000.0	4,213,112	3,534,878	
2007	Construct 11.8 miles of 138 kV line between West Lexington and Higby Mill	2,400,000.0	2,732,829	2,292,894	
2007	Construct 10.2 miles of 138 kV line between West Frankfort and Tyrone	2,600,000.0	2,960,565	2,483,968	
2007	Install two 345 kV breakers at Trimble County for GSU	2,000,000.0	2,277,358	1,910,745	
				<b>Construction PV</b>	<b>85,505,828</b>
				<b>PV Savings of Losses</b>	<b>1,869,265</b>
				<b>Net PVRR</b>	<b>83,636,563</b>

**MISO Option #2 (WF-BR, MC-HC)**

<u>Year</u>	<u>Construction</u>	2003 \$'s	Inflated \$'s	Present Value	
2007	Construct 30.4 miles of 345 kV line between West Frankfort and Brown	36,400,000.0	41,447,913	34,775,555	
2007	Construct 42.9 miles of 345 kV line between Mill Creek and Hardin County	49,900,000.0	56,820,079	47,673,082	
2007	Install a second 345/138 kV, 450 MVA transformer at Brown	3,700,000.0	4,213,112	3,534,878	
2007	Construct 11.8 miles of 138 kV line between West Lexington and Higby Mill	2,400,000.0	2,732,829	2,292,894	
2007	Increase the clearance of the 500 MCM Cu conductor for Blue Lick-Bullitt County 161 kV	1,000,000.0	1,138,679	955,372	
2007	Replace 2000A equipment on Buckner-Middletown and Trimble Co.-Middletown 345 kV	700,000.0	797,075	668,761	
2007	Reconductor Hardin County-Etown 138 kV (1.3 miles) with 954 kcm ACSR	200,000.0	227,736	191,074	
2007	Install two 345 kV breakers at Trimble County for GSU	2,000,000.0	2,277,358	1,910,745	
				<b>Construction PV</b>	<b>92,002,360</b>
				<b>PV Savings of Losses</b>	<b>2,667,785</b>
				<b>Net PVRR</b>	<b>89,334,575</b>

Present Value of TC #2 Transmission Options based on potential requirements







**LOUISVILLE GAS AND ELECTRIC COMPANY  
KENTUCKY UTILITIES COMPANY**

**CASE NO. 2005-00142  
CASE NO. 2005-00154  
CASE NO. 2005-00155**

**Response to Commission Staff's First Data Request  
Dated: June 30, 2005**

**Question No. 12**

**Responding Witness: Michael G. Toll**

Q-12. Document how the short-and long-term thermal ratings of all electrical equipment (e.g., breakers, combustion turbines, conductor, wave traps, disconnect switches, relays, bushings, transformers, and other equipment) are calculated. Include secondary ratings, ratings within a ring bus, and the ambient and operating temperatures used.

A-12. Please see attached.



December 01,2004

## **LG&E Energy LLC Transmission Rating Methodologies**

This Transmission Ratings Methodologies document describes the factors utilized in the development of summer and winter ratings for planning purposes. The Transmission System is operated using ambient temperature adjusted ratings that are based upon these methodologies.

### **Breakers**

IEEE Std C37.04-1999, IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers defines the ambient temperature range for the continuous current rating under Usual Service conditions. The nameplate continuous current rating is applicable when the ambient temperature is not above 40°C or below -30°C. Summer and winter seasonal ratings are established at the Manufacturer's continuous current rating.

### **Bus – Conductor**

The thermal ratings of bus conductors are calculated using the same parameters as Line Conductors - Overhead except LGEE designs and operates its station bus to a maximum temperature of 212°F (100°C). The normal rating for station bus is 176°F (80°C).

### **Bus – Tubular and Angle**

The thermal ratings of Tubular and Angle bus are calculated based on the formulas found in Appendix C, Thermal Considerations for Outdoor Bus-Conductor Designs of the ANSI/IEEE Standard 605-1987, IEEE Guide for Design of Substation Rigid Bus Structures. The parameters used to define the rating are the same as Line Conductors – Overhead except for the following bus characteristics.

- 1) Bus Characteristics – The bus parameters necessary to determine the rating include:
  - a) Shape – LGEE uses typical manufacturer's data for each station bus type and size.
    - i) Round bus – the diameter.
    - ii) Square bus – the dimension of one side.
    - iii) Rectangular bus – the dimension of two sides.
    - iv) Angle bus – the outside dimension of the two sides.
  - f) Maximum Operating Temperature – LGEE designs and operates its station bus to a maximum temperature of 212°F (100°C). The normal rating for station bus is 176°F (80°C).

### **Current Limiting Reactors**

Summer seasonal ratings are established at the Manufacturer's continuous current rating at 40°C and winter seasonal ratings are established at the Manufacturer's continuous current rating at -5°C.

### **Current Transformers – Bushing Type**

The normal ratings of bushing type current transformers are calculated using the same parameters as Current Transformers – Other. The emergency ratings of bushing type current transformers are determined using the greater of two calculations: 1) the rating using the same parameters as Current Transformers – Other and 2) the rating calculated based upon the formula,

$$\text{Tap Rating} * (\text{Nameplate Rating} / \text{Tap Rating})^{**1/2}$$

### **Current Transformers – Other**

IEEE Std C57.13-1993, IEEE Standard Requirements for Instrument Transformers defines the ambient temperature range for the continuous current rating under Usual Service conditions. The nameplate

continuous current rating is applicable if the ambient temperature of the cooling air does not exceed 40°C and the average ambient temperature of the cooling air for any 24-hour period does not exceed 30°C. Summer and winter seasonal ratings are established at the Manufacturer's continuous current rating of the selected tap times the continuous thermal current rating factor (RF).

### **Line Conductors – Overhead**

The thermal ratings of overhead line conductors are calculated based on the formulas from the 1989 ECAR Transmission Conductors Thermal Ratings report 89-TFP-28. The parameters that must be defined to determine a rating relate to the following: 1) conductor, 2) sun position, 3) wind velocity and angle, and 4) ambient air temperature.

- 1) Conductor Characteristics – The conductor parameters necessary to determine the rating include: a) diameter, b) ac resistance, c) oxidation, d) azimuth, e) elevation above sea level and f) maximum operating temperature.
  - a) Diameter – LGEE uses typical manufacturer's data for each conductor type and size.
  - b) AC Resistance – The electrical resistance of a conductor is a function of its temperature. LGEE obtains resistance values at two temperatures from typical manufacturer's data.
  - c) Oxidation – LGEE assumes that the emissivity and solar absorption values are 0.80.
  - d) Azimuth – LGEE assumes that the conductor and sun azimuths are oriented perpendicular to each other.
  - e) Elevation above sea level – For the LGEE service territory, elevations range from 257' along the Mississippi River in southwest Kentucky to 4145' atop Black Mountain in the southeast. The approximate mean elevation across the state is 750'. A significant portion of the LGEE transmission system is located primarily in the Bluegrass Region. Elevations in this region range from 800 to 1000 feet above sea level. Therefore, LGEE assumes conductors are 1000' above sea level.
  - f) Maximum Operating Temperature – LGEE designs and operates its transmission lines to a maximum conductor temperature of 212°F (100°C). A transmission line will not be rated above 176°F (80°C) without field verification of its maximum operating temperature. Clearances between the conductor and all applicable possible code conflicts (i.e. ground, buildings, roads, water, railroad, other lines, etc.) are verified in accordance with the NESC 2002 requirements. The clearances are checked throughout the conductor movement envelope as detailed in the NESC 2002. The conductor sag is modeled as being in either a heavy or medium loading district as defined by the NESC. If the maximum operating temperature of a conductor has not been field verified, then the maximum allowable operating temperature will be determined based upon transmission system needs.

The normal rating for the conductor is the lesser of 176°F (80°C) and the maximum operating temperature.
- 2) Sun Position – The sun and conductor azimuths are assumed perpendicular.
- 3) Wind velocity and angle – LGEE calculations assume two mile per hour perpendicular winds.
- 4) Ambient Air Temperature – The ambient temperature used to calculate ratings is 96°F for summer conditions and 23°F for winter conditions.

### **Line Conductors – Underground**

Summer and winter seasonal ratings are established at the Manufacturer's continuous current rating.

### **Relays**

Protection schemes are designed with the objective that the continuous current into the relay will not exceed 5 amps. When available CT ratios require that the relay be operated above the desired 5 amps, the continuous current into the relay will not exceed the manufacturer's continuous current rating.

**Switches – Bus and Line**

IEEE Std C37.37 – IEEE Loading Guide for AC High-Voltage Air Switches (in Excess of 1000V) was developed to aid users in the determination of continuous and emergency load current capabilities of air switches under various conditions of ambient temperature.

The current carrying capability of a switch is dependent on the characteristics of the switch parts, ambient temperature, and the duration at which a switch will be operated in an emergency state. The following parameters are used to establish switch ratings:

- Summer Ambient Temperature is 96°F (35.6°C)
- Winter Ambient Temperature is 23°F (-5°C)
- Emergency Periods are more than 24 hours in duration
- The switches could be made with parts from the most restrictive class designation

IEEE Std C37.37 and the above specific parameters have been used to determine transmission line and substation air switch ratings:

Condition	Rating
Summer Normal	1.05 times Nameplate
Summer Emergency	1.20 times Nameplate
Winter Normal	1.32 times Nameplate
Winter Emergency	1.35 times Nameplate

**Transformers**

IEEE has developed guides for loading transformers above nameplate based on the life expectancy of transformer insulation as affected by temperature and time. IEEE Std 756, IEEE Trial-Use Guide for Loading Mineral-Oil-Immersed Power Transformers Rated in Excess of 100 MVA (65°C Winding Rise) describes four different time-temperature based types of loading in excess of nameplate rating that may be applied to transformers. IEEE's Planned Loading Beyond Nameplate and Long-Time Emergency Loading definitions are consistent with LGEE's transmission system design and risk tolerance.

1. Planned Loading Beyond Nameplate – defines a condition wherein a 65°C transformer is so loaded that its hottest-spot temperature is in the temperature range of 120°C-130°C for a maximum of 4 hours daily. The characteristics of this type of loading are no system outages and regular and comparatively frequent occurrences.
2. Long-Time Emergency Loading - defines a condition wherein a 65°C transformer is so loaded that its hottest-spot temperature is in the range of 120°C-130°C for a maximum of 4 hours and in the range of 130°C-140°C for a maximum of 6 hours daily. The characteristics of this type of loading are one long time outage of a transmission system element and two or three occurrences over the normal lifetime of the transformer, each occurrence may last several months.

Ambient Air Temperature – The ambient temperature used to calculate ratings differs depending on whether the rating will be used for a) planning or b) operating the system.

- a) Planning – Planning assumes a daily peak ambient temperature of 104°F for summer conditions and a daily peak ambient temperature of 23°F for winter conditions.
- b) Operation – The daily capability of transformers is based on expected or actual daily peak ambient temperature.

Nameplate Rise	Maximum Nameplate Rating Multiplier			
	SN	SE	WN	WE
55C	1.00	1.20	1.37	1.44
65C	1.00	1.15	1.30	1.35

**Wave Traps**

ANSI C93.3-1995, Requirements for Power-Line Carrier Carrier Traps defines the ambient temperature range for the continuous current rating under Usual Service conditions. The nameplate continuous current rating is applicable when the mean 1 hr temperature does not exceed 45°C and the mean 24 hr temperature does not exceed 40°C. Summer and winter seasonal ratings are established at the Manufacturer's continuous current rating.



**LOUISVILLE GAS AND ELECTRIC COMPANY  
KENTUCKY UTILITIES COMPANY**

**CASE NO. 2005-00142  
CASE NO. 2005-00154  
CASE NO. 2005-00155**

**Response to Commission Staff's First Data Request  
Dated: June 30, 2005**

**Question No. 13**

**Responding Witness: Mark S. Johnson**

- Q-13. Explain or graphically depict on a system map regional considerations such as transfer limits, loop flows, voltage limits, and generation clusters.
- A-13. Please see the MISO studies provided as Exhibits MSJ-1, MSJ-2, and MSJ-3 to the testimony of Mark S. Johnson. Also please see the response to Question No. 10.



**LOUISVILLE GAS AND ELECTRIC COMPANY  
KENTUCKY UTILITIES COMPANY**

**CASE NO. 2005-00142**

**CASE NO. 2005-00154**

**CASE NO. 2005-00155**

**Response to Commission Staff's First Data Request  
Dated: June 30, 2005**

**Question No. 14**

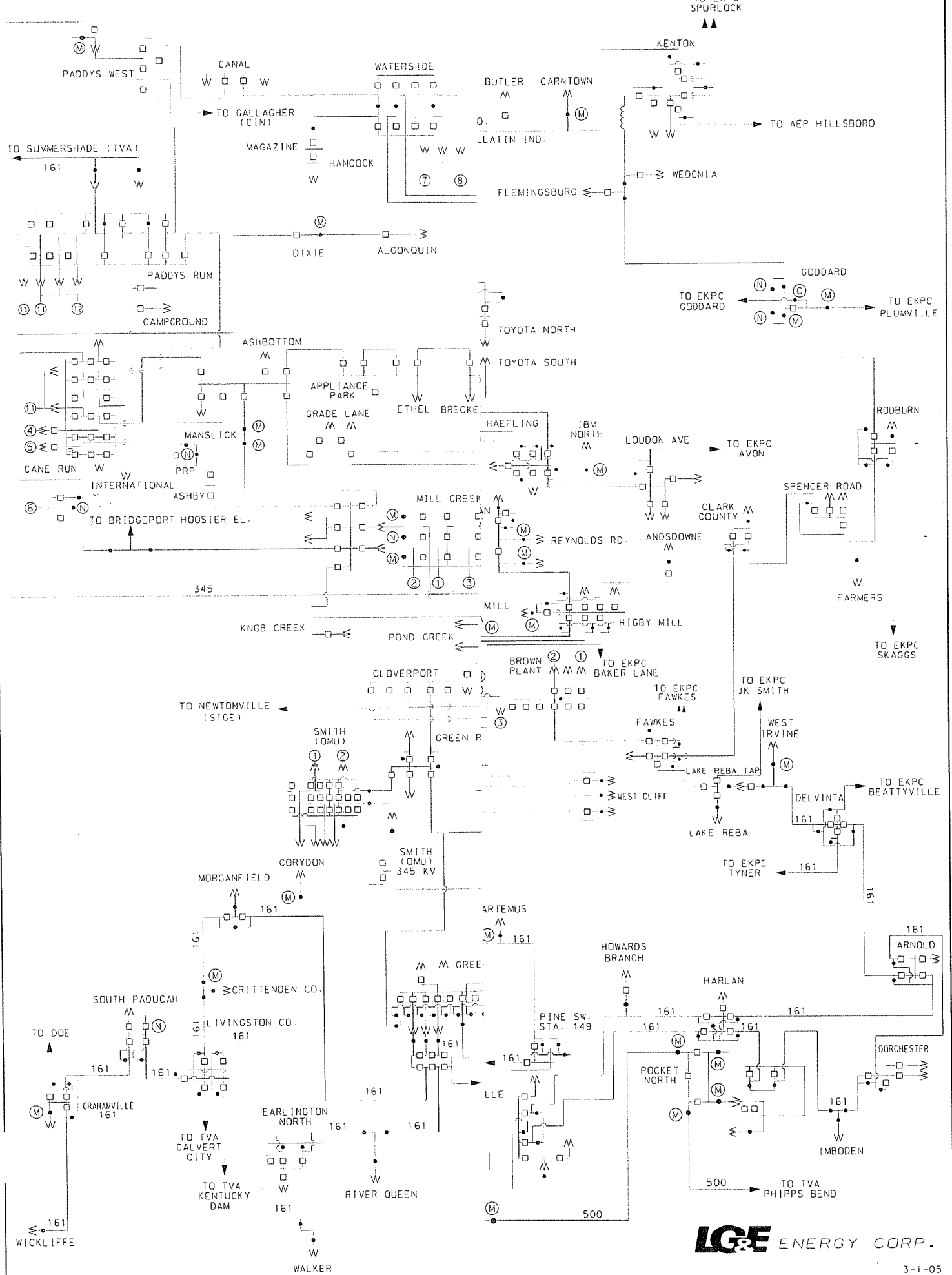
**Responding Witness: Michael G. Toll**

Q-14. Provide a detailed map that shows the geographical placement and identification of transmission electrical facilities in Kentucky.

A-14. Please see attached.







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