A-4

Innovative Waste Recovery

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TO: Mark Sager

Fax Number: 908.918.9153

Date: 7.10.2008

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From: Aaron Santarosa

Number of pages including cover: 1

Regarding: TDF Specs.

Dear Mark,

Thank you for the phone call today. I would be happy to provide you with any further information you may need. If you are seriously considering TDF we would be more than happy to supply you or to operate a facility on your behalf.

My contact info is below.

Thanks

Best regards,

G. Aaron Santarosa

716.583.2735 cell

G & C LAB

G and C COAL ANALYSIS LAB., INC.

1341 HOFFMAN HOLLOW RD.
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RECEIVED FROM:

Buffalo Fuel Corp.
Attn: Aaron Santarosa
4870 Packard Rd.
Niagara Falls, NY 14304

LAB NO. 654566
SAMPLED
RECEIVED 08/24/06
REPORTED 09/22/06

SAMPLE MARKED:

TDF W/O Wire

ANALYSIS REPORT

	AS RECEIVED	DRY BASIS
% Moisture	1.21	
% Ash	6.82	6.90
% Sulfur	1.82	1.84
B.T.U	16,110	16,307
BTU (Moisture-ash free)	17,516	

THE ABOVE ANALYTICAL RESULTS WERE OBTAINED FOLLOWING ASTM PROCEDURES.

G&C COAL ANALYSIS LAB., INC.

APPROVED BY [signature]

increase when: (1) baseline mercury capture is high; or (2) coal mercury content is low, because a smaller quantity of mercury is removed from the flue gas for a given level of control. For this analysis, the 20-year levelized incremental cost of mercury control varies from about $3,910 to $179,000/lb Hg removed. The lower bound was calculated for 70% ACI mercury removal at Holcomb Station Unit 1, when byproduct impacts are excluded. The upper bound corresponds to 50% ACI mercury removal at Lee Station Unit 1, with the inclusion of byproduct impacts.

The following sections delve into the mercury control cost estimates for each coal rank. Note that Monroe Station Unit 4, which typically fires a 60% PRB and 40% bituminous coal blend, is included in the bituminous fraction, while St. Clair Unit 1, which normally burns an 85% PRB and 15% bituminous coal blend, is grouped with the PRB units.

Bituminous Coal-Fired Units

As shown in Table 1, this analysis provides plant-specific cost estimates for different levels of ACI mercury control based on the performance of: (1) conventional Super HOK injection at Plant Yates Unit 1; (2) conventional DARCO® Hg injection at Monroe Station Unit 4; (3) brominated B-PAC™ injection at Lee Station Unit 1; and (4) chemically-treated Mer-Clean™ 8-21 injection at Portland Station Unit 1. For these ACI systems, the total capital requirement (TCR) values expressed as a function of unit capacity range from $3.82/kW for the 785 MW Monroe Station Unit 4 to $16.02/kW for the 79 MW Lee Station Unit 1.

For 70% ACI mercury removal with no byproduct impacts, the increase in COE ranges from 0.69 to 1.95 mills/kWh, while the incremental cost varies from about $14,900 to $87,200/lb Hg removed for Portland and Lee, respectively. The incremental costs for Yates and Lee are noticeably higher than the estimates provided for 70% ACI mercury removal at Monroe and Portland. The high incremental costs are a consequence of two important plant-specific factors: the low mercury content (3.35 lb/TBtu) of the bituminous coal burned at Lee, and the 50% baseline mercury removal observed during Phase II testing at Yates, which reduce the quantity of mercury that is removed for a given level of ACI mercury control. With the inclusion of byproduct impacts, the increase in COE ranges from 1.84 to 3.66 mills/kWh, while the incremental cost of 70% ACI mercury removal varies from about $39,600 to $164,000/lb Hg removed.

For 80% ACI mercury removal at Monroe, injection of DARCO® Hg at 5.78 lb/MMacf yields an increase in COE of 1.20 mills/kWh and an incremental cost of about $33,800/lb Hg removed, when byproduct impacts are excluded. For 80% ACI mercury removal at Lee, a B-PAC™ injection rate of 8.27 lb/MMacf results in an increase in COE of 2.95 mills/kWh and an incremental cost of about $103,000/lb Hg removed, when byproduct impacts are excluded. The economics of 90% ACI mercury removal at Portland were also tabulated. Based on Mer-Clean™ 8-21 injection at 5.34 lb/MMacf, the increase in COE for Portland is 1.94 mills/kWh and incremental cost of 90% ACI mercury removal is approximately $32,300/lb Hg removed, when byproduct impacts are excluded. When byproduct impacts are included, the increase in COE for 90% ACI mercury removal at Portland is 3.09 mills/kWh, while the incremental cost is about $51,500/lb Hg removed.

PRB Coal-Fired Units

is not readily captured by existing APCD, while particulate-bound mercury is captured by ESP and FF. Oxidized mercury is water-soluble and therefore readily captured in wet FGD systems.

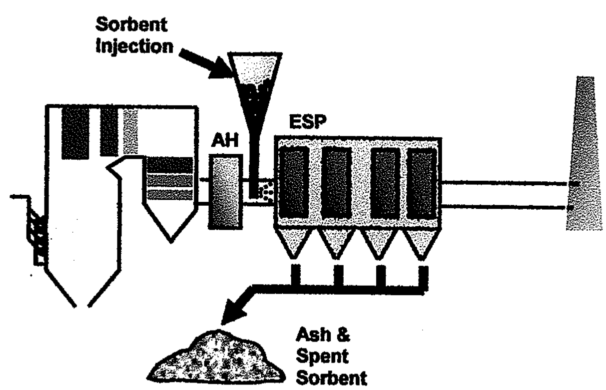
In general, plants burning PRB and lignite coals demonstrate significantly lower co-benefit mercury capture than similarly equipped bituminous-fired plants. The lower native removal observed for these low-rank coals has been linked to higher levels of elemental mercury, associated with the coal's low chlorine content. For units equipped with an SDA/FF configuration, the reduced co-benefit mercury capture observed at units burning lower-rank coals can be attributed to chlorine capture across the SDA that leads to inadequate chlorine levels at the FF to participate in the oxidation and capture of elemental mercury.[8] Table 4 presents a summary of average co-benefit mercury capture for the APCD configurations and coal ranks analyzed in this report. The Information Collection Request (ICR) data was collected by EPA in 1999.[3]

Table 4 – Average Co-benefit Mercury Capture from EPA ICR Database[g]

APCD Configuration	Average Percentage Mercury Capture			
	Bituminous	PRB/Bit. Blend	PRB	Lignite
CS-ESP	36 %	21 %	3 %	-4 %
SDA/FF	98 %	N/A	24 %	0 %

Although existing APCD can capture some mercury, innovative control technologies will be needed to comply with the CAMR Phase II mercury emission cap. To date, ACI has shown the most promise as a near-term mercury control technology. In a typical configuration, PAC is injected downstream of the plants' air heater and upstream of the existing particulate control device – either an ESP or FF (Figure 1). The PAC adsorbs the mercury from the combustion flue gas and is subsequently captured along with the fly ash in an ESP or FF. Although initial field testing of ACI has been relatively successful, additional research, development and demonstration (RD&D) activities are required before it is considered a commercial technology for the broad range of coals burned by, and various APCD installed on, today's coal-fired power plants. For example, the effect of continuous long-term ACI on plant operations has yet to be fully determined.

Figure 1 – Activated Carbon Injection Technology Schematic



[g] The negative value presented for a lignite-fired plant equipped with a CS-ESP is suspected to be a function of mercury measurement limitations.

Table 9 - Cost Estimate for 50% Mercury Removal at Bituminous Units

50% ACI Mercury Removal				
Plant	**Plant Yates Unit 1**	**Monroe Station Unit 4**	**Lee Station Unit 1**	**Portland Station Unit 1**
Capacity, MW	100	785	79	172
Fuel	Low-Sulfur Bituminous	60:40 PRB/Bit. Blend	Low-Sulfur Bituminous	Medium-Sulfur Bituminous
Coal Hg Content, lb/TBtu	5.92	5.59	3.35	8.23
Flue Gas Flow Rate, acfm	480,000	3,600,000	320,000	520,621
Unit APCD	CS-ESP & Wet FGD	SCR & CS-ESP (SO_3 FGC)	CS-ESP	CS-ESP
PAC / SEA	Super HOK	DARCO® Hg	B-PAC™	Mer-Clean™ 8-21
ACI Rate, lb/MMacf	3.85	1.46	2.07	0.59
TCR, (2006 $)	$1,270,000	$3,000,000	$1,270,000	$1,360,000
TCR, (2006 $/kW)	$12.66	$3.82	$16.02	$8.00
First-Year Annual O&M (2006 $) with 80% Capacity Factor				
PAC Consumption, $/yr	$303,000	$1,190,000	$265,000	$176,000
PAC Disposal, $/yr	$6,600	$18,800	$2,370	$1,110
Other, $/yr	$107,000	$155,000	$105,000	$107,000
Total, $/yr	$417,000	$1,370,000	$372,000	$284,000
Byproduct Impacts, $/yr	$1,080,000	$5,450,000	$758,000	$1,090,000
COE Increase, 20-Year Levelized Cost (Current $), mills/kWh				
w/o byproduct impacts	0.98	0.38	1.14	0.45
with byproduct impacts	2.92	1.62	2.85	1.60
Incremental Cost of Control, 20-Year Levelized Cost (Current $), $/lb Hg Removed				
w/o byproduct impacts	$55,200	$17,200	$71,400	$13,400
with byproduct impacts	$165,000	$73,100	$179,000	$47,900

Ref.

Table 1 -- 20-Year Levelized Cost of Mercury Control for Bituminous Units

Plant	Byproduct Impacts	50%			70%			80–90%[e]		
		ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed
Yates Unit 1 (Super HOK)	without	3.85	0.98	$55,200	8.98	1.72	$69,500	N/A		
	with		2.92	$165,000		3.66	$148,000			
Monroe Unit 4 (DARCO® Hg)	without	1.46	0.38	$17,200	3.38	0.75	$24,000	5.78	1.20	$33,800
	with		1.62	$73,100		1.99	$63,900		2.45	$68,800
Lee Unit 1 (B-PAC™)	without	2.07	1.14	$71,400	4.83	1.95	$87,200	8.27	2.95	$103,000
	with		2.85	$179,000		3.66	$164,000		4.67	$163,000
Portland Unit 1 (Mer-Clean™ 8-21)	without	0.59	0.45	$13,400	1.39	0.69	$14,900	5.34	1.94	$32,300
	with		1.60	$47,900		1.84	$39,600		3.09	$51,500

Table 2 -- 20-Year Levelized Cost of Mercury Control for PRB Units

Plant	Byproduct Impacts	50%			70%			90%		
		ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed
Holcomb Unit 1 (DARCO® Hg-LH)	without	0.11	0.15	$4,380	0.27	0.18	$3,910	1.03	0.37	$6,090
	with		0.86	$25,600		0.89	$19,000		1.08	$17,900
St. Clair Unit 1 (B-PAC™)	without	0.26	0.39	$17,200	0.60	0.52	$16,300	2.31	1.16	$28,500
	with		1.36	$60,500		1.49	$47,200		2.13	$52,500
Meramec Unit 2 (DARCO® Hg-LH)	without	0.27	0.38	$12,200	0.62	0.48	$11,100	2.40	0.99	$17,800
	with		1.74	$56,100		1.84	$42,400		2.35	$42,100
Dave Johnston Unit 3 (Mer-Clean™ 8)	without	0.06	0.26	$7,440	0.14	0.30	$5,970	0.55	0.46	$7,190
	with		1.55	$44,000		1.59	$32,100		1.75	$27,500
Stanton Unit 1 (B-PAC™)	without	0.41	0.39	$16,700	0.95	0.54	$16,500	3.65	1.29	$30,500
	with		1.07	$45,400		1.22	$36,900		1.97	$46,400

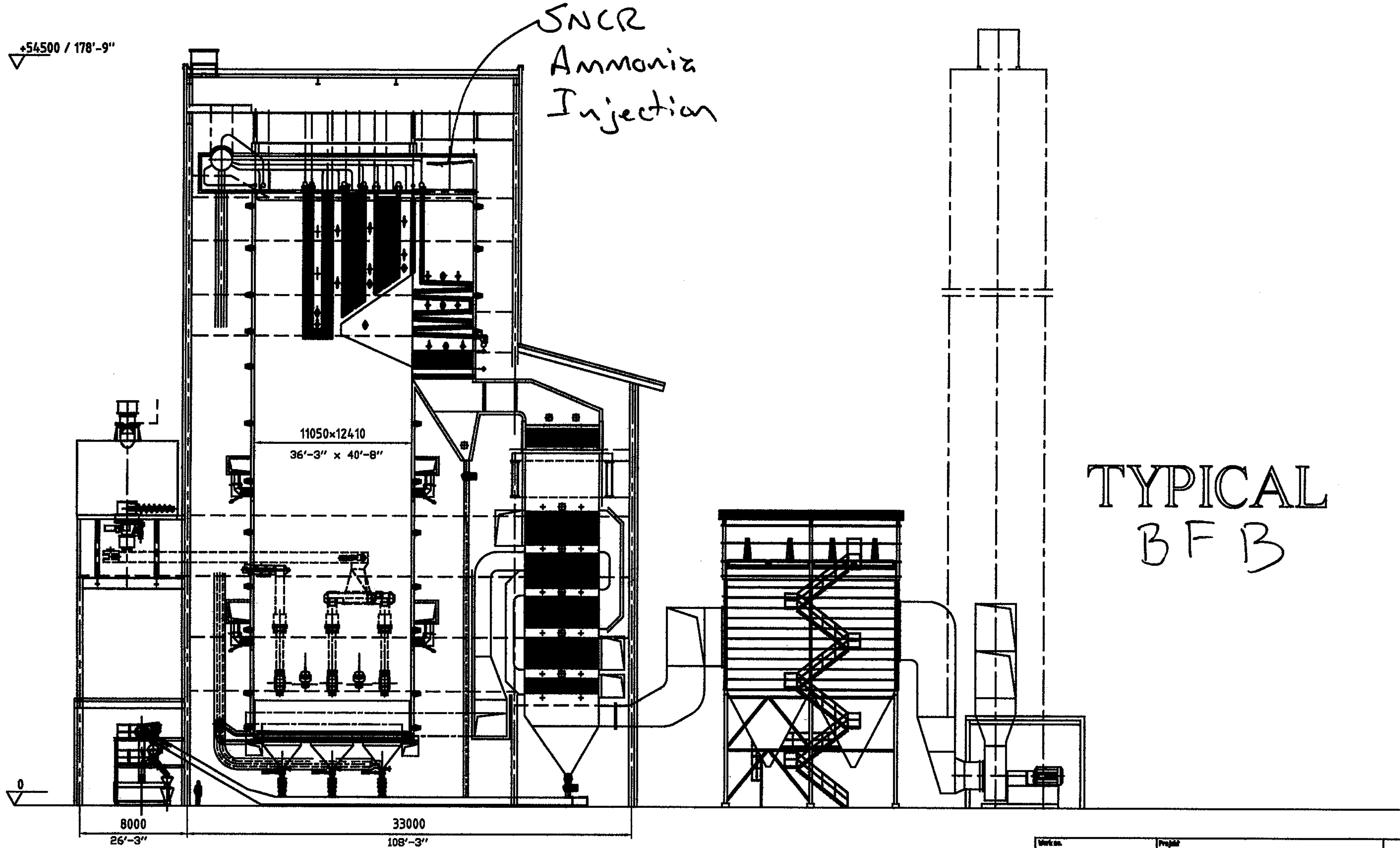
Table 3 - 20-Year Levelized Cost of Mercury Control for ND Lignite Units

Plant	Byproduct Impacts	50%			70%			80–90%[f]		
		ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed	ACI, lb/MMacf	COE Increase, mills/kWh	$/lb Hg Removed
Leland Olds Unit 1 (DARCO® Hg & $CaCl_2$)	without	2.15	0.74	$18,300	5.04	1.21	$21,500	8.65	1.81	$24,900
	with		3.37	$83,600		3.84	$68,200		4.44	$61,200
Stanton Unit 10 (DARCO® Hg-LH)	without	0.49	0.85	$20,300	1.15	1.05	$17,900	1.98	1.30	$17,300
	with		2.58	$61,500		2.78	$47,300		3.03	$40,100
Leland Olds Unit 1 (Mer-Clean™ 8)	without	0.18	0.32	$7,900	0.42	0.42	$7,400	1.64	0.91	$12,600
	with		2.95	$73,200		3.05	$54,100		3.54	$48,900

[e] Table 1 displays economic data for 80% ACI mercury removal at Monroe and Lee, and 90% ACI mercury removal at Portland.

[f] Table 3 displays economic data for 80% ACI mercury removal at Leland Olds and Stanton 10, and 90% ACI mercury removal via Mer-Clean™ 8 injection at Leland Olds.

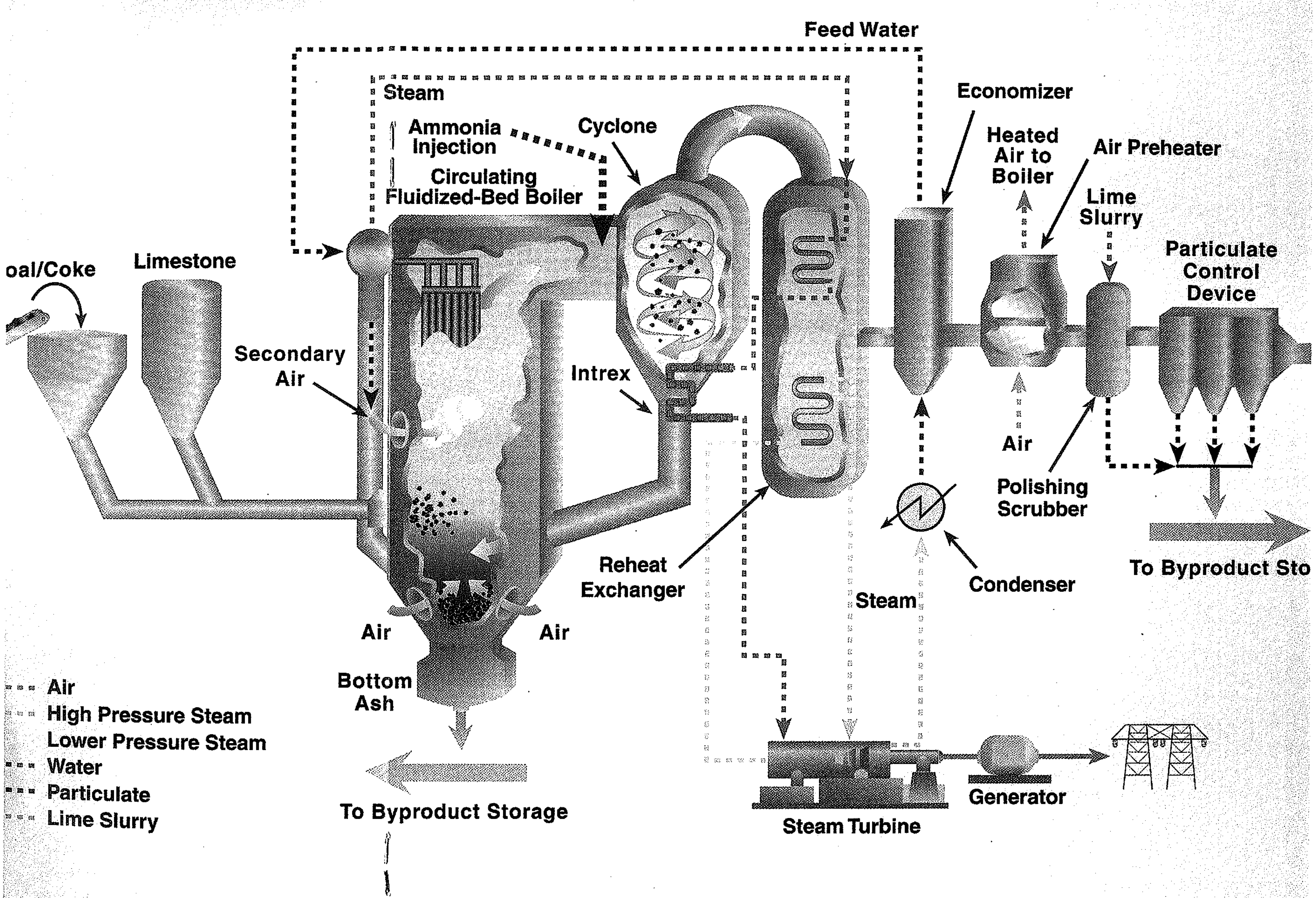
A-6



Work no.	Project		Date
AKER KVAERNER	NACOGDOCHES POWER LLC TEXAS	Drawn	13.01.2006 PSa
		Ch'd	
Kvaerner Power Oy, TAMPERE, FINLAND	HYBEX BOILER LAYOUT SIDE VIEW	Appr'd	
		T80001560	

REV	DATE /PREP'D	DATE /REV'D	DATE /APPR'D	DESCRIPTION OF REVISION	REV

JEA Large-Scale CFB Combustion Demonstration Project



A-7