Plant Name: Mill Creek
Unit: 4
MW 525
Project description High Level Emissions Control Study
Revised on: 05/28/10

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
WFGD	$455,000,000	$867	$21,775,000	$77,149,000
Fabric Filter	$133,000,000	$253	$5,804,000	$21,990,000
PAC Injection	$6,890,000	$13	$3,858,000	$4,697,000
Neural Networks	$1,000,000	$2	$100,000	$222,000
Total	$595,890,000	$1,135	$31,537,000	$104,058,000

DRAFT

From: Saunders, Eileen
To: Turner, Steven; Hensley, Mike
Sent: 6/3/2010 2:41:35 PM
Subject: FW: 167987.26.0000 100530 - EON Draft AQCS Costs - Cane Run
Attachments: Cane Run Unit 4 Cost Estimates 052810.pdf; Cane Run Unit 5 Cost Estimates 052810.pdf; Cane Run Unit 6 Cost Estimates 052810.pdf

All,

Please find the Draft costs I received from B&V. Ralph Bowling is on vacation but I reviewed the information with John Voyles and Scott Straight today. As discussed recently by Paul Thompson in the manager's meeting, the issues surrounding these studies are highly sensitive. Therefore, I ask that you are careful in how you distribute or discuss the information at your station. Please note that the numbers are not final and we are still working with B&V to refine the technology options so the estimate may change.

Also, B&V is working on a report that will include the backup information regarding how these numbers were developed, site arrangements and simple flow diagrams. Once I receive that information, I will send that along to you.

If you have any questions, please let me know.

Thank you,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Sunday, May 30, 2010 3:34 PM
To: Saunders, Eileen
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: 167987.26.0000 100530 - EON Draft AQCS Costs - Cane Run

Eileen,

Attached please find the draft AQCS Costs for the approved technologies at Cane Run Units 4-6. The levelized annual cost was based on the Capital Recovery Factor (CRF) of 12.17% as supplied by EON as part of the economic criteria.

Regards,

Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

Plant Name: Cane Run
Unit: 4
MW 168
Project description High Level Emissions Control Study
Revised on: 05/28/10

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$63,000,000	$375	$2,219,000	$9,886,000
WFGD	$152,000,000	$905	$8,428,000	$26,926,000
Fabric Filter	$33,000,000	$196	$1,924,000	$5,940,000
Lime Injection	$2,569,000	$15	$983,000	$1,296,000
PAC Injection	$2,326,000	$14	$1,087,000	$1,370,000
Neural Networks	$500,000	$3	$50,000	$111,000
Total	$253,395,000	$1,508	$14,691,000	$45,529,000

Plant Name:	Cane Run
Unit:	5
MW	181
Project description	High Level Emissions Control Study
Revised on:	05/28/10

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$66,000,000	$365	$2,421,000	$10,453,000
WFGD	$159,000,000	$878	$8,789,000	$28,139,000
Fabric Filter	$35,000,000	$193	$2,061,000	$6,321,000
Lime Injection	$2,752,000	$15	$1,089,000	$1,424,000
PAC Injection	$2,490,000	$14	$1,120,000	$1,423,000
Neural Networks	$500,000	$3	$50,000	$111,000
Total	$265,742,000	$1,468	$15,530,000	$47,871,000

Plant Name: Cane Run
Unit: 6
MW 261
Project description High Level Emissions Control Study
Revised on: 05/28/10

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$86,000,000	$330	$2,793,000	$13,259,000
WFGD	$202,000,000	$774	$10,431,000	$35,014,000
Fabric Filter	$45,000,000	$172	$2,672,000	$8,149,000
Lime Injection	$3,873,000	$15	$1,367,000	$1,838,000
PAC Injection	$3,490,000	$13	$1,336,000	$1,761,000
Neural Networks	$500,000	$2	$50,000	$111,000
Total	$340,863,000	$1,306	$18,649,000	$60,132,000

DRAFT

From:	Lucas, Kyle J.
To:	Saunders, Eileen
CC:	Hillman, Timothy M.; Mahabaleshwarkar, Anand
Sent:	6/2/2010 7:55:13 AM
Subject:	167987.23.0200 100602 - EON Draft AQCS Design Basis
Attachments:	Design Basis for E-ON 060110.pdf

Eileen,
Attached please find the design basis with updated references based on our conversation last week.
Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

EON
EW Brown, Ghent, Cane Run, Mill Creek, Trimble County, Green River
Design Basis
6/1/2010

Unit Designation	EW Brown			Ghent				Cane Run			Mill Creek				Trimble County		Green River		Reference
	1	2	3	1	2	3	4	4	5	6	1	2	3	4	1	2	3	4	
Ultimate Coal analysis, wet basis																			
Carbon, %	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	61.20	65.41	65.41	Data from E-ON
Hydrogen, %	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.28	4.46	4.46	Data from E-ON
Sulfur, %	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	2.60	2.60	Data from E-ON
Nitrogen, %	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.34	1.34	Data from E-ON
Chlorine, %	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Data from E-ON
Oxygen, %	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.89	6.69	6.69	Data from E-ON
Ash, %	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	9.00	9.00	Data from E-ON
Moisture, %	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	10.50	10.50	Data from E-ON
Higher Heating Value, Btu/lb	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,600	11,600	Data from E-ON
Trace Metal Analysis, ppm																			
Antimony (Sb)	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.07	1.07	Data from E-ON
Arsenic (As)	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	10.00	10.00	Data from E-ON
Barium (Ba)	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	74.00	49.00	49.00	Data from E-ON
Cadmium (Cd)	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.30	0.30	Data from E-ON
Chlorine (Cl)	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1845.00	1845.00	Data from E-ON
Chromium (Cr)	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	23.00	17.00	17.00	Data from E-ON
Fluorine (F)	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	98.00	71.00	71.00	Data from E-ON
Lead (Pb)	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	Data from E-ON
Magnesium (Mg)	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	684.00	509.00	509.00	Data from E-ON
Mercury (Hg)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.10	0.10	Data from E-ON
Nickel (Ni)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	14.00	14.00	Data from E-ON
Selenium (Se)	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	1.93	1.93	Data from E-ON
Strontium (Sr)	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	30.00	30.00	Data from E-ON
Vanadium (V)	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	Data from E-ON
Zinc (Zn)	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	50.00	50.00	Data from E-ON
Ash Analysis, % by mass																			
Alumina (Al2O3)	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	21.69	19.45	19.45	Data from E-ON
Barium Oxide (BaO)	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	Data from E-ON
Lime (CaO)	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.74	2.89	2.89	Data from E-ON
Iron Oxide (Fe2O3)	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	19.90	19.90	Data from E-ON
Magnesia (MgO)	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	Data from E-ON
Manganese Oxide (MnO)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	Data from E-ON
Phosphorous Pentoxide (P2O5)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.21	0.21	Data from E-ON
Potassium Oxide (K2O)	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.41	2.41	Data from E-ON
Silica (SiO2)	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	45.88	49.65	49.65	Data from E-ON
Sodium Oxide (Na2O)	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.77	0.77	Data from E-ON
Strontium Oxide (SrO)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	Data from E-ON
Sulfur Trioxide (SO3)	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.47	2.47	Data from E-ON
Titania (TiO2)	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.08	1.08	Data from E-ON
Undetermined	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	Data from E-ON
Unit Characteristics																			
Gross Turbine Generator Load, MW	110	180	457	541	517	523	526	168	181	261	330	330	423	525	547	760	75	109	Data from E-ON
Boiler Efficiency, % (HHV)	85.32	86.73	86.53	85.74	86.83	86.31	86.77	85.12	87.14	87.09	85.40	85.40	86.51	86.51	86.88	86.92	89.02	85.25	Data from E-ON
Boiler Heat Input, MBtu/hr (HHV)	999.80	1,665.50	4,120.43	5,369	4,327	5,496	5,473	1,603	1,757	2,589	3,224	3,311	4,209	5,122	5,310	6,583	848	1,150	Data from E-ON
Coal Flow Rate, lb/hr	89,268	148,705	367,895	479,375	386,339	490,714	488,661	143,125	156,875	231,161	287,857	295,625	375,804	457,321	474,107	587,768	73,103	99,138	Data from E-ON
Capacity Factor, %	44.00	62.00	57.00	81.00	71.00	78.00	77.00	60.00	62.00	54.00	68.00	70.00	75.00	75.00	85.00	87.00	26.00	32.00	Data from E-ON
Fly Ash Portion of Total Ash, %	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	Data from E-ON
Air Heater Leakage, %	10.0	10.0	10.0	10.0	10.0	10.0	10.0	16.7	17.0	7.8	10.0	10.0	10.0	10.0	10.0	6.0	6.8	6.8	Data from E-ON
Excess Air, %	34.352	18.258	16.848	18.258	21.926	21.926	20.433	20.00	20.00	20.00	20.00	20.00	20.00	20.00	18.258	19.700	25.000	25.000	Data from E-ON
Economizer Outlet Conditions																			
Flue Gas Temperature, F	650	730	730	729	610	731	791	580	630	617	760	760	690	640	700	586	475	610	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.	-8.0	-3.7	-5.0	-3.2	-5.1	-5.1	-4.5	-4.0	-3.0	-4.0	-5.0	-5.0	-5.0	-5.0	-6.0	-6.0	-5.0	-6.0	B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr	1,090,927	1,615,221	3,952,267	5,206,933	4,316,060	5,482,104	5,397,559	1,575,668	1,727,042	2,544,856	3,169,029	3,254,545	4,137,234	5,034,667	5,149,714	6,455,853	886,785	1,202,598	B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm	509,072	796,739	1,955,176	2,563,081	1,922,533	2,718,161	2,805,958	680,015	779,254	1,137,376	1,608,445	1,651,849	1,979,343	2,303,938	2,490,348	2,816,034	345,095	536,927	B&V Combustion Calculations
Uncontrolled Sulfur Dioxide Concentration, lb/MBtu	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	4.48	4.48	= % Sulfur in Coal x 20,000 / HHV
Uncontrolled Sulfur Dioxide Mass Flow Rate, lb/hr	5,993	9,983	24,697	32,161	25,936	32,942	32,805	9,608	10,531	15,518	19,324	19,846	25,228	30,701	31,828	39,458	3,798	5,150	B&V Combustion Calculations
Uncontrolled PM Concentration, lb/MBtu	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	8.746	6.334	6.334	B&V Combustion Calculations
Uncontrolled PM Mass Flow Rate, lb/hr	8,744	14,566	36,037	46,957	37,844	48,068	47,867	14,020	15,367	22,643	28,197	28,958	36,812	44,797	46,441	57,575	5,371	7,284	= Uncontrolled PM (lb/MBtu) x Heat Input (MBtu/hr)
Uncontrolled Mercury Concentration, lb/TBtu	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	10.71	8.62	8.62	= Hg in Coal (ppm) x Coal Flow Rate (lb/hr) / Heat Input (MBtu/hr)
Uncontrolled HCl Mass Flow Rate, lb/hr	147	244.63	605.21	789	636	807	804	235	258	380	474	486	618	752	780	967	139	188	= HCl in Coal (ppm) / 1,000,000 x Coal Flow Rate (lb/hr) x MW of HCl / MW of Cl
Uncontrolled HCl Concentration, lb/MBtu	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.16	0.16	= HCl Flowrate (lb/hr) / Heat Input (MBtu/hr)
Hot-Side ESP Outlet Conditions																			
Flue Gas Temperature, F	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	605	708	770	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	No Hot-side ESP. Unit has a Cold-side ESP	600	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.					-10.80	-10.90	-10.8											-8.1	B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr					4,531,863	5,756,209	5,667,437											1,262,728	B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm					2,041,027	2,843,960	2,947,083											562,236	B&V Combustion Calculations
Controlled PM Concentration, lb/MBtu					0.0565	0.0451	0.0248											0.08	B&V Combustion Calculations
Controlled PM Mass Flow Rate, lb/hr					244	248	135.73											92	= Controlled PM (lb/MBtu) x Heat Input (MBtu/hr)
Particulate Removal Efficiency, %					99.35	99.48	99.72											98.74	= { 1- Controlled PM (lb/MBtu) / Uncontrolled PM (lb/MBtu) } x 100
SCR Outlet Conditions																			
Flue Gas Temperature, F	No SCR	No SCR	New SCR Planned for 2012	729	No SCR	708	770	No SCR	No SCR	No SCR	No SCR	No SCR	690	640	700	586	No SCR	No SCR	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.				-13.2		-20.90	-20.8						-13.0	-13.0	-16.0	-11.0			B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr				5,311,071		5,871,333	5,780,766						4,219,979	5,135,360	5,252,708	6,584,970			B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm				2,682,371		2,977,658	3,085,629						2,061,162	2,399,175	2,606,716	2,910,365			B&V Combustion Calculations
Controlled NOx Concentration, lb/MBtu				0.0639		0.0479	0.0627						0.0584	0.0589	0.076	0.076			Data from E-ON
Controlled NOx Mass Flow Rate, lb/hr				343		263	343						246	302	404	500			= Controlled NOx (lb/MBtu) x Heat Input (MBtu/hr)
Air Heater Outlet Conditions																			
Flue Gas Temperature, F	350	330	340	361	309	322	309	369	299	318	375	375	330	330	320	324	243	363	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.	-14.00	-8.00	-18.00	-22.4	-18.60	-36.10	-29.4	-8.0	-6.0	-8.0	-10.0	-10.0	-18.0	-18.0	-22.5	-16.0	-9.0	-13.5	B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr	1,200,020	1,776,743	4,347,494	5,842,179	4,985,049	6,458,467	6,358,865	1,839,262	2,021,310	2,744,081	3,485,932	3,580,000	4,641,976	5,648,896	5,777,979	6,980,068	947,426	1,349,077	B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm	415,851	589,646	1,498,187	2,091,568	1,657,754	2,288,309	2,175,592	641,787	642,552	896,674	1,229,416	1,262,592	1,581,582	1,924,653	1,965,750	2,345,528	280,496	473,593	B&V Combustion Calculations
Cold-Side ESP Outlet Conditions																			
Flue Gas Temperature, F	340	320	330	358	No Cold-side ESP. Unit has a Hot-side ESP	No Cold-side ESP. Unit has a Hot-side ESP	No Cold-side ESP. Unit has a Hot-side ESP	369	299	318	340	340	330	330	320	324	230	No Cold-side ESP. Unit has a Hot-side ESP	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.	-18.00	-12.00	-19.00	-25.7				-9.1	-6.8	-9.8	-14.0	-14.0	-23.0	-21.0	-25.5	-18.0	-11.0		B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr	1,260,021	1,865,580	4,564,869	6,134,288				1,931,225	2,122,376	2,881,285	3,660,228	3,759,000	4,874,075	5,931,341	6,066,878	7,398,872	994,797		B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm	436,197	618,296	1,559,510	2,209,920				676,568	676,855	947,034	1,250,977	1,284,735	1,684,442	2,039,199	2,082,968	2,502,995	290,916		B&V Combustion Calculations
Controlled PM Concentration, lb/MBtu	0.241	0.1	0.1	0.023				0.041	0.034	0.024	0.0385	0.0443	0.0517	0.0354	0.017	0.31	0.063		Data from E-ON
Controlled PM Mass Flow Rate, lb/hr	241	166.55	412.04	123				66	60	62	124	147	218	181	90	2041	53		= Controlled PM (lb/MBtu) x Heat Input (MBtu/hr)
Particulate Removal Efficiency, %	97.24	98.86	98.86	99.74				99.53	99.61	99.73	99.56	99.49	99.41	99.60	99.81	96.46	99.01		= { 1- Controlled PM (lb/MBtu) / Uncontrolled PM (lb/MBtu) } x 100
Fabric Filter Outlet Conditions																			
Flue Gas Temperature, F	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	No Fabric Filter	313	No Fabric Filter	No Fabric Filter	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.																-23.1			B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr																7,398,872			B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm																2,500,664			B&V Combustion Calculations
Controlled PM Concentration, lb/MBtu																0.015			Data from E-ON
Controlled PM Mass Flow Rate, lb/hr																99			= Controlled PM from fabric Filter (lb/MBtu) x Heat Input (MBtu/hr)
Particulate Removal Efficiency, %																95.16			= { 1- FF Controlled PM (lb/MBtu) / ESP Controlled PM (lb/MBtu) } x 100
ID Fan Outlet Conditions																			
Flue Gas Temperature, F	356.05	332.17	346.44	376.94	325.52	346.34	333.60	379.03	306.39	327.81	354.85	355.15	348.83	348.83	340.08	334.60	235.91	371.55	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.	10.00	10.00	10.00	6.10	11.40	5.90	14.60	8.00	7.00	8.00	10.00	10.00	10.00	10.00	10.00	15.77	1.00	1.00	B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr	1,260,021	1,865,580	4,564,869	6,134,288	4,985,049	6,458,467	6,358,865	1,931,225	2,122,376	2,881,285	3,660,228	3,759,000	4,874,075	5,931,341	6,066,878	7,398,872	994,797	1,349,077	B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm	415,059	594,805	1,481,211	2,086,965	1,571,913	2,119,437	2,010,799	656,526	660,654	917,824	1,200,841	1,233,697	1,588,066	1,932,543	1,954,644	2,334,113	284,775	461,503	B&V Combustion Calculations

EON
EW Brown, Ghent, Cane Run, Mill Creek, Trimble County, Green River
Design Basis
6/1/2010

Unit Designation	EW Brown			Ghent				Cane Run			Mill Creek				Trimble County		Green River		Reference
	1	2	3	1	2	3	4	4	5	6	1	2	3	4	1	2	3	4	
Scrubber Outlet Conditions	(For 3 units combined to a common/shared scrubber)																		
Flue Gas Temperature, F	129.64			131.74	128.04	129.28	128.50	131.19	125.96	128.80	130.30	130.32	129.60	129.60	129.24	129.43	No Scrubber	No Scrubber	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.	2.00			1.70	1.50	2.00	1.60	2.00	2.00	2.00	1.00	1.00	1.00	1.00	2.00	6.00			B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr	8,136,097			6,534,149	5,252,980	6,834,132	6,711,801	2,056,206	2,226,116	3,036,144	3,879,298	3,984,228	5,157,618	6,277,442	6,413,722	7,813,543			B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm	2,029,766			1,643,977	1,306,064	1,705,743	1,671,656	517,157	550,120	754,452	972,502	998,878	1,291,025	1,571,359	1,598,535	1,927,087			B&V Combustion Calculations
Controlled Sulfur Dioxide Mass Flow Rate, lb/hr	679			805	865	824	821	659	736	1,750	1,515	1,556	2,441	2,407	441	546			B&V Combustion Calculations
Controlled Sulfur Dioxide Concentration, lb/MBtu	0.10			0.150	0.200	0.150	0.150	0.411	0.419	0.676	0.47	0.47	0.58	0.47	0.083	0.083			= Controlled SO_2 (lb/hr) / Heat Input (MBtu/hr)
Sulfur Dioxide Removal Efficiency, %	98.33			97.50	96.67	97.50	97.50	93.15	93.02	88.73	92.17	92.17	90.33	92.17	98.62	98.62			= { 1- Controlled SO_2 (lb/MBtu) / Uncontrolled SO_2 (lb/MBtu) } x 100
Wet ESP Outlet Conditions																			
Flue Gas Temperature, F	No WESP			No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	No WESP	129.43	No WESP	No WESP	B&V Combustion Calculations
Flue Gas Pressure, in. w.g.																2.00			B&V Combustion Calculations
Flue Gas Mass Flow Rate, lb/hr																7,813,543			B&V Combustion Calculations
Volumetric Flue Gas Flow Rate, acfm																1,945,943			B&V Combustion Calculations
Stack Outlet Emissions[1]																			
Sulfur Dioxide Emission Concentration, lb/MBtu	0.10	0.10	0.10	0.15	0.20	0.15	0.15	0.411	0.419	0.676	0.47	0.47	0.58	0.47	0.083	0.083	4.48	4.48	Data from E-ON
Sulfur Dioxide Emission Rate, lb/hr	100	167	412	805	865	824	821	659	736	1,750	1,515	1,556	2,441	2,407	441	546	3,798	5,150	= SO_2 Emission (lb/MBtu) x Heat Input (MBtu/hr)
PM Emission Concentration, lb/MBtu	0.241	0.1	0.1	0.023	0.0565	0.0451	0.0248	0.041	0.034	0.024	0.0385	0.0443	0.0517	0.0354	0.017	0.015	0.063	0.08	Data from E-ON
PM Emission Rate, lb/hr	241	167	412	123	244	248	136	66	60	62	124	147	218	181	90	99	53	92	= PM Emission (lb/MBtu) x Heat Input (MBtu/hr)
NOx Emission Concentration, lb/MBtu	0.4463	0.4374	0.3319	0.0639	0.276	0.0479	0.0627	0.3394	0.3843	0.272	0.3169	0.3139	0.0584	0.0589	0.076	0.076	0.4011	0.3864	Data from E-ON
NOx Emission Rate, lb/hr	446	728	1,368	343	1,194	263	343	544	675	704	1,022	1,039	246	302	404	500	340	444	= NOx Emission (lb/MBtu) x Heat Input (MBtu/hr)
Hg Emission Concentration, lb/TBtu	5.0	5.0	5.0	2.0	3.5	2.0	2.0	3.5	3.5	3.5	3.0	3.0	2.5	2.5	1.2	1.0	5.5	5.5	Data from E-ON
Hg Emission Rate, lb/hr	5.00E-03	8.33E-03	2.06E-02	1.07E-02	1.51E-02	1.10E-02	1.09E-02	5.61E-03	6.15E-03	9.06E-03	9.67E-03	9.93E-03	1.05E-02	1.28E-02	6.37E-03	6.58E-03	4.66E-03	6.33E-03	= Hg Emission (lb/TBtu) x Heat Input (MBtu/hr) / 1,000,000
HCl Emission Concentration, lb/MBtu	0.002	0.002	0.002	0.0015	0.0017	0.0015	0.0015	0.00095	0.00095	0.00095	0.0015	0.0015	0.0015	0.0015	0.00085	0.00085	0.017	0.017	Data from E-ON
HCl Emission Rate, lb/hr	2	3	8	8	7	8	8	2	2	2	5	5	6	8	5	6	14	20	= HCl Emission (lb/MBtu) x Heat Input (MBtu/hr)
CO Emission Concentration, lb/MBtu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	CO Emissions are not known
CO Emission Rate, lb/hr	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	CO Emissions are not known
Dioxin/Furan Emission Concentration, lb/MBtu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Dioxin/Furan Emissions are not known
Dioxin/Furan Emission Rate, lb/hr	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Dioxin/Furan Emissions are not known

Notes:
1. Current Outlet Emissions as noted in E-ON Matrix

Revision History:

Rev	Date	Description
0	5/21/2010	Initial Issue
1	6/1/2010	Final Issue

From:	Ritchey, Stacy
To:	Saunders, Eileen
Sent:	6/2/2010 10:21:39 AM
Subject:	Environmental Summay (rev3 6-1-10).xlsx
Attachments:	Environmental Summay (rev3 6-1-10).xlsx

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Black & Veatch Study Cost Estimates													
2	$ in thousands													
3														
4														
5			**Capital Cost**		**O&M Cost**		**Total Capital and O&M**		**Levelized Annual Costs**			2010	2011	2012
6	**BROWN**													
7	Brown 1 - Low NOx Burners		$1,156		$0		$1,156		$141					
8	Brown 1 - Baghouse		$40,000		$1,477		$41,477		$6,345					
9	Brown 1 - PAC Injection		$1,599		$614		$2,213		$809					
10	Brown 1 - Neural Networks		$500		$50		$550		$111					
11	Brown 1 - Overfire Air		$767		$132		$899		$225					
12	Total Brown 1		**$44,022**		**$2,273**		**$46,295**		**$7,631**					
13														
14	Brown 2 - SCR		$92,000		$3,278		$95,278		$14,474				$18,400	$41,400
15	Brown 2 - Baghouse		$51,000		$1,959		$52,959		$8,166					
16	Brown 2 - PAC Injection		$2,476		$1,090		$3,566		$1,391					
17	Brown 2 - Neural Networks		$500		$50		$550		$111					
18	Brown 2 - Lime Injection		$2,739		$1,155		$3,894		$1,488					
19	Total Brown 2		**$148,715**		**$7,532**		**$156,247**		**$25,630**					
20														
21	Brown 3 - Baghouse		$61,000		$3,321		$64,321		$10,745					
22	Brown 3 - PAC Injection		$5,426		$2,330		$7,756		$2,990					
23	Brown 3 - Neural Networks		$1,000		$100		$1,100		$222					
24	Total Brown 3		**$67,426**		**$5,751**		**$73,177**		**$13,957**					
25														
26	**Total Brown**		**$260,163**		**$15,556**		**$275,719**		**$47,218**					
27														
28														
29	**GHENT**													
30	Ghent 1 - Baghouse		$131,000		$5,888		$136,888		$21,831					
31	Ghent 1 - PAC Injection		$6,380		$4,208		$10,588		$4,984					
32	Ghent 1 - Neural Networks		$1,000		$100		$1,100		$222					
33	Total Ghent 1		**$138,380**		**$10,196**		**$148,576**		**$27,037**					
34														
35	Ghent 2 - SCR		$227,000		$7,078		$234,078		$34,704				$45,400	$102,150
36	Ghent 2 - Baghouse		$120,000		$5,002		$125,002		$19,606					
37	Ghent 2 - PAC Injection		$6,109		$2,880		$8,989		$3,623					
38	Ghent 2 - Lime Injection		$5,483		$2,775		$8,258		$3,442					
39	Ghent 2 - Neural Networks		$1,000		$100		$1,100		$222					
40	Total Ghent 2		**$359,592**		**$17,835**		**$377,427**		**$61,597**					
41														
42	Ghent 3 - Baghouse		$138,000		$6,122		$144,122		$22,917					
43	Ghent 3 - PAC Injection		$6,173		$4,134		$10,307		$4,885					
44	Ghent 3 - Neural Networks		$1,000		$100		$1,100		$222					
45	Total Ghent 3		**$145,173**		**$10,356**		**$155,529**		**$28,024**					
46														

	O	P	Q	R	S
1					
2					
3					
4					
5	2013	2014	2015	2016	Total
6					
7					
8					
9					
10					
11					
12					
13					
14	$31,280	$920			$92,000
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35	$77,180	$2,270			$227,000
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
47	Ghent 4 - Baghouse		$117,000		$5,363		$122,363		$19,602					
48	Ghent 4 - PAC Injection		$6,210		$3,896		$10,106		$4,652					
49	Ghent 4 - Neural Networks		$1,000		$100		$1,100		$222					
50	Total Ghent 4		$124,210		$9,359		$133,569		$24,476					
51														
52	**Total Ghent**		**$767,355**		**$47,746**		**$815,101**		**$141,134**					
53														
54														
55	**GREEN RIVER**													
56	Green River 3 - SCR		$29,000		$1,040		$30,040		$4,569				$5,800	$13,050
57	Green River 3 - CDS-FF		$38,000		$6,874		$44,874		$11,499					
58	Green River 3 - PAC Injection		$1,112		$323		$1,435		$458					
59	Green River 3 - Neural Networks		$500		$50		$550		$111					
60	Total Green River 3		**$68,612**		**$8,287**		**$76,899**		**$16,637**					
61														
62	Green River 4 - SCR		$42,000		$1,442		$43,442		$6,553				$8,400	$18,900
63	Green River 4 - CDS-FF		$54,000		$10,289		$64,289		$16,861					
64	Green River 4 - PAC Injection		$1,583		$515		$2,098		$708					
65	Green River 4 - Neural Networks		$500		$50		$550		$111					
66	Total Green River 4		**$98,083**		**$12,296**		**$110,379**		**$24,233**					
67														
68	**Total Green River**		**$166,695**		**$20,583**		**$187,278**		**$40,870**					
69														
70														
71	**CANE RUN**													
72	Cane Run 4 - FGD		$152,000		$8,428		$160,428		$26,926				$39,520	$76,000
73	Cane Run 4 - SCR		$63,000		$2,219		$65,219		$9,886				$12,600	$28,350
74	Cane Run 4 - Baghouse		$33,000		$1,924		$34,924		$5,940					
75	Cane Run 4 - PAC Injection		$2,326		$1,087		$3,413		$1,370					
76	Cane Run 4 - Lime Injection		$2,569		$983		$3,552		$1,296					
77	Cane Run 4 - Neural Networks		$500		$50		$550		$111					
78	Total Cane Run 4		**$253,395**		**$14,691**		**$268,086**		**$45,529**					
79														
80	Cane Run 5 - FGD		$159,000		$8,789		$167,789		$28,139				$41,340	$79,500
81	Cane Run 5 - SCR		$66,000		$2,421		$68,421		$10,453				$13,200	$29,700
82	Cane Run 5 - Baghouse		$35,000		$2,061		$37,061		$6,321					
83	Cane Run 5 - PAC Injection		$2,490		$1,120		$3,610		$1,423					
84	Cane Run 5 - Lime Injection		$2,752		$1,089		$3,841		$1,424					
85	Cane Run 5 - Neural Networks		$500		$50		$550		$111					
86	Total Cane Run 5		**$265,742**		**$15,530**		**$281,272**		**$47,871**					
87														
88	Cane Run 6 - FGD		$202,000		$10,431		$212,431		$35,014				$52,520	$101,000
89	Cane Run 6 - SCR		$86,000		$2,793		$88,793		$13,259				$17,200	$38,700
90	Can Rune 6 - Baghouse		$45,000		$2,672		$47,672		$8,149					
91	Cane Run 6 - PAC Injection		$3,490		$1,336		$4,826		$1,761					
92	Cane Run 6 - Lime Injection		$3,873		$1,367		$5,240		$1,838					

	O	P	Q	R	S
47					
48					
49					
50					
51					
52					
53					
54					
55					
56	$9,860	$290			$29,000
57					
58					
59					
60					
61					
62	$14,280	$420			$42,000
63					
64					
65					
66					
67					
68					
69					
70					
71					
72	$34,200	$2,280			$152,000
73	$21,420	$630			$63,000
74					
75					
76					
77					
78					
79					
80	$35,775	$2,385			$159,000
81	$22,440	$660			$66,000
82					
83					
84					
85					
86					
87					
88	$45,450	$3,030			$202,000
89	$29,240	$860			$86,000
90					
91					
92					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
93	Cane Run 6 - Neural Networks		$500		$50		$550		$111					
94	Total Can Run 6		$340,863		$18,649		$359,512		$60,132					
95														
96	**Total Cane Run**		**$860,000**		**$48,870**		**$908,870**		**$153,532**					
97														
98														
99	**Mill Creek**													
100	Mill Creek 1 - FGD		$297,000		$14,341		$311,341		$50,486				$77,220	$148,500
101	Mill Creek 1 - SCR		$97,000		$3,366		$100,366		$15,171				$19,400	$43,650
102	Mill Creek 1 - Baghouse		$81,000		$3,477		$84,477		$13,335					
103	Mill Creek 1 - Electrostatic Precipitator		$32,882		$3,581		$36,463		$7,583					
104	Mill Creek 1 - PAC Injection		$4,412		$2,213		$6,625		$2,750					
105	Mill Creek 1 - Lime Injection		$4,480		$2,024		$6,504		$2,569					
106	Mill Creek 1 - Neural Networks		$1,000		$100		$1,100		$222					
107	Total Mill Creek 1		**$517,774**		**$29,102**		**$546,876**		**$92,116**					
108														
109	Mill Creek 2 - FGD		$297,000		$14,604		$311,604		$50,749				$77,220	$148,500
110	Mill Creek 2 - SCR		$97,000		$3,401		$100,401		$15,206				$19,400	$43,650
111	Mill Creek 2 - Baghouse		$81,000		$3,518		$84,518		$13,376					
112	Mill Creek 2 - Electrostatic Precipitator		$32,882		$3,664		$36,546		$7,666					
113	Mill Creek 2 - PAC Injection		$4,412		$2,340		$6,752		$2,877					
114	Mill Creek 2 - Lime Injection		$4,480		$2,117		$6,597		$2,662					
115	Mill Creek 2 - Neural Networks		$1,000		$100		$1,100		$222					
116	Total Mill Creek 2		**$517,774**		**$29,744**		**$547,518**		**$92,758**					
117														
118	Mill Creek 3 - FGD		$392,000		$18,911		$410,911		$66,617				$101,920	$196,000
119	Mill Creek 3 - Baghouse		$114,000		$4,923		$118,923		$18,797					
120	Mill Creek 3 - PAC Injection		$5,592		$3,213		$8,805		$3,894					
121	Mill Creek 3 - Neural Networks		$1,000		$100		$1,100		$222					
122	Total Mill Creek 3		**$512,592**		**$27,147**		**$539,739**		**$89,530**					
123														
124	Mill Creek 4 - FGD		$455,000		$21,775		$476,775		$77,149				$118,300	$227,500
125	Mill Creek 4 - Baghouse		$133,000		$5,804		$138,804		$21,990					
126	Mill Creek 4 - PAC Injection		$6,890		$3,858		$10,748		$4,697					
127	Mill Creek 4 - Neural Networks		$1,000		$100		$1,100		$222					
128	Total Mill Creek 4		**$595,890**		**$31,537**		**$627,427**		**$104,058**					
129														
130	**Total Mill Creek**		**$2,144,030**		**$117,530**		**$2,261,560**		**$378,462**					
131														
132														
133	**TRIMBLE**													
134	Trimble 1 - Baghouse		$128,000		$5,782		$133,782		$21,360					
135	Trimble 1 - PAC Injection		$6,451		$4,413		$10,864		$5,198					
136	Trimble 1 - Neural Networks		$1,000		$100		$1,100		$222					
137	Total Trimble 1		$135,451		$10,295		$145,746		$26,780					
138														

	O	P	Q	R	S
93					
94					
95					
96					
97					
98					
99					
100	$66,825	$4,455			$297,000
101	$32,980	$970			$97,000
102					
103					
104					
105					
106					
107					
108					
109	$66,825	$4,455			$297,000
110	$32,980	$970			$97,000
111					
112					
113					
114					
115					
116					
117					
118	$88,200	$5,880			$392,000
119					
120					
121					
122					
123					
124	$102,375	$6,825			$455,000
125					
126					
127					
128					
129					
130					
131					
132					
133					
134					
135					
136					
137					
138					

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
139	**Total Trimble**		**$135,451**		**$10,295**		**$145,746**		**$26,780**					
140														
141														
142	**Grand Total**		**$4,333,694**		**$260,580**		**$4,594,274**		**$787,996**			$0	$667,840	$1,336,550

	O	P	Q	R	S
139					
140					
141					
142	$711,310	$37,300	$0	$0	$2,753,000

From:	Saunders, Eileen
To:	Wilson, Stuart; Karavayev, Louanne
Sent:	6/4/2010 3:49:26 PM
Subject:	Draft- Environmental Compliance Summary
Attachments:	Environmental Summay (rev5 6-3-10).xlsx

Stuart and LouAnne,

As described in my meeting notice, please see the summary of the information I received from B&V. Due to the sensitivity of this information, I ask that it not be distributed at this time. We can discuss the summary in more detail during our call on Monday.

Thank you,

Eileen

	A	B	C	D	E	F	G	H
1	Black & Veatch Study Cost Estimates							
2	$ in thousands							
3								
4								
5			**Capital Cost**		**O&M Cost**		**Levelized Annual Costs**	
6	**BROWN**							
7	Brown 1 - Low NOx Burners		$1,156		$0		$141	
8	Brown 1 - Baghouse		$40,000		$1,477		$6,345	
9	Brown 1 - PAC Injection		$1,599		$614		$809	
10	Brown 1 - Neural Networks		$500		$50		$111	
11	Brown 1 - Overfire Air		$767		$132		$225	
12	Total Brown 1		**$44,022**		**$2,273**		**$7,631**	
13								
14	Brown 2 - SCR		$92,000		$3,278		$14,474	
15	Brown 2 - Baghouse		$51,000		$1,959		$8,166	
16	Brown 2 - PAC Injection		$2,476		$1,090		$1,391	
17	Brown 2 - Neural Networks		$500		$50		$111	
18	Brown 2 - Lime Injection		$2,739		$1,155		$1,488	
19	Total Brown 2		**$148,715**		**$7,532**		**$25,630**	
20								
21	Brown 3 - Baghouse		$61,000		$3,321		$10,745	
22	Brown 3 - PAC Injection		$5,426		$2,330		$2,990	
23	Brown 3 - Neural Networks		$1,000		$100		$222	
24	Total Brown 3		**$67,426**		**$5,751**		**$13,957**	
25								
26	**Total Brown**		**$260,163**		**$15,556**		**$47,218**	
27								
28								
29	**GHENT**							
30	Ghent 1 - Baghouse		$131,000		$5,888		$21,831	
31	Ghent 1 - PAC Injection		$6,380		$4,208		$4,984	
32	Ghent 1 - Neural Networks		$1,000		$100		$222	
33	Total Ghent 1		**$138,380**		**$10,196**		**$27,037**	
34								
35	Ghent 2 - SCR		$227,000		$7,078		$34,704	
36	Ghent 2 - Baghouse		$120,000		$5,002		$19,606	
37	Ghent 2 - PAC Injection		$6,109		$2,880		$3,623	
38	Ghent 2 - Lime Injection		$5,483		$2,775		$3,442	
39	Ghent 2 - Neural Networks		$1,000		$100		$222	
40	Total Ghent 2		**$359,592**		**$17,835**		**$61,597**	
41								
42	Ghent 3 - Baghouse		$138,000		$6,122		$22,917	
43	Ghent 3 - PAC Injection		$6,173		$4,134		$4,885	
44	Ghent 3 - Neural Networks		$1,000		$100		$222	
45	Total Ghent 3		**$145,173**		**$10,356**		**$28,024**	
46								

	A	B	C	D	E	F	G	H
47	Ghent 4 - Baghouse		$117,000		$5,363		$19,602	
48	Ghent 4 - PAC Injection		$6,210		$3,896		$4,652	
49	Ghent 4 - Neural Networks		$1,000		$100		$222	
50	Total Ghent 4		$124,210		$9,359		$24,476	
51								
52	**Total Ghent**		**$767,355**		**$47,746**		**$141,134**	
53								
54								
55	**GREEN RIVER**							
56	Green River 3 - SCR		$29,000		$1,040		$4,569	
57	Green River 3 - CDS-FF		$38,000		$6,874		$11,499	
58	Green River 3 - PAC Injection		$1,112		$323		$458	
59	Green River 3 - Neural Networks		$500		$50		$111	
60	Total Green River 3		**$68,612**		**$8,287**		**$16,637**	
61								
62	Green River 4 - SCR		$42,000		$1,442		$6,553	
63	Green River 4 - CDS-FF		$54,000		$10,289		$16,861	
64	Green River 4 - PAC Injection		$1,583		$515		$708	
65	Green River 4 - Neural Networks		$500		$50		$111	
66	Total Green River 4		**$98,083**		**$12,296**		**$24,233**	
67								
68	**Total Green River**		**$166,695**		**$20,583**		**$40,870**	
69								
70								
71	**CANE RUN**							
72	Cane Run 4 - FGD		$152,000		$8,428		$26,926	
73	Cane Run 4 - SCR		$63,000		$2,219		$9,886	
74	Cane Run 4 - Baghouse		$33,000		$1,924		$5,940	
75	Cane Run 4 - PAC Injection		$2,326		$1,087		$1,370	
76	Cane Run 4 - Lime Injection		$2,569		$983		$1,296	
77	Cane Run 4 - Neural Networks		$500		$50		$111	
78	Total Cane Run 4		**$253,395**		**$14,691**		**$45,529**	
79								
80	Cane Run 5 - FGD		$159,000		$8,789		$28,139	
81	Cane Run 5 - SCR		$66,000		$2,421		$10,453	
82	Cane Run 5 - Baghouse		$35,000		$2,061		$6,321	
83	Cane Run 5 - PAC Injection		$2,490		$1,120		$1,423	
84	Cane Run 5 - Lime Injection		$2,752		$1,089		$1,424	
85	Cane Run 5 - Neural Networks		$500		$50		$111	
86	Total Cane Run 5		**$265,742**		**$15,530**		**$47,871**	
87								
88	Cane Run 6 - FGD		$202,000		$10,431		$35,014	
89	Cane Run 6 - SCR		$86,000		$2,793		$13,259	
90	Can Rune 6 - Baghouse		$45,000		$2,672		$8,149	
91	Cane Run 6 - PAC Injection		$3,490		$1,336		$1,761	
92	Cane Run 6 - Lime Injection		$3,873		$1,367		$1,838	

	A	B	C	D	E	F	G	H
93	Cane Run 6 - Neural Networks		$500		$50		$111	
94	Total Can Run 6		$340,863		$18,649		$60,132	
95								
96	**Total Cane Run**		**$860,000**		**$48,870**		**$153,532**	
97								
98								
99	**Mill Creek**							
100	Mill Creek 1 - FGD		$297,000		$14,341		$50,486	
101	Mill Creek 1 - SCR		$97,000		$3,366		$15,171	
102	Mill Creek 1 - Baghouse		$81,000		$3,477		$13,335	
103	Mill Creek 1 - Electrostatic Precipitator		$32,882		$3,581		$7,583	
104	Mill Creek 1 - PAC Injection		$4,412		$2,213		$2,750	
105	Mill Creek 1 - Lime Injection		$4,480		$2,024		$2,569	
106	Mill Creek 1 - Neural Networks		$1,000		$100		$222	
107	Total Mill Creek 1		**$517,774**		**$29,102**		**$92,116**	
108								
109	Mill Creek 2 - FGD		$297,000		$14,604		$50,749	
110	Mill Creek 2 - SCR		$97,000		$3,401		$15,206	
111	Mill Creek 2 - Baghouse		$81,000		$3,518		$13,376	
112	Mill Creek 2 - Electrostatic Precipitator		$32,882		$3,664		$7,666	
113	Mill Creek 2 - PAC Injection		$4,412		$2,340		$2,877	
114	Mill Creek 2 - Lime Injection		$4,480		$2,117		$2,662	
115	Mill Creek 2 - Neural Networks		$1,000		$100		$222	
116	Total Mill Creek 2		**$517,774**		**$29,744**		**$92,758**	
117								
118	Mill Creek 3 - FGD		$392,000		$18,911		$66,617	
119	Mill Creek 3 - Baghouse		$114,000		$4,923		$18,797	
120	Mill Creek 3 - PAC Injection		$5,592		$3,213		$3,894	
121	Mill Creek 3 - Neural Networks		$1,000		$100		$222	
122	Total Mill Creek 3		**$512,592**		**$27,147**		**$89,530**	
123								
124	Mill Creek 4 - FGD		$455,000		$21,775		$77,149	
125	Mill Creek 4 - Baghouse		$133,000		$5,804		$21,990	
126	Mill Creek 4 - PAC Injection		$6,890		$3,858		$4,697	
127	Mill Creek 4 - Neural Networks		$1,000		$100		$222	
128	Total Mill Creek 4		**$595,890**		**$31,537**		**$104,058**	
129								
130	**Total Mill Creek**		**$2,144,030**		**$117,530**		**$378,462**	
131								
132								
133	**TRIMBLE**							
134	Trimble 1 - Baghouse		$128,000		$5,782		$21,360	
135	Trimble 1 - PAC Injection		$6,451		$4,413		$5,198	
136	Trimble 1 - Neural Networks		$1,000		$100		$222	
137	Total Trimble 1		$135,451		$10,295		$26,780	
138								

	A	B	C	D	E	F	G	H
139	**Total Trimble**		**$135,451**		**$10,295**		**$26,780**	
140								
141								
142	**Grand Total**		**$4,333,694**		**$260,580**		**$787,996**	

	A	B	C	D	E
1	Black & Veatch Study Cost Estimates				
2					
3					
4					
5			**MW**		**$/kW**
6	**BROWN**				
7	Brown 1 - Low NOx Burners				$11
8	Brown 1 - Baghouse				$364
9	Brown 1 - PAC Injection				$15
10	Brown 1 - Neural Networks				$5
11	Brown 1 - Overfire Air				$7
12	Total Brown 1		110		**$400**
13					
14	Brown 2 - SCR				$511
15	Brown 2 - Baghouse				$283
16	Brown 2 - PAC Injection				$14
17	Brown 2 - Neural Networks				$3
18	Brown 2 - Lime Injection				$15
19	Total Brown 2		180		**$826**
20					
21	Brown 3 - Baghouse				$133
22	Brown 3 - PAC Injection				$12
23	Brown 3 - Neural Networks				$2
24	Total Brown 3		457		**$148**
25					
26	**Total Brown**		**747**		**$348**
27					
28					
29	**GHENT**				
30	Ghent 1 - Baghouse				$242
31	Ghent 1 - PAC Injection				$12
32	Ghent 1 - Neural Networks				$2
33	Total Ghent 1		541		**$256**
34					
35	Ghent 2 - SCR				$439
36	Ghent 2 - Baghouse				$232
37	Ghent 2 - PAC Injection				$12
38	Ghent 2 - Lime Injection				$11
39	Ghent 2 - Neural Networks				$2
40	Total Ghent 2		517		**$696**
41					
42	Ghent 3 - Baghouse				$264
43	Ghent 3 - PAC Injection				$12
44	Ghent 3 - Neural Networks				$2
45	Total Ghent 3		523		**$278**
46					

	A	B	C	D	E
47	Ghent 4 - Baghouse				$222
48	Ghent 4 - PAC Injection				$12
49	Ghent 4 - Neural Networks				$2
50	Total Ghent 4		526		$236
51					
52	**Total Ghent**		**2,107**		**$364**
53					
54					
55					
56	**GREEN RIVER**				
57	Green River 3 - SCR				$408
58	Green River 3 - CDS-FF				$535
59	Green River 3 - PAC Injection				$16
60	Green River 3 - Neural Networks				$7
61	Total Green River 3		71		**$966**
62					
63	Green River 4 - SCR				$385
64	Green River 4 - CDS-FF				$495
65	Green River 4 - PAC Injection				$15
66	Green River 4 - Neural Networks				$5
67	Total Green River 4		109		**$900**
68					
69	**Total Green River**		**180**		**$926**
70					
71					
72	**CANE RUN**				
73	Cane Run 4 - FGD				$905
74	Cane Run 4 - SCR				$375
75	Cane Run 4 - Baghouse				$196
76	Cane Run 4 - PAC Injection				$14
77	Cane Run 4 - Lime Injection				$15
78	Cane Run 4 - Neural Networks				$3
79	Total Cane Run 4		168		**$1,508**
80					
81	Cane Run 5 - FGD				$878
82	Cane Run 5 - SCR				$365
83	Cane Run 5 - Baghouse				$193
84	Cane Run 5 - PAC Injection				$14
85	Cane Run 5 - Lime Injection				$15
86	Cane Run 5 - Neural Networks				$3
87	Total Cane Run 5		181		**$1,468**
88					
89	Cane Run 6 - FGD				$774
90	Cane Run 6 - SCR				$330
91	Can Rune 6 - Baghouse				$172
92	Cane Run 6 - PAC Injection				$13

	A	B	C	D	E
93	Cane Run 6 - Lime Injection				$15
94	Cane Run 6 - Neural Networks				$2
95	Total Can Run 6		261		$1,306
96					
97	**Total Cane Run**		**610**		**$1,410**
98					
99					
100	**Mill Creek**				
101	Mill Creek 1 - FGD				$900
102	Mill Creek 1 - SCR				$294
103	Mill Creek 1 - Baghouse				$245
104	Mill Creek 1 - Electrostatic Precipitator				$100
105	Mill Creek 1 - PAC Injection				$13
106	Mill Creek 1 - Lime Injection				$14
107	Mill Creek 1 - Neural Networks				$3
108	Total Mill Creek 1		330		**$1,569**
109					
110	Mill Creek 2 - FGD				$900
111	Mill Creek 2 - SCR				$294
112	Mill Creek 2 - Baghouse				$245
113	Mill Creek 2 - Electrostatic Precipitator				$100
114	Mill Creek 2 - PAC Injection				$13
115	Mill Creek 2 - Lime Injection				$14
116	Mill Creek 2 - Neural Networks				$3
117	Total Mill Creek 2		330		**$1,569**
118					
119	Mill Creek 3 - FGD				$927
120	Mill Creek 3 - Baghouse				$270
121	Mill Creek 3 - PAC Injection				$13
122	Mill Creek 3 - Neural Networks				$2
123	Total Mill Creek 3		423		**$1,212**
124					
125	Mill Creek 4 - FGD				$867
126	Mill Creek 4 - Baghouse				$253
127	Mill Creek 4 - PAC Injection				$13
128	Mill Creek 4 - Neural Networks				$2
129	Total Mill Creek 4		525		**$1,135**
130					
131	**Total Mill Creek**		**1,608**		**$1,333**
132					
133					
134	**TRIMBLE**				
135	Trimble 1 - Baghouse				$234
136	Trimble 1 - PAC Injection				$12
137	Trimble 1 - Neural Networks				$2
138	Total Trimble 1		547		$248

	A	B	C	D	E
139					
140	**Total Trimble**		**547**		**$248**
141					
142					
143	**Grand Total**		**5,799**		**$747**

From: Saunders, Eileen
To: Ritchey, Stacy
Sent: 6/22/2010 11:51:43 AM
Subject: Fw: 167987.26.0000 100614 - EON Draft AQCS Costs - EW Brown
Attachments: Brown Unit 1 Cost Estimates 061110.pdf

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Hillman, Timothy M. <HillmanTM@bv.com>; Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>
Sent: Mon Jun 14 12:58:22 2010
Subject: 167987.26.0000 100614 - EON Draft AQCS Costs - EW Brown

Eileen,
Attached please find the draft AQCS costs for the addition of an SCR for Brown Unit 1--the costs are included as option #1. Due to the time constraints with getting the information for the draft report compiled we will keep the approved LNB/OFA technology in the report and in associated process flows, schedules, and drawings for this unit. We can discuss including the SCR technology as part of the final report.
Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

From: Lucas, Kyle J.
Sent: Sunday, May 30, 2010 1:43 PM
To: 'Saunders, Eileen'
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: 167987.26.0000 100530 - EON Draft AQCS Costs - EW Brown

Eileen,

Attached please find the draft AQCS Costs for the approved technologies at EW Brown Units 1-3. The levelized annual cost was based on the Capital Recovery Factor (CRF) of 12.17% as supplied by EON as part of the economic criteria.

<< File: Brown Unit 3 Cost Estimates 052810.pdf >> << File: Brown Unit 1 Cost Estimates 052810.pdf >> << File: Brown Unit 2 Cost Estimates 052810.pdf >>

Regards,

Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

Plant Name:	Brown
Unit:	1
MW	110
Project description	High Level Emissions Control Study
Revised on:	06/11/10

Base Option - LNB and OFA for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Overfire Air	$767,000	$7	$132,000	$225,000
Low NOx Burners	$1,156,000	$11	$0	$141,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$44,022,000	$400	$2,273,000	$7,631,000

Option 1 - SCR for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$59,000,000	$536	$2,075,000	$9,255,000
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$101,099,000	$919	$4,216,000	$16,520,000

From: Hillman, Timothy M.
To: Lucas, Kyle J.; Saunders, Eileen; Mahabaleshwarkar, Anand; Mehta, Pratik D.
CC: King, Michael L. (Mike)
Sent: 6/7/2010 8:37:30 AM
Subject: RE: E.ON AQC Study - Weekly Project Conference Call
Attachments: EON ACTION ITEM LIST 060710.xls

Team,

Just a reminder of our 1 pm (2 pm EST) Project Conference Call this afternoon (conference room P3J-W for the B&V folks). I've attached an updated Action Item list for your review prior to the meeting. Also, lets add to the standing meeting agenda a discussion of the follow-up questions/comments from Eileen contained in her Friday, June 4th email.

Thanks,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

From: Hillman, Timothy M.
Sent: Wednesday, May 12, 2010 9:51 AM
To: Hillman, Timothy M.; Lucas, Kyle J.; 'Saunders, Eileen'; Mahabaleshwarkar, Anand
Cc: King, Michael L. (Mike)
Subject: E.ON AQC Study - Weekly Project Conference Call
When: Monday, June 07, 2010 1:00 PM-2:00 PM (GMT-06:00) Central Time (US & Canada).
Where: P3J-W (B&V Folks)

Weekly Project Update Conference Call.
Eileen, Please invite others as you see necessary.

Dial-in Number: 877-603-8688
Conf ID: 8791684

Standing Agenda:

1) Project Status

2) Action Item List

3) Scheduled Activities for the Week

	A	B	C	D	E	F	G	I	J	K
1	**ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY**									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		ATE ADDE	RIG DUE DAT	RR DUE D
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	05/21/10
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	05/24/10
20	16	Project Call	5/24/10	Update Design Basis Memo with Revised Data References		BV	AM	05/24/10	05/25/10	06/02/10
21	17	Project Call and S	5/24/10	Issue Capital and O&M Cost Data		BV	KL	05/24/10	COB 06/01/10	05/30/10
22	18	EON Email	6/1/10	AQC Cost Questions on Mill Creek, Brown, and Neural Networks		BV	TH	06/01/10	06/02/10	06/02/10
23	19	EON Email	6/4/10	AQC Cost Questions on Mill Creek and Brown		BV	KL	06/04/10	06/07/10	
24	20	Schedule	6/4/10	Issue Draft Report for EON Review		BV	KL	06/04/10	06/18/10	
25										

	M	N	O
1			
2			
3	STATUS	NOTES	
4			
5	Closed		
6	Closed		
7	Closed		
8	Closed		
9	Closed		
10	Closed		
11	Closed		
12	Closed		
13	Closed		
14	Closed	EON confirmed at 5/10 Kick-off Meeting.	
15	Closed		
16	Closed		
17	Closed		
18	Closed		
19	Closed		
20	Closed	Email of June 2nd with revised Design Basis.	
21	Closed		
22	Closed	Responses provided during 1030 (EST) call.	
23	Open	Plan to discuss in Monday (6/7) call.	
24	Open		
25			

	A	B	C	D	E	F	G	I	J	K
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									
50	45									

	M	N	O
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

	A	B	C	D	E	F	G	I	J	K
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									
74	69									

	M	N	O
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			

	A	B	C	D	E	F	G	I	J	K
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									
99	94									

	M	N	O
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			

	A	B	C	D	E	F	G	I	J	K
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										
124										
125										

	M	N	O
100			
101			
102			
103			
104			
105			
106			
107			
108			
109			
110			
111			
112			
113			
114			
115			
116			
117			
118			
119			
120			
121			
122			
123			
124			
125			

	A	B	C	D	E	F	G	I	J	K
7098										
7099										
7100										
7101										
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O
7098			
7099			
7100			
7101			
7102			
7103			
7104			
7105			
7106			
7107			
7108			
7109			

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Sent: 6/14/2010 12:58:22 PM
Subject: 167987.26.0000 100614 - EON Draft AQCS Costs - EW Brown
Attachments: Brown Unit 1 Cost Estimates 061110.pdf

Eileen,
Attached please find the draft AQCS costs for the addition of an SCR for Brown Unit 1--the costs are included as option #1. Due to the time constraints with getting the information for the draft report compiled we will keep the approved LNB/OFA technology in the report and in associated process flows, schedules, and drawings for this unit. We can discuss including the SCR technology as part of the final report.
Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: (913) 458-9062 | Fax: (913) 458-9062
Email: lucaskj@bv.com

From: Lucas, Kyle J.
Sent: Sunday, May 30, 2010 1:43 PM
To: 'Saunders, Eileen'
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: 167987.26.0000 100530 - EON Draft AQCS Costs - EW Brown

Eileen,

Attached please find the draft AQCS Costs for the approved technologies at EW Brown Units 1-3. The levelized annual cost was based on the Capital Recovery Factor (CRF) of 12.17% as supplied by EON as part of the economic criteria.

<< File: Brown Unit 3 Cost Estimates 052810.pdf >> << File: Brown Unit 1 Cost Estimates 052810.pdf >> << File: Brown Unit 2 Cost Estimates 052810.pdf >>

Regards,

Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: (913) 458-9062 | Fax: (913) 458-9062
Email: lucaskj@bv.com

Plant Name:	Brown
Unit:	1
MW	110
Project description	High Level Emissions Control Study
Revised on:	06/11/10

Base Option - LNB and OFA for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Overfire Air	$767,000	$7	$132,000	$225,000
Low NOx Burners	$1,156,000	$11	$0	$141,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$44,022,000	$400	$2,273,000	$7,631,000

Option 1 - SCR for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$59,000,000	$536	$2,075,000	$9,255,000
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$101,099,000	$919	$4,216,000	$16,520,000

From: Saunders, Eileen
To: Straight, Scott
Sent: 6/7/2010 11:16:42 AM
Subject: FW: E.ON AQC Study - Weekly Project Conference Call
Attachments: EON ACTION ITEM LIST 060710.xls

Scott,

On Friday, I sent you an invitation to participate on the B&V call at 2pm our time. Here is the action item list and the call in number below. Let me know if you will participate.

Thanks,

Eileen

From: Hillman, Timothy M. [mailto:HillmanTM@bv.com]
Sent: Monday, June 07, 2010 8:38 AM
To: Lucas, Kyle J.; Saunders, Eileen; Mahabaleshwarkar, Anand; Mehta, Pratik D.
Cc: King, Michael L. (Mike)
Subject: RE: E.ON AQC Study - Weekly Project Conference Call

Team,

Just a reminder of our 1 pm (2 pm EST) Project Conference Call this afternoon (conference room P3J-W for the B&V folks). I've attached an updated Action Item list for your review prior to the meeting. Also, lets add to the standing meeting agenda a discussion of the follow-up questions/comments from Eileen contained in her Friday, June 4th email.

Thanks,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

---

nothy M.
May 12, 2010 9:51 AM
thy M.; Lucas, Kyle J.; 'Saunders, Eileen'; Mahabaleshwarkar, Anand
L. (Mike)
AQC Study - Weekly Project Conference Call
ıne 07, 2010 1:00 PM-2:00 PM (GMT-06:00) Central Time (US & Canada).
.V Folks)

Weekly Project Update Conference Call.
Eileen, Please invite others as you see necessary.

Dial-in Number: 877-603-8688
Conf ID: 8791684

Standing Agenda:

1) Project Status

2) Action Item List

3) Scheduled Activities for the Week

	A	B	C	D	E	F	G	I	J	K
1	ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		)ATE ADDE	)RIG DUE DAT	RR DUE D/
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	05/21/10
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	05/24/10
20	16	Project Call	5/24/10	Update Design Basis Memo with Revised Data References		BV	AM	05/24/10	05/25/10	06/02/10
21	17	Project Call and S	5/24/10	Issue Capital and O&M Cost Data		BV	KL	05/24/10	COB 06/01/10	05/30/10
22	18	EON Email	6/1/10	AQC Cost Questions on Mill Creek, Brown, and Neural Networks		BV	TH	06/01/10	06/02/10	06/02/10
23	19	EON Email	6/4/10	AQC Cost Questions on Mill Creek and Brown		BV	KL	06/04/10	06/07/10	
24	20	Schedule	6/4/10	Issue Draft Report for EON Review		BV	KL	06/04/10	06/18/10	
25										

	M	N	O
1			
2			
3	STATUS	NOTES	
4			
5	Closed		
6	Closed		
7	Closed		
8	Closed		
9	Closed		
10	Closed		
11	Closed		
12	Closed		
13	Closed		
14	Closed	EON confirmed at 5/10 Kick-off Meeting.	
15	Closed		
16	Closed		
17	Closed		
18	Closed		
19	Closed		
20	Closed	Email of June 2nd with revised Design Basis.	
21	Closed		
22	Closed	Responses provided during 1030 (EST) call.	
23	Open	Plan to discuss in Monday (6/7) call.	
24	Open		
25			

	A	B	C	D	E	F	G	I	J	K
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									
50	45									

	M	N	O
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

	A	B	C	D	E	F	G	I	J	K
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									
74	69									

	M	N	O
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			

	A	B	C	D	E	F	G	I	J	K
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									
99	94									

	M	N	O
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			

	A	B	C	D	E	F	G	I	J	K
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										
124										
125										

	M	N	O
100			
101			
102			
103			
104			
105			
106			
107			
108			
109			
110			
111			
112			
113			
114			
115			
116			
117			
118			
119			
120			
121			
122			
123			
124			
125			

	A	B	C	D	E	F	G	I	J	K
7098										
7099										
7100										
7101										
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O
7098			
7099			
7100			
7101			
7102			
7103			
7104			
7105			
7106			
7107			
7108			
7109			

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From: Saunders, Eileen
To: Wilson, Stuart; Karavayev, Louanne
Sent: 6/14/2010 2:17:39 PM
Subject: Fw: 167987.26.0000 100614 - EON Draft AQCS Costs - EW Brown
Attachments: Brown Unit 1 Cost Estimates 061110.pdf

Stuart and LouAnne,

Please see the cost estimate for a Brown Unit 1 SCR. I had to leave early for an afternoon doctor's appointment but please email me if you have any questions.

Thanks,

Eileen

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Hillman, Timothy M. <HillmanTM@bv.com>; Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>
Sent: Mon Jun 14 12:58:22 2010
Subject: 167987.26.0000 100614 - EON Draft AQCS Costs - EW Brown

Eileen,
Attached please find the draft AQCS costs for the addition of an SCR for Brown Unit 1--the costs are included as option #1. Due to the time constraints with getting the information for the draft report compiled we will keep the approved LNB/OFA technology in the report and in associated process flows, schedules, and drawings for this unit. We can discuss including the SCR technology as part of the final report.
Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

From: Lucas, Kyle J.
Sent: Sunday, May 30, 2010 1:43 PM
To: 'Saunders, Eileen'
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: 167987.26.0000 100530 - EON Draft AQCS Costs - EW Brown

Eileen,

Attached please find the draft AQCS Costs for the approved technologies at EW Brown Units 1-3. The levelized annual cost was based on the Capital Recovery Factor (CRF) of 12.17% as supplied by EON as part of the economic criteria.

<< File: Brown Unit 3 Cost Estimates 052810.pdf >> << File: Brown Unit 1 Cost Estimates 052810.pdf >> << File: Brown Unit 2 Cost Estimates 052810.pdf >>

Regards,

Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

Plant Name:	Brown
Unit:	1
MW	110
Project description	High Level Emissions Control Study
Revised on:	06/11/10

Base Option - LNB and OFA for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Overfire Air	$767,000	$7	$132,000	$225,000
Low NOx Burners	$1,156,000	$11	$0	$141,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$44,022,000	$400	$2,273,000	$7,631,000

Option 1 - SCR for NOx Control

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
SCR	$59,000,000	$536	$2,075,000	$9,255,000
Fabric Filter	$40,000,000	$364	$1,477,000	$6,345,000
PAC Injection	$1,599,000	$15	$614,000	$809,000
Neural Networks	$500,000	$5	$50,000	$111,000
Total	$101,099,000	$919	$4,216,000	$16,520,000

From:	Hillman, Timothy M.
To:	Saunders, Eileen
CC:	Mahabaleshwarkar, Anand; Lucas, Kyle J.
Sent:	6/14/2010 3:40:08 PM
Subject:	167987.28.0600 100614 EON AQC Project - Action Item List from 061410 Project Conference Call
Attachments:	EON ACTION ITEM LIST 061410.xls

Eileen,

Please find attached the updated action item list from our conference call today.

Best regards,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

	A	B	C	D	E	F	G	I	J	K
1	ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		)ATE ADDE	)RIG DUE DAT	RR DUE D/
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	05/21/10
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	05/24/10
20	16	Project Call	5/24/10	Update Design Basis Memo with Revised Data References		BV	AM	05/24/10	05/25/10	06/02/10
21	17	Project Call and S	5/24/10	Issue Capital and O&M Cost Data		BV	KL	05/24/10	COB 06/01/10	05/30/10
22	18	EON Email	6/1/10	AQC Cost Questions on Mill Creek, Brown, and Neural Networks		BV	TH	06/01/10	06/02/10	06/02/10
23	19	EON Email	6/4/10	AQC Cost Questions on Mill Creek and Brown		BV	KL	06/04/10	06/07/10	
24	20	Schedule	6/4/10	Issue Draft Report for EON Review		BV	KL	06/04/10	06/18/10	
25	21	Conf Call	6/7/10	Estimate AQC Costs for Brown Units 1 & 2 Combined		BV	AM	06/07/10	06/08/10	

	M	N	O	P	Q	R	S	T	U	V	W
1											
2											
3	STATUS	NOTES									
4											
5	Closed										
6	Closed										
7	Closed										
8	Closed										
9	Closed										
10	Closed										
11	Closed										
12	Closed										
13	Closed										
14	Closed	EON confirmed at 5/10 Kick-off Meeting.									
15	Closed										
16	Closed										
17	Closed										
18	Closed										
19	Closed										
20	Closed	Email of June 2nd with revised Design Basis.									
21	Closed										
22	Closed	Responses provided during 1030 (EST) call.									
23	Closed	Responses provided during Monday (6/7) call.									
24	Open										
25	Closed	Email of June 8th.									

	A	B	C	D	E	F	G	I	J	K
26	22	Conf Call	6/7/10	Provide Description of the Fixed and Variable O&M Costs included in the estimate.		BV	AM	06/07/10	06/08/10	
27	23	EON Email	6/10/10	Brown 1 SCR Costs		BV	KL	06/10/10	06/14/10	
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									

	M	N	O	P	Q	R	S	T	U	V	W
26	Closed	Email of June 8th.									
27	Closed	Email of June 14th - Note: Draft Report will have LNB. E.ON to comment during review period whether to use SCR or LNB in the Final Report.									
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											

	A	B	C	D	E	F	G	I	J	K
50	45									
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									

	M	N	O	P	Q	R	S	T	U	V	W
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											

	A	B	C	D	E	F	G	I	J	K
74	69									
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									

	M	N	O	P	Q	R	S	T	U	V	W
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											

	A	B	C	D	E	F	G	I	J	K
99	94									
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										

	M	N	O	P	Q	R	S	T	U	V	W
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											
121											
122											
123											

	A	B	C	D	E	F	G	I	J	K
7097										
7098										
7099										
7100										
7101										
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O	P	Q	R	S	T	U	V	W
7097											
7098											
7099											
7100											
7101											
7102											
7103											
7104											
7105											
7106											
7107											
7108											
7109											

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From:	Hillman, Timothy M.
To:	Saunders, Eileen
CC:	Mahabaleshwarkar, Anand; Lucas, Kyle J.
Sent:	6/23/2010 2:05:02 PM
Subject:	167987.28.0600 100623 EON AQC Project - Action Item List from 062110 Project Conference Call
Attachments:	EON ACTION ITEM LIST 062310.xls

Eileen,

Please find attached the updated action item list from our Monday conference call.

Best regards,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

	A	B	C	D	E	F	G	I	J	K
1	ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		ATE ADDE	RIG DUE DAT	RR DUE D
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	05/21/10
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	05/24/10
20	16	Project Call	5/24/10	Update Design Basis Memo with Revised Data References		BV	AM	05/24/10	05/25/10	06/02/10
21	17	Project Call and S	5/24/10	Issue Capital and O&M Cost Data		BV	KL	05/24/10	COB 06/01/10	05/30/10
22	18	EON Email	6/1/10	AQC Cost Questions on Mill Creek, Brown, and Neural Networks		BV	TH	06/01/10	06/02/10	06/02/10
23	19	EON Email	6/4/10	AQC Cost Questions on Mill Creek and Brown		BV	KL	06/04/10	06/07/10	
24	20	Schedule	6/4/10	Issue Draft Report for EON Review		BV	KL	06/04/10	06/18/10	06/17/10
25	21	Conf Call	6/7/10	Estimate AQC Costs for Brown Units 1 & 2 Combined		BV	AM	06/07/10	06/08/10	

	M	N	O	P	Q	R	S	T	U	V	W
1											
2											
3	STATUS	NOTES									
4											
5	Closed										
6	Closed										
7	Closed										
8	Closed										
9	Closed										
10	Closed										
11	Closed										
12	Closed										
13	Closed										
14	Closed	EON confirmed at 5/10 Kick-off Meeting.									
15	Closed										
16	Closed										
17	Closed										
18	Closed										
19	Closed										
20	Closed	Email of June 2nd with revised Design Basis.									
21	Closed										
22	Closed	Responses provided during 1030 (EST) call.									
23	Closed	Responses provided during Monday (6/7) call.									
24	Closed										
25	Closed	Email of June 8th.									

	A	B	C	D	E	F	G	I	J	K
26	22	Conf Call	6/7/10	Provide Description of the Fixed and Variable O&M Costs included in the estimate.		BV	AM	06/07/10	06/08/10	
27	23	EON Email	6/10/10	Brown 1 SCR Costs		BV	KL	06/10/10	06/14/10	
28	24	BV Email	6/17/10	Receive EON comments on draft report		EON	ES	06/21/10	06/24/10	
29	25	EON Email	6/22/10	Perform additional (out of scope) cost scenarios as described in BV email of 6/21/10.		BV	KL	06/22/10	06/25/10	
30	26	EON Email	6/22/10	Issue Final Report		BV	KL	06/22/10	07/09/10	
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									

	M	N	O	P	Q	R	S	T	U	V	W
26	Closed	Email of June 8th.									
27	Closed	Email of June 14th - Note: Draft Report will have LNB. E.ON to comment during review period whether to use SCR or LNB in the Final Report.									
28	Open										
29	Open	Balance of deliverables due with final report.									
30	Open										
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											

	A	B	C	D	E	F	G	I	J	K
50	45									
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									

	M	N	O	P	Q	R	S	T	U	V	W
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											

	A	B	C	D	E	F	G	I	J	K
74	69									
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									

	M	N	O	P	Q	R	S	T	U	V	W
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											

	A	B	C	D	E	F	G	I	J	K
99	94									
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										

	M	N	O	P	Q	R	S	T	U	V	W
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											
121											
122											
123											

	A	B	C	D	E	F	G	I	J	K
124										
125										
126										
127										
128										
129										
130										
131										
132										
133										
134										
135										
136										
137										
138										
139										
140										
141										
142										
143										
144										
145										
146										
147										
148										
149										
150										
7090										
7091										
7092										
7093										
7094										
7095										
7096										
7097										
7098										
7099										
7100										

	M	N	O	P	Q	R	S	T	U	V	W
124											
125											
126											
127											
128											
129											
130											
131											
132											
133											
134											
135											
136											
137											
138											
139											
140											
141											
142											
143											
144											
145											
146											
147											
148											
149											
150											
7090											
7091											
7092											
7093											
7094											
7095											
7096											
7097											
7098											
7099											
7100											

	A	B	C	D	E	F	G	I	J	K
7101										
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O	P	Q	R	S	T	U	V	W
7101											
7102											
7103											
7104											
7105											
7106											
7107											
7108											
7109											

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From:	Jackson, Audrey
To:	Saunders, Eileen
Sent:	6/23/2010 3:15:48 PM
Subject:	Document Comment Blank (2) (2).xls
Attachments:	Document Comment Blank (2) (2).xls

FYI

	A	B	C	D	E	F	G	H
1	ENVIRONMENTAL COMPLIANCE AQCS PROJECT							
2								
3								
4						Due Date:		
5		Description:						
6								
7	Item No	ent reference or s	By	Comment Dat	EON US Comments	Black and Veatch Response	Response Date	
8	1							
9	2							
10	3							
11	4							
12	5							
13	6							
14	7							
15	8							
16	9							
17	10							
18	11							
19	12							
20	13							
21	14							
22	15							
23	16							
24	17							
25	18							
26	19							
27	20							
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								
53								
54								

From:	Hillman, Timothy M.
To:	Saunders, Eileen
CC:	Mahabaleshwarkar, Anand; Lucas, Kyle J.
Sent:	6/8/2010 3:38:24 PM
Subject:	167987.28.0600 100608 EON AQC Project - Action Item List from 060710 Project Conference Call
Attachments:	EON ACTION ITEM LIST 060810.xls

Eileen,

Please find attached the updated action item list from our conference call yesterday.

Best regards,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

	A	B	C	D	E	F	G	I	J	K
1	**ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY**									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		ATE ADDE	RIG DUE DAT	RR DUE D
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	05/21/10
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	05/24/10
20	16	Project Call	5/24/10	Update Design Basis Memo with Revised Data References		BV	AM	05/24/10	05/25/10	06/02/10
21	17	Project Call and S	5/24/10	Issue Capital and O&M Cost Data		BV	KL	05/24/10	COB 06/01/10	05/30/10
22	18	EON Email	6/1/10	AQC Cost Questions on Mill Creek, Brown, and Neural Networks		BV	TH	06/01/10	06/02/10	06/02/10
23	19	EON Email	6/4/10	AQC Cost Questions on Mill Creek and Brown		BV	KL	06/04/10	06/07/10	
24	20	Schedule	6/4/10	Issue Draft Report for EON Review		BV	KL	06/04/10	06/18/10	
25	21	Conf Call	6/7/10	Estimate AQC Costs for Brown Units 1 & 2 Combined		BV	AM	06/07/10	06/08/10	

	M	N	O
1			
2			
3	STATUS	NOTES	
4			
5	Closed		
6	Closed		
7	Closed		
8	Closed		
9	Closed		
10	Closed		
11	Closed		
12	Closed		
13	Closed		
14	Closed	EON confirmed at 5/10 Kick-off Meeting.	
15	Closed		
16	Closed		
17	Closed		
18	Closed		
19	Closed		
20	Closed	Email of June 2nd with revised Design Basis.	
21	Closed		
22	Closed	Responses provided during 1030 (EST) call.	
23	Closed	Responses provided during Monday (6/7) call.	
24	Open		
25	Closed	Email of June 8th.	

	A	B	C	D	E	F	G	I	J	K
26	22	Conf Call	6/7/10	Provide Description of the Fixed and Variable O&M Costs included in the estimate.		BV	AM	06/07/10	06/08/10	
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									
50	45									

	M	N	O
26	Closed	Email of June 8th.	
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

	A	B	C	D	E	F	G	I	J	K
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									
74	69									

	M	N	O
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			

	A	B	C	D	E	F	G	I	J	K
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									
99	94									

	M	N	O
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			

	A	B	C	D	E	F	G	I	J	K
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										
124										
125										

	M	N	O
100			
101			
102			
103			
104			
105			
106			
107			
108			
109			
110			
111			
112			
113			
114			
115			
116			
117			
118			
119			
120			
121			
122			
123			
124			
125			

	A	B	C	D	E	F	G	I	J	K
126										
127										
128										
129										
130										
131										
132										
133										
134										
135										
136										
137										
138										
139										
140										
141										
142										
143										
144										
145										
146										
147										
148										
149										
150										
151										
152										
7091										
7092										
7093										
7094										
7095										
7096										
7097										
7098										
7099										
7100										
7101										

	M	N	O
126			
127			
128			
129			
130			
131			
132			
133			
134			
135			
136			
137			
138			
139			
140			
141			
142			
143			
144			
145			
146			
147			
148			
149			
150			
151			
152			
7091			
7092			
7093			
7094			
7095			
7096			
7097			
7098			
7099			
7100			
7101			

	A	B	C	D	E	F	G	I	J	K
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O
7102			
7103			
7104			
7105			
7106			
7107			
7108			
7109			

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From: Saunders, Eileen
To: Straight, Scott
Sent: 6/10/2010 8:25:55 AM
Subject: FW: 167987.14.0100 100608 - Conference Call (6/7) Question Response
Attachments: Brown 1&2 Combined Fabric Filter 060810.pdf

Scott,

Here is the follow-up information from our call with B&V.

Thanks,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Tuesday, June 08, 2010 10:08 AM
To: Saunders, Eileen
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: 167987.14.0100 100608 - Conference Call (6/7) Question Response

Eileen,
From the conference call yesterday there were two questions in which B&V was to investigate and provide response.

1. What is the high level estimated cost to combine Brown's Unit 1 and Unit 2 exhaust flows into one common PJFF?

Response.
Attached please find the draft cost estimate for the common PJFF. For the common PJFF, real estate is available, but will require some demolition and relocation of scrubber electrical feedlines (13.2 kV electrical feedlines). The PJFF will also need to be elevated to provide access to road traffic. The difference between individual and combined PJFF is approximately $23,000,000 in capital cost. The combined PJFF will be cheaper than individual PJFF.

2. Will B&V provide both fixed and variable O&M costs?

Response.
The O&M costs included on the draft cost summary sheets for each unit's approved AQC technology provided on May 30, 2010 are comprised of both fixed and variable O&M costs. These costs are based on both unit specific information as well as other economic data provided by E.ON. The detailed fixed and variable O&M costs will be included as part of the draft report on June 18.

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

Plant Name: Brown
Unit: 1 & 2
MW 290
Project description High Level Emissions Control Study
Revised on: 06/07/10

AQC Equipment	Total Capital Cost	$/kW	O&M Cost	Levelized Annual Costs
Fabric Filter	$68,000,000	$234	$2,789,000	$11,065,000

DRAFT

From: Revlett, Gary
To: Straight, Scott
Sent: 5/13/2010 2:28:34 PM
Subject: Re: Potential New Environmental Requirements for Electric Generating Units

Scott,

Will do, but this is what Eileen passed out at our Black and Veatch kick-off meeting this pass Monday.

Gary

From: Straight, Scott
To: Revlett, Gary
Sent: Thu May 13 13:09:58 2010
Subject: FW: Potential New Environmental Requirements for Electric Generating Units

Gary, this caught me off guard today in front of Paul. Please cc me on anything you send to one of my staff in the future. Thanks

Scott

From: Voyles, John
Sent: Thursday, May 13, 2010 12:03 PM
To: Thompson, Paul; Bowling, Ralph; Sinclair, David; Straight, Scott; Schram, Chuck; Hudson, Rusty; Pfeiffer, Caryl; Schetzel, Doug
Subject: Fw: Potential New Environmental Requirements for Electric Generating Units

Here's the emission limit draft from EA to the scenario team.

JV

From: Revlett, Gary
To: Saunders, Eileen
Cc: Voyles, John; Black, Greg
Sent: Fri May 07 07:51:44 2010
Subject: Potential New Environmental Requirements for Electric Generating Units

Good Morning Eileen,

Attached is my revised estimate of future EPA environmental requirements and limits. As mentioned earlier this week, I have been asked to develop information under 3 options. The first air table (EPA acts fast) is similar to the air requirement table I originally sent you. However, I have revised some of the numeric limits based on last week's publication of the proposed industrial boiler MACT regulation. The last two tables have been added as additional options. The first new table represents a delay in implementation schedule and the second new table represents a delay in implementation and possible higher limits being proposed under the EGU MACT and revised CAIR. If you have any questions, let me know.

Thanks,

Gary

<<Generation Future Environmental Requirements.xlsx>>

From:	Lucas, Kyle J.
To:	Saunders, Eileen
Sent:	5/14/2010 9:52:24 AM
Subject:	AQC template for EON approval of technologies
Attachments:	AQC technology Recommendation 051310.pdf

Here is the template

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the site-specific considerations developed during the field work conducted during the week of May 10^{th}, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	*B&V to insert recommended technology*	□ Yes □ No
SO_2	*B&V to insert recommended technology*	□ Yes □ No
PM	*B&V to insert recommended technology*	□ Yes □ No
CO	*B&V to insert recommended technology*	□ Yes □ No
Hg	*B&V to insert recommended technology*	□ Yes □ No
HCl	*B&V to insert recommended technology*	□ Yes □ No
Dioxin/Furan	*B&V to insert recommended technology*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

Special Considerations Summary:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: NO_x

Feasible Control Options:
- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:
- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: SO_2

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: Particulate (PM)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: CO

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:
- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:
- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: Dioxin/Furan

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/14/2010 10:12:39 AM
Subject: B&V Template
Attachments: AQC technology Recommendation 051310.pdf; AQCS Fleetwide Compliance Matrix B&V May 3 2010.xls

Scott,

I would like to send this out to John and Ralph prior to our call. This template is an example of one of the deliverables B&V plans to send throughout the week next week. Also, I am attaching a copy of the compliance matrix that they will complete for us by June 1, 2010 for one option per unit.

I am sitting on a quick conference call now but if you would like to reach me, please call my cell phone 693-9231.

Thanks,

Eileen

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the site-specific considerations developed during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	*B&V to insert recommended technology*	□ Yes □ No
SO_2	*B&V to insert recommended technology*	□ Yes □ No
PM	*B&V to insert recommended technology*	□ Yes □ No
CO	*B&V to insert recommended technology*	□ Yes □ No
Hg	*B&V to insert recommended technology*	□ Yes □ No
HCl	*B&V to insert recommended technology*	□ Yes □ No
Dioxin/Furan	*B&V to insert recommended technology*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

Special Considerations Summary:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: NO_x

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: SO_2

Feasible Control Options:
- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:
- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Particulate (PM)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: CO

Feasible Control Options:
- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:
- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Dioxin/Furan

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW Net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Er	Removal %
4		E. W. Brown											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				

	N	O	P	Q	R	S	T	U	V	W
1	mpliance Analysis and High Level Capital and O&M Cost Estimation									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections if applicable		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			

	A	B	C	D	E	F	G	H	I	J	K	L	M
47									HAPs				
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56													
57		Revision #											
58		Date of Revision											
59		Notes											
60													
61													

	N	O	P	Q	R	S	T	U	V	W
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										

	X	Y	Z
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Er	Removal %
4		Ghent											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				
47									HAPs				

	N	O	P	Q	R	S	T	U	V	W
1	ompliance Analysis and High Level Capital and O&M Cost Estimation									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			

	A	B	C	D	E	F	G	H	I	J	K	L	M
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56				4					NOx				
57									SO2				
58									PM				
59									PM				
60													
61									CO				
62									VOC				
63									Hg				
64									HAPs				
65									H2SO4				
66									SO3-SAM				
67									HCL				
68									HF				
69													
70													
71													
72													
73													
74		Revision #											
75		Date of Revision											
76		Notes											
77													
78													

	N	O	P	Q	R	S	T	U	V	W
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										

	X	Y	Z
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													**EON Fleetwide AQCS Co**
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Em	Removal %
4		Cane Run											
5	1			4					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				5					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				6					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	***$***		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			

	A	B	C	D	E	F	G	H	I	J	K	L	M
47									HAPs				
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56													
57		Revision #											
58		Date of Revision											
59		Notes											
60													
61													

	N	O	P	Q	R	S	T	U	V	W
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										

	X	Y	Z
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Er	Removal %
4		Mill Creek											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				
47									HAPs				

	N	O	P	Q	R	S	T	U	V	W
1	ompliance Analysis and High Level Capital and O&M Cost Estimation									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			

	A	B	C	D	E	F	G	H	I	J	K	L	M
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56				4					NOx				
57									SO2				
58									PM				
59									PM				
60													
61									CO				
62									VOC				
63									Hg				
64									HAPs				
65									H2SO4				
66									SO3-SAM				
67									HCL				
68									HF				
69													
70													
71													
72													
73													
74		Revision #											
75		Date of Revision											
76		Notes											
77													
78													

	N	O	P	Q	R	S	T	U	V	W
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										

	X	Y	Z
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													**EON Fleetwide AQCS Co**
2													
3	**Item #**	**Plant/Site**	**Vintage**	**Unit**	**Unit rating MWg**	**MW net**	**Priority**	**Fuel Burned**	**Pollutant**	**Compliance D**	**AQC Control**	**Uncontrolled Er**	**Removal %**
4		Trimble County											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39													
40		Revision #											
41		Date of Revision											
42		Notes											
43													
44													

	N	O	P	Q	R	S	T	U	V	W
1	**ɔmpliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													**EON Fleetwide AQCS Co**
2													
3	**Item #**	**Plant/Site**	**Vintage**	**Unit**	**Unit rating MWg**	**MW net**	**Priority**	**Fuel Burned**	**Pollutant**	**Compliance D**	**AQC Control**	**Uncontrolled Er**	**Removal %**
4		Green River											
5	1			3					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				4					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39													
40		Revision #											
41		Date of Revision											
42		Notes											
43													
44													

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			

From:	Saunders, Eileen
To:	Voyles, John; Bowling, Ralph
CC:	Straight, Scott
Sent:	5/14/2010 12:09:20 PM
Subject:	Information for the Conference Call
Attachments:	AQC technology Recommendation 051310.pdf; AQCS Fleetwide Compliance Matrix B&V May 3 2010.xls

John and Ralph,

Here are two templates I will be discussing on our call today.

Thank you,

Eileen

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the site-specific considerations developed during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	*B&V to insert recommended technology*	□ Yes □ No
SO_2	*B&V to insert recommended technology*	□ Yes □ No
PM	*B&V to insert recommended technology*	□ Yes □ No
CO	*B&V to insert recommended technology*	□ Yes □ No
Hg	*B&V to insert recommended technology*	□ Yes □ No
HCl	*B&V to insert recommended technology*	□ Yes □ No
Dioxin/Furan	*B&V to insert recommended technology*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

Special Considerations Summary:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: NO_x

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: SO_2

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Particulate (PM)

Feasible Control Options:
- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:
- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Insert Plant Name***
Unit: ***Insert Number***

Pollutant: CO

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Insert Plant Name*
Unit: *Insert Number*

Pollutant: Dioxin/Furan

Feasible Control Options:

- Name of option #1
- Name of option #2
- Name of option # (continue as needed)
- Not Applicable as the unit is currently meeting target emission level. *(If this is the case delete the bullets above and this parenthesis.)*

Special Considerations:

- Consideration #1
- Consideration #2
- Consideration # (continue as needed)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW Net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled En	Removal %
4		E. W. Brown											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections if applicable		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	**$**		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			

	A	B	C	D	E	F	G	H	I	J	K	L	M
47									HAPs				
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56													
57		Revision #											
58		Date of Revision											
59		Notes											
60													
61													

	N	O	P	Q	R	S	T	U	V	W
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										

	X	Y	Z
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													**EON Fleetwide AQCS Co**
2													
3	**Item #**	**Plant/Site**	**Vintage**	**Unit**	**Unit rating MWg**	**MW net**	**Priority**	**Fuel Burned**	**Pollutant**	**Compliance D**	**AQC Control**	**Uncontrolled Er**	**Removal %**
4		Ghent											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				
47									HAPs				

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			

	A	B	C	D	E	F	G	H	I	J	K	L	M
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56				4					NOx				
57									SO2				
58									PM				
59									PM				
60													
61									CO				
62									VOC				
63									Hg				
64									HAPs				
65									H2SO4				
66									SO3-SAM				
67									HCL				
68									HF				
69													
70													
71													
72													
73													
74		Revision #											
75		Date of Revision											
76		Notes											
77													
78													

	N	O	P	Q	R	S	T	U	V	W
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										

	X	Y	Z
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Er	Removal %
4		Cane Run											
5	1			4					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				5					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				6					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				

	N	O	P	Q	R	S	T	U	V	W
1	**ɔmpliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	***$***		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			

	A	B	C	D	E	F	G	H	I	J	K	L	M
47									HAPs				
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56													
57		Revision #											
58		Date of Revision											
59		Notes											
60													
61													

	N	O	P	Q	R	S	T	U	V	W
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										

	X	Y	Z
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													EON Fleetwide AQCS Co
2													
3	Item #	Plant/Site	Vintage	Unit	Unit rating MWg	MW net	Priority	Fuel Burned	Pollutant	Compliance D	AQC Control	Uncontrolled Er	Removal %
4		Mill Creek											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39				3					NOx				
40									SO2				
41									PM				
42									PM				
43													
44									CO				
45									VOC				
46									Hg				
47									HAPs				

	N	O	P	Q	R	S	T	U	V	W
1	mpliance Analysis and High Level Capital and O&M Cost Estimation									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			

	A	B	C	D	E	F	G	H	I	J	K	L	M
48									H2SO4				
49									SO3-SAM				
50									HCL				
51									HF				
52													
53													
54													
55													
56				4					NOx				
57									SO2				
58									PM				
59									PM				
60													
61									CO				
62									VOC				
63									Hg				
64									HAPs				
65									H2SO4				
66									SO3-SAM				
67									HCL				
68									HF				
69													
70													
71													
72													
73													
74		Revision #											
75		Date of Revision											
76		Notes											
77													
78													

	N	O	P	Q	R	S	T	U	V	W
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										

	X	Y	Z
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1												**EON Fleetwide AQCS Co**	
2													
3	**Item #**	**Plant/Site**	**Vintage**	**Unit**	**Unit rating MWg**	**MW net**	**Priority**	**Fuel Burned**	**Pollutant**	**Compliance D**	**AQC Control**	**Uncontrolled En**	**Removal %**
4		Trimble County											
5	1			1					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				2					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39													
40		Revision #											
41		Date of Revision											
42		Notes											
43													
44													

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	**$**		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			

	A	B	C	D	E	F	G	H	I	J	K	L	M
1												**EON Fleetwide AQCS Co**	
2													
3	**Item #**	**Plant/Site**	**Vintage**	**Unit**	**Unit rating MWg**	**MW net**	**Priority**	**Fuel Burned**	**Pollutant**	**Compliance D**	**AQC Control**	**Uncontrolled Er**	**Removal %**
4		Green River											
5	1			3					NOx				
6	2								SO2				
7	3								PM				
8	4								PM				
9	5												
10	6								CO				
11	7								VOC				
12	8								Hg				
13	9								HAPs				
14	10								H2SO4				
15	11								SO3-SAM				
16	12								HCL				
17	13								HF				
18													
19													
20													
21													
22				4					NOx				
23									SO2				
24									PM				
25									PM				
26													
27									CO				
28									VOC				
29									Hg				
30									HAPs				
31									H2SO4				
32									SO3-SAM				
33									HCL				
34									HF				
35													
36													
37													
38													
39													
40		Revision #											
41		Date of Revision											
42		Notes											
43													
44													

	N	O	P	Q	R	S	T	U	V	W
1	**ompliance Analysis and High Level Capital and O&M Cost Estimation**									
2										
3	Current Controlled	Future Required Er	Future Regulatory D	Tons removed with (	Tons removed with	Capital costs		Cost Corrections		O&M Costs
4						*$/ton removed*	*$/kW*	*$/ton removed*	*$/kW*	*$*
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										

	X	Y	Z
1			
2			
3	**Levelized Annu**	**Remarks**	**Revision**
4	*$*		
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			

From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Sent: 5/17/2010 12:53:34 PM
Subject: EON - AQC Assessment Draft TOC
Attachments: Draft EON AQC Report TOC 051710.pdf

Eileen,
Attached please find the draft AQC assessment report's Table of Contents. This draft TOC represents our first approach to the report's structure. If you would like, we can discuss at today's conference call.

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E. ON US
Coal-Fired Fleet Wide

Air Quality Control
Technology Cost Assessment

B&V Project: 167987
B&V File No.: 32.0000

Issue Date and Revision
May 2010
REV A

BLACK & VEATCH
Building a world of difference.

e·on

Table of Contents

Table of Contents (Continued)

Tables

Appendices

From:	Hillman, Timothy M.
To:	Saunders, Eileen
CC:	Mahabaleshwarkar, Anand; Lucas, Kyle J.
Sent:	5/17/2010 4:58:12 PM
Subject:	EON - AQC Study - Action Item List from 051710 Project Conference Call
Attachments:	EON ACTION ITEM LIST 051710.xls

Eileen,

Please find attached an updated action item list from our project conference call this afternoon.

Best regards,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

	A	B	C	D	E	F	G	I	J	K
1	**ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY**									
2										
3	ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		ATE ADDE	RIG DUE DAT	RR DUE D/
4		DOC/MTNG	DATE			CO.	INITIAL			
5	1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
6	2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
7	3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
8	4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
9	5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
10	6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
11	7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
12	8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
13	9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
14	10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
15	11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
16	12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
17	13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
18	14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	
19	15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	
20										
21										
22										
23										
24										
25										

	M	N	O
1			
2			
3	STATUS	NOTES	
4			
5	Closed		
6	Closed		
7	Closed		
8	Closed		
9	Closed		
10	Closed		
11	Closed		
12	Closed		
13	Closed		
14	Closed	EON confirmed at 5/10 Kick-off Meeting.	
15	Closed		
16	Open		
17	Open		
18	Open		
19	Open		
20			
21			
22			
23			
24			
25			

	A	B	C	D	E	F	G	I	J	K
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									
50	45									

	M	N	O
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

	A	B	C	D	E	F	G	I	J	K
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									
74	69									

	M	N	O
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			

	A	B	C	D	E	F	G	I	J	K
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									
99	94									

	M	N	O
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			

	A	B	C	D	E	F	G	I	J	K
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										
124										
125										

	M	N	O
100			
101			
102			
103			
104			
105			
106			
107			
108			
109			
110			
111			
112			
113			
114			
115			
116			
117			
118			
119			
120			
121			
122			
123			
124			
125			

	A	B	C	D	E	F	G	I	J	K
126										
127										
128										
129										
130										
131										
132										
133										
134										
135										
136										
137										
138										
139										
140										
141										
142										
143										
144										
145										
146										
147										
148										
149										
150										
151										
152										
7091										
7092										
7093										
7094										
7095										
7096										
7097										
7098										
7099										
7100										
7101										

	M	N	O
126			
127			
128			
129			
130			
131			
132			
133			
134			
135			
136			
137			
138			
139			
140			
141			
142			
143			
144			
145			
146			
147			
148			
149			
150			
151			
152			
7091			
7092			
7093			
7094			
7095			
7096			
7097			
7098			
7099			
7100			
7101			

	A	B	C	D	E	F	G	I	J	K
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O
7102			
7103			
7104			
7105			
7106			
7107			
7108			
7109			

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From: Hillman, Timothy M.
To: Saunders, Eileen
CC: Mahabaleshwarkar, Anand; Lucas, Kyle J.
Sent: 5/17/2010 5:19:44 PM
Subject: RE: EON - AQC Study - Action Item List from 051710 Project Conference Call
Attachments: EON ACTION ITEM LIST 051710.xls

Slight revision made to the action item list.

Thanks,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

From: Hillman, Timothy M.
Sent: Monday, May 17, 2010 3:58 PM
To: 'Saunders, Eileen'
Cc: Mahabaleshwarkar, Anand; Lucas, Kyle J.
Subject: EON - AQC Study - Action Item List from 051710 Project Conference Call

Eileen,

Please find attached an updated action item list from our project conference call this afternoon.

Best regards,

Tim Hillman | Senior Air Quality Scientist
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-7928**
Email: **hillmantm@bv.com**

ACTION ITEM LIST - EON AIR QUALITY CONTROL STUDY

ITEM #	SOURCE		DESCRIPTION	FILE NO.	RESPONSIBILITY		ATE ADDE	RIG DUE DAT	RR DUE DA
	DOC/MTNG	DATE			CO.	INITIAL			
1	Conf Call	5/3/10	Send template for environmental requirements matrix		BV	AM	05/03/10	05/03/10	05/03/10
2	Conf Call	5/3/10	Establish a "General" folder in the IBackup document manager		BV	BO	05/03/10	05/04/10	05/03/10
3	Conf Call	5/3/10	Set up weekly project status conference call and action item list		BV	TH	05/03/10	05/07/10	05/12/10
4	Conf Call	5/3/10	Prepare draft agenda for May 10 kickoff meeting		BV	TH	05/03/10	05/04/10	05/05/10
5	Conf Call	5/3/10	Send EON names and disciplines of AQC site teams		BV	AM	05/03/10	05/04/10	05/03/10
6	Conf Call	5/3/10	Send previous project invoice format to EON for review		BV	MK/TH	05/03/10	05/06/10	05/05/10
7	Conf Call	5/3/10	Prepare a more detailed/specific data request		BV	AM	05/03/10	05/03/10	05/03/10
8	Conf Call	5/3/10	Email suggestions for coordination and order of site visits		EON	ES	05/03/10	05/04/10	05/05/10
9	Conf Call	5/3/10	Set up contact with EON Fuels		EON	ES	05/03/10	05/04/10	05/04/10
10	Conf Call	5/3/10	Determine financial model input requirements (i.e., owner's cost, etc)		EON	ES	05/03/10	05/07/10	
11	Kick-Off Mtng	5/10/10	Prepare Meeting Minutes from Kick-off Meeting		BV	KL	05/10/10	05/13/10	05/17/10
12	Project Call	5/17/10	Review Kickoff Meeting Minutes		EON	ES	05/17/10	05/18/10	
13	Project Call	5/17/10	Issue AQC Recommendation Summaries		BV	KL	5/17/10	05/18-05/20	
14	Project Call	5/17/10	Issue Design Basis		BV	KL	5/17/10	05/20/10	
15	Project Call	5/17/10	Review and Approve AQC Recommendations		EON	ES	5/17/10	05/21/10	

	M	N	O
1			
2			
3	STATUS	NOTES	
4			
5	Closed		
6	Closed		
7	Closed		
8	Closed		
9	Closed		
10	Closed		
11	Closed		
12	Closed		
13	Closed		
14	Closed	EON confirmed at 5/10 Kick-off Meeting.	
15	Closed		
16	Open		
17	Open		
18	Open		
19	Open		
20			
21			
22			
23			
24			
25			

	A	B	C	D	E	F	G	I	J	K
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41	36									
42	37									
43	38									
44	39									
45	40									
46	41									
47	42									
48	43									
49	44									
50	45									

	M	N	O
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			

	A	B	C	D	E	F	G	I	J	K
51	46									
52	47									
53	48									
54	49									
55	50									
56	51									
57	52									
58	53									
59	54									
60	55									
61	56									
62	57									
63	58									
64	59									
65	60									
66	61									
67	62									
68	63									
69	64									
70	65									
71	66									
72	67									
73	68									
74	69									

	M	N	O
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			

	A	B	C	D	E	F	G	I	J	K
75	70									
76	71									
77	72									
78	73									
79	74									
80	75									
81	76									
82	77									
83	78									
84	79									
85	80									
86	81									
87	82									
88	83									
89	84									
90	85									
91	86									
92	87									
93	88									
94	89									
95	90									
96	91									
97	92									
98	93									
99	94									

	M	N	O
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			

	A	B	C	D	E	F	G	I	J	K
100	95									
101	96									
102	97									
103	98									
104	99									
105	100									
106	101									
107	102									
108	103									
109	104									
110	105									
111	106									
112	107									
113	108									
114	109									
115	110									
116	111									
117	112									
118	113									
119	114									
120	115									
121										
122										
123										
124										
125										

	M	N	O
100			
101			
102			
103			
104			
105			
106			
107			
108			
109			
110			
111			
112			
113			
114			
115			
116			
117			
118			
119			
120			
121			
122			
123			
124			
125			

	A	B	C	D	E	F	G	I	J	K
126										
127										
128										
129										
130										
131										
132										
133										
134										
135										
136										
137										
138										
139										
140										
141										
142										
143										
144										
145										
146										
147										
148										
149										
150										
151										
152										
7091										
7092										
7093										
7094										
7095										
7096										
7097										
7098										
7099										
7100										
7101										

	M	N	O
126			
127			
128			
129			
130			
131			
132			
133			
134			
135			
136			
137			
138			
139			
140			
141			
142			
143			
144			
145			
146			
147			
148			
149			
150			
151			
152			
7091			
7092			
7093			
7094			
7095			
7096			
7097			
7098			
7099			
7100			
7101			

	A	B	C	D	E	F	G	I	J	K
7102										
7103										
7104										
7105										
7106										
7107										
7108										
7109	58									

	M	N	O
7102			
7103			
7104			
7105			
7106			
7107			
7108			
7109			

	A	B	C	D	E
1	EON	E.ON U.S. SERVICES INC. COMPANY			
2	ES	Eileen Saunders			
3	GB	Greg Black			
4	GR	Gary Revlett			
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15	BV	Black & Veatch (B&V)			
16	TH	Tim Hillman			
17	KL	Kyle Lucas			
18	AM	Anand Mahabaleshwarker			
19	MK	Mike King			
20	BO	Brian O'Neal			

From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Sent: 5/18/2010 7:02:30 PM
Subject: EON AQC Selection Sheet - Trimble County
Attachments: Trimble County Unit 1 051810.doc

Eileen,
Attached please find the AQC technology selection sheet for Trimble County Unit 1. At this time, we believe that Unit 2 has a full suite of AQC technologies that may meet the target emission levels and will be determined later when the unit is operational. Thus, we have not included an AQC technology selection sheet for this unit. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, please confirm the CO targeted emission level noted in the matrix is 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | **Environmental Permitting Manager**
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBTU emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size PJFF.***	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection*** *and new Pulse Jet Fabric Filter (PJFF) required to meet the compliance requirements.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NO_x control technology is required**. The unit is currently equipped with state of the art SCR that can meet future target NOx emissions level of 0.11 lb/MBtu.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

continuous basis and hence is the most feasible control technology. The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.

Special Considerations:

- Full size PJFF.
- *PAC to be injected downstream of the existing ESP but upstream of new PJFF.*
- Location: A PJFF would be required downstream of the PAC injection system.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole and electrical duct banks running underground between the existing ID fans and scrubber inlet duct will need to be avoided or relocated to make real estate available.
    - Array of I-beam structures (currently supporting no equipment) located between the existing ID fans and scrubber inlet needs to be demolished.
    - New PJFF will be installed at a higher elevation needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- The **new PAC injection with new PJFF considered for mercury control** can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Crutcher, Tom; Turner, Haley
Sent: 5/18/2010 7:08:40 PM
Subject: Fw: EON AQC Selection Sheet - Trimble County
Attachments: Trimble County Unit 1 051810.doc

Tom and Haley,

Please see the information below. As described in my earlier email, I will send out a conference number so we can discuss this tomorrow.

I have not had the chance to open this since I am working from my Blackberry at the moment.

Also, disregard the question they asked in the email. I will check that out with Gary in the morning.

Thank you,

Eileen

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>; Hillman, Timothy M. <HillmanTM@bv.com>
Sent: Tue May 18 19:02:30 2010
Subject: EON AQC Selection Sheet - Trimble County

Eileen,
Attached please find the AQC technology selection sheet for Trimble County Unit 1. At this time, we believe that Unit 2 has a full suite of AQC technologies that may meet the target emission levels and will be determined later when the unit is operational. Thus, we have not included an AQC technology selection sheet for this unit. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, please confirm the CO targeted emission level noted in the matrix is 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBTU emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size PJFF.***	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection*** *and new Pulse Jet Fabric Filter (PJFF) required to meet the compliance requirements.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NO_x control technology is required**. The unit is currently equipped with state of the art SCR that can meet future target NOx emissions level of 0.11 lb/MBtu.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

continuous basis and hence is the most feasible control technology. The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.

Special Considerations:

- Full size PJFF.
- *PAC to be injected downstream of the existing ESP but upstream of new PJFF.*
- Location: A PJFF would be required downstream of the PAC injection system.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole and electrical duct banks running underground between the existing ID fans and scrubber inlet duct will need to be avoided or relocated to make real estate available.
    - Array of I-beam structures (currently supporting no equipment) located between the existing ID fans and scrubber inlet needs to be demolished.
    - New PJFF will be installed at a higher elevation needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- The **new PAC injection with new PJFF considered for mercury control** can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/18/2010 7:15:13 PM
Subject: Fw: EON AQC Selection Sheet - Trimble County
Attachments: Trimble County Unit 1 051810.doc

Scott,

Here is the first document from B&V. If you open this on your Blackberry, you can scroll down and read some of the text.

Also, I will get the question they asked in their email clarified in the morning.

I will be setting up a call to discuss with the TC team in the morning.

Thanks,

Eileen

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>; Hillman, Timothy M. <HillmanTM@bv.com>
Sent: Tue May 18 19:02:30 2010
Subject: EON AQC Selection Sheet - Trimble County

Eileen,
Attached please find the AQC technology selection sheet for Trimble County Unit 1. At this time, we believe that Unit 2 has a full suite of AQC technologies that may meet the target emission levels and will be determined later when the unit is operational. Thus, we have not included an AQC technology selection sheet for this unit. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, please confirm the CO targeted emission level noted in the matrix is 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBTU emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size PJFF.***	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection*** *and new Pulse Jet Fabric Filter (PJFF) required to meet the compliance requirements.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Trimble County***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NO_x control technology is required**. The unit is currently equipped with state of the art SCR that can meet future target NOx emissions level of 0.11 lb/MBtu.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

continuous basis and hence is the most feasible control technology. The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.

Special Considerations:

- Full size PJFF.
- *PAC to be injected downstream of the existing ESP but upstream of new PJFF.*
- Location: A PJFF would be required downstream of the PAC injection system.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole and electrical duct banks running underground between the existing ID fans and scrubber inlet duct will need to be avoided or relocated to make real estate available.
    - Array of I-beam structures (currently supporting no equipment) located between the existing ID fans and scrubber inlet needs to be demolished.
    - New PJFF will be installed at a higher elevation needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- The **new PAC injection with new PJFF considered for mercury control** can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Trimble County*
Unit: *1*

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From:	Lucas, Kyle J.
To:	Saunders, Eileen
CC:	Mahabaleshwarkar, Anand; Hillman, Timothy M.
Sent:	5/19/2010 2:26:31 PM
Subject:	EON AQC Selection Sheets - E.W. Brown
Attachments:	E.W. Brown Unit 1 051910.doc; E.W. Brown Unit 2 051910.doc; E.W. Brown Unit 3 051910.doc

Eileen,
Attached please find the AQC technology selection sheet for E.W. Brown Units 1-3 . Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, We understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected****. Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be located downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – No space is available outside the boiler building on the north side to install the SCR. Therefore, the new SCR needs to be constructed on the east side of the boiler building. Potentially at an elevated level.
- Construction Issues – Tight space for tie-in and connection of ductwork between economizer outlet and SCR.
  - Soot blower air compressor tanks, service water piping and circulating water piping needs to be demolished and relocated.
  - Demineralization system building, which is currently not in use and is located on the north side of the boiler building, needs to be demolished.
  - Secondary air duct may need to be raised to clear the space.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: Particulate (PM)

<u>Feasible Control Options</u>:
- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- <u>Location</u>: A new PJFF for Unit 1 will be located downstream of the ductwork exiting the ID fans of Unit 1 and upstream of new booster fans for Unit 1.
- <u>Real Estate Constraints</u> – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- <u>Construction Issues</u> – Heavy foundations and supports.
  - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

<u>Feasible Control Options</u>:
- <u>***No feasible and proven technology is available for this type and size of unit***</u> <u>to meet the 0.02 lb/MBtu emission limit.</u>
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 1.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 1.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but not a long term solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Limited space available at grade level outside the boiler building on the north side to install the SCR. Therefore the new SCR will need to be constructed at an elevation above grade level.
- Construction Issues – Unit 2 abandoned dry stack and main auxiliary transformer on the north side outside the boiler building.
    - Demolition and relocation of main auxiliary transformer of Unit 2.
    - Demolition of existing pre-dust collectors.
    - SCR will need to be constructed on a dance floor.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the ductwork exiting the ID fans of Unit 2 and upstream of new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *The new SCR which will be constructed in 2012 can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit will be equipped with SCR in 2012 that can meet the future target NO_x emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of common wet FGD scrubber.
- Real Estate Constraints – No real estate constraints.
- Construction Issues – Possible underground service water pipelines interference.
    - May require relocation of underground service water pipelines

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 3.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From:	Clements, Joe
To:	'Lucas, Kyle J.'
CC:	King, Michael L. (Mike); Hillman, Timothy M.; Mahabaleshwarkar, Anand; Saunders, Eileen; Imber, Philip; Straight, Scott; Whitworth, Wayne
Sent:	4/26/2010 9:21:33 AM
Subject:	RE: E.ON Air Quality Control Study
Attachments:	Clements, Joe.vcf

Kyle,

Please provide a native format copy of your proposal. Please include an excel worksheet of your estimate with it as well. We would like to see resource x hours x billing rate by task by COB today.

I am out of my office all day today at the Trimble County Station, with spotty cell phone coverage. If you need to speak with me directly, drop me an email and I will phone you when I am available.

Thanks

Joe Clements
Project Engineering
Mgr. Contracts
Major Capital Projects
Mobile 502-724-9101
Work 502-627-2760
EON U.S.
820 West Broadway
Louisville, Ky 40202

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Friday, April 23, 2010 5:11 PM
To: Clements, Joe
Cc: King, Michael L. (Mike); Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: E.ON Air Quality Control Study

Joe,
Based on our telephone conversation on Wednesday April 21, attached please find the proposal for the requested air quality control services. We understand that E.ON requires this study to be completed by June 18 and we are available to start this project immediately to meet this deadline. Additionally, we have completed a similar study for Ameren UE and have included a Letter of Recommendation for your consideration.

Please feel free to contact Mike King at (734) 622-8516 or myself should you have any questions.

Regards,
Kyle Lucas

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

Full Name:	Clements, Joe
Last Name:	Clements
First Name:	Joe
Job Title:	Mgr Contracts/Mjr Capital Proj
Company:	E.ON U.S. Services Inc. Project Engineering
Business Address:	Broadway Office Complex-3 820 W. Broadway Louisville, KY 40202
Business:	(502) 627-2760
Mobile:	
Pager:	
E-mail:	Joe.Clements@eon-us.com
E-mail Display As:	Clements, Joe <Joe.Clements@eon-us.com>

From:	Saunders, Eileen
To:	Fraley, Jeffrey; Pabian, Brad; Carman, Barry
Sent:	5/19/2010 2:38:16 PM
Subject:	FW: EON AQC Selection Sheets - E.W. Brown
Attachments:	E.W. Brown Unit 1 051910.doc; E.W. Brown Unit 2 051910.doc; E.W. Brown Unit 3 051910.doc

All,

I just received the sheets for Brown. Please review them and I will set up a conference call for tomorrow so we can discuss what we would like B&V to estimate.

Please ignore the question in the email below regarding the CO targeted emission level. Gary Revlett is checking on that answer for me.

Thank you,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Wednesday, May 19, 2010 2:27 PM
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Subject: EON AQC Selection Sheets - E.W. Brown

Eileen,
Attached please find the AQC technology selection sheet for E.W. Brown Units 1-3 . Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, We understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of* 1×10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected****. Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of* 15×10^{-18} *lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: NO_x

Feasible Control Options:
- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:
- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be located downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – No space is available outside the boiler building on the north side to install the SCR. Therefore, the new SCR needs to be constructed on the east side of the boiler building. Potentially at an elevated level.
- Construction Issues – Tight space for tie-in and connection of ductwork between economizer outlet and SCR.
    - Soot blower air compressor tanks, service water piping and circulating water piping needs to be demolished and relocated.
    - Demineralization system building, which is currently not in use and is located on the north side of the boiler building, needs to be demolished.
    - Secondary air duct may need to be raised to clear the space.

Pollutant: SO_2

Feasible Control Options:
- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the ductwork exiting the ID fans of Unit 1 and upstream of new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 1.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 1.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10^{th}, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but not a long term solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Limited space available at grade level outside the boiler building on the north side to install the SCR. Therefore the new SCR will need to be constructed at an elevation above grade level.
- Construction Issues – Unit 2 abandoned dry stack and main auxiliary transformer on the north side outside the boiler building.
    - Demolition and relocation of main auxiliary transformer of Unit 2.
    - Demolition of existing pre-dust collectors.
    - SCR will need to be constructed on a dance floor.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Particulate (PM)

Feasible Control Options:
- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the ductwork exiting the ID fans of Unit 2 and upstream of new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *The new SCR which will be constructed in 2012 can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit will be equipped with SCR in 2012 that can meet the future target NO_x emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of common wet FGD scrubber.
- Real Estate Constraints – No real estate constraints.
- Construction Issues – Possible underground service water pipelines interference.
    - May require relocation of underground service water pipelines

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:
- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:
- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 3.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:
- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:
- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/19/2010 3:46:55 PM
Subject: FW: EON AQC Selection Sheets - E.W. Brown
Attachments: E.W. Brown Unit 1 051910.doc; E.W. Brown Unit 2 051910.doc; E.W. Brown Unit 3 051910.doc

Here is the template for Brown. I have a call with the station in the morning to discuss. My call with Trimble was moved to Friday due to a schedule conflict. I expect to receive Ghent's information later this evening and the other three stations tomorrow.

Thank you,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Wednesday, May 19, 2010 2:27 PM
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Subject: EON AQC Selection Sheets - E.W. Brown

Eileen,
Attached please find the AQC technology selection sheet for E.W. Brown Units 1-3 . Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, We understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be located downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – No space is available outside the boiler building on the north side to install the SCR. Therefore, the new SCR needs to be constructed on the east side of the boiler building. Potentially at an elevated level.
- Construction Issues – Tight space for tie-in and connection of ductwork between economizer outlet and SCR.
  - Soot blower air compressor tanks, service water piping and circulating water piping needs to be demolished and relocated.
  - Demineralization system building, which is currently not in use and is located on the north side of the boiler building, needs to be demolished.
  - Secondary air duct may need to be raised to clear the space.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the ductwork exiting the ID fans of Unit 1 and upstream of new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
  - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 1.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 1.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but not a long term solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Limited space available at grade level outside the boiler building on the north side to install the SCR. Therefore the new SCR will need to be constructed at an elevation above grade level.
- Construction Issues – Unit 2 abandoned dry stack and main auxiliary transformer on the north side outside the boiler building.
    - Demolition and relocation of main auxiliary transformer of Unit 2.
    - Demolition of existing pre-dust collectors.
    - SCR will need to be constructed on a dance floor.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the ductwork exiting the ID fans of Unit 2 and upstream of new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *The new SCR which will be constructed in 2012 can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit will be equipped with SCR in 2012 that can meet the future target NO_x emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of common wet FGD scrubber.
- Real Estate Constraints – No real estate constraints.
- Construction Issues – Possible underground service water pipelines interference.
    - May require relocation of underground service water pipelines

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 3.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Sent: 5/19/2010 6:02:21 PM
Subject: EON AQC Selection Sheets - Ghent
Attachments: Ghent Unit 1 051910.doc; Ghent Unit 2 051910.doc; Ghent Unit 3 051910.doc; Ghent Unit 4 051910.doc

Eileen,
Attached please find the AQC technology selection sheets for Ghent Units 1- 4. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | **Environmental Permitting Manager**
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required.** The unit is currently equipped with an ESP technology that can meet the future target PM emission level of 0.03 lb/MBTU.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *1*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 1.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 1.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the existing ID fans of Unit 1 and upstream of the new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork and abandoned stack interference. Access for heavy cranes may be a possible issue
  - Require demolition of ductwork
  - May require demolition of existing abandoned dry stack of Unit 1
  - Demolition and relocation of pipe rack for access

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Space is available outside the boiler building on the south side to install the SCR. The SCR will be elevated above grade.
- Construction Issues – Access for heavy equipment and cranes is not available.
  - Demolition and relocation of overhead walkway from Unit 2 to Unit 3 boiler building.
  - Demolition and relocation of some of the overhead power lines.
  - Tower cranes are required for access of heavy equipment and construction of SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the existing ID fans of Unit 2 and upstream of the new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork interference. Access for heavy cranes may be a possible issue
  - Requires demolition of ductwork
  - Demolition and relocation of pipe rack for access

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected***. *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

Pollutant: NO_x

Feasible Control Options:
- **No new NO_x control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:
- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:
- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of the new booster fans for Unit 3.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
  - Warehouse needs to be demolished
  - Well water pumps needs to be relocated

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 3.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:
- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:
- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:
- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:
- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:
- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 4.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 4.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 4 will be located downstream of the existing ID fans of Unit 4 and upstream of the new booster fans for Unit 4.
- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
    - Warehouse needs to be demolished
    - Well water pumps needs to be relocated

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From:	Saunders, Eileen
To:	Joyce, Jeff; Nix, Stephen; Piening, Carla
Sent:	5/19/2010 6:23:10 PM
Subject:	Fw: EON AQC Selection Sheets - Ghent
Attachments:	Ghent Unit 1 051910.doc; Ghent Unit 2 051910.doc; Ghent Unit 3 051910.doc; Ghent Unit 4 051910.doc

All,

Here are the templates for Ghent. I will arrange a call tomorrow for us to discuss their data sheets.

Thanks,

Eileen

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>; Hillman, Timothy M. <HillmanTM@bv.com>
Sent: Wed May 19 18:02:21 2010
Subject: EON AQC Selection Sheets - Ghent

Eileen,
Attached please find the AQC technology selection sheets for Ghent Units 1- 4. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | **Environmental Permitting Manager**
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required.** The unit is currently equipped with an ESP technology that can meet the future target PM emission level of 0.03 lb/MBTU.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 1.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 1.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the existing ID fans of Unit 1 and upstream of the new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork and abandoned stack interference. Access for heavy cranes may be a possible issue
    - Require demolition of ductwork
    - May require demolition of existing abandoned dry stack of Unit 1
    - Demolition and relocation of pipe rack for access

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Space is available outside the boiler building on the south side to install the SCR. The SCR will be elevated above grade.
- Construction Issues – Access for heavy equipment and cranes is not available.
  - Demolition and relocation of overhead walkway from Unit 2 to Unit 3 boiler building.
  - Demolition and relocation of some of the overhead power lines.
  - Tower cranes are required for access of heavy equipment and construction of SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: Particulate (PM)

Feasible Control Options:
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the existing ID fans of Unit 2 and upstream of the new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork interference. Access for heavy cranes may be a possible issue
  - Requires demolition of ductwork
  - Demolition and relocation of pipe rack for access

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new* NO_x *compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of* 1×10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of* 15×10^{-18} *lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

Pollutant: NO_x

Feasible Control Options:

- **No new NO_x control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of the new booster fans for Unit 3.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
    - Warehouse needs to be demolished
    - Well water pumps needs to be relocated

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 3.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 4.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 4.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 4 will be located downstream of the existing ID fans of Unit 4 and upstream of the new booster fans for Unit 4.
- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
    - Warehouse needs to be demolished
    - Well water pumps needs to be relocated

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/19/2010 9:29:30 PM
Subject: Fw: EON AQC Selection Sheets - Ghent
Attachments: Ghent Unit 1 051910.doc; Ghent Unit 2 051910.doc; Ghent Unit 3 051910.doc; Ghent Unit 4 051910.doc

Ghent

From: Lucas, Kyle J. <LucasKJ@bv.com>
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand <MahabaleshwarkarA@bv.com>; Hillman, Timothy M. <HillmanTM@bv.com>
Sent: Wed May 19 18:02:21 2010
Subject: EON AQC Selection Sheets - Ghent

Eileen,
Attached please find the AQC technology selection sheets for Ghent Units 1- 4. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required.** The unit is currently equipped with an ESP technology that can meet the future target PM emission level of 0.03 lb/MBTU.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *1*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 1.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 1.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the existing ID fans of Unit 1 and upstream of the new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork and abandoned stack interference. Access for heavy cranes may be a possible issue
    - Require demolition of ductwork
    - May require demolition of existing abandoned dry stack of Unit 1
    - Demolition and relocation of pipe rack for access

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***1***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new* NO_x *compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing WFGD can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of* 1×10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of* 15×10^{-18} *lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***2***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Space is available outside the boiler building on the south side to install the SCR. The SCR will be elevated above grade.
- Construction Issues – Access for heavy equipment and cranes is not available.
  - Demolition and relocation of overhead walkway from Unit 2 to Unit 3 boiler building.
  - Demolition and relocation of some of the overhead power lines.
  - Tower cranes are required for access of heavy equipment and construction of SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the existing ID fans of Unit 2 and upstream of the new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, with Booster fan or ID fan upgrades.
- Construction Issues – Ductwork interference. Access for heavy cranes may be a possible issue
  - Requires demolition of ductwork
  - Demolition and relocation of pipe rack for access

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *2*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected***. *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

Pollutant: NO_x

Feasible Control Options:

- **No new NO_x control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of the new booster fans for Unit 3.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
  - Warehouse needs to be demolished
  - Well water pumps needs to be relocated

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 3.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***3***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *Existing SCR can meet the new* NO_x *compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing WFGD can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***No new technology is required*** *for PM as current ESP is capable of meeting 0.03 lb/MBtu emissions.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of* 1×10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of* 15×10^{-18} *lb/MBtu.*	□ Yes □ No
Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment		

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit is currently equipped with SCR that can meet the future target NOx emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- **No new PM control technology is required** to meet the 0.03 lb/MBTU emissions limit.

Special Considerations:

- A new PJFF will be required to meet mercury control using PAC. The existing ESP alone will not be capable of meeting the mercury compliance emissions using PAC.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Ghent*
Unit: *4*

Pollutant: Mercury (Hg)

Feasible Control Options:
- New Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:
- The existing hot-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- PJFF for Unit 4.
- *PAC to be injected downstream of the existing ID fans but upstream of new full size PJFF for Unit 4.*
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 4 will be located downstream of the existing ID fans of Unit 4 and upstream of the new booster fans for Unit 4.
- Real Estate Constraints – There is very limited space available between the ID fan outlet and wet scrubber inlet on the west side. The new PJFF will be installed on the south side of Unit 4 ESP, with Booster fan or ID fan upgrades.
- Construction Issues – Electrical manhole, electrical duct banks and circulating water and storm water drain piping running underground on the south side of Unit 4 ESP will need to be relocated to make real estate available.
    - Warehouse needs to be demolished
    - Well water pumps needs to be relocated

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:
- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Ghent***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Sent: 5/20/2010 11:08:35 AM
Subject: SNCR description
Attachments: Picture (Metafile) 1.jpg

Eileen,
Please pass this along to your staff.

SNCR systems reduce NO_x emissions by injecting a reagent at multiple levels in the steam generator, as illustrated in the figure. SNCR systems rely solely on reagent injection (rather than a catalyst) and an appropriate reagent injection temperature, good reagent/gas mixing, and adequate reaction time to achieve NO_x reductions. SNCR systems can use either ammonia or urea as the reagent. Ammonia or urea is injected into areas of the steam generator where the flue gas temperature ranges from 1,500 to 2,200° F. The furnace of a pulverized coal fired boiler operates at temperatures between 2,500 to 3,000° F.

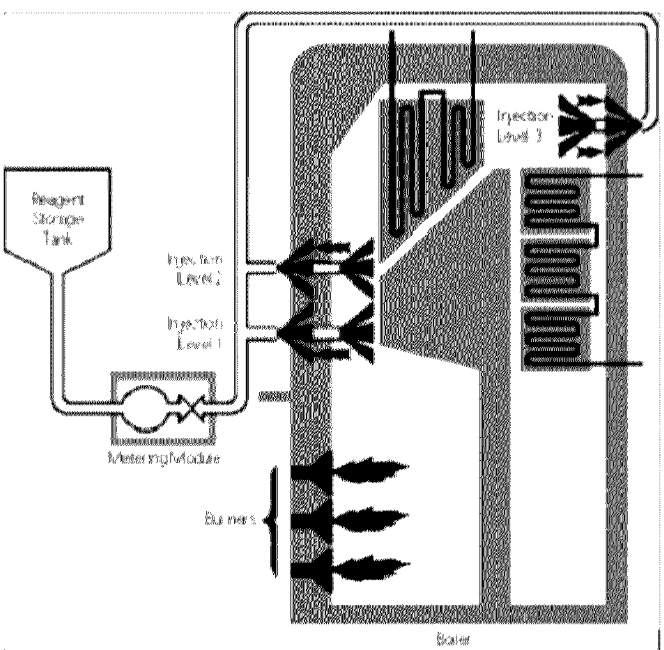
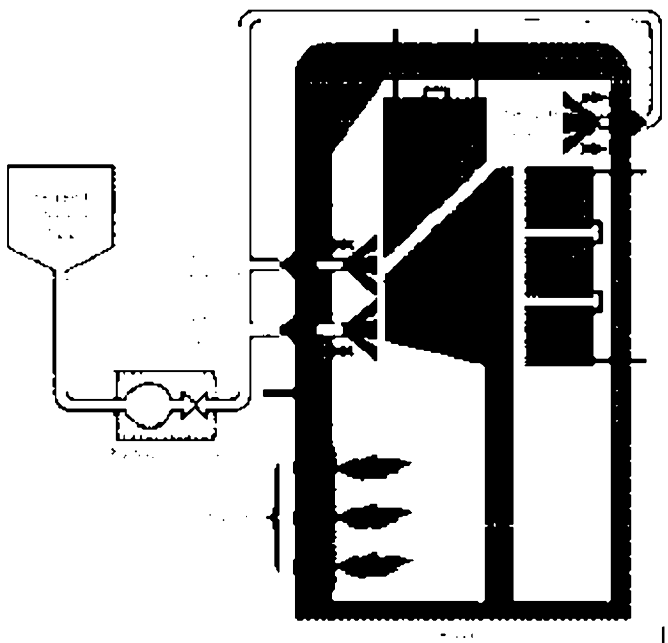


Figure
Schematic of SNCR System with Multiple Injection Levels

SNCR systems are capable of achieving a NO_x emission reduction as high as 50 to 60 percent in optimum conditions (adequate reaction time, temperature, and reagent/ flue gas mixing, high baseline NO_x conditions, multiple levels of injectors), with ammonia slips of 10 to 50 ppmvd. Lower ammonia slip values can be achieved with lower NO_x reduction capabilities. Typically, optimum conditions are difficult to achieve, resulting in emission reduction levels of 20 to 40 percent. Potential performance is very site-specific and varies with fuel type, steam generator size, allowable ammonia slip, furnace carbon monoxide (CO) concentrations, and steam generator heat transfer characteristics.

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**



From: Saunders, Eileen
To: Fraley, Jeffrey; Pabian, Brad; Carman, Barry
Sent: 5/20/2010 2:39:26 PM
Subject: FW: SNCR description
Attachments: Picture (Metafile) 1.jpg

Here is the SNCR description from B&V.

Thanks,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Thursday, May 20, 2010 11:09 AM
To: Saunders, Eileen
Cc: Hillman, Timothy M.; Mahabaleshwarkar, Anand
Subject: SNCR description

Eileen,
Please pass this along to your staff.

SNCR systems reduce NO_x emissions by injecting a reagent at multiple levels in the steam generator, as illustrated in the figure. SNCR systems rely solely on reagent injection (rather than a catalyst) and an appropriate reagent injection temperature, good reagent/gas mixing, and adequate reaction time to achieve NO_x reductions. SNCR systems can use either ammonia or urea as the reagent. Ammonia or urea is injected into areas of the steam generator where the flue gas temperature ranges from 1,500 to 2,200° F. The furnace of a pulverized coal fired boiler operates at temperatures between 2,500 to 3,000° F.

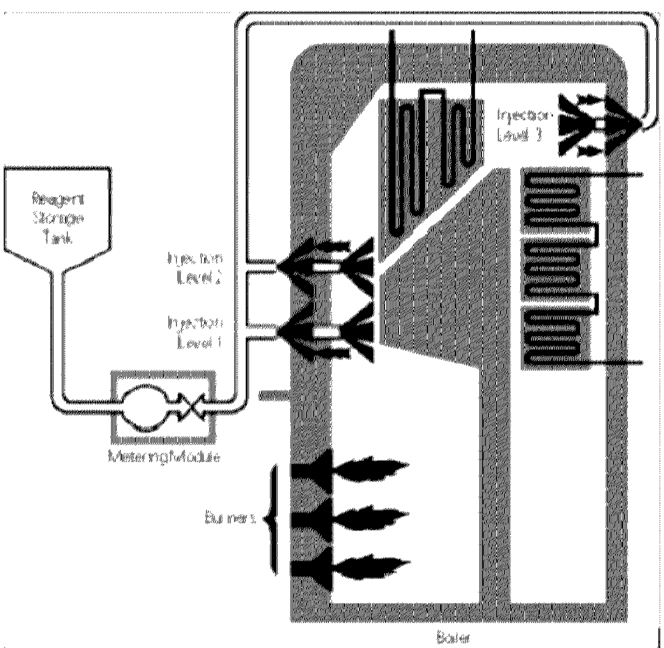
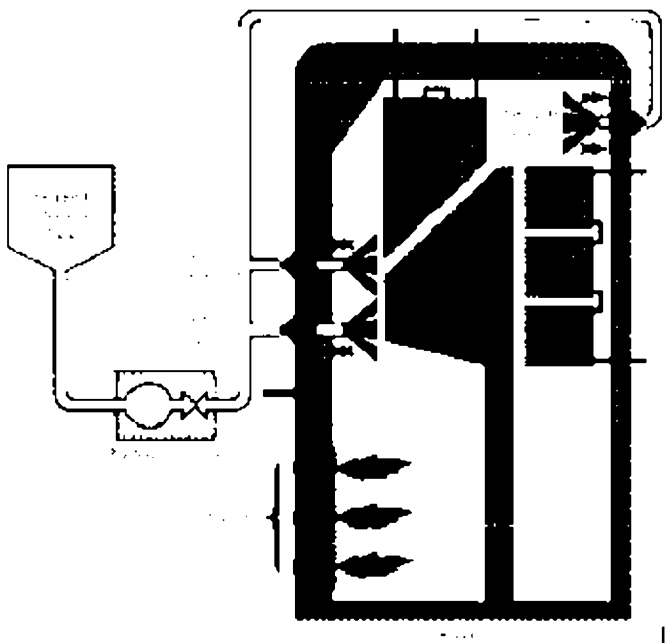


Figure
Schematic of SNCR System with Multiple Injection Levels

SNCR systems are capable of achieving a NO_x emission reduction as high as 50 to 60 percent in optimum conditions (adequate reaction time, temperature, and reagent/ flue gas mixing, high baseline NO_x conditions, multiple levels of injectors), with ammonia slips of 10 to 50 ppmvd. Lower ammonia slip values can be achieved with lower NO_x reduction capabilities. Typically, optimum conditions are difficult to achieve, resulting in emission reduction levels of 20 to 40 percent. Potential performance is very site-specific and varies with fuel type, steam generator size, allowable ammonia slip, furnace carbon monoxide (CO) concentrations, and steam generator heat transfer characteristics.

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**



From: Lucas, Kyle J.
To: Saunders, Eileen
CC: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Sent: 5/20/2010 3:13:24 PM
Subject: EON AQC Selection Sheets - Cane Run
Attachments: Cane Run Unit 4 052010.doc; Cane Run Unit 5 052010.doc; Cane Run Unit 6 052010.doc

Eileen,
Attached please find the AQC technology selection sheets for Cane Run Units 4-6. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 4.
- New ID Fans and wet liner/stack required for Unit 4 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- <u>Location</u>: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 4 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: A new PJFF for Unit 4 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 4 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 4*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 5.
- New ID Fans and wet liner/stack required for Unit 5 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 5 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 5 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 5 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 5*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 6.
- New ID Fans and wet liner/stack required for Unit 6 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NOx compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NOx emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NOx emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NOx emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 6 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 6 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 6 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 6*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From:	Saunders, Eileen
To:	Turner, Steven; Hensley, Mike
Sent:	5/20/2010 3:17:47 PM
Subject:	FW: EON AQC Selection Sheets - Cane Run
Attachments:	Cane Run Unit 4 052010.doc; Cane Run Unit 5 052010.doc; Cane Run Unit 6 052010.doc

Steve and Mike,

Please see the AQCS Template for your station. I will check your calendars to see if you are available for a conference call tomorrow. Please ignore the CO question below as I have already passed that question on to Gary Revlett.

Thank you,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Thursday, May 20, 2010 3:13 PM
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Subject: EON AQC Selection Sheets - Cane Run

Eileen,
Attached please find the AQC technology selection sheets for Cane Run Units 4-6. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

therein by error, please contact the sender and delete the material from your/any storage medium.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 4.
- New ID Fans and wet liner/stack required for Unit 4 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 4 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 4 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 4 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 4*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 5.
- New ID Fans and wet liner/stack required for Unit 5 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 5 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 5 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 5 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 5*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 6.
- New ID Fans and wet liner/stack required for Unit 6 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NOx compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NOx emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NOx emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NOx emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 6 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 6 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 6 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 6*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Hensley, Mike; Turner, Steven
Sent: 5/20/2010 3:19:34 PM
Subject: FW: EON AQC Selection Sheets - Cane Run
Attachments: Cane Run Unit 4 052010.doc; Cane Run Unit 5 052010.doc; Cane Run Unit 6 052010.doc

My apologies. I was working on the Brown document and accidentally forwarded their information to you. Please delete that email and use this one instead.

Thanks,

Eileen

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Thursday, May 20, 2010 3:13 PM
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Subject: EON AQC Selection Sheets - Cane Run

Eileen,
Attached please find the AQC technology selection sheets for Cane Run Units 4-6. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 4.
- New ID Fans and wet liner/stack required for Unit 4 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 4 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 4 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 4 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 4*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 5.
- New ID Fans and wet liner/stack required for Unit 5 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: NO_x

Feasible Control Options:
- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:
- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:
- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:
- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 5 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 5 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 5 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 5*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

Special Considerations Summary:
- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 6.
- New ID Fans and wet liner/stack required for Unit 6 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NOx compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NOx emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NOx emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NOx emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 6 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 6 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 6 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 6*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Fraley, Jeffrey; Pabian, Brad; Carman, Barry
Sent: 5/20/2010 3:35:03 PM
Subject: AQCS Response - Brown Station
Attachments: Brown AQC Comments.docx; E W Brown Unit 1 051910 eon response.doc; E W Brown Unit 2 051910 eon response.docx; E W Brown Unit 3 051910 eon response.docx

All,

Please see the email and attachments that I would like to forward to B&V. I decided Brad did an excellent job explaining his points and put his comments as a separate document. You will see though, that I refer to those comments in the body of the template.

If I missed anything, please feel free to edit and send it back to me. I would like to send this today, but if you cannot review, please send it back to me tomorrow morning so I can forward it to B&V.

Here is the sample email to B&V:

All,

Please see the response from the Brown Team. You will notice that I have attached a separate document with comments regarding their preference for controlling NOx for the ***station****. As you review the document, please refer to the previously forwarded document titled, "Estimated Requirements Under Future New Environmental Regulations" developed by Gary Revlett for guidance.*

If you have any questions, please contact me as soon as possible.

Thank you,

Eileen

Comments on Brown AQC study by Black and Veatch
Brad Pabian

B&V recommended either a SNCR or SCR on Brown units 1 and 2 in their initial assessment of Brown station. This was due to their assertion that NOx limits would be imposed on a unit by unit basis. If this is the case, then their recommendations are valid. If, however, the NOx limits are imposed on a plant wide basis, then there may be a cheaper alternative. Brown 3 will be fitted with an SCR capable of 0.07 lbs/MMBTU NOx output. If Brown 2 was fitted with a similar SCR, Brown 1 may be able to come into compliance simply with better low NOx burners and over fired air. The rough calculations below show how this may be possible. These are not detailed and accurate numbers, only rough approximations.

Current Unit 3 Full Load Heat Input: ~4700 MMBTU/hr
Current Unit 2 Full Load Heat Input: ~1730 MMBTU/hr
Current Unit 1 Full Load Heat Input: ~1070 MMBTU/hr
Total Plant Full Load Heat Input: ~7500 MMBTU/hr
Maximum Plant Full Load NOx Emissions (at 0.11 lb/MMBTU): 825 lb/hr
Maximum Unit 3 NOx Emissions with 0.07 lb/MMBTU SCR in service: 329 lb/hr
Maximum Unit 2 NOx Emissions with 0.07 lb/MMBTU SCR in service: 121 lb/hr

Maximum allowable Unit 1 NOx Emissions with Unit 2 and 3 SCR in service: 375 lb/hr
Maximum allowable Unit 1 NOx Emission rate: 0.35 lb/MMBTU

Unit 1 currently runs between 0.4 and 0.5 lb/MMBTU, which is the reason that it seemed possible to attain 0.35 lb/MMBTU with less costly means. In addition, when capacity factor is considered, the allowable NOx emission rate on Unit 1 would be higher, since it has historically had a lower capacity factor than the other two units at Brown. I would suggest that capacity factor be treated as safety margin with respect to meeting the limits and that B&V propose a cost to upgrade burner equipment on Unit 1 to achieve approximately 0.3 to 0.32 lb/MMBTU emissions. The only time that this would not be a practical solution would be if the NOx limits were applied on a continuous basis, rather than by year. If so, then a Unit 3 outage would put the plant over the limit. This could be managed, possibly, with overlapping outages, etc. If the NOx regulations are applied on a unit by unit basis, NOx removal of 30-40% by an SNCR as described by B&V would not be capable of bringing Unit 1 into compliance, and a full SCR would be required.

The second major question I had was relative to disposal of material captured by a future baghouse, particularly considering heavy metals that would be captured. Please be sure B&V identifies costs that may be associated with construction of facilities to handle the waste. It should also be made clear in their final document that the potential baghouse requirements for Units 1 and 2 could be met by a single combined baghouse.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x* 10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x* 10^{-18} *lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

E.ON Comments:

Please clarify if the PJFF is shared between Units 1&2. Also, the plant would prefer B&V to estimate the option of using low NOx burners and overfire air on Unit 1 and put the SCR on Unit 2 and 3 in order to achieve Plant compliance. According to the sheet titled, "Estimated Requirements Under Future New Environmental Regulations" provided to B&V by E.ON, the revised CAIR section 4.9 calls for Plant wide compliance. The Brown Team does not believe that an SCR should be the first option for compliance for this Unit. Please see the attached document prepared by Brad Pabian for further details.

Therefore, B&V should explore this option for the basis of the estimate. Eileen Saunders will discuss with management if E.ON would like B&V to provide costs associated with adding an SCR to Unit 1.

Is an SNCR feasible for the Brown Station? If not, please explain.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be located downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – No space is available outside the boiler building on the north side to install the SCR. Therefore, the new SCR needs to be constructed on the east side of the boiler building. Potentially at an elevated level.
- Construction Issues – Tight space for tie-in and connection of ductwork between economizer outlet and SCR.
    - Soot blower air compressor tanks, service water piping and circulating water piping needs to be demolished and relocated.
    - Demineralization system building, which is currently not in use and is located on the north side of the boiler building, needs to be demolished.
    - Secondary air duct may need to be raised to clear the space.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the ductwork exiting the ID fans of Unit 1 and upstream of new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 1.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 1.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15 x 10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

Please clarify if the PJFF is shared between Units 1&2. If so, B&V needs to make sure that the cost estimate only reflects one baghouse.

See comments on Unit 1 regarding the SCR estimate.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but not a long term solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Limited space available at grade level outside the boiler building on the north side to install the SCR. Therefore the new SCR will need to be constructed at an elevation above grade level.
- Construction Issues – Unit 2 abandoned dry stack and main auxiliary transformer on the north side outside the boiler building.
    - Demolition and relocation of main auxiliary transformer of Unit 2.
    - Demolition of existing pre-dust collectors.
    - SCR will need to be constructed on a dance floor.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Particulate (PM)

Feasible Control Options:
- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the ductwork exiting the ID fans of Unit 2 and upstream of new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *The new SCR which will be constructed in 2012 can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

No additional comments

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: NO_x

Feasible Control Options:

- **No new NOx control technology is required**. The unit will be equipped with SCR in 2012 that can meet the future target NO_x emissions level of 0.11 lb/MBtu.

Special Considerations:

- Plant is currently planning injection technology to mitigate SO_3 from the SCR.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 3 will be located downstream of the existing ID fans of Unit 3 and upstream of common wet FGD scrubber.
- Real Estate Constraints – No real estate constraints.
- Construction Issues – Possible underground service water pipelines interference.
    - May require relocation of underground service water pipelines

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 3.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 3.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***3***

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/20/2010 3:56:49 PM
Subject: FW: EON AQC Selection Sheets - Cane Run
Attachments: Cane Run Unit 4 052010.doc; Cane Run Unit 5 052010.doc; Cane Run Unit 6 052010.doc

Cane Run data.

From: Lucas, Kyle J. [mailto:LucasKJ@bv.com]
Sent: Thursday, May 20, 2010 3:13 PM
To: Saunders, Eileen
Cc: Mahabaleshwarkar, Anand; Hillman, Timothy M.
Subject: EON AQC Selection Sheets - Cane Run

Eileen,
Attached please find the AQC technology selection sheets for Cane Run Units 4-6. Please review this information and provide your approval for the recommended technologies. If E.ON chooses not to approve any of recommended technologies, please provide a detailed description of the alternative approach.

Additionally, we understand you are confirming the CO targeted emission level noted in the matrix of 0.02 lb/MBtu (for each of the 18 coal-fired units). We have assumed that this value is correct and was developed from the recent boiler MACT. However, B&V does not know of any feasible and proven CO control technology for units of this type and size.

Please feel free to contact us if you have any questions,

Regards,
Kyle

Kyle Lucas | Environmental Permitting Manager
Black & Veatch - Building a World of Difference™
11401 Lamar Avenue
Overland Park, KS 66211
Phone: **(913) 458-9062** | Fax: **(913) 458-9062**
Email: **lucaskj@bv.com**

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 4.
- New ID Fans and wet liner/stack required for Unit 4 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: NO_x

Feasible Control Options:
- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:
- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- <u>Location</u>: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:
- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:
- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *4*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 4 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 4 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 4 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 4*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***4***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 5.
- New ID Fans and wet liner/stack required for Unit 5 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:

- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:

- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *5*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.
- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 5 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:
- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:
- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 5 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF can meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 5 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 5*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***5***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for the one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu.*	□ Yes □ No
SO_2	***New Wet Flue Gas Desulfurization (WFGD) is required*** *to meet the new SO_2 compliance limit of 0.25 lb/MBtu.*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBTU (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x 10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing WFGD can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail. *E.ON to return written approval and comments sections to B&V.*

Special Considerations Summary:

- Complete demolition of everything behind the boiler.
- Demolish and Build in Phases; requires ~20-30 month of construction outage for Unit 6.
- New ID Fans and wet liner/stack required for Unit 6 which will be a common concrete shell for units 4, 5 and 6 with separate wet flue liners.
- Relocate existing overhead power lines towards the backend equipment to minimize construction hazards.
- New common stack located near unit 5.
- Existing stacks demolished.
- Construction sequence starts with unit 5.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

E.ON Comments:

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

Pollutant: NO_x

Feasible Control Options:
- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:
- SNCR/SCR Hybrid systems may be able to achieve the new NOx compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NOx emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NOx emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NOx emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigation system.
- New ID fan installation as needed.
- New air heater needed.
- Existing air heater demolished.
- Location: SCR would be required downstream of the existing economizer and upstream of the new air heater.

Pollutant: SO_2

Feasible Control Options:
- Semi-Dry Flue Gas Desulfurization (FGD)
- Wet Flue Gas Desulfurization (WFGD)

Special Considerations:
- Semi-Dry FGD systems may be able to achieve the new SO_2 compliance limit of 0.25 lb/MBtu but it will not provide a long term consistent solution for SO_2 emissions less than 0.25 lb/MBtu on high sulfur fuels. The O&M costs economics could favor use of a wet FGD technology when scrubbing high sulfur coals expected to be burned at Cane Run units.
- WFGD can consistently achieve SO_2 emissions of 0.25 lb/MBtu on a continuous basis and has a capability to expand to meet the SO_2 emissions even lower than

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *Cane Run*
Unit: *6*

0.25 lb/MBtu burning high sulfur content coals. Hence WFGD is the most feasible and expandable control technology considered for SO_2 reduction including future requirements.

- New ID fan installation as needed.
- Existing WFGD will be demolished.
- Existing ID fans will be demolished
- Location: WFGD would be required downstream of the new ID fans and upstream of the new stack.
- To minimize outage time, Unit 6 Scrubbers will be installed in parallel with SCR. and installation of baghouse.

Pollutant: Particulate (PM)

Feasible Control Options:

- Cold-side Dry ESP
- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF) .

Special Considerations:

- Both dry cold-side ESP and COHPAC combination may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu. However a full size PJFF offers more direct benefits or co-benefits of removing future multi-pollutants using some form of injection upstream when compared to dry ESPs. Hence either ESPs or COHPAC combination is not recommended.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New ID fan installation as needed.
- Existing ESP will be demolished (no additional PM filtration proposed for ash sales).
- New air heater needed.
- Existing air heater demolished.
- Location: A new PJFF for Unit 6 will be located downstream of the new air heater and upstream of the new ID fans.
- Existing ID fans will be demolished.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note* : Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.

Pollutant: Mercury (Hg)

Feasible Control Options:

- **New Powdered Activated Carbon (PAC) Injection in conjunction new PJFF** can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable to removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- A Full size PJFF in conjunction with PAC injection for Unit 6 is recommended to remove 90% mercury emissions.
- *PAC to be injected downstream of the new air heater but upstream of new full size PJFF for Unit 6*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCl emissions with an existing Wet FGD and similarly it is expected to meet the same target emission level of 0.002 lb/MBtu with new Wet FGD recommended.

Special Considerations:

- New WFGD proposed as control technology for SO_2 reduction for future requirements will also meet HCl target emission level.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***Cane Run***
Unit: ***6***

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

From: Saunders, Eileen
To: Straight, Scott
Sent: 5/20/2010 3:56:29 PM
Subject: FW: AQCS Response - Brown Station
Attachments: Brown AQC Comments.docx; E W Brown Unit 1 051910 eon response.doc; E W Brown Unit 2 051910 eon response.docx; E W Brown Unit 3 051910 eon response.docx

Scott,

Here is the proposed response for cost estimating for Brown. Jeff Fraley and his staff were involved in creating the response. I have sent it to them for review before it goes to B&V.

I have also had conferences with the Ghent team and TC is tomorrow. I am in the process of scheduling Cane Run's conference call hopefully for tomorrow as well.

The only outstanding stations at this point are Mill Creek and Green River. B&V is working toward getting that information to me today.

Thanks,

Eileen

From: Saunders, Eileen
Sent: Thursday, May 20, 2010 3:35 PM
To: Fraley, Jeffrey; Pabian, Brad; Carman, Barry
Subject: AQCS Response - Brown Station

All,

Please see the email and attachments that I would like to forward to B&V. I decided Brad did an excellent job explaining his points and put his comments as a separate document. You will see though, that I refer to those comments in the body of the template.

If I missed anything, please feel free to edit and send it back to me. I would like to send this today, but if you cannot review, please send it back to me tomorrow morning so I can forward it to B&V.

Here is the sample email to B&V:

All,

Please see the response from the Brown Team. You will notice that I have attached a separate document with comments regarding their preference for controlling NOx for the ***station****. As you review the document, please refer to the previously forwarded document titled, "Estimated Requirements Under Future New Environmental Regulations" developed by Gary Revlett for guidance.*

If you have any questions, please contact me as soon as possible.

Thank you,

Eileen

Comments on Brown AQC study by Black and Veatch
Brad Pabian

B&V recommended either a SNCR or SCR on Brown units 1 and 2 in their initial assessment of Brown station. This was due to their assertion that NOx limits would be imposed on a unit by unit basis. If this is the case, then their recommendations are valid. If, however, the NOx limits are imposed on a plant wide basis, then there may be a cheaper alternative. Brown 3 will be fitted with an SCR capable of 0.07 lbs/MMBTU NOx output. If Brown 2 was fitted with a similar SCR, Brown 1 may be able to come into compliance simply with better low NOx burners and over fired air. The rough calculations below show how this may be possible. These are not detailed and accurate numbers, only rough approximations.

Current Unit 3 Full Load Heat Input: ~4700 MMBTU/hr
Current Unit 2 Full Load Heat Input: ~1730 MMBTU/hr
Current Unit 1 Full Load Heat Input: ~1070 MMBTU/hr
Total Plant Full Load Heat Input: ~7500 MMBTU/hr
Maximum Plant Full Load NOx Emissions (at 0.11 lb/MMBTU): 825 lb/hr
Maximum Unit 3 NOx Emissions with 0.07 lb/MMBTU SCR in service: 329 lb/hr
Maximum Unit 2 NOx Emissions with 0.07 lb/MMBTU SCR in service: 121 lb/hr

Maximum allowable Unit 1 NOx Emissions with Unit 2 and 3 SCR in service: 375 lb/hr
Maximum allowable Unit 1 NOx Emission rate: 0.35 lb/MMBTU

Unit 1 currently runs between 0.4 and 0.5 lb/MMBTU, which is the reason that it seemed possible to attain 0.35 lb/MMBTU with less costly means. In addition, when capacity factor is considered, the allowable NOx emission rate on Unit 1 would be higher, since it has historically had a lower capacity factor than the other two units at Brown. I would suggest that capacity factor be treated as safety margin with respect to meeting the limits and that B&V propose a cost to upgrade burner equipment on Unit 1 to achieve approximately 0.3 to 0.32 lb/MMBTU emissions. The only time that this would not be a practical solution would be if the NOx limits were applied on a continuous basis, rather than by year. If so, then a Unit 3 outage would put the plant over the limit. This could be managed, possibly, with overlapping outages, etc. If the NOx regulations are applied on a unit by unit basis, NOx removal of 30-40% by an SNCR as described by B&V would not be capable of bringing Unit 1 into compliance, and a full SCR would be required.

The second major question I had was relative to disposal of material captured by a future baghouse, particularly considering heavy metals that would be captured. Please be sure B&V identifies costs that may be associated with construction of facilities to handle the waste. It should also be made clear in their final document that the potential baghouse requirements for Units 1 and 2 could be met by a single combined baghouse.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NOx compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new* SO_2 *compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available****. Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1 x* 10^{-6} *lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected****. Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15 x* 10^{-18} *lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

Please clarify if the PJFF is shared between Units 1&2. Also, the plant would prefer B&V to estimate the option of using low NOx burners and overfire air on Unit 1 and put the SCR on Unit 2 and 3 in order to achieve Plant compliance. According to the sheet titled, “Estimated Requirements Under Future New Environmental Regulations” provided to B&V by E.ON, the revised CAIR section 4.9 calls for Plant wide compliance. The Brown Team does not believe that an SCR should be the first option for compliance for this Unit. Please see the attached document prepared by Brad Pabian for further details.

Therefore, B&V should explore this option for the basis of the estimate. Eileen Saunders will discuss with management if E.ON would like B&V to provide costs associated with adding an SCR to Unit 1.

Is an SNCR feasible for the Brown Station? If not, please explain.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but it will not provide a long term consistent solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NO_x reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be located downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – No space is available outside the boiler building on the north side to install the SCR. Therefore, the new SCR needs to be constructed on the east side of the boiler building. Potentially at an elevated level.
- Construction Issues – Tight space for tie-in and connection of ductwork between economizer outlet and SCR.
    - Soot blower air compressor tanks, service water piping and circulating water piping needs to be demolished and relocated.
    - Demineralization system building, which is currently not in use and is located on the north side of the boiler building, needs to be demolished.
    - Secondary air duct may need to be raised to clear the space.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***1***

Pollutant: Particulate (PM)

Feasible Control Options:

- Compact Hybrid Particulate Collector (COHPAC™).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:

- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but it is not considered a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 1 will be located downstream of the ductwork exiting the ID fans of Unit 1 and upstream of new booster fans for Unit 1.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:

- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *1*

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 1.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 1.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***New Selective Catalytic Reduction (SCR) is required*** *to meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required****. Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Note: If E.ON does not approve a specific technology, an explanation can be included in the following section--comments by E.ON on specific issues regarding control equipment and a decision to approve a technology should be described in detail.

E.ON to return written approval and comments sections to B&V.

E.ON Comments:

Please clarify if the PJFF is shared between Units 1&2. If so, B&V needs to make sure that the cost estimate only reflects one baghouse.

See comments on Unit 1 regarding the SCR estimate.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: NO_x

Feasible Control Options:

- Selective Non Catalytic Reduction (SNCR) / Selective Catalytic Reduction (SCR) Hybrid
- Selective Catalytic Reduction (SCR)

Special Considerations:

- SNCR/SCR Hybrid systems may be able to achieve the new NO_x compliance limit of 0.11 lb/MBtu but not a long term solution for NO_x emissions less than 0.11 lb/MBtu.
- SCR can consistently achieve NO_x emissions of 0.11 lb/MBtu on a continuous basis and has a capability to expand to meet the NO_x emissions even lower than 0.11 lb/MBtu. Hence SCR is the most feasible and expandable control technology considered for NOx reduction including future requirements.
- Likely require SO_3 mitigate system.
- New booster and/or ID fan installation as needed.
- Location: SCR would be required downstream of the existing economizer and upstream of the air heater.
- Real Estate Constraints – Limited space available at grade level outside the boiler building on the north side to install the SCR. Therefore the new SCR will need to be constructed at an elevation above grade level.
- Construction Issues – Unit 2 abandoned dry stack and main auxiliary transformer on the north side outside the boiler building.
    - Demolition and relocation of main auxiliary transformer of Unit 2.
    - Demolition of existing pre-dust collectors.
    - SCR will need to be constructed on a dance floor.

Pollutant: SO_2

Feasible Control Options:

- **No new SO_2 control technology is required**. The unit is currently equipped with a shared/common wet FGD technology that can meet future target SO_2 emissions level of 0.25 lb/MBtu.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *2*

Pollutant: Particulate (PM)

Feasible Control Options:
- Compact Hybrid Particulate Collector (COHPAC^{TM}).
- Pulse Jet Fabric Filter (PJFF)

Special Considerations:
- COHPAC may be able to achieve the new PM compliance limit of 0.03 lb/MBtu but not a long term solution for PM emissions less than 0.03 lb/MBtu.
- A full-size PJFF can consistently achieve PM emissions of less than 0.03 lb/MBtu on a continuous basis and has a capability to expand to meet the PM emissions lower than 0.03 lb/MBtu. Hence a full size PJFF is the most feasible and expandable control technology considered for PM reduction including future requirements.
- New booster and/or ID fan installation as needed.
- Existing ESP to be kept for additional PM filtration.
- Location: A new PJFF for Unit 2 will be located downstream of the ductwork exiting the ID fans of Unit 2 and upstream of new booster fans for Unit 2.
- Real Estate Constraints – No space is available at grade level to install the new PJFF. Therefore the new PJFF will need to be constructed at an elevation above grade level, probably above the existing ESP with Booster fan or ID fan upgrades.
- Construction Issues – Heavy foundations and supports.
    - New PJFF will be installed at a higher elevation above the existing ESP, needing heavy support columns that need to be landing outside the existing ESP foundations.

Pollutant: CO

Feasible Control Options:
- ***No feasible and proven technology is available for this type and size of unit*** to meet the 0.02 lb/MBtu emission limit.
- *Note: Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu.*

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: ***E.W. Brown***
Unit: ***2***

Pollutant: Mercury (Hg)

Feasible Control Options:

- Powdered Activated Carbon (PAC) Injection in conjunction with new full size PJFF can meet the new Hg compliance limit of 1×10^{-6} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- The existing cold-side dry ESP will not be capable of removing 90% mercury with PAC injection and hence not recommended for cost considerations.
- Full size PJFF for Unit 2.
- *PAC to be injected downstream of the existing ESP but upstream of new full size PJFF for Unit 2.*

Pollutant: Hydrogen Chloride (HCl)

Feasible Control Options:

- **No new control technology is required** as the unit is currently meeting target emission level of 0.002 lb/MBtu HCL emissions with an existing Wet FGD.

Pollutant: Dioxin/Furan

Feasible Control Options:

- PAC injection with new PJFF considered for mercury control can meet the dioxin/furan compliance limit of 15×10^{-18} lb/MBtu or lower on a continuous basis and hence is the most feasible control technology.

Special Considerations:

- Dioxin and Furan removal will be a co-benefit with targeted mercury emissions removal and additional PAC consumption beyond mercury removal will be required.

E.ON US
Coal-Fired Fleet Wide
Air Quality Control Technology Assessment
Technology Options

Plant: *E.W. Brown*
Unit: *3*

The following AQC control technologies comprise the recommended technologies to control unit pollutant emissions to the targeted emission levels. As summarized on the following pages, the recommended technologies are based on the known technology limitations, future expanding capability, arrangement or site fatal flaws, constructability challenges, unit off-line schedule requirements or site-specific considerations developed or understood during the field work conducted during the week of May 10th, as well as information provided by E.ON. B&V will analyze costs for one selected/approved technology for each applicable pollutant.

AQC Technology Recommendation		
Pollutant	AQC Equipment	E.ON Approval to Cost*
NO_x	***No new technology is required***. *The new SCR which will be constructed in 2012 can meet the new NO_x compliance limit of 0.11 lb/MBtu*	□ Yes □ No
SO_2	***No new technology is required***. *Existing common WFGD to units 1, 2 and 3 can meet the new SO_2 compliance limit of 0.25 lb/MBtu*	□ Yes □ No
PM	***New full size Pulse Jet Fabric Filter (PJFF) is required*** *to meet the new PM compliance limit of 0.03 lb/MBtu.*	□ Yes □ No
CO	***No feasible and proven technology is available.*** *Existing combustion controls cannot meet the new CO compliance limit of 0.02 lb/MBtu (Please confirm CO emission level is 0.02 and not 0.20 lb/MBtu)*	□ Yes □ No
Hg	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new Hg compliance limit of 1×10^{-6} lb/MBtu.*	□ Yes □ No
HCl	***No new technology selected.*** *Existing common WFGD to units 1, 2 and 3 can meet the new HCl compliance limit of 0.002 lb/MBtu*	□ Yes □ No
Dioxin/Furan	***New Powdered Activated Carbon (PAC) Injection required with new full size Pulse Jet Fabric Filter (PJFF)*** *to meet the new dioxin/furan compliance limit of 15×10^{-18} lb/MBtu.*	□ Yes □ No