

RECEIVED

MAY 24 2013

PUBLIC SERVICE
COMMISSION

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

APPLICATION OF KENTUCKY POWER COMPANY FOR)
APPROVAL OF THE TERMS AND CONDITIONS OF THE)
RENEWABLE ENERGY PURCHASE AGREEMENT FOR)
BIOMASS ENERGY RESOURCES BETWEEN THE)
COMPANY AND ECOPOWER GENERATION-HAZARD)
LLC; AUTHORIZATION TO ENTER INTO THE)
AGREEMENT; GRANT OF CERTAIN DECLARATORY)
RELIEF; AND GRANT OF ALL OTHER REQUIRED)
APPROVALS AND RELIEF)

Case No. 2013-00144

KENTUCKY POWER COMPANY RESPONSES TO
KIUC FIRST SET OF DATA REQUESTS

Volume 2 of 2

May 24, 2013

Kentucky Power Company

REQUEST

Please provide a copy of all reports, studies, and analyses that quantify the costs of the proposed facility if AEP or Kentucky Power Company constructed the facility rather than a third party. If the Company has not performed such analyses, then please explain why it has not.

RESPONSE

No analysis was performed because neither the Company nor AEP had any interest in owning or constructing the facility.

WITNESS: Gregory G Pauley

Kentucky Power Company

REQUEST

Please provide the Company's most recent load/resource projection for the next 20 years with and without the proposed REPA. Provide the date this projection was prepared, the purpose for which it was prepared, the case number for any filings that were made, a description of the review by and the approvals from specific AEP and Kentucky Power Company officers, and the approvals received from the Kentucky Public Service Commission, if any.

RESPONSE

Attachment 1 provides the most recent 20 year load forecast for the Company. A resource plan associated with this forecast has not been developed and is therefore not available. However, an updated resource plan will be provided later this year as part of the Company's Integrated Resource Plan filing. This forecast was finalized in January 2013 and was developed for any and all load forecast needs the Company may have until the next forecast is produced, which is typically late 3rd or early 4th quarter of each year. The first five years of the forecast were provided as part of the Company's Administrative Case No. 387 Annual Resource Assessment filing with the Commission. This assessment was filed on April 30, 2013.

WITNESS: Gregory G Pauley

Kentucky Power Company
Forecast Internal Energy Requirements (GWh) and Seasonal Peak Demand (MW)

Year	Internal Energy Requirements										Peak Demand	
	Residential	Commercial	Industrial	Other	Total		Wholesale	Internal Sales	Losses	Requirements	Summer	Preceding Winter
					Ultimate Sales	Internal Sales						
2013	2,265	1,390	3,089	11	6,754	98	6,852	460	7,313	1,208	1,499	
2014	2,239	1,401	3,122	11	6,772	99	6,872	467	7,339	1,214	1,503	
2015	2,220	1,408	3,149	11	6,788	100	6,888	474	7,362	1,220	1,505	
2016	2,205	1,405	3,175	11	6,796	100	6,896	474	7,370	1,219	1,500	
2017	2,194	1,406	3,203	11	6,813	101	6,914	468	7,382	1,218	1,501	
2018	2,187	1,409	3,228	11	6,835	101	6,937	472	7,408	1,224	1,504	
2019	2,186	1,415	3,253	11	6,865	102	6,966	471	7,437	1,229	1,507	
2020	2,180	1,418	3,276	11	6,886	102	6,988	475	7,463	1,234	1,507	
2021	2,181	1,428	3,302	11	6,922	102	7,025	472	7,497	1,244	1,517	
2022	2,184	1,435	3,327	11	6,957	103	7,059	476	7,536	1,253	1,523	
2023	2,187	1,444	3,352	11	6,993	103	7,097	479	7,576	1,254	1,527	
2024	2,193	1,453	3,375	11	7,033	104	7,136	483	7,619	1,261	1,530	
2025	2,200	1,465	3,400	11	7,076	104	7,180	479	7,659	1,273	1,541	
2026	2,205	1,473	3,428	11	7,117	104	7,222	484	7,705	1,282	1,549	
2027	2,211	1,481	3,456	11	7,159	105	7,264	488	7,753	1,293	1,557	
2028	2,219	1,488	3,484	11	7,202	105	7,307	495	7,802	1,300	1,562	
2029	2,228	1,497	3,513	11	7,249	105	7,354	491	7,845	1,306	1,570	
2030	2,236	1,504	3,540	11	7,291	106	7,397	494	7,891	1,315	1,578	
2031	2,245	1,510	3,569	11	7,335	106	7,441	496	7,937	1,326	1,586	
2032	2,255	1,515	3,595	11	7,377	106	7,483	501	7,985	1,332	1,590	

Kentucky Power Company

REQUEST

Refer to page 8 lines 18-19 of Mr. Pauley's Direct Testimony wherein he states that "the REPA is necessary for, and consistent with, proper performance by Kentucky Power of that service to the public." Please state all support for the proposition that the REPA is necessary for the Company's service to the public to the exclusion of other lower cost alternatives.

RESPONSE

Kentucky Power recognizes the value to its customers of diversifying its generation portfolio. In addition to its ongoing evaluation of converting Big Sandy Unit 1 to natural gas, entering into this REPA allows Kentucky Power to further diversify its portfolio. Entering into the REPA also serves Kentucky Power's customers by supporting economic development within its service territory and fosters the implementation of new technologies in the region. The REPA also helps Kentucky Power support the goals set forth in Kentucky's Energy Plan regarding the development of renewable fuel resources, specifically biomass. All of these factors make the REPA necessary for the Company's service to the public.

WITNESS: Gregory G Pauley

Kentucky Power Company

REQUEST

On pages 6 and 7 of the REPA states:

“Commission Approval Order” means final, non-appealable order from the Commission, among other things, (i) approving the terms and conditions of this REPA without modification, (ii) declaring that concurrent recovery of costs associated with this REPA through Kentucky retail rates via a monthly rider or monthly surcharge to purchaser’s base rates is appropriate (iii) approving and authorizing Purchaser to enter into this REPA and (iv) granting without modification or condition all approvals required to accomplish the Mitchell Transaction, which order is satisfactory to Purchaser in all respects in its sole discretion.” (emphasis added)

Explain the relationship between the Mitchell Transaction and the REPA. Why is approval of the Mitchell Transaction a condition of a Commission Approval Order according to the terms of the REPA?

RESPONSE

See the Company's response KPSC 1-6.

WITNESS: Gregory G Pauley

Kentucky Power Company

REQUEST

Refer to the Direct Testimony of Mr. Pauley, page 5. Regarding the proposed 69kV switchyard and 1.5 mile transmission line connecting to AEP's Engle Substation ("the transmission facilities"):

- a. Will AEP own these transmission facilities?
- b. What are the projected costs of these transmission facilities, Please provide all reports, analyses, workpapers, and documentation in support of your response.
- c. Are these costs included in the cost estimate in RKW-1? If not, how does Kentucky Power propose that the cost of these transmission facilities be recovered? Will EcoPower be charged?
- d. If the Commission does not approve the REPA, will Kentucky Power build these transmission facilities?

RESPONSE

- a. No.
- b. EcoPower will be responsible for the transmission facilities; therefore, the Company does not have the requested information.
- c. The cost estimate in RKW-1 is an all-in price, and the transmission facility cost component is not separated from other costs.
- d. No.

WITNESS: Jay F. Godfrey/Ranie K. Wohnhas

Kentucky Power Company

REQUEST

Please provide the Company's estimate of transmission costs, including line losses and congestion costs for the purchases pursuant to this proposed REPA by year. Provide all assumptions, data, and calculations, including electronic spreadsheets with formulas intact.

RESPONSE

Because of expected unit retirements and related transmission additions and upgrades within PJM, the Company is unable to forecast the transmission costs, including line losses and congestion costs for the purchases pursuant to the proposed REPA. However, because the Point of Delivery is within the Company's traditional footprint, the Company does not expect the transmission costs, including line losses and congestion costs, to be material.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Please provide all reports, analyses, workpapers, and documentation in support of Exhibit RWK-1, and any other reports, analyses, workpapers, and documentation related to the rate impact of the REPA. This information should be provided electronically with all formulas intact and no pasted in values.

RESPONSE

Please see the enclosed CD for the electronic workpaper of RKW-1. Confidential treatment is being sought for a portion of this exhibit.

See also Attachment 1, the 2015/2016 RPM Base Residual Auction Results.

WITNESS: Ranie K Wohnhas



2015/2016 RPM Base Residual Auction Results

Executive Summary

The 2015/2016 Reliability Pricing Model (RPM) Base Residual Auction cleared 164,561.2 megawatts (MW) of capacity. The actual reserve margin for the entire RTO will be 20.2%.

This RPM auction was impacted by an unprecedented amount of planned generation retirements (more than 14,000 MW) driven largely by environmental regulations, which drove prices higher than last year's auction. The auction produced record amounts of offers of new generation, demand response and energy efficiency. A record number of new generation resources were procured compared to any single RPM auction.

Megawatts of New and Alternative Capacity Procured by Type

	New Generation	Generation Uprates	Demand Response	Energy Efficiency
2015/2016 BRA	4,898.9	447.4	14,832.8	922.5
2014/2015 BRA	415.5	341.1	14,118.4	822.1

Because of transmission constraints, the capacity prices in two areas are higher than the rest of the PJM (i.e. the "RTO" price). The RTO price for annual resources is \$136.00 per megawatt-day (MW-day). The RTO prices for Limited Demand Response and Extended Summer Demand Response are \$118.54/MW-day and \$136.00/MW-day, respectively.

In PJM's MAAC area, the price for annual resources is \$167.46/MW-day. The MAAC price for Limited Demand Response and Extended Summer Demand Response are \$150/MW-day and \$167.46/MW-day, respectively. The MAAC area consists of the transmission system of Atlantic City Electric, Baltimore Gas and Electric Company, Delmarva Power, Jersey Central Power and Light Company (JCP&L), Metropolitan Edison Company (Met-Ed), PECO, Pennsylvania Electric Company (Penelec), Pepco, PPL Electric Utilities, Public Service Electric and Gas Company (PSE&G), and Rockland Electric Company.

In northern Ohio for the ATSI LDA, the price for annual resources is \$357.00/MW-day. The ATSI price for Limited Demand Response and Extended Summer Demand Response are \$304.62/MW-day and \$322.08/MW-day, respectively.

A further discussion of the 2015/2016 auction results and additional information are detailed in the body of this report. The discussion also provides a comparison of the 2015/2016 auction results to the results from the 2007/2008 through 2014/2015 RPM auctions.



2015/2016 RPM Base Residual Auction Results

Introduction

This document provides information for PJM stakeholders regarding the results of the 2015/2016 Reliability Pricing Model (RPM) Base Residual Auction (BRA). The 2015/2016 BRA opened on May 7, 2012 and the results were posted on May 18, 2012.

In each BRA, PJM seeks to procure a target capacity reserve level for the RTO in a least cost manner while recognizing locational constraints and minimum requirements on the commitment of less limited capacity products. Locational constraints are established by setting up Locational Deliverability Areas (LDAs) with each LDA having a separate target capacity reserve level and a maximum limit on the amount of capacity that it can import from resources located outside of the LDA. A Minimum Annual Resource Requirement and a Minimum Extended Summer Resource Requirement is established for the RTO and each modeled LDA and the auction clearing process can select Extended Summer Demand Resources (DR) or Annual Resources (Annual Resources include generation capacity resources, energy efficiency resources and Annual DR) out of merit order, if necessary, to procure the minimum required quantities, similar to the way in which RPM auctions can select resources out of merit order to address locational constraints. In those cases where one or both on the minimum resource requirements do bind in the auction solution, just as with resources selected to resolve locational constraints, resources selected out of merit order to meet the necessary minimum resource requirements will receive a minimum resource requirement adder to the system marginal price of capacity (in addition to any locational price adder(s) received to resolve locational constraints).

This document begins with a high level Executive Summary of the BRA results followed by sections containing detailed descriptions of the auction results.

Summary of Results

The 2015/2016 Reliability Pricing Model (RPM) Base Residual Auction (BRA) cleared 164,561.2 MW of unforced capacity in the RTO representing a 20.6% reserve margin. When the Fixed Resource Requirement (FRR) load and resources are considered the reserve margin for the entire RTO is 20.2%.

This RPM auction was impacted by a series of significant developments. Over the next three years an unprecedented amount, over 14,000 MW, of generation retirements have been announced driven largely by environmental regulations, primarily EPA Mercury and Air Toxics Standards (MATS) and the High Electricity Demand Day Rule (HEDD) in New Jersey which have compliance deadlines of April 16, 2015 and May 1, 2015 respectively. These environmental rules and resulting resource retirements significantly impacted the RPM auction results. The announced generation retirements send a strong signal that there would be a need for new resources, and this auction witnessed a record number of new generation offers, 6,854 MW; a record number of demand resource offers, 19,956.3



2015/2016 RPM Base Residual Auction Results

MW; and a record number of energy efficiency resource offers, 940.3 MW. This significant amount of additional resource offers also impacted the RPM auction results. The auction results also represent the continuing trend, starting in the 2014/2015 BRA, of a significant decline in the amount of coal-fired generation cleared and a significant shift to increased amounts of new natural gas-fired generation cleared. The auction clearing prices are higher than the previous auction driven largely by the impact of environmental regulations.

The MAAC LDA and ATSI LDA are locationally constrained in the 2015/2016 BRA; therefore, Resource Clearing Prices in these LDAs differ from the Resources Clearing Prices of the rest of the RTO. The Resource Clearing Price for Limited DR, Extended Summer DR and Annual Resources located in the RTO is \$118.54/MW-day, \$136.00/MW-day and \$136.00/MW-day, respectively. The Resource Clearing Price for Limited DR, Extended Summer DR and Annual Resources located in the MAAC LDA is \$150.00/MW-day, \$167.46/MW-day and \$167.46/MW-day, respectively. The Resource Clearing Price for Limited DR, Extended Summer DR and Annual Resources located in the ATSI LDA is \$304.62/MW-day, \$322.08/MW-day and \$357.00/MW-day, respectively. The Minimum Extended Summer Resource Requirement was a binding constraint for the entire RTO and since both Annual Resources and Extended Summer DR may be used to satisfy this constraint, Annual Resources and Extended Summer DR received a higher Resource Clearing Price than did Limited DR. Annual Resources in the ATSI LDA received a higher Resource Clearing Price than did Extended Summer DR in the ATSI LDA since the Minimum Annual Resource Requirement was an additional binding constraint in the ATSI LDA.

The annual resource clearing price in the MAAC region increased from \$136.50 in the 2014/2015 Delivery Year to \$167.46 in the 2015/2016 Delivery Year; the annual resource clearing price in the ATSI LDA increased from \$125.99 in the 2014/2015 Delivery Year to \$357.00 in the 2015/2016 Delivery Year; the annual resource clearing price in the rest of RTO region increased from \$125.99 in the 2014/2015 Delivery Year to \$136.00 in the 2015/2016 Delivery Year and the annual resource clearing price in the Northern PSEG LDA decreased from \$225.00 in the 2014/2015 Delivery Year to \$167.46 in the 2015/2016 Delivery Year.

A total of 12,508.8 MW of incrementally new capacity in PJM was available for the 2015/2016 Base Residual Auction. This incrementally new capacity includes new generation capacity resources, capacity upgrades to existing generation capacity resources, new demand resources, upgrades to existing demand resources, and new energy efficiency resources. The increase is partially offset by generation capacity retirements and derations to existing generation capacity resources to yield a net increase of 6,076.2 MW of capacity.

The total quantity of new generation resources offered into the auction was 6,843.7 MW (UCAP) and the total existing generation uprates offered was 478.6 MW (UCAP). The amount of new generation capacity resources cleared was 4,898.9 MW (UCAP) and the



2015/2016 RPM Base Residual Auction Results

total amount of existing generation updates that cleared was 447.4 MW (UCAP). This auction resulted in a record number of new generation resources cleared in any single RPM auction. Total imports offered into the auction from resources located in regions west of the PJM RTO increased by about 325 MW to 4,335.2 MW.

The total quantity of demand resources offered into the 2015/2016 BRA was 19,956.3 MW (UCAP) which represents an increase of 4,410.7 MW (28.4%) over the demand resources that offered into the 2014/2015 BRA. Approximately 74% (14,832.8 MW) of these demand resources cleared in the auction. Demand resources totaling 356.8 MW were included in FRR capacity plans for a total DR capacity market participation of 20,313.1 MW.

The total quantity of energy efficiency (EE) resources offered into the 2015/2016 BRA was 940.3 MW (UCAP) which represents an increase of 13% over the EE resources that offered into the 2014/2015 BRA. Approximately 98% (922.5 MW) of these EE resources cleared in the auction.

All existing generation sell offers into the 2015/2016 Base Residual Auction were subject to market power mitigation through the application of the Market Structure Test (i.e., the Three-Pivotal Supplier Test). The RTO as a whole failed the Market Structure Test, resulting in mitigation of any existing generation resources. Mitigation was applied to a supplier's existing generation resources resulting in utilizing the lesser of the supplier's approved offer cap for such resource or the supplier's submitted offer price for such resource in the RPM Auction clearing

All new generation capacity resource offers were subject to the Minimum Offer Price Rule (MOPR). The PJM IMM had submitted a complaint to FERC on May 1, 2012 regarding its concerns with the application of the MOPR exception process. The issues specified in the IMM complaint regarding application of the MOPR exception process had no impact on the auction results. The complaint was withdrawn by the IMM on May 17, 2012.

A further discussion of the 2015/2016 Base Residual Auction results and additional information regarding the 2015/2016 Reliability Pricing Model (RPM) Base Residual Auction results are detailed in the body of this report. The discussion also provides a comparison of the 2015/2016 auction results to the results from the 2007/2008 through 2014/2015 RPM auctions.



2015/2016 RPM Base Residual Auction Results

2015/2016 Base Residual Auction Results Discussion

Table 1 contains a summary of the RTO clearing prices resulting from the 2015/2016 RPM Base Residual Auction in comparison to those from 2007/2008 through 2014/2015 RPM Base Residual Auctions.

Table 1 –RPM Base Residual Auction Resource Clearing Price Results in the RTO

Auction Results	RTO										
	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012*	2012/2013	2013/2014**	2014/2015***	2015/2016		
Resource Clearing Price	\$40.80	\$111.92	\$102.04	\$174.29	\$110.00	\$16.46	\$27.73	\$125.99	\$136.00		
Cleared UCAP (MW)	129,409.2	129,597.6	132,231.8	132,190.4	132,221.5	136,143.5	152,743.3	149,974.7	164,561.2		
Reserve Margin	19.2%	17.5%	17.8%	16.5%	18.1%	20.9%	20.2%	19.6%	20.2%		

*2011/2012 BRA was conducted without Duquesne zone load.

**2013/2014 BRA includes ATSI zone load

***2014/2015 BRA includes Duke zone

****2015/2016 BRA includes a significant portion of AEP and DEOK zone load previously under the FRR-Alternative

The cleared UCAP is the amount of unforced capacity that was procured in the auction to meet the RTO demand for capacity. The 2015/2016 Reliability Pricing Model (RPM) Base Residual Auction cleared 164,561.2 MW of unforced capacity in the RTO representing a 20.6% reserve margin. When the Fixed Resource Requirement (FRR) load and associated resources are considered the actual reserve margin for the entire RTO is 20.2%. The Reserve Margin presented in Table 1 represents the percentage of installed capacity cleared in RPM and committed by FRR entities excess of the RTO load (including load served under the Fixed Resource Requirement alternative).

The 2015/2016 Base Residual Auction results reflect very strong participation by planned generation, demand resources and meaningful participation from energy efficiency resources.

New Generation Resource Participation

There was 8,207 MW ICAP of new generation resource participation, in the 2015/2016 Base Residual Auction including new generation and uprates at existing generating facilities. This figure is nearly 5 times greater than in the 2014/2015 Base Residual Auction value of 1,582.8 MW and more than double the previous high of 3,576.3 MW seen in the 2011/2012 Base Residual Auction which holds the distinction as the first Base Residual Auction held a full three years prior to the delivery year. Table 2A shows the



2015/2016 RPM Base Residual Auction Results

increase in generation participation across broken down by new units and uprates at existing resources since the 2007/2008 Delivery Year.

Table 2A –Incremental Capacity Resource Increases

Capacity Changes (in ICAP) Increase in Generation Capacity	RTO											Total
	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016			
	602.0	724.2	1,272.3	1,776.2	3,576.3	1,893.5	1,737.5	1,582.8	8,207.0	21,371.8		

This marked increase in new generation participation is driven by the 2015 compliance deadlines for the EPA’s Mercury and Air Toxics Standard (MATS) applicable to coal and oil steam generation, and New Jersey’s High Electricity Demand Day (HEDD) rule setting NOx emissions rate standards for generation in New Jersey and the continued trend in the relative competitiveness of natural gas relative to coal with the continued increase in production from shale gas regions such as the Marcellus formation in Pennsylvania. Of the new generation made available, 1,382.5 MW ICAP are natural gas CTs, and 5,914.5 MW ICAP are natural gas combined cycle facilities. In total, new natural gas generation accounts for 95 percent of new generation participation in the 2015/2016 Base Residual Auction.

Table 2B shows the breakdown of new generation participation by major Locational Deliverability Area (LDA) in ICAP terms. Values are not reported at a more granular level so as to protect confidentiality and commercially sensitive information of market participants. Table 3B shows that new generation is relatively evenly distributed throughout the RTO with just over half of the new generation located in MAAC or east of historic transmission constraints associated with west to east flows of power.

Table 2B –Location of Generation Capacity Increase (in ICAP MW)

LDA Name	Gen Capacity Increase
EMAAC	3528.5
MAAC	4576.2
Total RTO	8207

**All Values in ICAP terms

*MAAC includes EMAAC

**RTO includes MAAC



2015/2016 RPM Base Residual Auction Results

Table 2C shows the breakdown, by major LDA, of capacity in UCAP terms of new units and uprates at existing units offered in the auction and capacity actually clearing in the auction. Of the new generation capacity offered into the 2015/2016 BRA, 70 percent cleared the auction.

Table 2C – Offered and Cleared New Generation Capacity by LDA (in UCAP MW)

LDA	Offered			Cleared		
	Uprate	New Unit	Total	Uprate	New Unit	Total
EMAAC	180.7	3,145.9	3,326.6	164.9	2,313.5	2,478.4
MAAC	220.7	4,105.5	4,326.2	189.5	2,990.7	3,180.2
Total RTO	478.6	6,843.7	7,322.3	447.4	4,898.9	5,346.3

*All MW Values are in UCAP Terms

**MAAC includes EMAAC

***RTO includes MAAC

Demand Resource Participation

The total quantity of demand resources offered into the 2015/2016 BRA, 19,956.3 MW (UCAP), representing an increase of 28.4% over the demand resources that offered into the 2014/2015 BRA. Of the 19,956.3 MW of total demand response that offered in this auction, 14,832.8 MW cleared and will be awarded capacity payments. The cleared demand response is 714.4 MW greater than that which cleared in the 2014/2015 BRA representing a 5% increase. Of this change, 588.1 fewer MWs of DR cleared in the MAAC LDA and 1,302.5 additional MWs of DR cleared outside of the MAAC LDA. *Table 3A* contains a comparison of the Demand Resources Offered and Cleared in 2014/2015 BRA & 2015/2016 BRA represented in UCAP.



2015/2016 RPM Base Residual Auction Results

Table 3A – Comparison of Demand Resources Offered and Cleared in 2014/15 BRA & 2015/16 BRA represented in UCAP

LDA	Zone	Offered MW*		Increase in Offered MW	Cleared MW*		Increase in Cleared MW
		2014/2015	2015/2016		2014/2015	2015/2016	
EMAAC	AECO	268.2	249.2	(19.0)	205.4	207.9	2.5
EMAAC/DPL-S	DPL	470.9	524.3	53.4	391.5	433.5	42.0
EMAAC	JCPL	553.0	524.0	(29.0)	444.0	350.2	(93.8)
EMAAC	PECO	992.4	1,458.1	465.7	830.5	801.8	(28.7)
PSEG/PS-N	PSEG	1,140.1	1,081.9	(58.2)	964.2	796.1	(168.1)
EMAAC	RECO	42.0	37.4	(4.6)	31.2	20.9	(10.3)
EMAAC Sub Total		3,466.6	3,874.9	408.3	2,866.8	2,610.4	(256.4)
PEFCO	PEFCO	1,022.5	966.4	(56.1)	893.1	867.4	(25.7)
SWMAAC	BGE	1,450.9	1,328.8	(122.1)	1,341.3	1,141.7	(199.6)
MAAC	METED	469.9	472.2	2.3	398.4	348.6	(49.8)
MAAC	PENELEC	498.6	710.7	212.1	437.7	525.6	87.9
MAAC	PPL	1,505.3	1,810.3	305.0	1,299.5	1,155.0	(144.5)
MAAC** Sub Total		8,413.8	9,163.3	749.5	7,236.8	6,648.7	(588.1)
RTO	AEP	1,665.4	2,175.6	510.2	1,635.1	1,684.4	49.3
RTO	APS	912.0	1,175.1	263.1	886.8	935.5	48.7
ATSI	ATSI	1,055.1	2,038.5	983.4	955.7	1,763.7	808.0
RTO	COMED	1,546.9	2,765.9	1,219.0	1,535.7	1,698.2	162.5
RTO	DAY	265.1	324.8	59.7	231.9	196.9	(35.0)
RTO	DEOK	60.4	358.8	298.4	54.6	278.9	224.3
RTO	DOM	1,381.3	1,653.1	271.8	1,359.5	1,381.8	22.3
RTO	DUQ	245.6	301.2	55.6	222.3	244.7	22.4
Grand Total		15,545.6	19,956.3	4,410.7	14,118.4	14,832.8	714.4

*All MW values are expressed in UCAP

**MAAC sub-total includes all MAAC Zones

Each demand resource (DR) offering into the 2015/2016 RPM BRA was identified by the DR provider as being one of three DR product types: (1) Annual DR, (2) Extended Summer DR or (3) Limited DR. A DR provider with a resource that can potentially qualify as more than one of the three DR product types may submit separate but coupled sell offers for each DR product type for



2015/2016 RPM Base Residual Auction Results

which it qualifies. By coupling separate DR offers, the seller informs PJM and the RPM auction clearing engine that only one of the coupled demand resources may clear at most. Submitting DR offers in a coupled manner is not a requirement; it is an optional offer type available to the seller in addition to the conventional, non-coupled offer type. DR offers that are not specified as being coupled offers are cleared independent of each other and each offer could potentially clear.

Table 3B shows a breakdown of Demand Resources Offered and Cleared in the 2015/2016 BRA grouped by the potential Demand Resource coupling scenarios.

Table 3B – Breakdown of Demand Resources Offered versus Cleared by Product Type in the 2015/16 BRA represented in UCAP

Coupling Scenario	Resource Offer MW (UCAP)			Cleared MW (UCAP)		
	Limited Product Type	Extended Summer Product Type	Annual Product Type	Limited Product Type	Extended Summer Product Type	Annual Product Type
Annual, Extended Summer, and Limited	7,228.2	7,228.0	7,226.2	3,964.9	2,279.3	320.0
Annual and Extended Summer	-	-	-	-	-	-
Annual and Limited	92.4	-	79.7	30.9	-	-
Extended Summer and Limited	4,067.8	4,031.9	-	616.2	2,410.7	-
Annual Only	-	-	66.0	-	-	63.3
Extended Summer Only	-	1,798.2	-	-	512.3	-
Limited Only	6,703.1	-	-	4,635.2	-	-
Grand Total	18,091.5	13,058.1	7,371.9	9,247.2	5,202.3	383.3

Energy Efficiency Resource Participation

An energy efficiency (EE) resource is a project that involves the installation of more efficient devices/equipment or the implementation of more efficient processes/systems exceeding then-current building codes, appliance standards, or other relevant standards at the time of installation as known at the time of commitment. The EE resource must achieve a permanent, continuous reduction in electric energy consumption (during the defined EE performance hours) that is not reflected in the peak load forecast used for the Base Residual Auction for the Delivery Year for which the EE resource is proposed. The EE resource must be fully implemented at all times during the delivery year, without any requirement of notice, dispatch, or operator intervention. Of the 940.3 MW's of energy efficiency that offered into the 2015/2016 Base Residual Auction, 922.7 MW of EE resources cleared in the auction and will be awarded capacity payments.



2015/2016 RPM Base Residual Auction Results

Table 3C contains a summary of the demand resources and energy efficiency resources that offered and cleared by zone in the 2015/2016 Base Residual Auction. Approximately 74% of the demand resources and 98% of the energy efficiency resources that were offered into the BRA cleared. The uncleared resources were offered at a price above the clearing price for the LDA in which the resource was offered.

Figure 1 illustrates the demand side participation in the PJM Capacity Market from 2005/2006 Delivery Year to the 2015/2016 Delivery Year. Demand side participation includes active load management (ALM) prior to 2007/2008 Delivery Year, Interruptible Load for Reliability (ILR) and demand resources offered into each BRA and nominated in FRR Plans, and energy efficiency resources starting with the 2012/2013 Delivery Year. The demand side participation in the capacity market has increased dramatically since the inception of RPM in the 2007/2008 Delivery Year.



2015/2016 RPM Base Residual Auction Results

Table 3C – Comparison of Demand Resources and Energy Efficiency Resources Offered versus Cleared in the 2015/16 BRA represented in UCAP

LDA	Zone	Offered MW*			Cleared MW*		
		Demand	EE	Total	Demand	EE	Total
EMAAC	AECO	249.2	1.6	250.8	207.9	1.2	209.1
EMAAC/DPL-S	DPL	524.3	16.2	540.5	433.5	15.5	449.0
EMAAC	JCPL	524.0	-	524.0	350.2	-	350.2
EMAAC	PECO	1,458.1	20.8	1,478.9	801.8	14.8	816.6
PSEG/PS-N	PSEG	1,081.9	11.9	1,093.8	796.1	10.7	806.8
EMAAC	RECO	37.4	-	37.4	20.9	-	20.9
EMAAC Sub Total		3,874.9	50.5	3,925.4	2,610.4	42.2	2,652.6
PEPCO	PEPCO	966.4	56.2	1,022.6	867.4	55.8	923.2
SWMAAC	BGE	1,328.8	103.6	1,432.4	1,141.7	103.6	1,245.3
MAAC	METED	472.2	4.1	476.3	348.6	3.4	352.0
MAAC	PENIELEC	710.7	4.1	714.8	525.6	3.4	529.0
MAAC	PPL	1,810.3	18.7	1,829.0	1,155.0	14.2	1,169.2
MAAC** Sub Total		9,163.3	237.2	9,400.5	6,648.7	222.6	6,871.3
RTO	AEP	2,175.6	213.9	2,389.5	1,684.4	213.9	1,898.3
RTO	APS	1,175.1	0.8	1,175.9	935.5	0.8	936.3
ATSI	ATSI	2,038.5	48.1	2,086.6	1,763.7	44.9	1,808.6
RTO	COMED	2,765.9	422.4	3,188.3	1,698.2	422.4	2,120.6
RTO	DAY	324.8	2.0	326.8	196.9	2.0	198.9
RTO	DEOK	358.8	4.6	363.4	278.9	4.6	283.5
RTO	DOM	1,653.1	7.2	1,660.3	1,381.8	7.2	1,389.0
RTO	DUQ	301.2	4.1	305.3	244.7	4.1	248.8
Grand Total		19,956.3	940.3	20,896.6	14,832.8	922.5	15,755.3

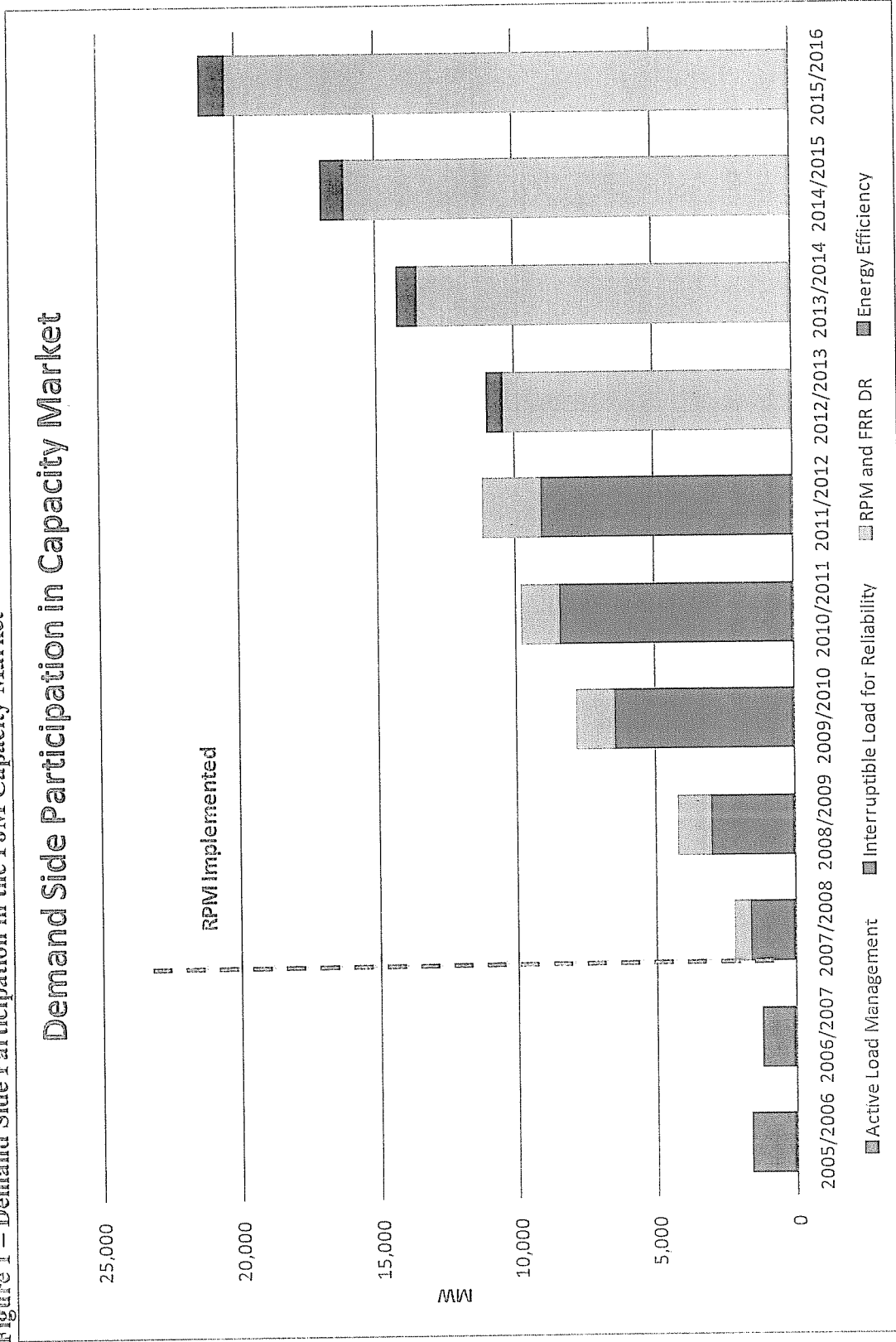
*All MW values are expressed in UCAP

**MAAC sub-total includes all MAAC Zones



2015/2016 RPM Base Residual Auction Results

Figure 1 – Demand Side Participation in the PJM Capacity Market





2015/2016 RPM Base Residual Auction Results

Renewable Resource Participation

796.3 MW of wind resources were offered into and cleared the 2015/2016 Base Residual Auction. The capacity factor applied to wind resources is 13%, meaning that for every 100 MW of wind energy, 13 MW are eligible to meet capacity requirements. The 796.3 MW of cleared wind capacity translates to 6,125 MW of wind energy that is expected to be available in the 2015/2016 Delivery Year.

56.2 MW of solar resources were offered into and cleared the 2015/2016 Base Residual Auction. The capacity factor applied to solar resources is 38%, meaning that for every 100 MW of solar energy, 38 MW are eligible to meet capacity requirements. The 56.2 MW of cleared solar capacity translates to 147.8 MW of solar energy that is expected to be available in the 2015/2016 Delivery Year.

LDA Results

An LDA was modeled in the Base Residual Auction and had a separate VRR Curve if (1) the LDA has a CETO/CETL margin that is less than 115%; or (2) the LDA had a locational price adder in any of the three immediately preceding Base Residual Auctions; or (3) the LDA is likely to have a locational price adder based on a PJM analysis using historic offer price levels; or (4) the LDA is EMAAC, SWMAAC, and MAAC.

As a result of the above criteria, MAAC, EMAAC, SWMAAC, PSEG, PS-NORTH, DPL-SOUTH, PEPCO and ATSI were modeled as LDAs in the 2015/2016 RPM Base Residual Auction; however, only the MAAC and ATSI LDAs were binding constraints resulting in a Locational Price Adder for these LDAs. A Locational Price Adder represents the difference in Resource Clearing Prices for the Limited capacity product between a resource in a constrained LDA and the immediate higher level LDA.



2015/2016 RPM Base Residual Auction Results

Table 4 contains a summary of the clearing results in the LDAs from the 2015/2016 RPM Base Residual Auction.

Table 4 –RPM Base Residual Auction Clearing Results in the LDAs

Auction Results	RTO	MAAC	SWMAAC	PEPCO	BMAAC	DPL-SOUTH	PSEG	PS-NORTH	ATSI
Offered MW (UCAP)	178,587.7	74,260.5	12,721.9	6,235.1	37,226.4	1,767.7	8,964.1	4,930.5	11,777.1
Cleared MW (UCAP)	164,561.2	65,790.4	10,999.8	6,135.7	33,047.7	1,722.1	6,729.8	3,641.2	10,667.6
System Marginal Price	\$118.54	\$118.54	\$118.54	\$118.54	\$118.54	\$118.54	\$118.54	\$118.54	\$118.54
Locational Price Adder*	\$0.00	\$31.46	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$186.08
Extended Summer Price Adder**	\$17.46	\$17.46	\$17.46	\$17.46	\$17.46	\$17.46	\$17.46	\$17.46	\$17.46
Annual Price Adder	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$34.92
Resource Clearing Price for Limited Resources	\$118.54	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00	\$304.62
Resource Clearing Price for Extended Summer Resources	\$136.00	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$322.08
Resource Clearing Price for Annual Resources	\$136.00	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$167.46	\$357.00

*Locational Price Adder is with respect to the immediate parent LDA

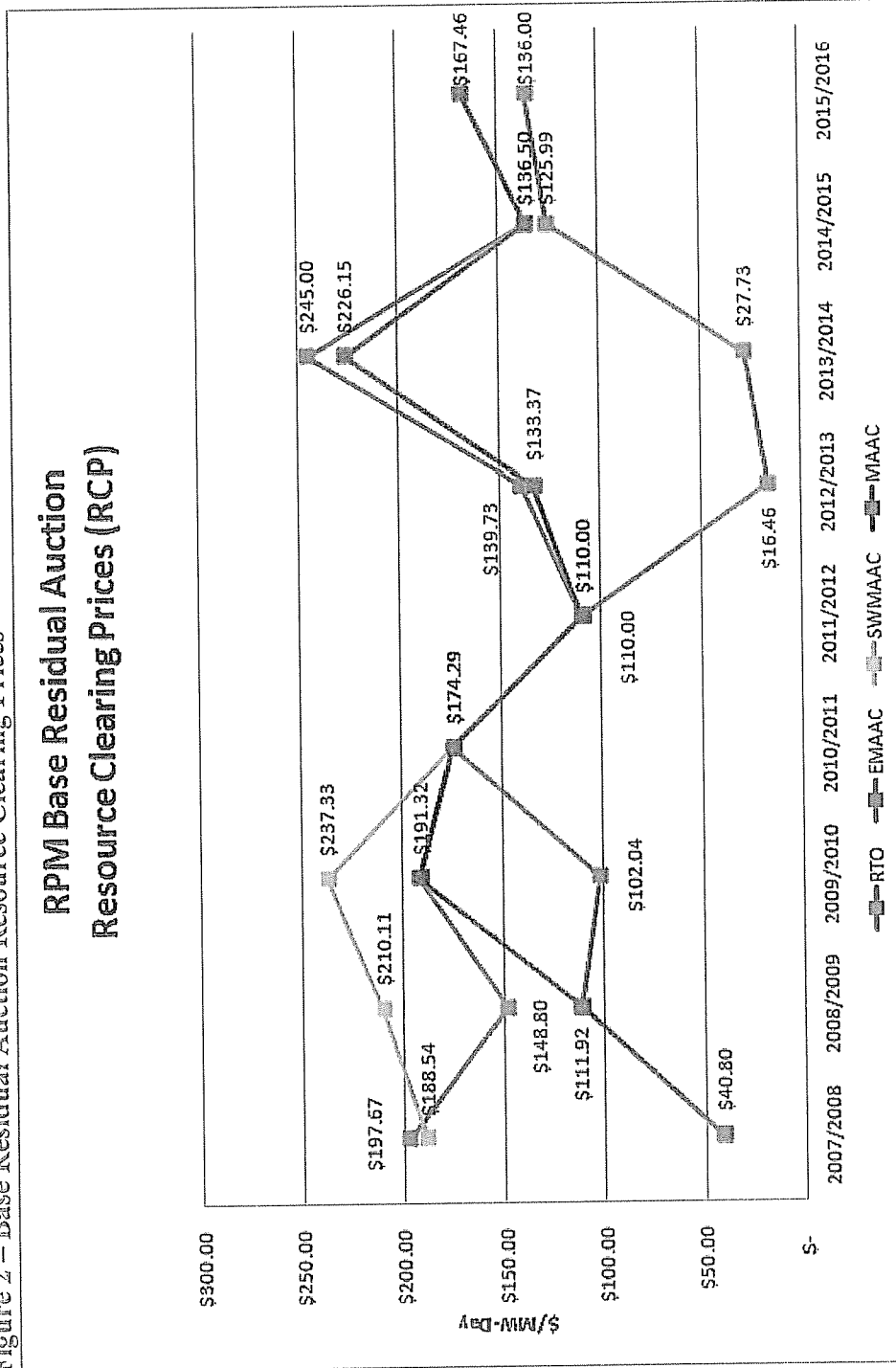
**Annual Resources and Extended Summer DR receive the Extended Summer Price Adder

Since the MAAC and ATSI were constrained LDAs, Capacity Transfer Rights (CTRs) will be allocated to loads in the constrained LDAs for the 2015/2016 Delivery Year. CTRs are allocated by load ratio share to all Load Serving Entities (LSEs) in a constrained LDA that has a higher clearing price than the unconstrained region. CTRs serve as a credit back to the LSEs in the constrained LDA for use of the transmission system to import less expensive capacity into that constrained LDA and are valued at the difference in the clearing prices of the constrained and unconstrained regions.



2015/2016 RPM Base Residual Auction Results

Figure 2 – Base Residual Auction Resource Clearing Prices



* RTO and MAAC Resource Clearing Prices for the 2007/2008, 2008/2009, 2010/2011, and 2011/2012 BRA are equal.
 **EMAAC and MAAC Resource Clearing Prices for the 2009/2010, and 2010/2011, and 2011/2012, 2015/2016 BRA are equal.
 ***SWMAAC and MAAC Resource Clearing Prices for the 2010/2011, 2011/2012, and 2012/2013, 2015/2016 BRA are equal.
 ****2014/2015 and 2015/2016 Prices reflect the Annual Resource Clearing Prices



2015/2016 RPM Base Residual Auction Results

Table 5 contains a summary of the offer and resultant data in the RTO for each cleared Base Residual Auction from 2008/09 through the 2015/2016 Delivery Years. The summary includes all resources located in the RTO (including all LDAs within the RTO) and notes the capacity located outside the PJM footprint that was offered into the auction.

Table 5 –RPM Base Residual Auction Generation, Demand, and Energy Efficiency Resource Information in the RTO

Auction Supply (all values in ICAP)	RTO ¹										
	2008/2009	2009/2010	2010/2011	2011/2012 ²	2012/2013	2013/2014 ³	2014/2015 ⁴	2015/2016			
Internal PJM Capacity	166,037.9	167,026.3	168,457.3	169,241.6	179,791.2	195,633.4	199,375.5	207,559.1			
Imports Offered	2,612.0	2,563.2	2,982.4	6,814.2	4,152.4	4,766.1	4,299.4	4,649.7			
Total Eligible RPM Capacity	168,649.9	169,589.5	171,439.7	176,055.8	183,943.6	200,399.5	203,674.9	212,208.8			
Exports / Delistings	4,205.8	2,240.9	3,378.2	3,389.2	2,783.9	2,624.5	1,230.1	1,218.8			
FRR Commitments	24,953.5	25,316.2	26,305.7	25,921.2	26,302.1	25,793.1	33,612.7	15,997.9			
Excused	722.0	1,121.9	1,290.7	1,580.0	1,732.2	1,825.7	3,255.2	8,712.9			
Total Eligible RPM Capacity - Excused	29,881.3	28,679.0	30,974.6	30,890.4	30,818.2	30,243.3	38,098.0	25,929.6			
Remaining Eligible RPM Capacity	138,768.6	140,910.5	140,465.1	145,165.4	153,125.4	170,156.2	168,897.7	186,279.2			
Generation Offered	138,076.7	140,003.6	139,529.5	143,568.1	142,957.7	156,894.1	153,048.1	166,127.8			
DR Offered	691.9	906.9	935.6	1,597.3	9,535.4	12,528.7	15,043.1	19,243.6			
EE Offered	0.0	0.0	0.0	0.0	632.3	733.4	806.5	907.8			
Total Eligible RPM Capacity Offered	138,768.6	140,910.5	140,465.1	145,165.4	153,125.4	170,156.2	168,897.7	186,279.2			
Total Eligible RPM Capacity Unoffered	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			

¹RTO numbers include all LDAs.

²All generation in the Duquesne zone is considered external to PJM for the 2011/2012 BRA.

³2013/2014 includes ATSI zone and generation

⁴2014/2015 includes Duke zone and generation



2015/2016 RPM Base Residual Auction Results

A total of 212,208.8 MW of installed capacity was eligible to be offered into the 2015/2016 Base Residual Auction. Of this eligible amount, 4,649.7 MW were from external resources that had fulfilled the eligibility requirements to be considered a PJM Capacity Resource. A portion of the external resource total was included in FRR Capacity Plans, and the remainder was offered into the auction. As illustrated in *Table 4*, the amount of capacity exports decreased in the 2015/2016 auction compared to the previous auction. FRR commitments decreased by 17,614.8 MW from the 2014/2015 Delivery Year due to load located in the AEP and DEOK zones which used the FRR Alternative in 2014/2015 but elected to move into RPM with the 2015/2016 BRA.

A total of 186,279.2 MW of installed capacity was offered into the Base Residual Auction. This is an increase of 17,381.5 MW from that which was offered into the 2014/2015 BRA. A total of 8,712.9 MW was eligible, but not offered due to either (1) inclusion in an FRR Capacity Plan, (2) export of the resource, or (3) having been excused from offering into the auction. Resources were excused from the must offer requirement for the following reasons: environmental restrictions, approved retirement requests not yet reflected in eRPM, and excess capacity owned by an FRR entity.

Participants' sell offer EFORD values were used to translate the generation installed capacity values into unforced capacity (UCAP) values. Demand resource (DR) sell offers and energy efficiency resource (EE) sell offers were converted into UCAP using the appropriate Demand Resource (DR) Factor and Forecast Pool Requirement (FPR) for the delivery year. In UCAP, a total of 178,587.7 MW were offered into the 2015/2016 Base Residual Auction, comprised of 157,691.1 MW of generation capacity, 19,956.3 MW of capacity from demand resources, and 940.3 MW of capacity from energy efficiency resources. Of those offered, a total of 164,561.2 MW of capacity was cleared in the auction.

Of the 164,561.2 MW of capacity that cleared in the auction, 148,805.9 MW were from generation capacity, 14,832.8 MW were from demand resources, and 922.5 MW were from energy efficiency resources. Capacity that was offered but not cleared in the Base Residual Auction will be eligible to offer into the First, Second and Third Incremental Auctions for the 2015/2016 Delivery Year.

Table 6 illustrates the Generation, Demand Resources, and Energy Efficiency Resources Offered and Cleared in the RTO translated into Unforced Capacity MW amounts.



2015/2016 RPM Base Residual Auction Results

Table 6 – Generation, Demand Resources, and Energy Efficiency Resources Offered and Cleared Represented in Unforced Capacity MW

Auction Results (all values in UCAP**)	RTO*										
	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016			
Generation Offered	131,164.8	132,614.2	132,124.8	136,067.9	134,873.0	147,188.6	144,108.8	157,691.1			
DR Offered	715.8	936.8	967.9	1,652.4	9,847.6	12,952.7	15,545.6	19,956.3			
EE Offered	-	-	-	-	652.7	756.8	831.9	940.3			
Total Offered	131,880.6	133,551.0	133,092.7	137,720.3	145,373.3	160,898.1	160,486.3	178,587.7			
Generation Cleared	129,061.4	131,338.9	131,251.5	130,856.6	128,527.4	142,782.0	135,034.2	148,805.9			
DR Cleared	536.2	892.9	939.0	1,364.9	7,047.2	9,281.9	14,118.4	14,832.8			
EE Cleared	0.0	0.0	0.0	0.0	568.9	679.4	822.1	922.5			
Total Cleared	129,597.6	132,231.8	132,190.5	132,221.5	136,143.5	152,743.3	149,974.7	164,561.2			
Uncleared	2,283.0	1,319.2	902.2	5,498.8	9,229.8	8,154.8	10,511.6	14,026.5			

* RTO numbers include all LDAs

** UCAP calculated using sell offer EFORd for Generation Resources. DR and EE UCAP values include appropriate FPR and DR Factor.

Table 7 contains a summary of capacity additions and reductions from the 2007/2008 Base Residual Auction to the 2015/2016 Base Residual Auction. A total of 11,858.8 MW of incrementally new capacity in PJM was available for the 2015/2016 Base Residual Auction. This incrementally new capacity includes new generation capacity resources, capacity upgrades to existing generation capacity resources, new demand resources, upgrades to existing demand resources, and new energy efficiency resources. The increase is partially offset by generation capacity derations to existing generation capacity resources to yield a net increase of 5,426.2 MW of installed capacity.

Table 7 also illustrates the total amount of resource additions and reductions over nine Delivery Years since the implementation of the RPM construct. Over the period covering the first nine RPM Base Residual Auctions, 20,721.8 MW of new generation capacity was added which was partially offset by 15,327.4 MW of capacity de-ratings or retirements over the same period. Additionally, 19,681.4 MW of new demand resources and 907.8 MW of new energy efficiency resources were offered in the 2015/2016 auction. The total net increase in installed capacity in PJM over the period of the last seven RPM auctions was 25,983.6 MW.



2015/2016 RPM Base Residual Auction Results

Table 7 – Incremental Capacity Resource Additions and Reductions to Date

Capacity Changes (in iCAP)	RTO*											Total
	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014**	2014/2015*	2015/2016			
Increase in Generation Capacity	602.0	724.2	1,272.3	1,776.2	3,576.3	1,893.5	1,737.5	1,582.8	8,207.0			21,371.8
Decrease in Generation Capacity	-674.6	-375.4	-550.2	-301.8	-264.7	-3,253.9	-1,924.1	-1,550.1	-6,432.6			-15,327.4
Net Increase in Demand Resource Capacity**	555.0	574.7	215.0	28.7	661.7	7,938.1	2,993.3	2,514.4	4,200.5			19,681.4
Net Increase in Energy Efficiency Capacity***	0	0	0	0	0	632.3	101.1	73.1	101.3			907.8
Net Increase in Installed Capacity	482.4	923.5	937.1	1503.1	3973.3	7,210.00	2,907.80	2,620.20	6,076.20			26,633.6

* RTO numbers include all LDAs

** Values are with respect to the quantity offered in the previous year's Base Residual Auction.

*** Does not include Existing Generation located in ATSI Zone

+ Does not include Existing Generation located in Duke Zone



2015/2016 RPM Base Residual Auction Results

Table 7A provides a further breakdown of the generation increases and decreases for the 2015/2016 Delivery Year on an LDA basis.

Table 7A – Generation Increases and Decreases by LDA Effective 2015/2016 Delivery Year

LDA Name	Increase	Decrease
EMAAC	3528.5	-346.5
MAAC	4576.2	-861.3
Total RTO	8207	-6432.6

**All Values in ICAP terms

*MAAC includes EMAAC

**RTO includes MAAC

Table 7B provides a further breakdown of the new capacity offered and cleared in the 2015/2016 Base Residual Auction in UCAP terms.

Table 7B – New Generation Capacity in the 2015/2016 BRA

LDA	Offered		Cleared	
	Uprate	New Unit	Uprate	New Unit
EMAAC	180.7	3,145.9	164.9	2,313.5
MAAC	220.7	4,105.5	189.5	2,990.7
Total RTO	478.6	6,843.7	447.4	4,898.9
		3,326.6		2,478.4
		4,326.2		3,180.2
		7,322.3		5,346.3

*All MW Values are in UCAP Terms

*MAAC includes EMAAC

**RTO includes MAAC

Table 8 provides a further breakdown of the new capacity offered into the each BRA into the categories of new resources, reactivated units, and uprates to existing capacity, and then further down into resource type. As shown in this table, there was an increase in the amount of generating capacity from new resources offered into the 2015/2016 BRA in comparison with the 2014/15 BRA. The capacity offered in the 2015/2016 BRA resulted from both new generating resources and uprates to existing resources including gas,



2015/2016 RPM Base Residual Auction Results

diesel, coal, wind, and nuclear resources. While the largest growth remains in gas turbines and combined cycle plants, a fair amount of incremental capacity in Steam (coal) and Nuclear was offered into the recent auctions.

Figure 3 provides an illustration of the cumulative increase in new generation capacity by fuel type since the inception of RPM (June 1, 2007).

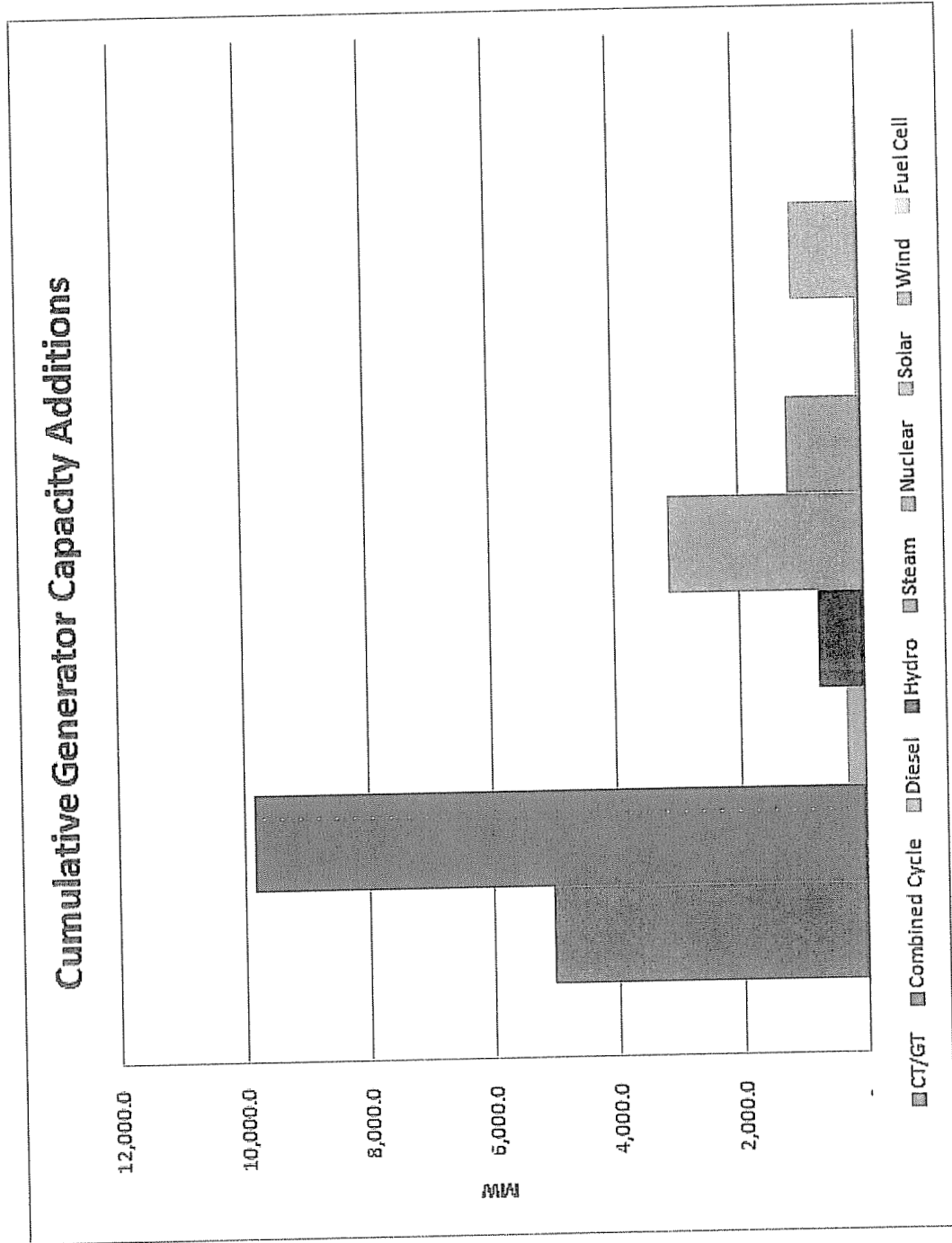
Table 3 – Further Breakdown of Incremental Capacity Resource Additions from 2007/2008 to 2015/16

Delivery Year	CT/GT	Combined Cycle	Diesel	Hydro	Steam	Nuclear	Solar	Wind	Fuel Cell	Total
2007/2008			18.7	0.3						19.0
2008/2009			27.0					66.1		93.1
2009/2010	399.5		23.8		53.0					476.3
2010/2011	283.3	580.0	23.0					141.4		1,027.7
2011/2012	416.4	1,135.0			704.8		1.1	75.2		2,332.5
2012/2013	403.8		7.8		621.3			75.1		1,108.0
2013/2014	329.0	705.0	6.0		25.0		9.5	245.7		1,320.2
2014/2015	108.0	650.0	35.1	132.9			28.0	146.6		1,100.6
2015/2016	1,382.5	5,914.5	19.4	148.4	45.4		13.8	104.9	30.0	7,658.9
2007/2008					47.0					47.0
2008/2009					131.0					131.0
2009/2010										-
2010/2011	160.0		10.7							170.7
2011/2012	80.0				101.0					181.0
2012/2013										-
2013/2014										-
2014/2015			9.0							9.0
2015/2016										-
2007/2008	114.5		13.9	80.0	235.6	92.0				536.0
2008/2009	108.2	34.0	18.0	105.5	196.0	38.4				500.1
2009/2010	152.2	206.0		162.5	61.4	197.4		16.5		796.0
2010/2011	117.3	163.0		48.0	89.2	160.3				577.8
2011/2012	369.2	148.6	57.4		186.8	292.1		8.7		1,062.8
2012/2013	231.2	164.3	14.2		193.0	126.0		56.8		785.5
2013/2014	56.4	59.0	0.3		215.0	47.0		39.6		417.3
2014/2015	104.9		0.5	41.5	138.6	107.0	7.1	73.6		473.2
2015/2016	216.8	72.0	4.7	15.7	63.4	149.2	2.2	24.1		548.1
Total	5,033.2	9,831.4	289.5	734.8	3,107.5	1,209.4	61.7	1,074.3	30.0	21,371.8



2015/2016 RPM Base Residual Auction Results

Figure 3: Cumulative Generation Capacity Increases by Fuel Type





2015/2016 RPM Base Residual Auction Results

Table 9 shows the changes that have occurred regarding resource deactivation and retirement since the RPM was approved by FERC. The MW values illustrated in Table 9 represent the quantity of unforced capacity cleared in 2015/2016 Base Residual Auction that came from resources that have either withdrawn their request to deactivate, postponed retirement, or been reactivated (i.e., came out of retirement or mothball state for the RPM auctions) since the RPM Settlement. This total accounts for 3,825.4 MW of cleared UCAP in the 2015/2016 BRA which equates to 5,169.6 MW of ICAP Offered.

Table 9 – Changes to Generation Retirement Decisions Since RPM Approval

Generation Resource Decision Changes	RTO*	
	ICAP Offered	UCAP Cleared
Withdrawn Deactivation Requests	1859.7	1097.8
Postponed or Cancelled Retirement	3027.9	2459.8
Reactivation	282.0	267.8
Total	5169.6	3825.4

RPM Impact To Date

As illustrated in Table 4, for the 2015/2016 auction, the capacity exports were 1218.9 MW and the capacity imports were 4,649.7 MW. The difference between the capacity imports and exports results in a net capacity import of 3,430.9 MW.

In the planning year preceding the RPM auction implementation, 2006/2007, there was a net capacity export of 2,616.0 MW. In this auction, PJM is now a net importer of 3,430.9 MW. Therefore RPM's impact on PJM capacity interchange is 6,047 MW.

The minimum net impact of the RPM implementation on the availability of Installed Capacity resources for the 2015/2016 planning year can be estimated by adding the net change in capacity imports and exports over the period, the forward demand and energy efficiency resources, the increase in Installed Capacity over the RPM implementation period from Table 8 and the net change generation retirements from Table 9. Therefore, as illustrated in Table 10, the minimum estimated net impact of the RPM implementation on the availability of capacity in the 2015/2016 compared to what would have happened absent this implementation is 52,181.4 MW.



2015/2016 RPM Base Residual Auction Results

Table 10 shows the details on RPM's impact to date in ICAP terms.

Table 10 – RPM's Impact to Date

Change in Capacity Availability	Installed Capacity MW
New Generation	15,136.3
Generation Upgrades (not including reactivations)	5,696.8
Generation Reactivation	538.7
Forward Demand and Energy Efficiency Resources	20,589.2
Cleared ICAP from Withdrawn or Canceled Retirements	4,173.5
Net increase in Capacity Imports	6,046.9
Total Impact on Capacity Availability in 2015/2016 Delivery Year	52,181.4



2015/2016 RPM Base Residual Auction Results

Discussion of Factors Impacting the RPM Clearing Prices

The main factors impacting 2015/2016 RPM BRA clearing prices relative to 2014/2015 BRA clearing prices are provided below separated out by significant changes to the market design and effects on the demand-side and supply-side of the market. An overriding theme of these effects is that there are many different effects and they often are offset by other market fundamentals such that there was not a large change but for the ATSI LDA.

Significant Changes to RPM Design for the 2015/2016 Base Residual Auction
FERC approved in its January 30, 2012 Order in ER12-513 on PJM's filing for tariff changes stemming from the Brattle Group's RPM Performance Assessment, PJM's proposal to maintain the Short-term Resource Procurement Target (STRPT aka 2.5% holdback) but modify how the Minimum Annual and Extended Summer Resource Requirements would be reflected in the BRA. The change provides for the minimum resource requirements to be met in total through the BRA while maintaining the overall 2.5% holdback. This change increases the minimum requirements to be purchased in the BRA by 2.5% relative to the minimum requirements in place for the 2014/2015 BRA. The Minimum Annual Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Annual Resources (Annual Resources include generation capacity resources, energy efficiency resources and annual demand resources). The Minimum Extended Summer Resource Requirement is the minimum amount of capacity sought to be procured in each auction from Extended Summer Demand Resources and Annual Resources.

On November 17, 2011 FERC approved PJM's May 12, 2011 compliance filing in ER11-2875 that set forth the procedures and the criteria by which Planned Generation Capacity Resources could seek an exception from the Minimum Offer Price Rule (MOPR) from the Independent Market Monitor and PJM. A potential new entrant can seek an exception by demonstrating lower costs or higher expected revenues resulting in a lower Net CONE value than is indicated by a 90% Net Asset Class CONE value threshold for combustion turbines and combined cycle gas facilities. This is the second BRA for which the revised MOPR has been in place, but the first with the articulated guidance approved by the Commission in the PJM tariff.



2015/2016 RPM Base Residual Auction Results

Changes that impacted the Demand Curve:

- Lower reliability requirements due to lower forecasted load. The RTO reliability requirement was 177,184 MW or just over 900 MW lower than the forecast reliability requirement of 178,086 MW for the 2014/2015 BRA. The slightly lower reliability requirement has the effect of reducing demand, and all else equal would reduce clearing prices.
- The Fixed Resource Requirement (FRR) obligation for the 2015/2016 Delivery Year is just over 50 percent less at 14,406 MW than it was in 2014/2015 at 29,763 MW due to the election by AEP Ohio load and Duke Ohio load to participate in the BRA. The effect of this is to increase demand, and all else equal increase clearing prices.
- As approved by FERC in January, the manner in which the Short-term Resource Procurement Target (STRPT or aka 2.5% holdback) and Minimum Annual and Extended Summer Requirements are expressed leaves the STRPT in place, but requires the Minimum Annual and Minimum Extended Summer Requirements be procured in the BRA. This has the effect of increasing the demand for Annual and Extended Summer Resources which should, all else equal, increase the prices for these resources in the BRA.
- The Net Cost of New Entry (CONE) values that serve as the basis for price on the RTO and LDA demand curves increased by 7.6% (for the RTO) and by 5.3% to 6.5% (depending on the LDA) over the 2013/2014 values.^[1] These changes are due to a 4.9% increase in the gross CONE coupled with updated Energy & Ancillary Services (E&AS) offset values. The Gross CONE value used in the BRA for the prior delivery year (2013/2014 DY) was adjusted using the most recently published twelve-month change in Total Other Plant Production Plant Index shown in the Handy Whitman (HWD) of Public Utility Construction Costs.

Changes that impacted the Supply Curve:

- There are over 14,000 MW of generation retirements pending by the beginning of the 2015/2016 Delivery Year. However, many of these units submitting retirement notices were not committed as Capacity Resources in the 2014/2015 Delivery Year, so while the unprecedented level of unit retirements has the effect, all else equal, of placing upward pressure on prices, the effect is likely muted by the fact many of the units retiring were not needed as capacity resources in the previous BRA.
- Supply resources in the DEOK and AEP Zones that were once committed to FRR load in these zones, and not slated for retirement, were included in the RTO supply curve for 2015/2016. This has the effect of increasing supply by 10,872 MW and

[1] Refer to 2015/2016 RPM BRA Planning Period Parameters Report



2015/2016 RPM Base Residual Auction Results

does offset to some extent the effect of increased demand in the BRA from load that has switched from FRR to participating in the BRA.

- o The 2015/2016 BRA attracted nearly 5000 MW of additional Demand Resources of various types and Energy Efficiency from 15,779 MW in the 2014/2015 BRA to 20,896 MW in the 2015/2016 BRA. The increasing depth of the supply pool has the effect, all else being equal, of placing downward pressure on prices.
- o The 2015/2016 BRA attracted 7,557 MW of new generation capacity in the form of new facilities and uprates at existing facilities. If all Planned Generation Capacity Resources are included this figure increases to about 8,200 MW. Again, the deepened pool of supply has the effect of putting downward pressure on clearing prices, but this effect is attenuated by the presence of the Minimum Offer Price Rule (MOPR) which requires new resource to offer at a floor price that is specific to a particular CONE Area if the resource is in a constrained LDA or to seek an exception with the Independent Market Monitor and PJM.
- o The Avoidable Cost Rate (ACR) default values used a Handy-Whitman indexing method such that the 2015/2016 Delivery Year default ACR data was increased based on the ten-year annual average rate of change in the applicable Handy-Whitman Index of Public Utility Costs. The default ACR values are the default offer caps that suppliers may elect to use in the event the Market Structure Test is failed and the supplier chooses not to calculate a unit-specific ACR data. The offer caps are calculated as the ACR less net revenues. Participants may choose either the technology specific default rate or to calculate their own based on unit-specific data. All else equal, the increase in the ACR values increases the cost of supply and would lead to increasing prices.
- o On February 16, 2012, the U.S. Environmental Protection Agency (EPA) published its final Mercury and Air Toxics Standard (MATS) in the Federal Register with the effective date to be 60 days after the publication, or April 16, 2012. Coal and Oil steam generators subject to the rule must comply by April 16, 2015, or just prior to the 2015/2016 Delivery Year. Compliance options include retirements (already mentioned above) or the installation of control technologies to achieve the emissions rate standard. In New Jersey, the so-called High Electricity Demand Day (HEDD) rule that institutes a NOx emission rate standard on intermediate and peaking units in the state goes into effect on May 1, 2015. And like the MATS rule, compliance requires either retirement or the installation of control technologies to achieve the standard. The cost of such investment, if adequately supported and documented, could be included in the ACR cost calculations applicable to the 2015/2016 BRA for resources impacted by the rule. The impact of this would be to increase clearing prices, all other things being equal.



2015/2016 RPM Base Residual Auction Results

- Expected net energy market revenues which would go toward offsetting high retrofit costs for the purposes of calculating Market Seller Offer Caps were lower for many of the units offering in environmental retrofits based on the historic revenues from 2009-2011. This has the effect of raising the level of the offer caps used in market power mitigation and, all else equal, places upward pressure on prices.

Overall Effects on Market Outcomes:

There are many changes in both the supply and demand curves for the 2015/2016 BRA that have offsetting effects. For example, the reduced pool of generation supply from retirements and increasing costs due to environmental retrofits were in large measure offset by the slightly lower demand, and deeper pool of supply coming from additional demand-side resources and generation supply which have resulted in slightly higher prices in the RTO for Annual Resources, increasing from \$125.99/MW-day to \$136.00/MW-day and in MAAC increasing from \$136.50/MW-day to \$167.46/MW-day. The only outlier is the ATSI LDA which experienced a large concentration of generator retirements and resulting transmission constraints with relatively little lead time for new resources to make entry decisions coupled with the need for retrofits at existing coal units resulting in much higher prices than last year. ATSI cleared with the RTO last year at \$125.99/MW-day but Annual Resources this year cleared at \$357.00/MW-day.

Another effect seen in the 2015/2016 BRA was the increased capacity transfer limits due to addition of transmission upgrades especially in PSEG which did not separate from the rest of EMAAC or MAAC as had been the case in previous auctions. In the 2014/2015 BRA PS-North cleared Annual Resources at \$225.00/MW-day, but with increase transfer capability, PS-North cleared with the rest of MAAC at \$167.46/MW-day.

Kentucky Power Company

REQUEST

Please provide a quantification of all other costs not included in RWK-1 that Kentucky Power will incur as a direct or indirect result of the REPA that will affect the Company's revenue requirement, such as the debt equivalent penalty. Please provide all reports, analyses, workpapers, and documentation of any type in support of your answer.

RESPONSE

All known costs were included in RKW-1. The Company has no knowledge of the amount, if any, of any "debt equivalent penalty".

WITNESS: Ranie K. Wohnhas

Kentucky Power Company

REQUEST

Please provide a copy of AEP's guidelines/methodology for assessing bid responses to RFPs that reflect a (power purchase agreement) PPA alternative, including, but not limited to, the methodology used to calculate the debt equivalent penalty resulting from a PPA and how that penalty is factored into the ranking of bid responses.

RESPONSE

No such guidelines/methodology exist as requested. The Company's process for assessing the debt equivalency for RFP bid responses regarding PPA's consists of evaluating each PPA's characteristics and reviewing the rating agencies' methodology. Currently, only Standard & Poor's (S&P) will generally impute debt related to a PPA. Neither Moody's or Fitch typically impute debt because they regard the PPA obligation as operating costs with no debt-like attributes as long as the Commission Order reflects pass-through rate treatment (See testimony of Company witness Wohnhas). The Company may consider reviewing the imputed debt using the Standard & Poor's methodology.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Refer to Mr. Godfrey's Testimony, page 11, beginning on line 7. What is the projected value of the Renewable Energy Certificates (RECs) that will be generated as a function of the REPA? Please provide all reports, analyses, workpapers, and documentation of any type in support of your answer. This information should be provided electronically with all formulas intact and no pasted in values.

RESPONSE

Please refer to the Company's response to KPSC 1-5.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Has Kentucky Power performed an assessment of how much the RECs that Kentucky Power will receive from the EcoPower transaction will cost? If so, please provide that assessment and all associated reports, analyses, workpapers, and documentation of any type in support of that assessment. If not, why has Kentucky Power not quantified estimates of the costs of the EcoPower RECs?

RESPONSE

The Company has not performed an assessment of the value of the RECs that KPCo will receive from the EcoPower transaction. The prices under the REPA are all inclusive (energy, capacity, RECs) and do not separately value the cost of the RECs. For recent REC values, please see the Company's response to KPSC 1-5.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Refer to Mr. Godfrey's Testimony, page 11, beginning on line 7. How does Kentucky Power propose that the REC benefits be flowed-through to customers? Provide all support documentation.

RESPONSE

The customers will receive the benefits of the RECs. To the extent not required to satisfy any renewable energy requirements, the Company anticipates selling the RECs and flowing the proceeds back to its customers. The Company proposes to credit these proceeds through the EcoPower rider or surcharge if approved by the Commission.

WITNESS: Ranie K Wohnhas

Kentucky Power Company

REQUEST

Refer to page 5 lines 16-23 of Mr. Wohnhas' Direct Testimony wherein he describes the S&P's imputed debt calculation, including the calculation of the net present value of the capacity payments and the "risk factor" that S&P's applies to the net present value.

- a. Please provide the projected capacity payments by year for the 20 year term of the REPA. Provide all assumptions, data, and calculations used for this purpose, including the basis for separating the energy rate pursuant to the REPA into a capacity rate and energy rate for the purpose of calculating the capacity payments for the debt equivalent, and all electronic spreadsheets with formulas intact.
- b. Please provide the Company's "risk factor" based on other debt equivalent calculations either for the Company or other AEP utilities and provide a copy of the source documents relied on for this risk fact
- c. Does Kentucky Power plan to add additional equity to its capital structure in response to this imputed debt? If so, how much? At what cost? Please provide all reports, analyses, workpapers, and documentation of any type in support of your answer.

RESPONSE

- a. Please see KIUC 1-38 Confidential Attachment 1 that was prepared in January 2013. It is the Company's opinion that a low risk factor will be applied to this plant. The expectation is that any debt imputation would apply beginning when the plant goes in service.
- b. Based on discussions with S&P, it is the Company's understanding that the routine risk factor with regulatory recovery is 25%; however, the cost recovery mechanisms to be sought by the Company are anticipated to reduce this risk factor. Upon receipt of Commission orders approving the REPA and establishing a cost recovery mechanism, the Company will provide the details to S&P in an effort to reduce the risk factor as low as possible given legislation regarding continued binding effect of the Commission's order, the order itself, and contract terms will allow.
- c. KIUC 1-38 Confidential Attachment 1 assumed that the additional equity contribution would be in the range of \$15 million to \$38 million depending on the risk factor attributed.

WITNESS: Ranie K. Wohnhas

Kentucky Power Company
Eco Power Generation Hazard LLC

1	Off-taking Entity	Commercial Operation Date	End Date	Name Plate Capacity Rating (MW)	Capacity	Annual Energy (MWh)	2017	2018	2019	2020	2021	>2022
	Committed Energy Purchases	1/1/2017	2037	56.2	88%	450,000	\$24,975,000	\$25,536,938	\$26,111,519	\$26,699,028	\$27,299,756	\$530,516,690

KYPCO

Implied Capacity Charge **\$55.50**
Page 2 of the S&P methodology for imputing debt - "We calculate a net present value (NPV) of the stream of the outstanding contracts' capacity payments..."

Discount Rate* **6.48%**
Page 2 of the S&P methodology for imputing debt - "We calculate the NPV of capacity payments using a discount rate equivalent to the company's average cost of debt..."

Present Value **\$338,387,611**
Page 3 of the S&P methodology for imputing debt - "Intermediate degrees of recovery risk are presented by a number of regulatory and legislative mechanisms. For example, some regulators use a utility's rate case to establish base rates that provide for the recovery of the fixed costs created by PPAs. Although we see this type of mechanism as generally supportive of credit quality, the fact remains that the utility will need to litigate the right to recover costs and the prudence of PPA capacity payments in successive rate cases to ensure ongoing recovery of its fixed costs. For such a PPA, we employ a 50% risk factor. In cases where a regulator has established a power cost adjustment mechanism that recovers all prudent PPA costs, we employ a risk factor of 25% because the recovery hurdle is lower than it is for a utility that must litigate time and again its right to recover costs."

Risk Factor **10%**
25%

Debt Equivalency **\$84,596,903**

*Current Kentucky Power Average Long Term Debt Rate

Kentucky Power Capital Structure	9/30/2012	10% Risk Factor	25% Risk Factor
Long-Term Debt	549,180,000	549,180,000	549,180,000
Imputed PPA Debt	0	33,838,761	84,596,903
Total Debt	549,180,000	583,018,761	633,776,903
Total Equity	476,638,000	476,638,000	476,638,000
Total Capitalization	1,025,818,000	1,059,656,761	1,110,414,903
Debt to Capitalization	53.54%	55.02%	57.08%
Equity Contribution Needed		15,227,443	38,068,606

CONFIDENTIAL

Kentucky Power Company

REQUEST

Please provide all documents related to the "Seller Performance Fund" including, but not limited to any contracts, term sheets or correspondence.

RESPONSE

Please refer to Section 11.1, Seller Security Fund, in the REPA. Additionally, see the Company's response to KIUC 1-6.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Please provide, in electronic spreadsheet format, EcoPower's complete financial statements (e.g., balance sheet, income statement, cash flow statement, statement of shareholders' equity, and statement of comprehensive income) on an annual (or year-end for the balance sheet) actual basis for the past calendar year and on an actual plus forecast basis for the current calendar year (or year-end for the balance sheet).

RESPONSE

The Company does not have the requested information.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Please provide, in electronic spreadsheet format, EcoPower's complete financial statements (e.g., balance sheet, income statement, cash flow statement, statement of shareholders' equity, and statement of comprehensive income) on an annual (or year-end for the balance sheet) pro forma basis for the life of the contract.

RESPONSE

Please see CONFIDENTIAL Attachment 2 provided in the Company's response to KIUC 1-14 for the EcoPower project pro forma financial statements for the life of the contract.

WITNESS: Jay F Godfrey

Kentucky Power Company

REQUEST

Refer to Exhibit JFG-1, page 80. Provide a copy of the Cumulative Environmental Assessment, including all supporting documentation.

RESPONSE

Please see KIUC 1-42 Attachment 1 for the requested Environmental Assessment.

WITNESS: Jay F Godfrey

**PHASE I ENVIRONMENTAL SITE ASSESSMENT
ECOPOWER GENERATION, LLC
COAL FIELDS INDUSTRIAL REGIONAL PARK
CHAVIES, PERRY COUNTY, KENTUCKY**

JANUARY 11, 2010

**Smith Management Group
1860B Williamson Court
Louisville, Kentucky 40223
502-587-6482**

PHASE I ENVIRONMENTAL SITE ASSESSMENT
ECOPOWER GENERATION, LLC
COAL FIELDS INDUSTRIAL REGIONAL PARK
CHAVIES, PERRY COUNTY, KENTUCKY
SMIG Project Number 2009-4752E

DECEMBER 23, 2009

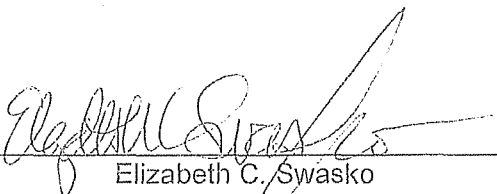
Prepared for:

ECOPOWER GENERATION, LLC
Lexington, Kentucky

Prepared by:

SMITH MANAGEMENT GROUP
Louisville, Kentucky

I declare that to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in 40 CFR 312.10. I have the specific qualifications based on education, training, and experience to assess a property of the nature, history and setting of the subject property. I have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.



Elizabeth C. Swasko
Environmental Scientist



Sara G. Smith
President

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	2
2.1	Purpose	2
2.2	Scope	2
2.3	Limitations and Exceptions	2
2.4	Reliance and Understanding	3
3.0	GENERAL SITE INFORMATION	4
3.1	Site Location and Description	4
3.2	Current Use Of The Site	4
3.3	Historic Use of the Site	4
3.4	Uses of Adjacent and Nearby Property	4
4.0	USER RESPONSIBILITIES	5
4.1	Chain of Title	5
4.2	User Knowledge and Property Limitations	5
5.0	RECORDS REVIEW	6
5.1	Topographic and Geologic Maps	6
5.2	Aerial Photographs and Historical Topographic Maps	6
5.3	Sanborn Maps	7
5.4	Federal Agencies Database Review	7
5.5	State Environmental Databases	8
5.6	State FOIA Records Review Request	8
5.7	City Directories and Local Agencies	9
5.8	Previous Environmental Investigations	9
6.0	SITE RECONNAISSANCE	10
6.1	General Observations	10
6.2	Wastewater Discharges	10
6.3	Hazardous Materials Use and Disposal	10
6.4	PCB Equipment	10
6.5	Storage Tanks	10
6.6	Contaminated Fill	10
6.7	Asbestos Evaluation	11
7.0	INTERVIEWS	12
8.0	DATA GAPS	13
9.0	CONCLUSIONS	14
10.0	QUALIFICATIONS	15

FIGURES

FIGURE 1	Site Location Map
FIGURE 2	Site Diagram (based on 2004 Aerial Photograph)
FIGURE 3	1940 Aerial Photograph
FIGURE 4	1960 Aerial Photograph
FIGURE 5	1988 Aerial Photograph
FIGURE 6	1913 Topographic Map

APPENDICES

APPENDIX A	Site Photographs
APPENDIX B	Environmental First Search Report
APPENDIX C	Regulatory Contacts
APPENDIX D	Qualifications – Environmental Professional

1.0 EXECUTIVE SUMMARY

Smith Management Group (SMG) was employed by ecoPower Generation, LLC ("ecoPower") to perform a Phase I Environmental Site Assessment (ESA) of an undeveloped property located within the Coal Fields Regional Industrial Park in Chavies, Perry County, Kentucky (hereinafter "subject site"). The assessment was conducted to identify releases or threatened releases of hazardous substances and petroleum products on, at, in or to the subject property within the limitations of the scope and process described in Sections 2.0 and 10.0 of this report. The assessment was completed in December 2009.

Based upon the information obtained and described herein, SMG did not identify any recognized environmental conditions (RECs) at the site. However, SMG did observe:

- Three areas where miscellaneous debris had been burned in what appeared to be a camp-like fire.

It should be noted that this Executive Summary does not contain the details of the methods used, limitations of available information, or information obtained. Therefore, the user must read this report in its entirety for a comprehensive understanding of the potential environmental risks that may or may not be present on this property.

2.0 INTRODUCTION

2.1 Purpose

The assessment was conducted using professional judgment with ASTM Standard E 1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, utilized as a guideline. The purpose of the assessment was to identify conditions indicative of releases and threatened releases of hazardous substances on, at, in or to the subject property, within the limitations of the scope and process described in Sections 2.0 and 10.0 of this report. SMG was authorized by ecoPower Generation, LLC to perform the assessment.

For the purposes of this investigation, conditions indicative of releases or threatened releases *do not include de minimis* conditions which are not considered likely to represent a material risk of harm to human health or the environment and would not likely be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

2.2 Scope

This investigation was limited to visual observations of the property, review of information provided by Mr. Gary Crawford, Chief Executive Officer (CEO), ecoPower Generation, LLC, interviews with individuals listed in this report and a review of readily accessible and publicly available records described in this report. SMG did not collect any samples of soil, water, or air for laboratory analysis or for any other purpose.

The scope of work did not include evaluation of the property for:

- Jurisdictional wetlands or floodplains;
- Radon, lead paint, or drinking water quality;
- Health and safety concerns; or
- Environmental compliance.

2.3 Limitations and Exceptions

SMG used professional judgment to make an appropriate inquiry into the current and previous use of the property to obtain commonly known or reasonably ascertainable information with respect to recognized environmental conditions on the property. This report is subject to the limitations of historical documentation, availability and accuracy of pertinent records, and the accuracy and personal recollection of those persons contacted. No site excavation, borings or other subsurface investigations or sampling of water, soil or air was conducted. Therefore, this document should not be construed as a guarantee or assurance that undiscovered environmental problems do not exist. Information sought and not obtained or incomplete information may represent a data gap which could influence the ability of the reviewer to reach a conclusion about the property. These gaps, if any, are described and discussed in Section 8.0 of this report.

2.4 Reliance and Understanding

This report has been prepared for ecoPower Generation, LLC and is provided for use by them. No other individual or entity shall have the right to rely upon this document or any part thereof, without SMG's express written consent.

SMG has requested information regarding known or suspected environmental problems associated with the property that were known to ecoPower Generation, LLC. SMG has presumed that all information obtained is reliable and accurate. Specific information requested may include an unusually low appraisal or sale price, environmental liens, current or prior sources of contamination or remediation activities.

3.0 GENERAL SITE INFORMATION

3.1 Site Location and Description

The subject site consists of approximately 125-acres of undeveloped land located within the Coal Fields Regional Industrial Park. The property is accessed via Coalfields Industrial Drive off Kentucky 15 (see *Site Location Map, Figure 1*).

The subject site is a reclaimed surface mine that is covered with grasses and a few secondary growth trees. The current topography is predominantly flat with some undulation (see *Figure 2*). Photographs of the property have been provided in *Appendix A - Site Photographs*.

There are no utilities currently at the site. However, reported utilities available at Coal Fields Regional Industrial Park are: electricity provided by AEP – Kentucky Power Company; potable water and sanitary wastewater/stormwater management by Hazard Utilities; cable by TV service & United Cable; and Broadband by Windstream Corporation. Currently there is no natural gas available to the industrial park.

3.2 Current Use Of The Site

The site is currently an undeveloped reclaimed mine site.

3.3 Historic Use of the Site

According to information obtained by SMG, the subject site was utilized as a surface mine since at least 1940. Historical topographic maps indicate that the site does not appear to have been utilized for any purpose other than mining since at least 1913.

3.4 Uses of Adjacent and Nearby Property

The subject site is located within an industrial park. Based on information obtained during the site visit, properties adjacent to the site are as follows:

- North: ACIN Property (undeveloped reclaimed mine lands), Hollybush Branch Impoundment with Ten Mile Creek Road and residences beyond;
- East: Undeveloped reclaimed mine lands (part of ACIN property) with residences (Napier family homes) and Kentucky 15 and beyond;
- South: Coalfields Industrial Park property (undeveloped reclaimed mine lands), Sykes Enterprises, AOD Transportation and Trus Joist Lane with Trus Joist/Weyerhaeuser beyond; and
- West: ACIN property (undeveloped reclaimed mine lands) with Pine Branch (AKA Mountain Properties) surface mine, residences (Floyd Mullins Estate and VG Combs).

Active mining at the Pine Brach surface mine can be seen from the western portion of the property. Coalfields Industrial Park properties are predominantly located adjacent to the south and beyond.

4.0 USER RESPONSIBILITIES

4.1 Chain of Title

A chain of title for the property was not provided to SMG for review. Therefore, SMG cannot confirm whether deed restrictions or environmental liens apply to the property.

4.2 User Knowledge and Property Limitations

A User Questionnaire was provided to ecoPower by SMG to ascertain whether their representatives had any knowledge of potential site contamination issues. The questionnaire requested a response to knowledge of any of the following items:

- Environmental liens.
- Deed restrictions controlling the use of the property due to the presence of hazardous substances or petroleum products.
- Pending, threatened or past litigation or administrative proceedings regarding hazardous substances or petroleum products.
- Notices or actions from any governmental entity regarding any possible violation or liability relating to hazardous substances or petroleum products.
- Purchase price that is significantly less than comparable properties.
- Activity and land use limitations (AUL) that are in place or that have been filed or recorded in a registry.
- Specialized knowledge or experience of the person seeking to qualify for the limited liability protection.
- Relationship of the purchase price to the fair market value of the property if it were not contaminated.
- Commonly known or reasonably ascertainable information about the property.
- The degree of obviousness of the presence or likely presence of contamination at the property, and the ability to detect the contamination.

Mr. Gary Crawford, CEO of ecoPower Generation, LLC, reported that he is not aware of any environmental liens, deed restrictions or control orders/mandated remediation actions are attributed to the property. Mr. Crawford reported that currently ecoPower has an option on the property and will conduct title research prior to closing.

5.0 RECORDS REVIEW

The following readily available federal, state, and/or local records were reviewed to identify recognized environmental conditions associated with the site and to develop a historical perspective of prior use.

5.1 Topographic and Geologic Maps

The US Geological Survey (USGS) Haddix and Krypton, KY 7.5-Minute Topographic Quadrangle maps were reviewed for information regarding site history and conditions. The site is located on portions of both maps. Both maps are dated 1972 and have no revisions. The subject site is located in an undeveloped area located approximately 1600-ft southwest of Engle, KY. The map indicates that surface mining has occurred on the site and that portions are wooded. Kentucky 15 is present to the east of the site. Based on the topographic map, the site elevation ranges from 1,000-ft to 1,400-ft above mean sea level; however, the site is a reclaimed surface mine and the depicted topography does not appear to be accurate.

A review of the USGS Haddix and Krypton Geologic Quadrangle maps was also conducted. The site is underlain by the Breathitt Formation from the lower to middle Pennsylvanian. The Breathitt formation is comprised of siltstone, shale, sandstone, coal and underclay. There are three coal seams present: the Hindman Coal Bed, the Hazard No. 7 Coal bed and the Hazard Coal Bed. Bedrock contours on the map indicate that the bedrock regionally dips to the west-southwest.

The Natural Resources Conservation Services Web Soils Survey website (<http://websoilsurvey.nrcs.usda.gov/app/>) was consulted for information pertaining to soils located on-site. The site is comprised of three soils: the Fairpoint soils, steep, benched; the DeKalb-Rock outcrop Latham Association, steep; and the Shelocta-Gilpin Association, steep. The Fairpoint soil is well drained, has a low available water capacity, a moderate shrink-swell potential, and does not meet hydric soils criteria. The DeKalb-Rock Outcrop Latham Association is well drained, has a low shrink-swell potential and available water capacity, is not flooded or ponded and does not meet hydric soils criteria. The Shelocta-Gilpin Association is well drained, has a low shrink-swell potential, high available water capacity, is not flooded or ponded and does not meet hydric soils criteria.

Groundwater in this area will generally occur in two different zones. The upper zone typically occurs in the unconsolidated surface materials near the soil/bedrock interface. The lower zone occurs within the deeper bedrock stratum. Flow direction in the upper zone typically follows the local topography. Based on a review of the site and the topographic map, the general flow on-site is anticipated to flow to the northeast/east toward Hollybush Branch. It is anticipated that the lower zones will most likely follow bedrock contours and flow to the west-southwest. However, actual groundwater flow at the subject site cannot be determined without well installation, monitoring, and instrumentation.

5.2 Aerial Photographs and Historical Topographic Map

SMG reviewed four readily available aerial photographs of the site taken in 1940, 1960, 1988, and 2004. The 1940, 1960 and 1988 aerial photographs were obtained from FirstSearch Technology Corporation (FirstSearch). The 2004 aerial was obtained from Google Earth (see

Figures 2 through 5). Aerial photographs are generally flown at medium to high altitudes and specific site details are not always discernable. However, aerial photographs are generally useful in comparing historical and current conditions.

1940 and 1960 Aerial Photographs: These aerials depict the site as wooded and undeveloped. Evidence of mining can be seen to on the western side of Kentucky 15. Kentucky 15 is visible to the east of the subject site (see Figures 3 and 4).

1988 Aerial Photograph: This aerial depicts the subject site as undeveloped. Unlike the 1940 and 1960 aerial photographs, contours suggest surface mining operations have occurred at the subject site. Tributaries of the North Fork of the Kentucky River are visible to the north, northeast, and northwest of the site.

2004 Aerial Photograph: The subject site and surrounding areas appear to be consistent with current site conditions (see Figure 2).

SMG also reviewed a historical topographical map dated 1913 obtained from FirstSearch (see Figure 6).

1913 Historical Topographical Map: No structures are depicted at the subject site. The map is sparsely populated with structures. Tenmile Fork, Hollybush Branch and Rockhouse Fork, tributaries of the North Fork of the Kentucky River are visible to the north, northeast, and northwest of the subject site.

5.3 Sanborn Maps

On October 28, 2009, SMG requested whether Sanborn Maps were available from FirstSearch. FirstSearch reported that Sanborn maps were not available for the subject site area (see Appendix B for FirstSearch documentation).

5.4 Federal Agencies Database Review

SMG obtained federal environmental database information from FirstSearch on November 10, 2009. This information is contained in **Appendix B - Environmental FirstSearch Report**. Standard ASTM database information available from FirstSearch is typically updated on approximate 90 day intervals. A summary of the search of the ASTM standard resource databases within the ASTM specified distances is provided on the following page. Also shown are the numbers of occurrences on each database.

Source	Description	Distance	Sites
NPL	Federal National Priorities List	within 1 mile	0
CERCLIS	Sites which have been or are currently under review for releases of hazardous substances on the Comprehensive Environmental Response, Compensation and Liability Information System	within 0.5 mile	0
NFRAP	CERCLIS archived sites with no further required action	within 0.5 mile	0
CORRACTS	RCRA facilities with reported violations and subject to corrective actions	within 1 mile	0

RCRA TSD	Hazardous waste treatment storage or disposal sites	within 0.5 mile	0
RCRA Generators	Hazardous waste generators, large or small	property or adjoining property	0
ERNS	Emergency Response Notification System, list of petroleum or hazardous substance spills	property only	0
Federal IC/EC	Federal Brownfield Management System	within 0.5 mile	0

Review of the information supplied by FirstSearch indicates that there are *no* reported NPL, CERCLIS, NFRAP, CORRACTS, TSD, RCRA Generators or ERNS facilities on the subject property or within the distances specified by ASTM Standard 1527-05.

5.5 State Environmental Databases

SMG obtained state environmental database information from FirstSearch on November 10, 2009. This information is contained in **Appendix B - Environmental FirstSearch Report**. Standard ASTM database information available from FirstSearch is typically updated on approximate 90 day intervals. A summary of the search of the ASTM standard resource databases within the ASTM specified distances is provided below.

Source	Description	Distance	Sites
STATE SITE	State Level CERCLA/Superfund Sites	within 1 mile	0
SWF/LF	Solid Waste Facilities/Landfills	within 0.5 mile	0
UST	State UST facilities	property or adjoining property	0
LUST	Leaking Underground Tanks	within 0.5 mile	0
BROWNFIELDS/VCP	State Contaminated Sites list	within 0.5 mile	0

Review of the information supplied by FirstSearch indicates that there are *no* reported STATE, SPILLS, SWF/LF, UST/AST, LUST, IC/EC or VCP/Brownfield facilities on the subject property or within the distances specified by ASTM Standard 1527-05.

Unmapped/Non-Geocoded Facilities

Unmapped or non-geocoded facilities are those that have incomplete address information or the location of the facilities are not known or could not be located on the database. SMG reviews this list and makes an attempt to locate these facilities during the site reconnaissance. The FirstSearch database identified fifteen (15) unmapped facilities within the zip code(s) searched. Based on the vehicle reconnaissance of the area at the time of the site visit, these non-geocoded facilities were not identified in close proximity to the subject site. Therefore, these facilities are not likely to be considered a source of contamination to the site.

5.6 State FOIA Records Review Request

A request was submitted to the Open Records representatives in Kentucky's Department for Environmental Protection, Division of Water (DOW), Division for Air Quality (DAQ), Division of

Waste Management (DWM), and DWM – Underground Storage Tank Branch. The DOW, DAQ, DWM, Underground Storage Tank Branch and DAQ reported that there were no files or records for the subject site. However, the DOW and DAQ indicated that they have files that pertain to Trus Joist/Weyerhaeuser, an adjacent property to the south. Files from the DAQ were not reviewed. However, the DOW provided the documents that they have on file via an email. SMG reviewed these documents from the DOW, including: wastewater treatment inspection reports, a work hazard assessment, a letter with a deficiency based upon a 2005 inspection, a notification of transfer of facility ownership and photos. Review of these files indicated that the Trus Joist facility would be of minimal environmental concern to the subject site.

On November 13, 2009, SMG spoke with Ms. Kristen Gale of the Kentucky Department of Natural Resources, Division of Mine Reclamation & Enforcement's Office to inquire about two closed mining permits associated with the site (Permit #s: 2970391 and 0970122). Permit # 2970391 was listed under River Coal Company, Inc. and Permit # 0970122 was listed under the Kem Coal Company. Ms. Gale indicated that the bonds had been released for both permits, indicating closure in compliance with the permits.

Copies of the initial e-mail and the responses are included in **Appendix C, Regulatory Contacts**.

5.7 City Directories and Local Agencies

City directories were not requested due to the rural location of the site.

5.8 Previous Environmental Investigations

SMG was not provided a previous environmental assessment to review.

6.0 SITE RECONNAISSANCE

6.1 General Observations

SMG conducted a site reconnaissance of the subject property on October 30, 2009 and was accompanied by Mr. Grant Curry, ecoPower. The site is located in Coal Fields Regional Industrial Park. The address is reported as 1244 Coal Fields Industrial Drive and is approximately 10.7-miles north of Hazard, KY. Photographs of the site have been included in **Appendix A**. The area surrounding the site is rural, has been mined or is undergoing active mining.

6.2 Wastewater Discharges

The site contains no apparent manufacturing or other commercial process wastewater sources. SMG did not observe pits, ponds or lagoons on-site that may have been utilized for wastewater treatment or storage.

The Hollybush Dam Impoundment was observed approximately 1,500-ft northeast of the site. This large pond was created by damming up Hollybush Creek.

6.3 Hazardous Materials Use and Disposal

SMG did not observe any obvious evidence of petroleum or hazardous substance releases (e.g., staining or spilled material). However, there were three easily accessible spots where burning of tires, shingles, bottles cardboard, wooden posts, plates and scrap wood had occurred (see **Appendix A, Photographs 11 through 13**).

SMG recommends that all of this material be removed prior to acquisition of the subject site.

6.4 PCB Equipment

SMG did not observe obvious evidence of the presence of PCB containing equipment on-site.

6.5 Storage Tanks

SMG observed no evidence of the presence of any aboveground or underground storage tanks on site.

6.6 Contaminated Fill

No obvious evidence of the placement of contaminated fill was observed by SMG during the site visit. Mr. Crawford (ecoPower) indicated that he was not aware of any contaminated fill being brought onto the property.

The site is a reclaimed mine site and fill materials were utilized to bring it up to the proper grade. These fill materials are typically comprised of overburden and interburden rock from the site that is returned to its original location or placed in designated fill areas. A site is not considered reclaimed and the bond released until all requirements described in the permits are met.

Ms. Kristen Gale of the Kentucky Department of Natural Resources, Division of Mine Reclamation & Enforcement's Office indicated that the bonds for the site had been released.

6.7 Asbestos Evaluation

An asbestos survey was not completed as part of this assessment. Additionally, there are no known structures present on-site.

7.0 INTERVIEWS

SMG spoke with Mr. Grant Curry, while onsite October 30, 2009. Mr. Crawford provided the following information:

- ecoPower has an option to purchase on the property;
- The subject site is approximately 125 acres; and
- He has limited knowledge of the site's history.

8.0 DATA GAPS

The information provided to and obtained by SMG was not complete enough to evaluate every aspect of the property. The bullet items below provide an analysis of the known and relevant data gaps for the assessment of the property.

- No chain of title was provided to SMG for review for the subject site or identified adjacent properties. Evidence of prior ownership and documentation of potential restrictive covenants or environmental liens could not be confirmed.
- Historical use of the property is surface mining, however, information pertaining to the exact dates and ownership was not readily available.

It is not expected that the existence of these data gaps has materially changed or altered the opinion expressed by the Environmental Professional in this report. In the event that additional information is discovered that changes the conclusions of this report, ecoPower Generation, LLC will be immediately notified.

9.0 CONCLUSIONS

SMG was employed by ecoPower Generation, LLC to perform a Phase I ESA of an undeveloped property in Coal Fields Regional Industrial Park in Chavies, Perry County, Kentucky. The reported address is 1244 Coal Fields Industrial Drive. The assessment was conducted to identify releases or threatened releases of hazardous substances on, at, in or to the subject property within the limitations of the scope and process described in Sections 2.0 and 10.0 of this report. The assessment was completed in November 2009.

The subject site consists of an undeveloped reclaimed surface mine site containing approximately 125-acres of land. The property is accessed via Coal Fields Industrial Drive from Kentucky 15. It is located in an industrial park that is situated in a rural area of Chavies, Kentucky (see **Site Location Map, Figure 1**).

- Based upon the information obtained and described herein, SMG did not identify any Recognized Environmental Conditions (RECs) at the site. While not considered a REC, SMG did observe three areas where miscellaneous debris had been burned. It is recommended that this material be removed prior to site development.

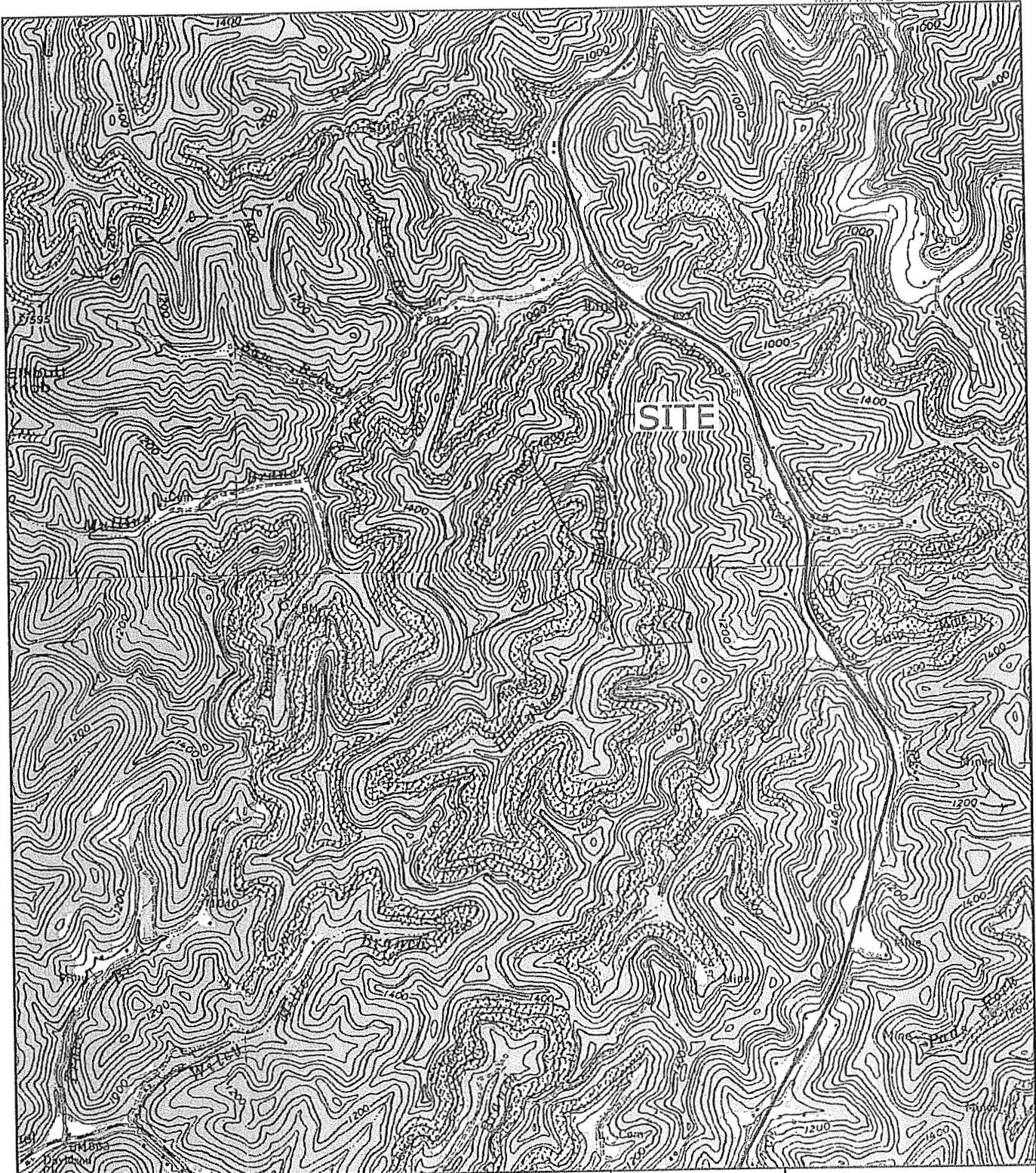
This report should be read in its entirety for details regarding the site conditions.

10.0 QUALIFICATIONS

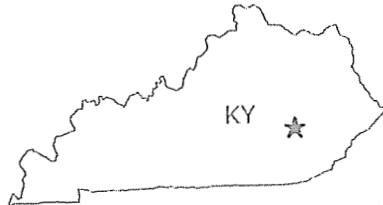
This report is intended as a limited assessment of the environmental conditions associated with the subject site. It was prepared in accordance with generally accepted practices for projects of this nature. SMG does not warrant the work of regulatory agencies or other third parties supplying information that may have been used in preparation of this report. The assessment relied primarily upon readily available and easily accessible historic information, visual observations and verbal/written reports of others. The limitations and data gaps of this assessment should be recognized as ecoPower Generation, LLC draws any conclusions with regard to environmental issues associated with this property.

Resumes of the SMG personnel responsible for the preparation of this environmental site assessment are included in **Appendix D** to this report.

FIGURES



1405 Mercer Road
 Lexington, KY 40511
 1860 B Williamson Court
 Louisville, KY 40223
 www.smithmanage.com



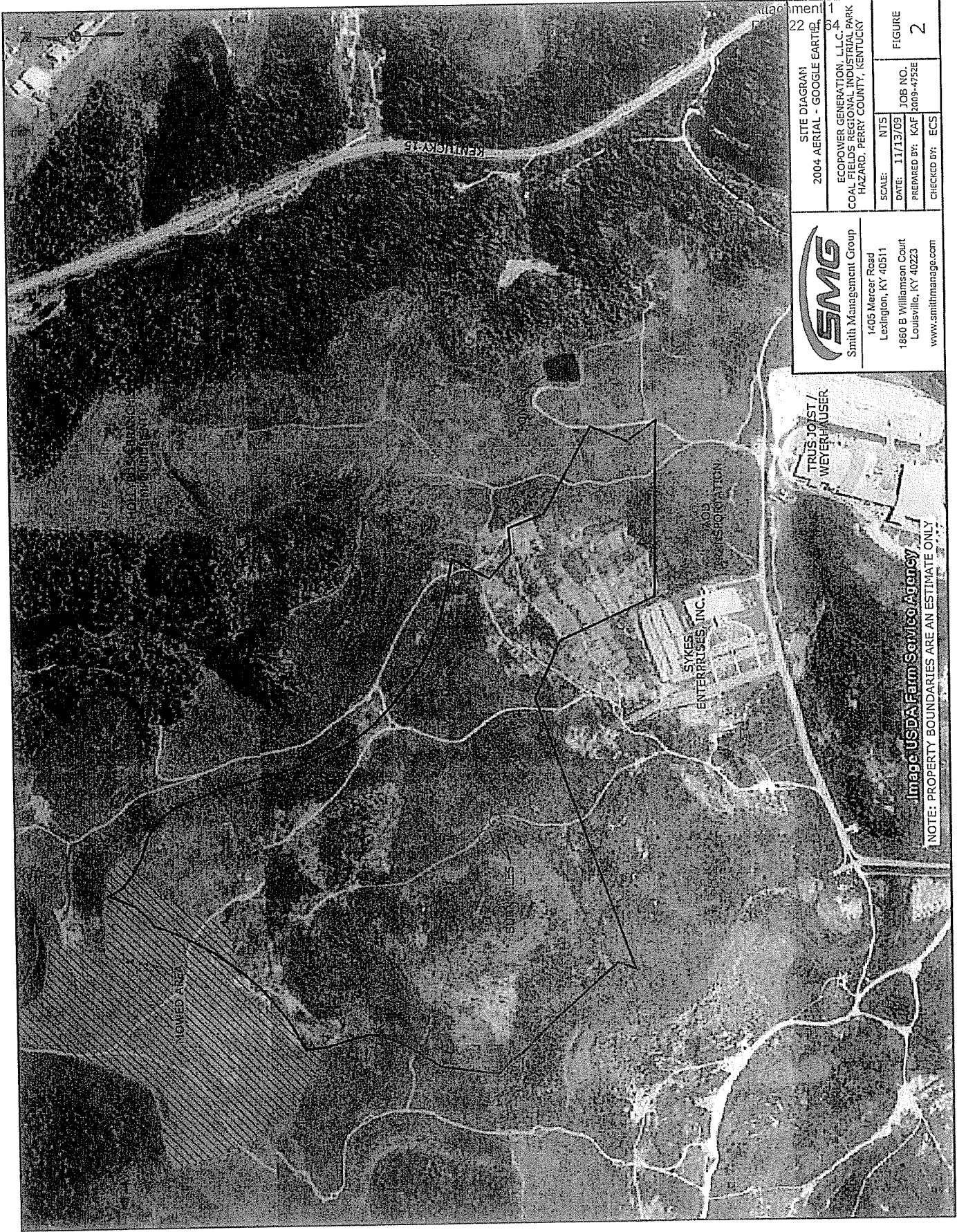
QUADRAANGLE INFORMATION


NORTHERN QUAD:
 HADDIX, KY. - 1972
 SOUTHERN QUAD:
 KRYPTON - 1972

SITE LOCATION MAP

ECOPOWER GENERATION, L.L.C.
 COAL FIELDS REGIONAL INDUSTRIAL PARK
 HAZARD, PERRY COUNTY, KENTUCKY

SCALE:	1" = 2000'	JOB NO. 2009-4752E	FIGURE 1
DATE:	11/13/09		
PREPARED BY:	KAF		
CHECKED BY:	ECS		

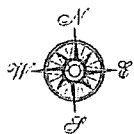


 Smith Management Group 1405 Mercer Road Lexington, KY 40511 1860 B Williamson Court Louisville, KY 40223 www.smithmanage.com	SITE DIAGRAM 2004 AERIAL - GOOGLE EARTH		Attachment 1
	ECONOMY GENERATION, L.L.C. COAL FIELDS REGIONAL INDUSTRIAL PARK HAZARD, PERRY COUNTY, KENTUCKY		Figure 2
SCALE: NTS	DATE: 11/13/09	JOB NO. 1009-4752E	FIGURE 2
PREPARED BY: KAF		CHECKED BY: ECS	

Image, USDA Farm Service Agency
NOTE: PROPERTY BOUNDARIES ARE AN ESTIMATE ONLY

FIGURE 3 1940 AERIAL

Source: FirstSearch

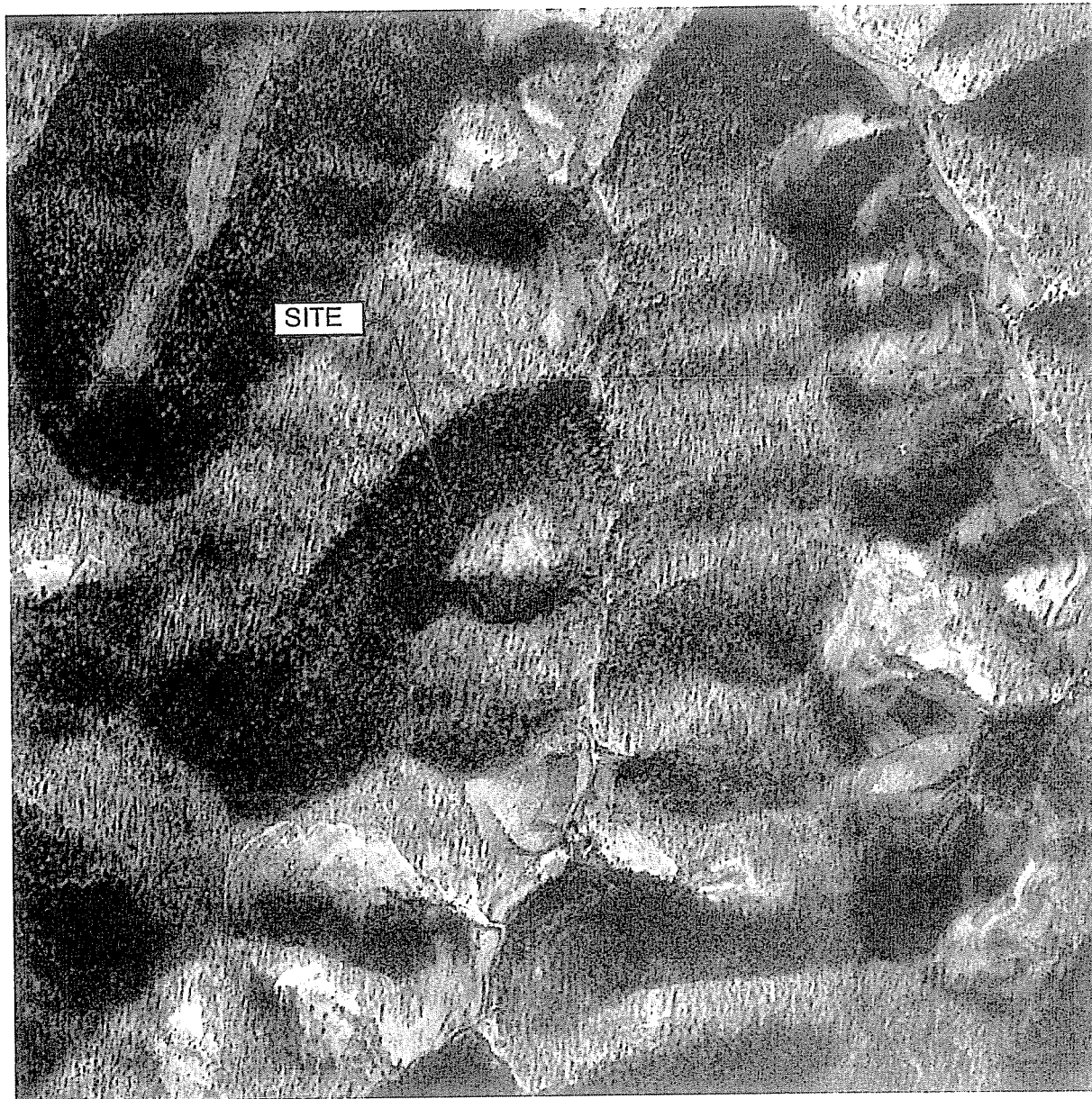


Environmental FirstSearch

Historical Aerial

1940

, HAZARD KY 41701



Source:

Target Site (Latitude: 37.376716 Longitude: -83.272582)

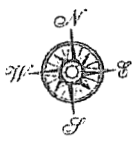
Quad Name: Haddix

Date: 1940

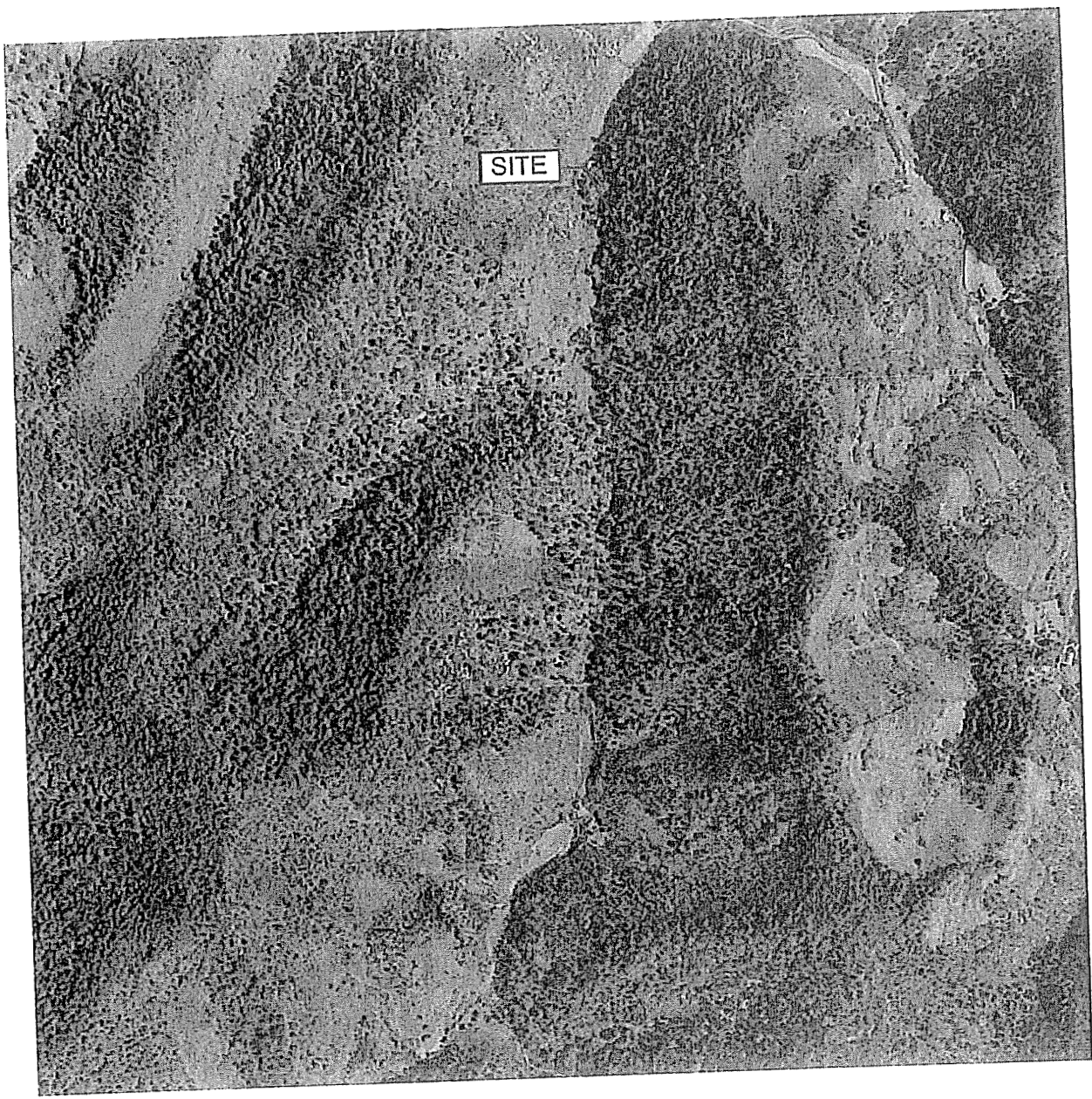
Approximate Scale: 1 inch equals 900 feet

FIGURE 4 1960 AERIAL

Source: FirstSearch



Environmental FirstSearch
Historical Aerial
1960
, HAZARD KY 41701



Source:
Target Site (Latitude: 37.376716 Longitude: -83.272582)
Quad Name: Haddix
Date: 1960

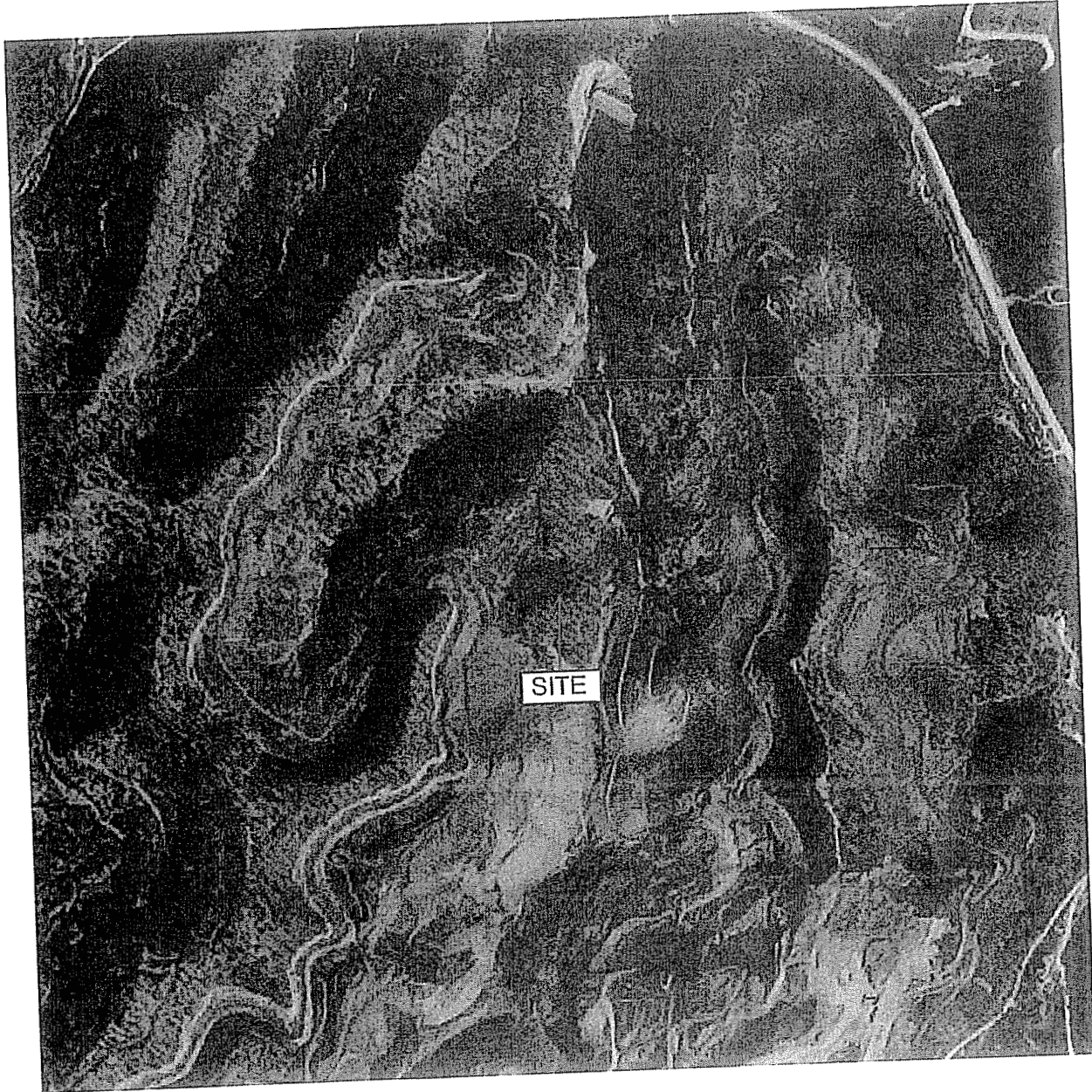
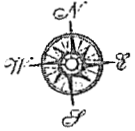
Approximate Scale: 1 inch equals 900 feet

FIGURE 5 1988 AERIAL

Source: FirstSearch



Environmental FirstSearch
Historical Aerial
1988
, HAZARD KY 41701



Source:
Target Site (Latitude: 37.376716 Longitude: -83.272582)
Quad Name: Haddix
Date: 1988

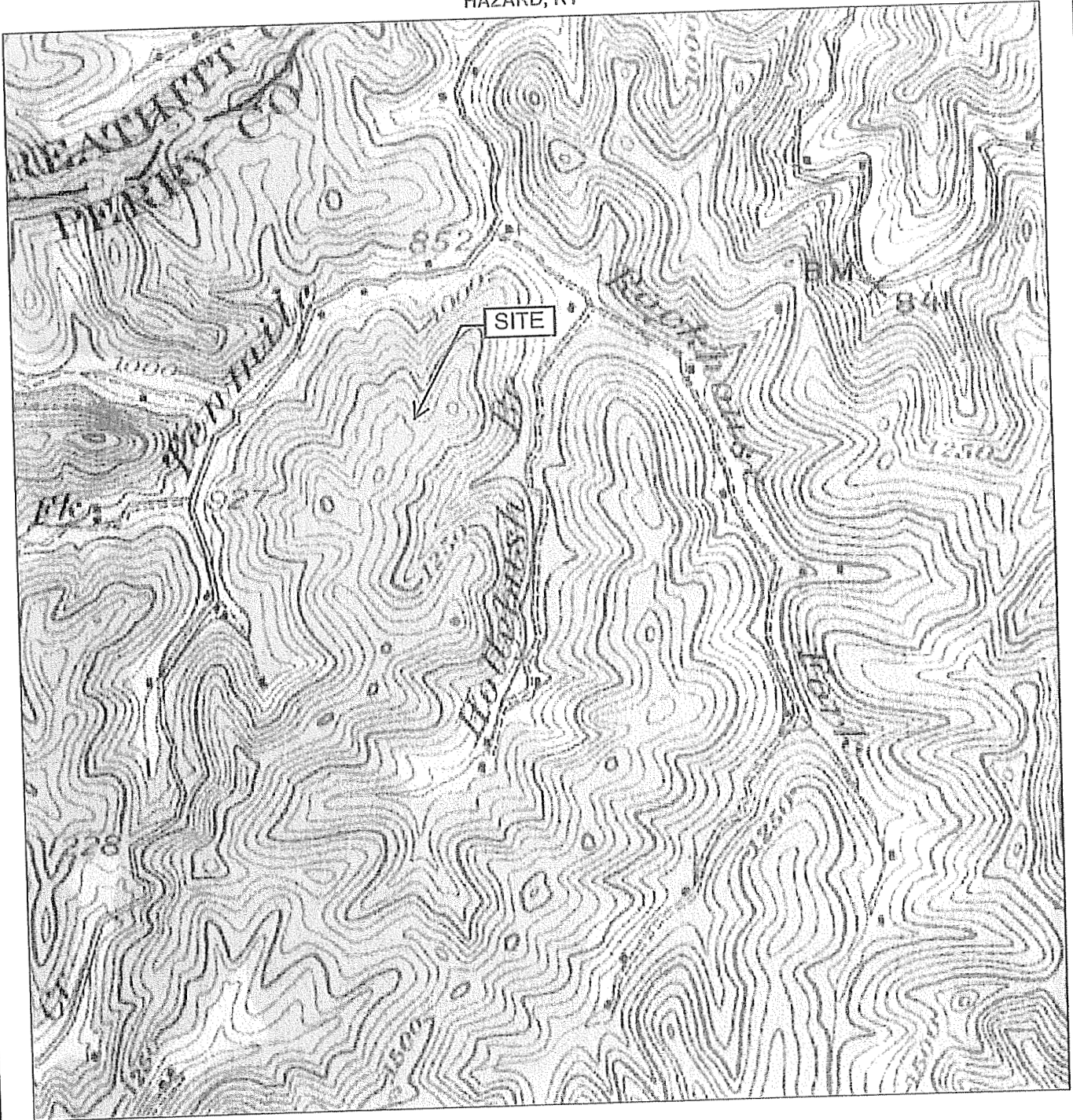
Approximate Scale: 1 inch equals 900 feet

FIGURE 6 1913 TOPOGRAPHIC MAP

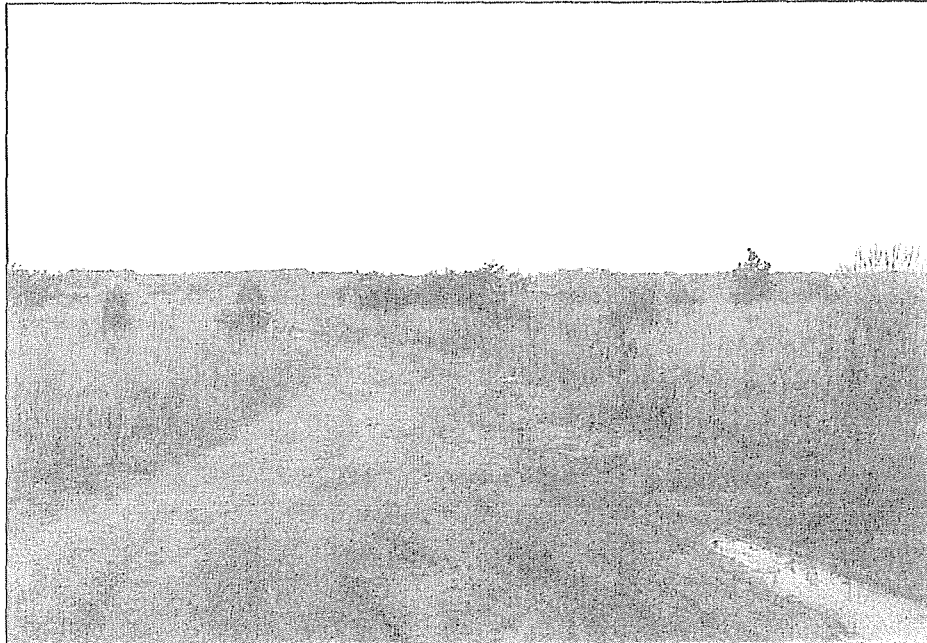
Source: FirstSearch



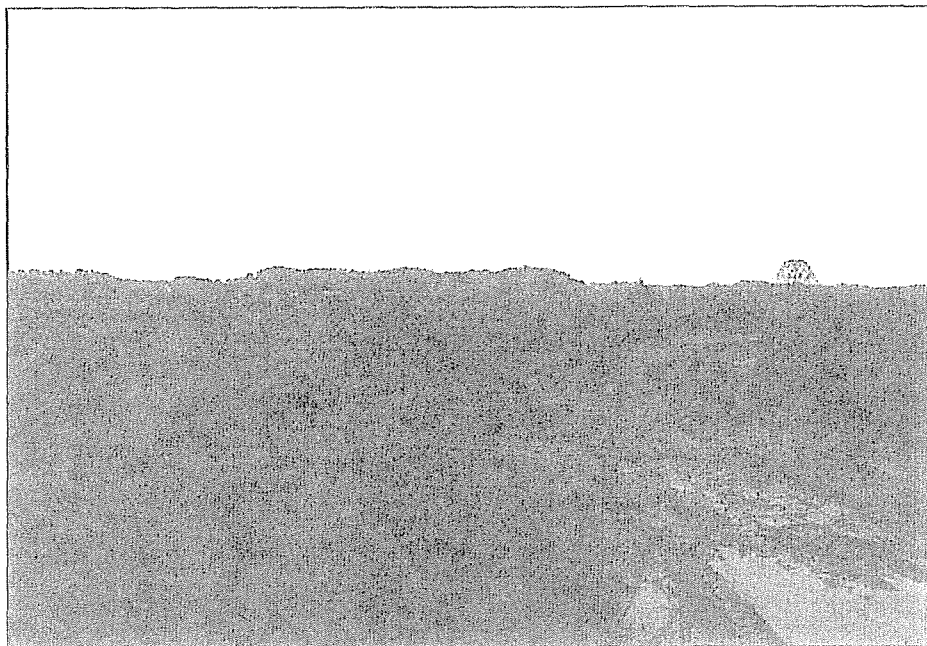
Environmental FirstSearch
Topo: Current Map 1.25 Mile Radius
Historical Topo
Quad Name: Buckhorn, KY
Year: 1913 Scale: 1: 62500
HAZARD, KY



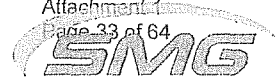
APPENDIX A



1) View from the subject site to the north. Photograph taken from the central portion of the property.



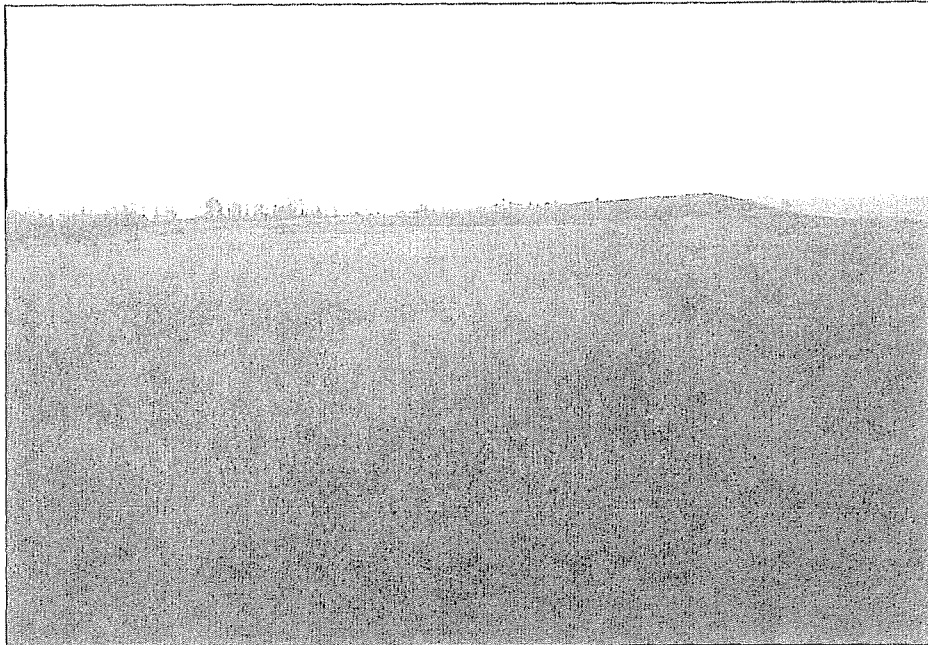
2) View from the subject site to the south. Photograph taken from the central portion of the property.



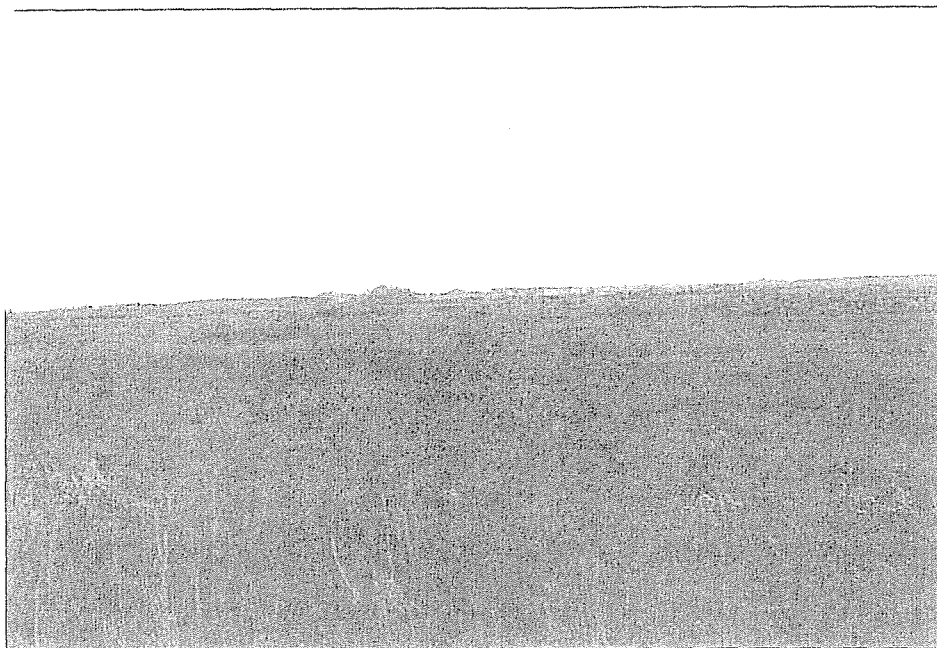
3) View from the subject site to the west. Photograph taken from the central portion of the property.



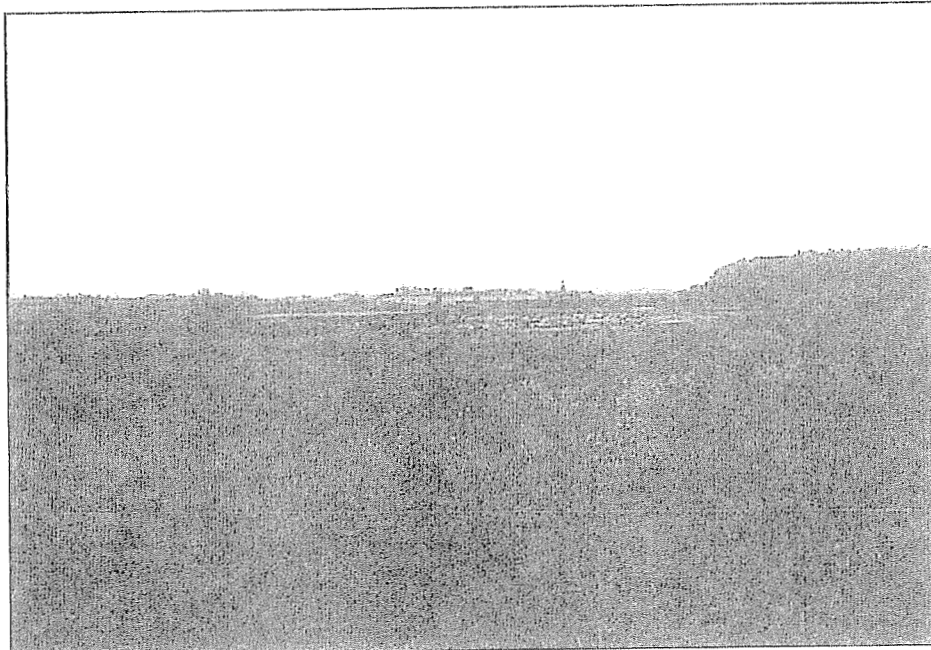
4) Photograph of mowed area on the northwest portion of the property.



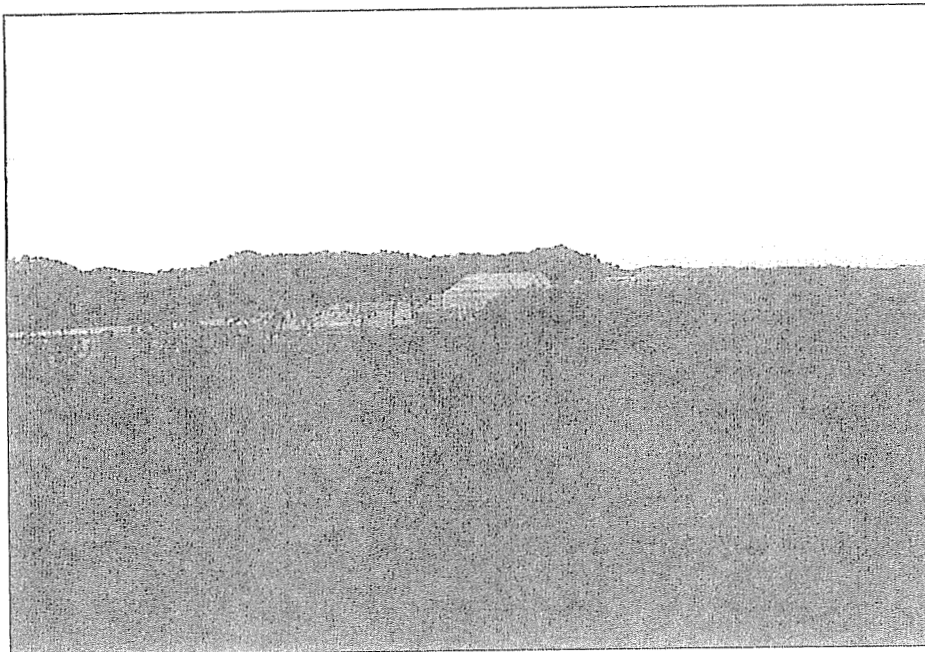
5) View of the site from the western side of the property to the east.



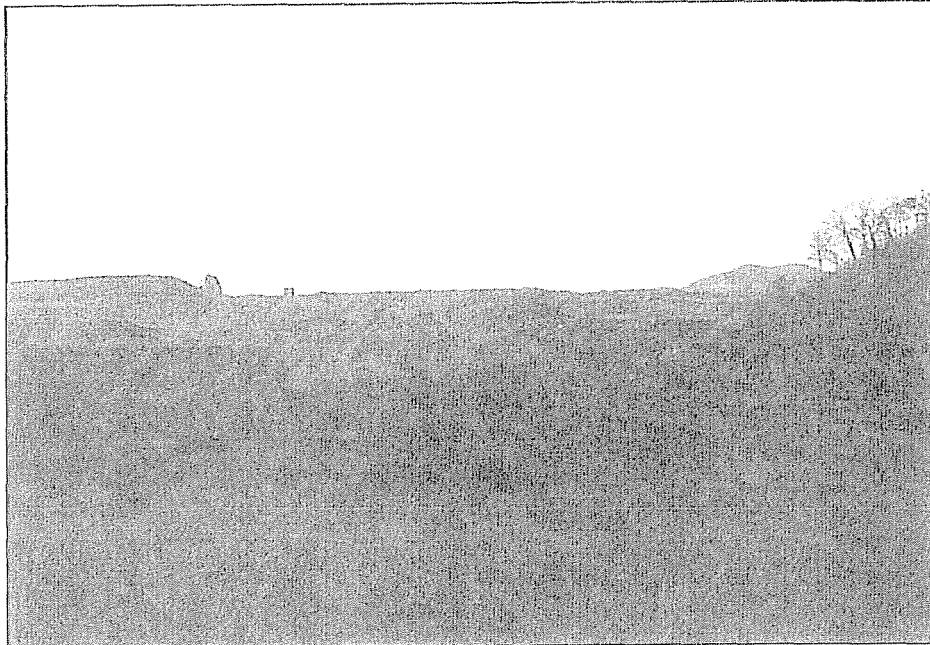
6) View of property from the southwest corner of the property to the northeast.



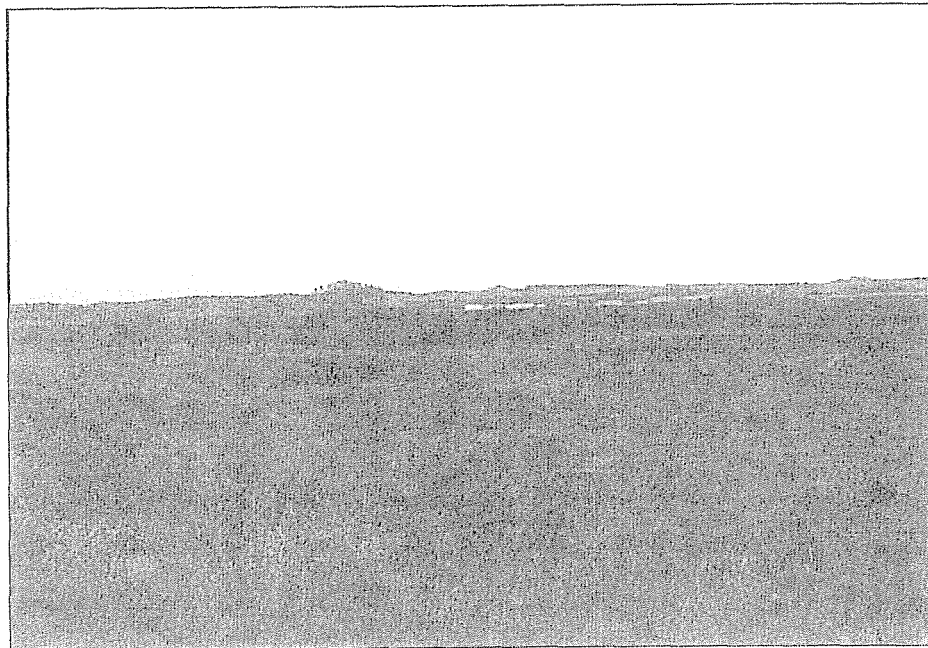
7) View of Sykes Enterprises, Inc., an adjacent property, to the south-southwest of the subject site.



8) View of Trus Joist/Weyerhaeuser facility to the south-southeast of the subject site.



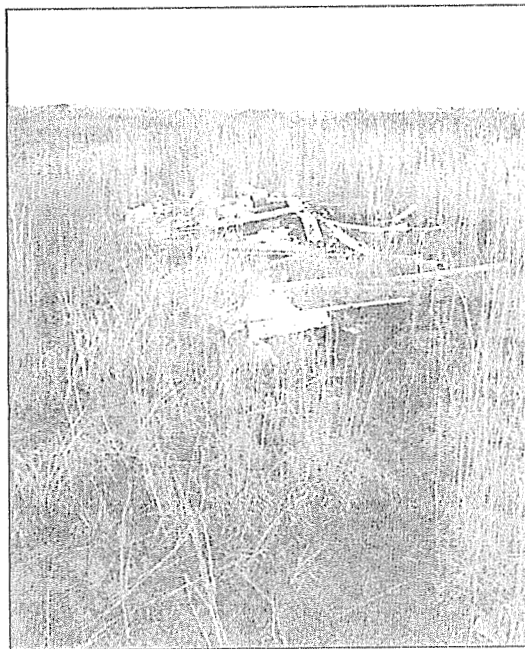
9) View of Pine Branch surface mine, an adjacent property, to the west of the subject site.



10) View of undeveloped property, adjacent to the north of the subject site, with the Wendell H Ford airport in the background.



11) Photograph of burn pile located in the central portion of the property.



12) Photograph of burn pile located in the central portion of the property.



13) Photograph of burn pile located in the central portion of the property.

APPENDIX B

FirstSearch Technology Corporation

Environmental FirstSearch™ Report

Target Property:

HAZARD KY 41701

Job Number: 2009-4752E

PREPARED FOR:

Smith Management Group, Inc

1860 B Williamson Court

Louisville, KY 40223

11-10-09



Tel: (407) 265-8900

Fax: (407) 265-8904

*Environmental FirstSearch
 Search Summary Report*

Target Site:

HAZARD KY 41701

FirstSearch Summary

Database	Sel	Updated	Radius	Site	1/8	1/4	1/2	1/2>	ZIP	TOTALS
NPL	Y	09-11-09	1.00	0	0	0	0	0	0	0
NPL Delisted	Y	09-11-09	0.50	0	0	0	0	-	0	0
CERCLIS	Y	10-01-09	0.50	0	0	0	0	-	0	0
NFRAP	Y	10-01-09	0.50	0	0	0	0	-	0	0
RCRA COR ACT	Y	10-14-09	1.00	0	0	0	0	0	0	0
RCRA TSD	Y	10-14-09	0.50	0	0	0	0	-	0	0
RCRA GEN	Y	10-14-09	0.25	0	0	0	-	-	4	4
Federal IC / EC	Y	08-06-09	0.50	0	0	0	0	-	0	0
ERNS	Y	09-13-09	0.12	0	0	-	-	-	11	11
Tribal Lands	Y	12-01-05	1.00	0	0	0	0	0	0	0
State/Tribal Sites	Y	09-15-09	1.00	0	0	0	0	0	0	0
State Spills 90	Y	NA	0.12	0	0	-	-	-	0	0
State/Tribal SWL	Y	01-01-09	0.50	0	0	0	0	-	0	0
State/Tribal LUST	Y	08-01-09	0.50	0	0	0	0	-	0	0
State/Tribal UST/AST	Y	07-28-09	0.25	0	0	0	-	-	0	0
State/Tribal EC	Y	NA	0.50	0	0	0	0	-	0	0
State/Tribal IC	Y	NA	0.25	0	0	0	-	-	0	0
State/Tribal VCP	Y	NA	0.50	0	0	0	0	-	0	0
State/Tribal Brownfields	Y	07-24-09	0.50	0	0	0	0	-	0	0
State Other	Y	01-01-07	0.25	0	0	0	-	-	0	0
- TOTALS -				0	0	0	0	0	15	15

Notice of Disclaimer

Due to the limitations, constraints, inaccuracies and incompleteness of government information and computer mapping data currently available to FirstSearch Technology Corp., certain conventions have been utilized in preparing the locations of all federal, state and local agency sites residing in FirstSearch Technology Corp.'s databases. All EPA NPL and state landfill sites are depicted by a rectangle approximating their location and size. The boundaries of the rectangles represent the eastern and western most longitudes; the northern and southern most latitudes. As such, the mapped areas may exceed the actual areas and do not represent the actual boundaries of these properties. All other sites are depicted by a point representing their approximate address location and make no attempt to represent the actual areas of the associated property. Actual boundaries and locations of individual properties can be found in the files residing at the agency responsible for such information.

Waiver of Liability

Although FirstSearch Technology Corp. uses its best efforts to research the actual location of each site, FirstSearch Technology Corp. does not and can not warrant the accuracy of these sites with regard to exact location and size. All authorized users of FirstSearch Technology Corp.'s services proceeding are signifying an understanding of FirstSearch Technology Corp.'s searching and mapping conventions, and agree to waive any and all liability claims associated with search and map results showing incomplete and or inaccurate site locations.

*Environmental FirstSearch
 Site Information Report*

Request Date: 11-10-09
 Requestor Name: Elizabeth Swasko
 Standard: AAI

Search Type: AREA
 0.25 sq mile(s)
 Job Number: 2009-4752E
 Filtered Report

Target Site:

HAZARD KY 41701

Demographics

Sites: 15	Non-Geocoded: 15	Population: NA
Radon: 0.9 PCI/L		

Site Location

	<u>Degrees (Decimal)</u>	<u>Degrees (Min/Sec)</u>	<u>UTMs</u>
Longitude:	-83.272582	-83:16:21	Easting: 298777.562
Latitude:	37.376716	37:22:36	Northing: 4138883.147
Elevation:	N/A		Zone: 17

Comment

Comment: EPG/HAZARD/KY/ESA

Additional Requests/Services

Adjacent ZIP Codes: 1 Mile(s)

Services:

ZIP Code	City Name	SF	Dist/Dir	Sel
41727	CHAVIES	KY 0.00	--	Y
41367	ROWDY	KY 0.45	NE	N

	Requested?	Date
Fire Insurance Maps	No	
Aerial Photographs	No	
Historical Topos	No	
City Directories	No	
Title Search/Env Liens	No	
Municipal Reports	No	
Online Topos	No	

*Environmental FirstSearch
 Sites Summary Report*

Target Property: HAZARD KY 41701

JOB: 2009-4752E
 EPG/HAZARD/KY/ESA

TOTAL: 15 GEOCODED: 0 NON GEOCODED: 15 SELECTED: 1

Map ID	DB Type	Site Name/ID/Status	Address	Dist/Dir	ElevDiff	Page No.
	ERNS	NORTHWEST OF HAZARD KY IN A RURAL NRC-538624/PIPELINE	BULL CREEK RD HAZARD KY	NON GC	N/A	N/A
	ERNS	NORTH MAIN ST. AT THE CITY PARK NRC-582129/FIXED	HAZARD KY	NON GC	N/A	N/A
	ERNS	LESLIE RESOURCES INC 294719/RAILROAD	LENNET TIPPLE FACILITY ROUT HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	KY/WV GAS CO 628213/FIXED FACILITY	STRAIGHT FORK OF LOTS CREEK HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	KY POWER CO 469718/HIGHWAY RELATED	HIGH ST HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	KENTUCKY/WV GAS CO 615667/PIPELINE RELATED	RTE 80, NEAR BIG CREEK HAZARD KY	NON GC	N/A	N/A
	ERNS	ABANDONED STRIP SITE, OFF OF RT 80 NRC-566905/MOBILE	UNKNOWN HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	497 GORMAN HOLLOW ROAD NRC-895100/FIXED	497 GORMAN HOLLOW RD HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	2199 MAIN STREET NRC-811670/FIXED	HAZARD KY	NON GC	N/A	N/A
	ERNS	10 MILES SOUTH OF HAZARD KY NRC-644252/FIXED	UNKNOWN HAZARD KY 41701	NON GC	N/A	N/A
	ERNS	1 MILE WEST OF HAZARD ON THE HAL R NRC-895535/MOBILE	1 W MILE OF HAZARD ON THE H HAZARD KY 41701	NON GC	N/A	N/A
	RCRAGN	VIRGIL RALEIGH TRUCKING KYR000034264/SGN	RALEIGH RD CHAVIES KY 41727	NON GC	N/A	N/A
	RCRAGN	WHAYNE SUPPLY COMPANY KYD981853153/VGN	DIABLOCK RD HAZARD KY 41701	NON GC	N/A	N/A
	RCRAGN	MIDCO KENTUCKY COMPANY KYD079666590/VGN	HIGHWAY 15 NORTH HAZARD KY 41701	NON GC	N/A	N/A
	RCRAGN	LOWES OF HAZARD 1819 KYR000048447/VGN	81 COMMERCE DR HAZARD KY 41701	NON GC	N/A	N/A

Environmental FirstSearch Descriptions

NPL: EPA NATIONAL PRIORITY LIST - The National Priorities List is a list of the worst hazardous waste sites that have been identified by Superfund. Sites are only put on the list after they have been scored using the Hazard Ranking System (HRS), and have been subjected to public comment. Any site on the NPL is eligible for cleanup using Superfund Trust money.

A Superfund site is any land in the United States that has been contaminated by hazardous waste and identified by the Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment.

FINAL - Currently on the Final NPL

PROPOSED - Proposed for NPL

NPL DELISTED: EPA NATIONAL PRIORITY LIST Subset - Database of delisted NPL sites. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425(c), sites may be deleted from the NPL where no further response is appropriate.

DELISTED - Deleted from the Final NPL

CERCLIS: EPA COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY INFORMATION SYSTEM (CERCLIS)- CERCLIS is a database of potential and confirmed hazardous waste sites at which the EPA Superfund program has some involvement. It contains sites that are either proposed to be or are on the National Priorities List (NPL) as well as sites that are in the screening and assessment phase for possible inclusion on the NPL.

PART OF NPL- Site is part of NPL site

DELETED - Deleted from the Final NPL

FINAL - Currently on the Final NPL

NOT PROPOSED - Not on the NPL

NOT VALID - Not Valid Site or Incident

PROPOSED - Proposed for NPL

REMOVED - Removed from Proposed NPL

SCAN PLAN - Pre-proposal Site

WITHDRAWN - Withdrawn

NFRAP: EPA COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY INFORMATION SYSTEM ARCHIVED SITES - database of Archive designated CERCLA sites that, to the best of EPA's knowledge, assessment has been completed and has determined no further steps will be taken to list this site on the National Priorities List (NPL). This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

NFRAP - No Further Remedial Action Plan

P - Site is part of NPL site

D - Deleted from the Final NPL

F - Currently on the Final NPL

N - Not on the NPL

O - Not Valid Site or Incident

P - Proposed for NPL

R - Removed from Proposed NPL

S - Pre-proposal Site

W - Withdrawn

RCRA COR ACT: EPA RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM SITES - Database of hazardous waste information contained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system about hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies, in turn pass on the information to regional and national EPA offices. This regulation is governed by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984.

RCRAInfo facilities that have reported violations and subject to corrective actions.

RCRA TSD: *EPA* RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM TREATMENT, STORAGE, and DISPOSAL FACILITIES. - Database of hazardous waste information contained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system about hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies, in turn pass on the information to regional and national EPA offices. This regulation is governed by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984.

Facilities that treat, store, dispose, or incinerate hazardous waste.

RCRA GEN: *EPA/MA DEP/CT DEP* RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM GENERATORS - Database of hazardous waste information contained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system about hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies, in turn pass on the information to regional and national EPA offices. This regulation is governed by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984.

Facilities that generate or transport hazardous waste or meet other RCRA requirements.

LGN - Large Quantity Generators

SGN - Small Quantity Generators

VGN - Conditionally Exempt Generator.

Included are RAATS (RCRA Administrative Action Tracking System) and CMEL (Compliance Monitoring & Enforcement List) facilities.

CONNECTICUT HAZARDOUS WASTE MANIFEST - Database of all shipments of hazardous waste within, into or from Connecticut. The data includes date of shipment, transporter and TSD info, and material shipped and quantity. This data is appended to the details of existing generator records.

MASSACHUSETTES HAZARDOUS WASTE GENERATOR - database of generators that are regulated under the MA DEP.

VQN-MA = generates less than 220 pounds or 27 gallons per month of hazardous waste or waste oil.

SQN-MA = generates 220 to 2,200 pounds or 27 to 270 gallons per month of waste oil.

LQG-MA = generates greater than 2,200 lbs of hazardous waste or waste oil per month.

Federal IC / EC: *EPA* BROWNFIELD MANAGEMENT SYSTEM (BMS) - database designed to assist EPA in collecting, tracking, and updating information, as well as reporting on the major activities and accomplishments of the various Brownfield grant Programs.

FEDERAL ENGINEERING AND INSTITUTIONAL CONTROLS- Superfund sites that have either an engineering or an institutional control. The data includes the control and the media contaminated.

ERNS: *EPA/NRC* EMERGENCY RESPONSE NOTIFICATION SYSTEM (ERNS) - Database of incidents reported to the National Response Center. These incidents include chemical spills, accidents involving chemicals (such as fires or explosions), oil spills, transportation accidents that involve oil or chemicals, releases of radioactive materials, sightings of oil sheens on bodies of water, terrorist incidents involving chemicals, incidents where illegally dumped chemicals have been found, and drills intended to prepare responders to handle these kinds of incidents. Data since January 2001 has been received from the National Response System database as the EPA no longer maintains this data.

Tribal Lands: *DOI/BIA* INDIAN LANDS OF THE UNITED STATES - Database of areas with boundaries established by treaty, statute, and (or) executive or court order, recognized by the Federal Government as territory in which American Indian tribes have primary governmental authority. The Indian Lands of the United States map layer shows areas of 640 acres or more, administered by the Bureau of Indian Affairs. Included are Federally-administered lands within a reservation which may or may not be considered part of the reservation.

BUREAU OF INDIAN AFFIARS CONTACT - Regional contact information for the Bureau of Indian Affairs offices.

State/Tribal Sites: *KYDEP* STATE LEADS LIST - database of state level cercla/superfund sites. The data includes river basin affected, contaminant and the program overseeing the site.

State/Tribal SWL: *KY DEP* PERMITTED OPERATING LANDFILLS - database of the permitted

contained landfills and the permitted construction/demolition debris landfills.

State/Tribal LUST: *KY DEP* SB 193 (SENATE BILL 193) - database of facilities eligible for reimbursement from the Petroleum Storage Tanks Environmental Assurance Fund (OPSTEAF).

State/Tribal UST/AST: *KY DEP* STATEWIDE UST LISTING - database of all registered underground storage tanks. The data includes installation date, removed date, capacity and construction information.

State/Tribal Brownfields: *KY DEP* BROWNFIELD INVENTORY - Database of verified brownfield sites. The data includes past and current use, utilities available, and owner and contact information.

RADON: *NTIS* NATIONAL RADON DATABASE - EPA radon data from 1990-1991 national radon project collected for a variety of zip codes across the United States.

State Other: *US DOJ* NATIONAL CLANDESTINE LABORATORY REGISTER - Database of addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the U.S. Department of Justice ("the Department"), and the Department has not verified the entry and does not guarantee its accuracy. All sites that are included in this data set will have an id that starts with NCLR.

Environmental FirstSearch Database Sources

NPL: *EPA* Environmental Protection Agency

Updated quarterly

NPL DELISTED: *EPA* Environmental Protection Agency

Updated quarterly

CERCLIS: *EPA* Environmental Protection Agency

Updated quarterly

NFRAP: *EPA* Environmental Protection Agency.

Updated quarterly

RCRA COR ACT: *EPA* Environmental Protection Agency.

Updated quarterly

RCRA TSD: *EPA* Environmental Protection Agency.

Updated quarterly

RCRA GEN: *EPA/MA DEP/CT DEP* Environmental Protection Agency, Massachusetts Department of Environmental Protection, Connecticut Department of Environmental Protection

Updated quarterly

Federal IC / EC: *EPA* Environmental Protection Agency

Updated quarterly

ERNS: *EPA/NRC* Environmental Protection Agency

Updated annually

Tribal Lands: *DOI/BIA* United States Department of the Interior

Updated annually

State/Tribal Sites: *KYDEP* Kentucky Department for Environmental Protection, Division of Waste Management Superfund Branch.

Updated when available

State/Tribal SWL: *KY DEP* Kentucky Department for Environmental Protection, Division of Waste Management Solid Waste Program

Updated annually

State/Tribal LUST: *KYDEP* Kentucky Department for Environmental Protection

Updated quarterly

State/Tribal UST/AST: *KYDEP* Kentucky Department for Environmental Protection

Updated quarterly

State/Tribal Brownfields: *KYDEP* Kentucky Department for Environmental Protection

Updated when available

RADON: *NTIS* Environmental Protection Agency, National Technical Information Services

Updated periodically

State Other: *US DOJ* U.S. Department of Justice

Updated when available

Environmental FirstSearch
Street Name Report for Streets within .25 Mile(s) of Target Property

Target Property: HAZARD KY 41701

JOB: 2009-4752E
EPG/HAZARD/KY/ESA

<u>Street Name</u>	<u>Dist/Dir</u>	<u>Street Name</u>	<u>Dist/Dir</u>
Brandon Ln	0.23 NE		
State Highway 15	0.25 NE		
Sykes Blvd	0.13 SE		
Tenmile Creek East C	0.23 NE		
Tenmile Creek West C	0.16 NW		
Trus Joist Ln	0.09 SE		
Upper Ten Mile Creek	0.10 NE		



HISTORICAL FIRE INSURANCE MAPS

NO MAPS AVAILABLE

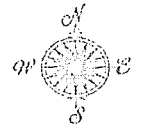
10-28-09
2009-4752E
HAZARD KY 41701

A search of FirstSearch Technology Corporation's proprietary database of historical fire insurance map availability confirmed that there are NO MAPS AVAILABLE for the Subject Location as shown above.

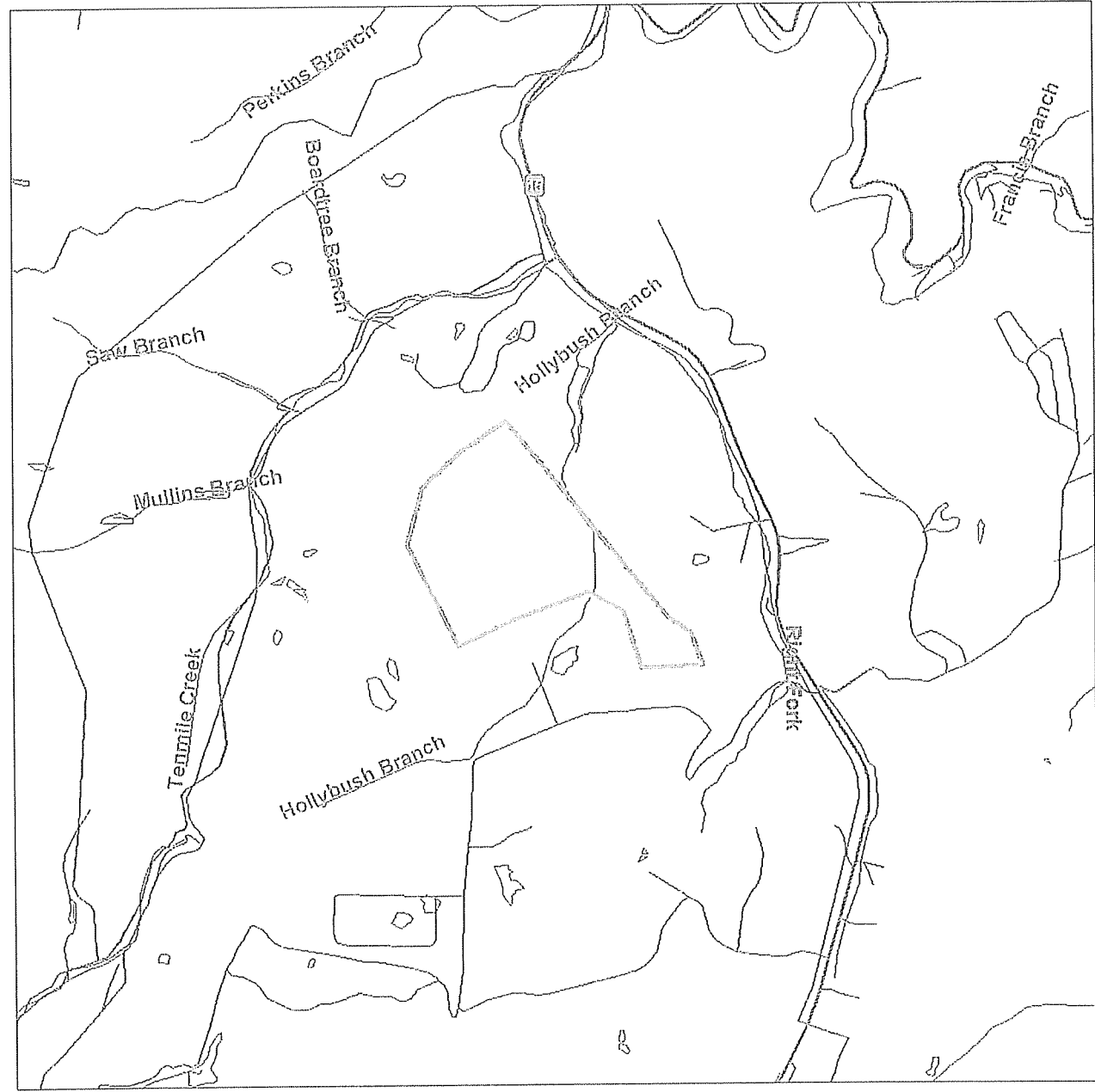
FirstSearch Technology Corporation's proprietary database of historical fire insurance map availability represents abstracted information from the Sanborn® Map Company obtained through online access to the U.S. Library of Congress via local libraries.

Copyright Policy & Disclaimer

Certain Sanborn® Fire Insurance Maps are copyrighted material and may not be reproduced without the expressed permission of the Sanborn Map Company. FirstSearch Technology Corporation warrants that it will employ its best efforts to maintain and deliver its information in an efficient and timely manner. Customer acknowledges that it understands that FirstSearch Technology Corporation obtains the above information from sources FirstSearch Technology Corporation considers reliable. However, THE WARRANTIES EXPRESSED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES, either expressed or implied, including without limitation any implied warranty of merchantability or fitness or suitability for a particular purpose (whether or not FirstSearch Technology Corporation may know, have reason to know, or have been advised of such purpose), whether arising by law or by reason of industry custom or usage. ALL SUCH OTHER WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED.

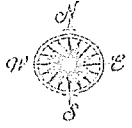


Environmental FirstSearch
 1 Mile Radius from Area
 ASTM Map: NPL, RCRACOR, STATE Sites
 , HAZARD KY 41701



Source: 2005 U.S. Census TIGER Files

Area Polygon	
Identified Site, Multiple Sites, Receptor	
NPL, DELNPL, Brownfield, Solid Waste Landfill (SWL), Hazardous Waste	
Triballand	
Railroads	



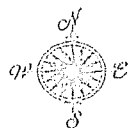
Environmental FirstSearch
 .5 Mile Radius from Area
 ASTM Map: CERCLIS, RCRATSD, LUST, SWL

, HAZARD KY 41701



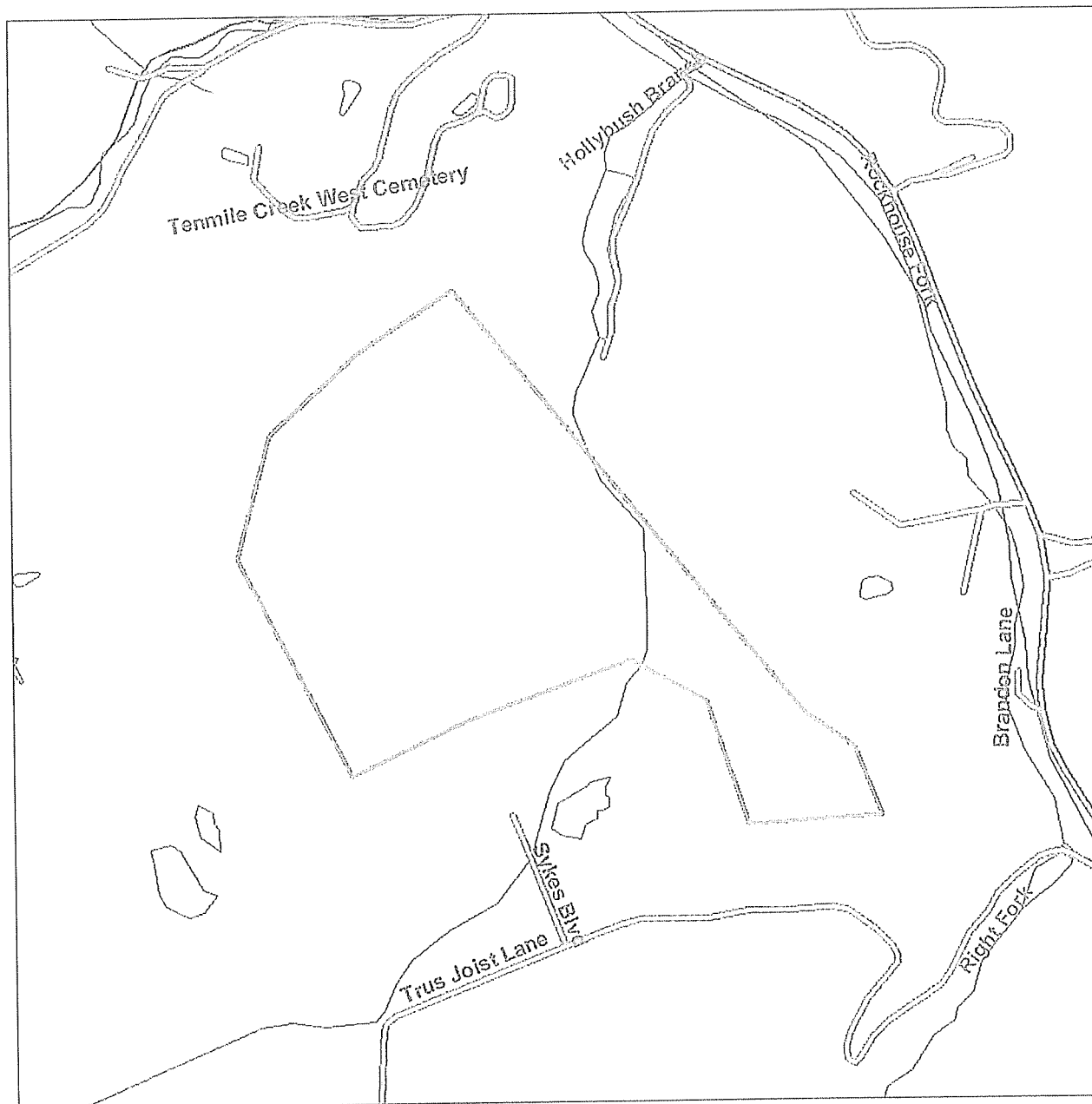
Source: 2005 U.S. Census TIGER Files

- Area Polygon
- Identified Site, Multiple Sites, Receptor
- NPL, DELNPL, Brownfield, Solid Waste Landfill (SWL), Hazardous Waste
- Triballand
- Railroads



Environmental First Search
 .25 Mile Radius from Area
 ASTM Map: RC-RAGEN, ERNS, UST

, HAZARD KY 41701



Source: 2005 U.S. Census TIGER Files

- Area Polygon
- Identified Site, Multiple Sites, Receptor
- NPL, DELNPL, Brownfield, Solid Waste Landfill (SWL), Hazardous Waste
- Triballand
- Railroads



Environmental FirstSearch
 .25 Mile Radius from Area
 Non-ASTM Map: No Sites Found
 , HAZARD KY 41704



Source: 2005 U.S. Census TIGER Files

- | | |
|--|--|
| Area Polygon | |
| Identified Site, Multiple Sites, Receptor | |
| NPL, DELNPL, Brownfield, Solid Waste Landfill (SWL), Hazardous Waste | |
| Triballand | |
| National Historic Sites and Landmark Sites | |
| Railroads | |

APPENDIX C

Liz Swasko

From: Liz Swasko [liza@smithmanage.com]
Sent: Wednesday, November 11, 2009 1:27 PM
To: 'UST.KORA@ky.gov'; 'Mary.Hawkins@ky.gov'; 'tina.fisher@ky.gov'; 'Morgan.Elliston@ky.gov'
Subject: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY
To Whom It May Concern:

Smith Management Group (SMG) is requesting to review files or records concerning the following businesses, properties, facilities and/or releases located in Chavies, Perry County, Kentucky. Specifically, I am requesting a review of files which you may have for any of the names, addresses and/or facility numbers referenced below:

Coal Fields Regional Industrial Park*, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Company
Lat: 37:22:36
Long: -83:16:21
Chavies, Perry County, Kentucky 41727

*The site is an undeveloped portion of the industrial park; the closest address is listed as Sykes Enterprises, 101 Sykes Blvd, Chavies, Perry Co, KY 41727-9100

Please inform me of the results of your review so I may schedule an appointment to review the file, if needed. If no records are found, please let me know. My contact information is provided below. Any assistance you can provide in this matter would be greatly appreciated.

Thanks!

Liz Swasko

Environmental Scientist
Smith Management Group 1860B Williamson Court
Louisville, KY 40223
(502) 587-6482 x 209

11/18/2009

Liz Swasko

From: Murphy, Darlene (EEC) [Darlene.Murphy@ky.gov] on behalf of EEC DEP UST KORA [UST.KORA@ky.gov]
Sent: Monday, November 16, 2009 9:51 AM
To: Liz Swasko
Subject: RE: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

I conducted a UST records search specifically for:

Coal Fields Regional Industrial Park, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Co, Chavies, Perry Co KY. I did not find any UST records for this specific information.

Regards,

Darlene Murphy

Underground Storage Tank Branch
200 Fair Oaks Lane, 1st Floor
Frankfort, KY 40601
Phone: 502-564-5981, ext 4564
Fax: (502)-564-9232
Email: ust.kora@ky.gov
Website: www.waste.ky.gov/branches/ust

From: Liz Swasko [mailto:lizs@smithmanage.com]
Sent: Wednesday, November 11, 2009 1:27 PM
To: EEC DEP UST KORA; Hawkins, Mary (EEC); Fisher, Tina (EEC); Elliston, Morgan (EEC)
Subject: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

To Whom It May Concern:

Smith Management Group (SMG) is requesting to review files or records concerning the following businesses, properties, facilities and/or releases located in *Chavies, Perry County, Kentucky*. Specifically, I am requesting a review of files which you may have for any of the names, addresses and/or facility numbers referenced below:

Coal Fields Regional Industrial Park*, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Company
Lat: 37:22:36
Long: -83:16:21
Chavies, Perry County, Kentucky 41727

*The site is an undeveloped portion of the industrial park; the closest address is listed as Sykes Enterprises, 101 Sykes Blvd, Chavies, Perry Co, KY 41727-9100

Please inform me of the results of your review so I may schedule an appointment to review the file, if needed. If no records are found, please let me know. My contact information is provided below. Any assistance you can provide in this matter would be greatly appreciated.

Thanks!

Liz Swasko

Environmental Scientist
Smith Management Group 1860B Williamson Court
Louisville, KY 40223
(502) 587-6482 x 209

11/18/2009

Liz Swasko

From: Hawkins, Mary (EEC) [Mary.Hawkins@ky.gov]
Sent: Monday, November 16, 2009 9:25 AM
To: Liz Swasko
Subject: RE: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY
The only thing I have on this request is Trus Joist. Are you interested in their files?

From: Liz Swasko [mailto:liz@smithmanage.com]
Sent: Wednesday, November 11, 2009 1:27 PM
To: EEC DEP UST KORA; Hawkins, Mary (EEC); Fisher, Tina (EEC); Elliston, Morgan (EEC)
Subject: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

To Whom It May Concern:

Smith Management Group (SMG) is requesting to review files or records concerning the following businesses, properties, facilities and/or releases located in **Chavies, Perry County, Kentucky**. Specifically, I am requesting a review of files which you may have for any of the names, addresses and/or facility numbers referenced below:

Coal Fields Regional Industrial Park*, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Company
Lat: 37.22:36
Long: -83:16:21
Chavies, Perry County, Kentucky 41727

*The site is an undeveloped portion of the industrial park; the closest address is listed as Sykes Enterprises, 101 Sykes Blvd, Chavies, Perry Co, KY 41727-9100

Please inform me of the results of your review so I may schedule an appointment to review the file, if needed. If no records are found, please let me know. My contact information is provided below. Any assistance you can provide in this matter would be greatly appreciated.

Thanks!

Liz Swasko

Environmental Scientist
Smith Management Group 1860B Williamson Court
Louisville, KY 40223
(502) 587-6482 x 209

11/18/2009

Liz Swasko

From: Fisher, Tina (EEC) [Tina.Fisher@ky.gov]
Sent: Monday, November 16, 2009 10:40 AM
To: Liz Swasko
Subject: RE: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

Ms. Swasko,

A search has been done in the DWM file room and no files have been found for the facility names / address listed below.

Tina

From: Liz Swasko [mailto:lizs@smithmanage.com]
Sent: Wednesday, November 11, 2009 1:27 PM
To: EEC DEP UST KORA; Hawkins, Mary (EEC); Fisher, Tina (EEC); Elliston, Morgan (EEC)
Subject: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

To Whom It May Concern:

Smith Management Group (SMG) is requesting to review files or records concerning the following businesses, properties, facilities and/or releases located in Chavies, Perry County, Kentucky. Specifically, I am requesting a review of files which you may have for any of the names, addresses and/or facility numbers referenced below:

Coal Fields Regional Industrial Park*, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Company
Lat: 37:22:36
Long: -83:16:21
Chavies, Perry County, Kentucky 41727

*The site is an undeveloped portion of the industrial park; the closest address is listed as Sykes Enterprises, 101 Sykes Blvd, Chavies, Perry Co, KY 41727-9100

Please inform me of the results of your review so I may schedule an appointment to review the file, if needed. If no records are found, please let me know. My contact information is provided below. Any assistance you can provide in this matter would be greatly appreciated.

Thanks!

Liz Swasko

Environmental Scientist
Smith Management Group 1860B Williamson Court
Louisville, KY 40223
(502) 587-6482 x 209

11/18/2009

Liz Swasko

From: Elliston, Morgan (EEC) [Morgan.Elliston@ky.gov]
Sent: Thursday, November 12, 2009 8:31 AM
To: Liz Swasko
Subject: RE: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY
Attachments: AI3457 06-26-2006 INSPTN 06177DEPC007050.pdf; AI3457 06-26-2006 INSPTN 06177DEPC007052.pdf; AI3457 06-26-2006 INSPTN 06177DEPC007055.pdf; AI3457 06-26-2006 INSPTN 06177DEPC007058.pdf; AI3457 08-05-2005 INSPTN 05220DEPA672369.pdf; AI3457 12-10-2008 ARNAPR 09016DEPC615111.pdf; DOWSW061305.pdf; TF146724.pdf

Ms. Swasko,

The Division of Water has NO files for the following in Chavies, Perry County, Kentucky:

- Coal Fields Regional Industrial Park
- Sykes Enterprises
- Weyerhaeuser Company
- Sykes Enterprises, 101 Skykes Blvd., Chavies, Perry Co, KY 41727-9100

However, the Division of Water has files for the following:

Trus Joist (AI 3457)
610 Trus Joist Ln
Chavies, (Perry), KY 41727

I have attached all files that are in the database. There may be some additional hard copy documents that are not in the database. If interested in those, you will need to set up a file review or I can make copies for you (\$0.10 each + shipping).

Thank you,

Morgan P. Elliston

KY Division of Water
200 Fair Oaks Lane
Frankfort, KY 40601
Phone: 502-564-3410 ext. 4571
Fax: 502-564-9232

From: Liz Swasko [mailto:lizs@smithmanage.com]
Sent: Wednesday, November 11, 2009 1:27 PM
To: EEC DEP UST KORA; Hawkins, Mary (EEC); Fisher, Tina (EEC); Elliston, Morgan (EEC)
Subject: Open Records Request for Coal Fields Regional Industrial Park, Perry Co., KY

To Whom It May Concern:

Smith Management Group (SMG) is requesting to review files or records concerning the following businesses, properties, facilities and/or releases located in **Chavies, Perry County, Kentucky**. Specifically, I am requesting a review of files which you may have for any of the names, addresses and/or facility numbers referenced below:

Coal Fields Regional Industrial Park*, Sykes Enterprises, Trus Joist and/or Weyerhaeuser Company
Lat: 37:22:36
Long: -83:16:21
Chavies, Perry County, Kentucky 41727

*The site is an undeveloped portion of the industrial park; the closest address is listed as Sykes Enterprises, 101 Sykes Blvd, Chavies, Perry Co, KY 41727-9100

Please inform me of the results of your review so I may schedule an appointment to review the file, if needed. If no records are found, please let me know. My contact information is provided below. Any assistance you can provide in this matter would be greatly appreciated.

11/18/2009

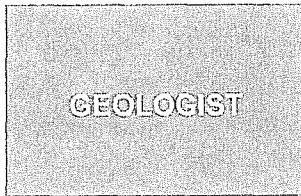
Thanks!

Liz Swasko

Environmental Scientist
Smith Management Group 1860B Williamson Court
Louisville, KY 40223
(502) 587-6482 x 209

APPENDIX D

ELIZABETH C. SWASKO



Education & Certification

B.A., Geology,
Wittenberg
University

Certified 40-hr
Hazardous Waste
Site Worker

Certified Asbestos
Inspector:
Kentucky
Indiana
Virginia

Qualified as an
Environmental
Professional
under AAI (ASTM
1527E-05)

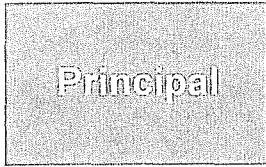
Elizabeth Swasko has experience in numerous areas, but her primary focus has been hazardous site supervision and remediation. She has participated in landfill closures and field activities associated with RCRA facility investigations and quarterly groundwater monitoring events. Ms. Swasko has overseen groundwater monitoring well installations, as well as conducted Phase I and II site assessments. She has also performed the primary air monitoring on several asbestos investigation sites, where she was responsible for documenting asbestos levels with air pumps during the abatement process. She is very familiar with the federal regulations regarding asbestos and asbestos removal. Ms. Swasko qualifies as an Environmental Professional under the All Appropriate Inquiry regulations.

Professional Experience

- Conducted numerous Phase I site assessments and NEPA reviews for telecommunications towers in KY, IN, OH, IL, VA, WV, NC and TN in accordance with ASTM 1527-00, ASTM 1527-05 and ASTM 1527E-05.
- Conducted Phase I site assessments for various manufacturing facilities complying with ASTM 1527-00, ASTM 1527-05 and ASTM 1527E-05.
- Provided technical oversight on a remediation project where excavation of soils was utilized to remove contamination of selected metals, SVOCs, PAHs and PCBs. Conducted soil sampling of walls and floor of excavated areas to delineate if additional soils needed to be removed.
- Oversaw and coordinated project where chlorinated solvents were reduced via injection of an oxidizing agent while working within the confines of a small space that was utilized by delivery trucks, personal vehicles and foot traffic to and from the businesses. Maintained a working relationship with the businesses to ensure the safety of all personnel.
- Participated in the performance of a long term groundwater monitoring program for large scale manufacturing firm to meet RCRA Part B Closure/Post Closure permit requirements. Oversaw the installation of a groundwater collection trench and soil blending to reduce the concentration of chlorinated solvents via bioremediation. Conducted groundwater sampling and compiled and compared data in quarterly & semi-annual reports.
- Has overseen large-scale abatement and air monitoring for asbestos projects and performed asbestos assessments for local post offices, manufacturing facilities and commercial buildings.
- Work with various manufacturing facilities through the performance of chemical exposure assessments and noise monitoring to ensure occupational exposures are compliant with OSHA and ACGIH standards.



SARA G. SMITH



Sara Smith is the President of Smith Management Group. She analyzes project risk management, provides ongoing analysis of legal developments in the environmental arena and directs interpretation of environmental regulations. Ms. Smith provides consulting services to SMG clients with regard to project development, regulatory issues and interface with agencies.

Education

J.D. with Highest Distinction, University of Kentucky College of Law

B.A., American Studies, Temple University, Summa Cum Laude

Professional Certifications

Admitted to Kentucky Bar

Certified Mediator

Ms. Smith received the first legal fellowship granted by the Institute for Mining and Minerals Research under Title III of the Federal Surface Mining and Reclamation Act. Prior to her legal practice, Ms. Smith worked as a title abstractor for an oil & gas exploration and development company and as a surveyor. Ms. Smith has developed experience as a transactional attorney, a certified mediator and as the senior manager for Smith Management Group.

Experience

- Principal responsible for development of Kentucky's Energy Project Site Bank for renewable, nuclear and coal gasification energy.
- Assists clients with compliance with environmental, health & safety issues and regulations; Review of environmental reports and plans for legal implications
- Environmental Consultants Advisory Board, DPIC (Chairman of Education Committee) 1994-2002
- Organizer and facilitator for Kentucky's Workgroup on Legal Issues of Carbon Sequestration
- Advisory Board, Center for Applied Energy Research, University of Kentucky, 2009-
- Attorney for seven years for corporate, banking, licensing and environmental issues at Kentucky's largest legal firm

Selected Publications/Presentations

"Utah International, Inc. v. Watt: Adjudicative or Legislative Hearing", Kentucky Law Journal, Volume 72, Number 1, 1983-84.

"Implied and Conditional Consent in the Sale of Horse Shares or Seasons", Kentucky Law Journal, Volume 74, Number 4, 1985-86

Legal and Technical Ramifications of Environmental Data Collection
National Symposium on Surface Mining Hydrology, Sedimentology and Reclamation, December 1984.

"How EPA's Toxic Release Inventory Regulations and ISO 14000 Certification Affect Coal Mining", 1997, 10th Annual Professional Engineers In Mining Seminar



Kentucky Power Company

REQUEST

Refer to Mr. Godfrey's Testimony, page 7. Provide a copy of the engineering, procurement and construction (EPC) proposal for the ecoPower project.

RESPONSE

Please see KIUC 1-24 CONFIDENTIAL Attachment 1 and KIUC 1-43 CONFIDENTIAL Attachment 1 for the requested information. Confidential treatment is being sought for KIUC 1-43 Attachment 1 in entirety.

WITNESS: Jay F Godfrey

CONFIDENTIAL

Firm Price Proposal P-012754

to

Stone and Webster, Inc (a Shaw Group company)

for

**New Biomass Boiler Island Project
Hazard, Kentucky**

in response to

Shaw Group Request for Proposal 311304-S-M-0001

submitted by



JUNE 8, 2011

Revision 1

This document is the property of Babcock & Wilcox Power Generation Group, Inc. (B&W) and is "CONFIDENTIAL AND PROPRIETARY" to B&W. Recipient and/or its representatives have, by receiving same, agreed to maintain its confidentiality and shall not reproduce, copy, disclose or disseminate the contents, in whole or in part, to any person or entity other than the Recipient and/or Recipient's representatives without the prior written consent of B&W.



DISCLAIMER FOR USE OF THIRD PARTY INFORMATION

In submission of this Proposal, B&W has assumed that you have the right to provide, use, copy and distribute all drawings and other documents received by B&W from you either with the Request for Proposal or after the award of the contract and that B&W's use of such drawings and other documents in preparing its Proposal or completing the contract does not and will not violate the intellectual property rights of any third party.

Your acceptance of B&W's submission of this Proposal indicates your concurrence with an affirmation of the above statement.

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No.P012754
 May 11, 2011

ALTERATION PAGE

	Section
Updated cover page with current information.....	Front Cover
Included Alteration Page..... Page ALT-1	Alterations
Updated Table of Contents – Removed all of section 5..... Page TC-1	Table of Contents
Removed ecoPower references from Introduction..... Page 1-1	1
Removed ecoPower reference from Selective Catalytic NOx Reduction..... Page 2A-9	2A
Updated Aqueous (19%) Ammonia System..... Page 2A-11	2A
Updated Dry Sorbent Injection System..... Page 2A-13	2A
Removed ecoPower reference from Training..... Page 2B-3	2B
Updated Division of Responsibilities..... Page 2C-1	2C
Updated Basis of Design – numbers 1, 3, and 17..... Page 2E-1 thru 2E-2	2E
Updated Equipment Data Sheets - Fans..... Page 2F-2	2F
Updated Predicted Performance Data Sheet..... Page 2G-1 thru 2G-2	2G
Updated Performance Guarantees – numbers 1, 2, 2.1, 2.2, 2.3, 3, 3.1, 3.2, 3.4, 3.5..... Page 2H-1 thru 2H-2	2H
Updated Performance Conditions – numbers 3 and 9..... Page 2I-3 and Page 2I-5	2I
Updated Table 1 – Design Basis Performance Summary..... Page 2I-7	2I

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Removed ecoPower reference from Project Organization	3A
Page 3A-2	
Removed ecoPower reference from Preliminary Project Schedule	3B
Page 3B-1	
Updated Preliminary Proposal Schedule	3B
Page 3B-3	
Removed ecoPower reference from Project Execution Plans	3C
Page 3C-1 thru 3C-4	
Removed ecoPower reference Quality Assurance Program	3D
Page 3D-1	
Updated Quality Assurance Certificates	3D
Pages 3D2 thru 3D-4	
Updated dates and pricing information	4A
Paged 4A-1	
Inserted Updated Commercial Fill-In Data Form and Request for Inquiry Package	4A
Page 4A-2 thru 4A-6	
Updated dates on the Limited Notice to Proceed Portion and Full Contract Release Portion	4B
Page 4B-1	
Removed all of Section 5 – Terms and Conditions for Base Offering with Deviation Register	5
Page 5, 5A, and 5B	
Updated Schematic Flow Diagram	Appendices
Appendix C	

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TABLE OF CONTENTS

Introduction	1
Technical Proposal	2
Equipment Description – BFB Boiler	2A
Scope of Supply- BFB Boiler & Equipment	2B
Division of Responsibilities	2C
Terminal Points	2D
Basis of Design	2E
Equipment Data Sheets	2F
Predicted Performance	2G
Performance Guarantees	2H
Conditions of Performance Guarantees	2I
Project Execution	3
Project Organization	3A
Preliminary Project Schedule	3B
Project Execution Plans	3C
Quality Assurance Program	3D
Safety	3E
Commercial Proposal	4
Base Price	4A
Terms of Payment	4B
Service Engineer Per Diem Rate Sheet	4C
Appendices	Appendix
Appendix A – Proposed Arrangement Drawings	
Appendix B – Field Weld Drawing	
Appendix C – Process Flow Diagram	
Appendix D – P&ID's	
Appendix E – BFB Experience List	

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

1. INTRODUCTION

The following material supply Proposal, P012754, is being submitted to Stone and Webster, Inc (a Shaw Group company). The Proposal is inclusive of select material for a biomass bubbling fluidized boiler and environmental equipment to be installed at the ecoPower facility near Coal Fields Road, Hazard Kentucky.

This Proposal is being submitted by Babcock & Wilcox Power Generation Group (B&W) which has their home office in Barberton, Ohio. B&W is a full scope supplier of steam generation equipment and accessories to the Energy Industry. B&W has over 140 years of experience in the supply of materials and highly engineered products as well as current state of the art technology.

B&W wishes to thank Stone and Webster, Inc (a Shaw Group company) for the opportunity to be an integral supplier in the success of the renewable energy facility.

Points of contact for questions and/or additional information are as follows:

Proposal No.: P012754
Proposal Date: May 11, 2011

B&W SALES

Greg Leibel
B&W Sales Engineer
212 S. Tryon St
Suite 400
Charlotte, NC 28281
(704)-334-4742
geleibel@babcock.com

B&W PROPOSAL MANAGEMENT

Randy Lombardi
20 S. Van Buren Avenue
Barberton, OH 44203
(330) 860-2028
rlombardi@babcock.com

Phil M^cKenzie
20 S. Van Buren Avenue
Barberton, OH 44203
(330) 860-1074
pamckenzie@babcock.com

The scope of supply, pricing and terms proposed are as stated in this Proposal.

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No.P012754
May 11, 2011

2. TECHNICAL PROPOSAL

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No. P012754
May 11, 2011

2A. EQUIPMENT DESCRIPTION -- BFB BOILER

Furnace and Fluid Bed Bottom

To assist with this discussion, arrangement drawings and P&ID schematics have been included in the Appendices.

BFB Operating Philosophy

Control of bed temperature and bed velocity is a primary control strategy in bubbling fluidized bed combustion. With the bed material *adequately fluidized (inventory) at the proper bed temperature of 1300F to 1600F*, fuel can be introduced into the bed. The hot bed material is equivalent to an ignitor on a burner. The measurement of proper bed inventory and proper bed temperature is equivalent to the flame scanner. In the same way a scanner will trip a burner when no flame is ignited, a bubbling fluidized bed will initiate a main fuel trip on low bed temperature and/or bed inventory.

Proper bed fluidization is obtained over a fixed bed velocity range. For a wide range of fuel moisture, the bed area is set for the highest moisture, which for a fixed area, corresponds to the highest bed velocity.

Bed temperature is largely determined by the as-fired heating value of the fuel, and the bed stoichiometry. The drier the fuel, the higher the uncontrolled bed temperature, while high moisture fuels decrease the bed temperature. A reduction or an increase of air flow to the bed can be used to control bed temperature within the desired range.

Bed temperature can also be reduced by adding flue gas recirculation (FGR) into the bed. As fuel moisture increases, the FGR will reduce and eventually shut off. With even higher moistures, uncontrolled bed temperatures would tend to drop. In this case, airflow to the bed is increased, resulting in more bed combustion, less freeboard combustion, and a corresponding rise in bed temperature to the control point. The combination of bed stoichiometry adjustment

and FGR allows a full range of fuel moistures to be fired while still achieving the desired steaming rate.

Fluidized Bed

The fluid bed bottom is an open hopper design which has been demonstrated to be successful in removing large quantities of rocks and tramp material which enters with the fuel. There will be six hoppers arranged in a 2 wide x 3 deep pattern. Large diameter under bed fluidizing air ducts supply air to the bubble caps to fluidize the bed. The bubble caps are arranged on a staggered matrix. Each bubble cap is fabricated from stainless steel material and is welded to the fluidizing air pipes.

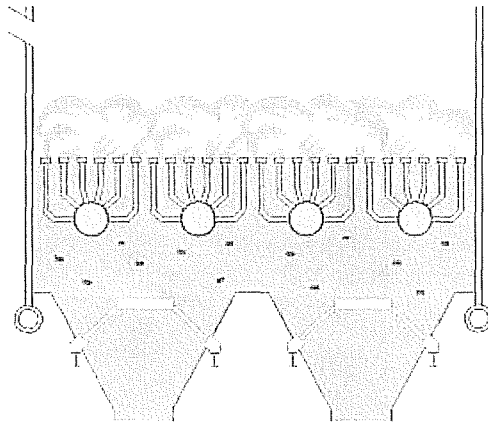


Bed hopper modules reduce erection time

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky

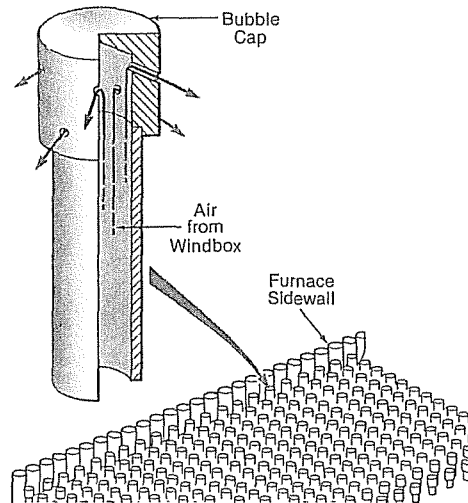


Proposal No. P012754
May 11, 2011



B&W's fluid bed design ensures even distribution of fuel and air resulting in improved combustion

The bubble caps are mounted on air pipes, and the air pipes are spaced to allow draining capability from the entire bed area. A double disc valve at the bottom of the sand hoppers regulates the flow. The top valve, a manual slide gate, is normally left open, and used only to isolate the bed recycle system during maintenance. The bottom valve, a double disc type, is pneumatically operated and opened intermittently to remove the bed material. Because the tramp material, primarily rock, is removed from the open design hoppers, high flow rates are not required and the drain rate is significantly lower than for a flat-membrane floor arrangement.



B&W's bubble cap provides for an extended service life free from plugging

The spent bed materials are removed on an intermittent, batch basis. This provides the flexibility of purging only the minimum required material and reducing sand make-up requirements. Tramp material and clinkers which may collect in the bed, progressively move below the bubble caps, eliminating the risk of de-fluidizing the bed and affecting combustion. Residence time in the hoppers below the bubble caps is sufficient to allow the contents to cool prior to removal, thereby eliminating the cost and maintenance of water-cooled ash removal. Furnace hoppers are constructed from carbon steel plate, suitably stiffened.

Bed Material Handling System

The bed material handling system is designed to take the material that is drained from the bed and separate reusable material from the clinkers and tramp material. The reusable material is recycled back into the furnace, and the tramp material is separated by a screen and deposited into a waste bin.

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky

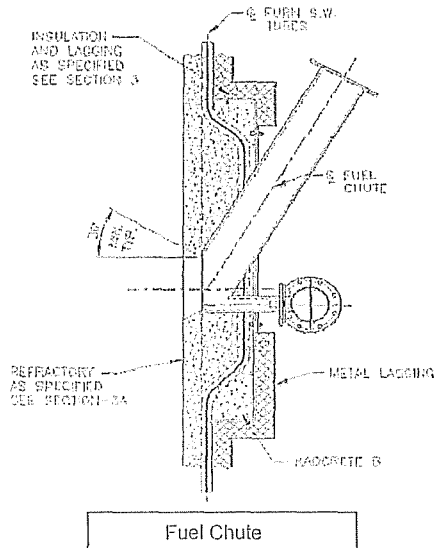


Proposal No P012754
 May 11, 2011

The bed material system consists of two hopper conveyors, one transfer vibrating conveyor and one bucket elevator. Bed material leaving the bed hoppers will drop onto the hopper conveyors which transports the material to the main transfer conveyor where the reusable material gets separated from the waste material. The usable material empties into a bucket elevator which transports the usable material to a chute where it is gravity fed back into the boiler.

Fuel Feed System

Two live-bottom type fuel storage bins, designed for 30 minutes of fuel storage capacity in the event of a conveyor shutdown, will be located inside the boiler structural steel. The fuel will be metered from the bins via a set of rotary screws. Fuel will be introduced to the bed through six B&W designed fuel chutes. These chutes will use air as the transport medium. The fuel chutes are located on the left-hand side wall for single side fuel feed. Back-draft dampers in the fuel chutes will prevent against fire in the chutes from the lower furnace combustion process.



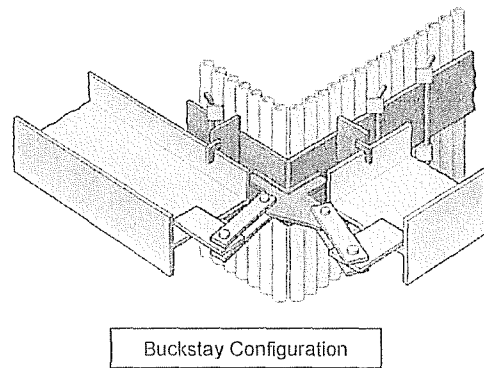
Start-up Burners

Four start-up burners are provided to heat the bed from a cold condition to normal bed operating temperature. Each burner is rated at 40 million Btu/hr heat input on propane gas. The burners are retractable and incorporate an HEI spark ignition system with an independently retractable spark rod which ensures longer service life. Two air cylinders are used to position the retractable assemblies. The burner assembly consists of a burner sleeve, air cylinders, combustion air inlet pipe, fuel element, swirler assembly, and spark ignition system. Combustion air ducting, control dampers and air measurement devices have been included.

Estimated start-up duration for cold start with the propane gas burners is 10-16 hours.

Furnace

The unit is a single drum, B&W Stirling type boiler of a well proven design. The furnace will utilize a full-membrane construction to provide a completely welded, gas tight enclosure, stiffened by buckstays, and covered by insulation and external lagging.



The lower furnace will be refractory lined to control bed temperature and protect the lower waterwalls. The refractory will extend up to

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

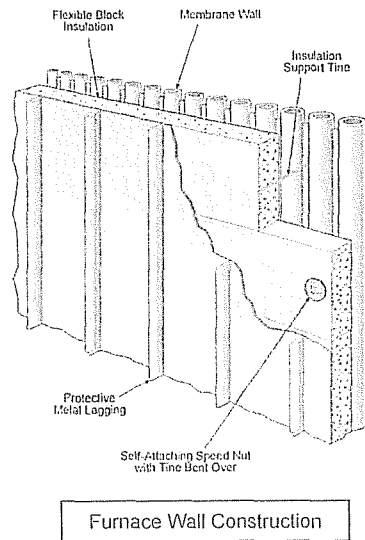
approximately 1 foot above the lower overfire air port elevation.

The furnace panels will include lower furnace wall headers. The headers are provided with welded hand-hole fittings for inspection purposes.

A system of multiple feed tubes supplies the water to the lower wall headers from the downcomers. The saturated steam/water mixture generated within the furnace walls is directed to the steam drum through a collection of riser tubes from the upper furnace wall headers.

In the contract phase, a complete circulation review will be performed to determine the size and quantity of supplies and risers for each of the furnace circuits to ensure adequate flow within the furnace at the maximum continuous rated (MCR) steam capacity.

During the manufacture of the wall panels, openings are provided by using bent tube sections for the field installation of access doors, observation ports, burners, sootblowers, overfire air nozzles, and fuel feed chutes.



Steam Drum and Drum Internals

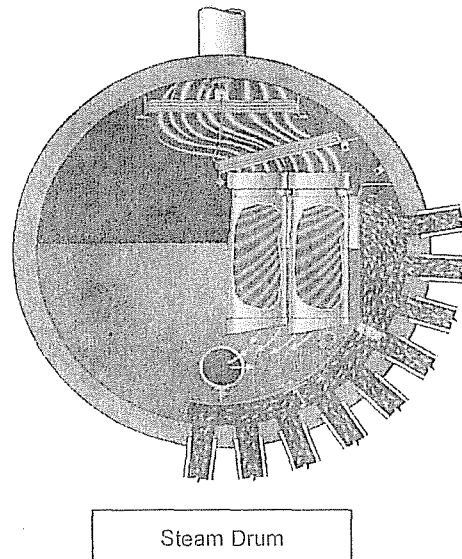
Babcock & Wilcox drums are manufactured to a cylindrical section with a high degree of accuracy. All joints are fusion welded to ASME Code specifications and completely radiograph tested to prove weld soundness.

The complete drum with all nozzles and other welded attachments is stress relieved to a minimum of 1100°F as required by code.

Steam Drum Features

Drum features include:

- Manholes in both ends of drum
- Manhole covers with hinges, fasteners, insulation retaining rings, and gaskets suitable for the operating pressure
- Wrenches for manhole nuts
- Gaskets for chemical cleaning – 3 sets



Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Cyclone Steam Separators

The steam drum is equipped with B&W cyclone steam separators. The cyclone separators are centrifugal-type steam/water separating devices. The cyclones make it possible for the steam drum to affect positive separation of steam and water even when handling variations in water level during load swings. The cyclone separators provide steam-free water in the downcomer circuits to eliminate carry-under thereby ensuring proper circulation. The action of the cyclone steam separator establishes a discrete steam/water interface in the drum resulting in a positive indication of drum water level. A primary scrubber is located above each cyclone separator to reduce the moisture and solids carryover to the superheater.

Secondary Steam Scrubbers

Secondary steam scrubbers are installed above the cyclone separators to further reduce moisture and solids carryover. Moisture, with its entrained solids, is entrapped in the corrugated passages of the scrubber plates and returned to the boiler water.

Internal Drum Piping

Internal piping is provided in the steam drum for the distribution of chemical feed, internal sample collecting header for saturated steam sample collection, and uniform collection of continuous blowdown.

Steam Drum Design

Material - SA 299 or equivalent
Design Pressure – 2200 psig

Superheater

The superheater was designed to produce steam at conditions of 1725 psig and 968°F at the outlet. The superheater arrangement is a secondary superheater, then a primary 2 superheater, and then a primary 1 superheater, in the direction of gas flow, with steam flow

both counter-current and parallel to the flue gas flow. The superheater tubes are 2.50" and 2.00" OD.

The design of a superheater from a metallurgic standpoint is directly related to B&W's knowledge that has been obtained through theoretical analysis, research and operating experience. Factors that have been considered in the selection of the tube metallurgy are:

- Steam flow unbalance between parallel tubes. This is a function of pressure drop in the tubes, header pressure drop, and physical arrangement of the superheater tubes, headers, and inlet and outlet connections
- Gas flow and gas temperature unbalance. This is a function of firing method (i.e., firing distribution across the width of the furnace together with the furnace design, and the method used to cool the furnace gases)
- Gas side corrosion. Operating experience and research indicates that chemical attack of the ash in the fuel on tube metals should be a strong consideration in the proper design of the superheater.

Economizer

The economizer consists of eight shop-fabricated modules. The modularized design significantly reduces on site construction time while affording the extra quality that can be obtained in a shop environment.

The economizer is a non-steaming, counter-flow design with the gas flow downward and the water flow upwards. The water up / gas down design eliminates the potential for steam pockets to form in the economizer which could result in water hammering and damage to the drum and boiler.

The economizer is a two part arrangement. The main economizer consists of the first four modules in the gas flow path. The last four

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

modules incorporate B&W's new innovative Split Stream Economizer design (B&W patent applied for).

The main economizer is a normal, modularized, in-line continuous tube design. Each module is completely assembled to include casing and inlet and outlet headers. The heating surface consists of 2.0" OD seamless SA-210A1 helical finned tubes. The main economizer performs as a traditional economizer lowering the gas temperature leaving the superheater to approximately 500 °F before entering the split stream economizer.

The split stream is constructed similar to the main economizer with each module being shipped complete with casing and inlet and outlet headers. The heating surface consists of 2.0" OD seamless SA-210A1 helical finned tubes.

The split stream economizer uses multiple flow paths along with flow biasing to control the amount of heat transfer that occurs within each section of the economizer. The split stream economizer integrates the water coil air heaters (WCAHs) directly into the flow paths within the economizer, eliminating the need for a tubular air heater while achieving lower exit gas temperature (higher efficiency).

Using flow biasing along with the WCAHs the final exit gas temperature can be maintained at a constant range of 300 - 320°F over all loads and under changing fuel and fuel moisture conditions. This results in improved operation and control of the boiler allowing for greater operating flexibility with varying moisture fuels.

Benefits of the Split Stream Economizer include:

- Significantly lower maintenance costs over a tubular air heater
- A smaller footprint resulting in less structural steel

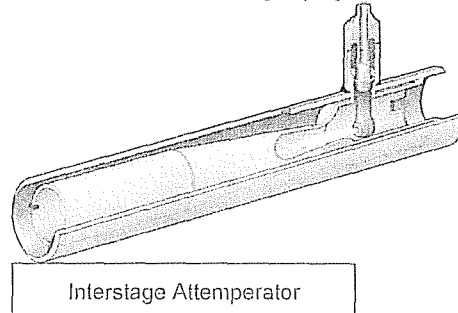
- Less sootblowers than required with a tubular air heater resulting in lower capital and maintenance costs and lower steam consumption
- Consistent exit gas temperature to back-end equipment resulting in better performance over varying fuel moistures
- Consistent back-end temperatures for optimal SCR performance over a wide fuel moisture range
- Requires no special materials or instrumentation allowing for ease of installation, operation, and maintenance

Water Coil Air Heaters (WCAHs)

The WCAHs design uses economizer feed-water to heat the combustion air to the bed and the overfire air system. The WCAHs are a finned, horizontal tube arrangement located at the forced draft fan outlet. The coils are designed for easy removal for repair or replacement. The WCAHs water flow path is integrated directly with the economizer as part of the split stream economizer design.

Inter-stage Attenuator System

An inter-stage spray water attenuator will be located in the primary 1 superheater outlet pipe between the primary 1 superheater outlet header and the primary 2 superheater inlet header. Another inter-stage spray water



Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

attemperator will be located in the primary 2 superheater outlet pipe between the primary 2 superheater outlet header and the secondary superheater inlet header. Feedwater sourced from the main economizer outlet will be used for superheater spray attemperation.

Air and Gas handling Equipment

Fans

Four fans are required for the arrangement shown on the P&ID schematics in Appendix D. A forced draft (FD) fan, a fluidizing air (FA) booster fan, a flue gas recirculation (FGR) fan, and an induced draft (ID) fan will be utilized. The FD fan provides combustion air to all of the combustion air systems including fuel chutes, start-up burners, and lower and upper over-fire air ports. This combustion air is heated with the water coil air heaters (WCAHs). The FA booster fan provides the fluidizing air to the bed and raises the pressure leaving the FD fan to bed pressure. The FGR fan takes clean flue gas downstream of the ID fan and injects the flue gas into the duct upstream of the booster fan and is necessary for bed temperature control. The ID fan is part of the balanced draft system and is used to draw the flue gas through the back-end equipment and into the stack.

Sootblowers

A complete automatic, sequential, steam blowing, electrically driven and operated sootblower system for cleaning the superheaters and economizers will be furnished. The sootblowers for the SCR will be a complete automatic, sequential, electrically driven and operated, air blowing system.

The sootblowing system will include retractable IK-type sootblowers for the superheaters and G9B rotary type sootblowers for the economizers. Retractable, rake-type sootblowers will be used for cleaning the layers of SCR catalyst. All sootblowers will include motors and will be controlled by a PLC based control system.

Refractory, Insulation, & Lagging Requirements

Boiler refractory is included for the lower furnace, but no insulation and lagging is provided for the boiler, piping, or accessory equipment. Specifications will be included for the refractory, insulation, and lagging.

The refractory will have the properties required to meet the expected service conditions at each location. Lower furnace walls will be covered with refractory. The thickness of the refractory is designed to enhance heat transfer and to minimize maintenance.

Instrumentation & Controls Engineering

All controls for the BFB boiler (except for the baghouse and sootblowers) will be implemented in the plant DCS. Therefore, system control equipment is not included in this Proposal.

The following engineering documents will be provided to enable the owner to implement the recommended boiler control strategy in the DCS:

- Process & Instrumentation Diagrams (P&ID's)
- System Requirement Specifications (SRS)
- International Society of Automation (ISA) data sheets
- I/O list
- Motor list
- Equipment & Instrument list
- Instrument location drawings

Piping System

Piping will be provided for main steam, feedwater (from the flow control valve inlet to first WCAH then to the split stream economizer inlet to the main economizers 2 – 4 then through the second WCAH to main economizer 1 and then to the steam drum and for spray water), boiler vent, blowdown, and propane gas fuel to the terminal points in the area of the boiler. Aqueous ammonia piping from the

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

ammonia flow control skid to the ammonia injection locations will be provided.

The piping systems will include all the piping, fittings, valves, hangers and instrumentation to provide a cost effective, reliable, process. All materials will be provided in accordance with the applicable codes and standards promulgated by general industry for the service.

All piping 3" diameter and larger will be shown on Erection Arrangement drawings. Piping less than 3" will be field routed. Piping with temperatures greater than 250°F will be evaluated for thermal expansion and stress analyses where required.

Structural Steel

Engineering and supply of the structural steel for the boiler and equipment provided in this proposal includes the following:

- The BFB Boiler, including back-pass section
- Bottom Ash Hoppers
- Main and split stream economizers
- SCR with flue gas bypass
- Interconnecting ductwork for FA and OFA between the fans and boiler
- Flue work between the boiler, economizers, baghouse, SCR, and stack inlet
- Fuel bins and associated biomass feed conveyor within the limits of the boiler island
- Critical pipe systems and associated vents/silencers
- Monorail beams for lifting boiler equipment including provisions for one full height drop zone within the boiler structure and a drop zone at the SCR for catalyst removal
- Bed material re-claim system components

Structural design features will include:

- Platform at main levels for access to maintain boiler equipment. Intermediate stairs or ladders will be used between elevations where changes in elevation occur within a given platform level.
- Two stair towers for access from grade to the various platform levels in the structure.
- Roof framing will be designed to accommodate roofing and associated roof loads. Roofing design by Buyer.

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

SELECTIVE CATALYTIC NO_x REDUCTION

B&W proposes to design, procure and deliver a Selective Catalytic Reduction (SCR) system for the BFB boiler for the Stone and Webster, Inc (a Shaw Group company) project to reduce flue gas nitrogen oxide (NO_x) to nitrogen and water vapor.

With the proposed B&W patent applied-for back-end arrangement, the physical location of the SCR has been moved to an intermediate temperature window behind the particulate collection device. The "clean-side" SCR arrangement is beneficial for the following reasons:

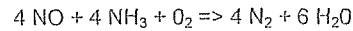
- Fuel flexibility – the potential to burn higher nitrogen fuel in the future.
- The potential for longer catalyst life and the corresponding lower life time costs. The low dust arrangement exposes the catalyst to less ash – consequently the potential deactivation due to bad actors in the ash (potassium, phosphorus etc) is mitigated.
- Having the catalyst in a lower temperature environment allows for some, or all of the potentially harmful species in the vaporous phase to condense (volatile phosphorus and some alkali aerosols for example) leading to longer catalyst life potential.
- Eliminates the catalyst suppliers concerns over unburned carbon in the ash.
- Less catalyst volume is required for equivalent performance.
- The temperature windows entering the SCR are controlled such that the catalyst is within optimal design conditions through a wide portion of the load range.
- Being downstream of the sorbent injection system means that SO₂ and SO₃ entering the catalyst can be controlled negating the concern for ammonium salts plugging the catalyst
- The physical location is just off grade, leading to less steel, less foundations and ease of catalyst loading and unloading

The narrative that follows provides a summary description of the process and major system components that comprise the NO_x emission control system proposed herein. A more detailed listing of the scope of supply upon which this proposal is based is provided in Section 2B. Proposal drawings and related information are provided in Appendix A.

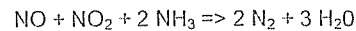
SCR Reactor Process System Description

In the presence of an appropriate catalyst, the following reactions occur at temperatures compatible with catalyst design:

(1) Reduction of NO



(2) Reduction of NO₂



The design of the proposed system to affect these reactions is based on the following major considerations:

- Selection of catalyst type and pitch to "best match" NO_x reduction requirements to process conditions as specified.
- Equipment/parameter selection to maximize surface contact between flue gas and catalyst to promote NO_x reduction reactions while providing an economical SCR reactor design.
- Process refinements to maximize ammonia utilization while maintaining a low gas-side pressure drop and required NO_x removal efficiency.

Flue work Layout

The SCR flue work has been designed to minimize pressure drop and still conform to internal design guidelines that address flue sizing and configuration. These guidelines set requirements for cross-sectional areas, for

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

making transitions (i.e. rounded corners), and for flue internals including turning vanes and flow splitters. They have been applied to ensure that velocities and the configuration of the gas flow path are consistent with keeping any small particle ash entrained and thus avoiding accumulations of this ash in the flues or on the catalyst.

Catalyst Configuration

B&W has worked with our catalyst vendors to ensure that the catalyst bed is sized to deliver the requisite NO_x conversion results with acceptably low pressure drop for this "two plus zero" reactor.

Ammonia Injection

B&W's proprietary ammonia injection grid is a traditionally low pressure drop option compared to other equipment in use in the industry.

SCR System Reactor

The SCR reactor is located in the flue gas path downstream of the baghouse.

Flue Gas Path

Flue gas leaving the superheater banks flows through one common flue to the outlet bank of the economizer. The flue gas then passes through the baghouse. At the exit of the baghouse (inlet to the SCR) an ammonia / air mixture is injected into the stream via the ammonia injection grid. The flue gas and ammonia mixture enters the reactor and passes vertically downward through the catalyst. At the reactor outlet, the treated flue gas enters flue work routed to the inlet bank of the economizer. The flues have been designed to minimize draft loss.

Reactor Housing

The SCR system utilizes fixed-bed catalyst in a vertical down-flow reactor. There is one reactor for this system. The SCR reactor is designed to contain sufficient catalyst to meet

the NO_x requirements over the expected life of the catalyst. We have forwarded the specification fuel and its corresponding ash analysis to the catalyst vendors and requested that the catalyst volume be sized for a minimum of 10,000 hrs operation. The reactor has been designed for two layers of catalyst. The reactor hood is configured for even flow and temperature distribution to the catalyst bed. The reactor housing consists of standard plate construction containing stiffeners and structural supports for earthquake and wind loading, catalyst support, sealing, loading stress, and thermal stress. The externally insulated reactor housing is constructed with a steel casing reinforced and supported by structural steel members. Access openings (one per layer) are provided for the loading and removal of catalyst blocks.

Catalyst

SCR catalysts of varying configurations and formulations are available from a number of manufacturers worldwide and must be selected to "fit" the specific performance and design requirements. B&W has prepared this proposal based on utilization of honeycomb catalyst.

Sample Catalyst

Provisions for sample catalyst elements are incorporated into the reactor design to allow for their periodic removal for inspection and testing. The location and quantity of the sample catalyst is different for each of the catalyst vendors.

Catalyst Seal System Design

Catalyst modules will be sealed against gas flow leakage along the top edges of the catalyst modules. These seals also act as dust shields along the top edge of the modules to prevent ash buildup between modules and module-to-reactor wall interface.

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Catalyst Cleaning Devices

One air sootblower will be supplied for each of the initial catalyst layers for the purpose of keeping the catalyst free of ash accumulations. The sootblowers will be rake-type blowers.

SCR Bypass

An SCR bypass sized to provide 30% bypass of the full load flue gas flow will be supplied. The bypass is typically used during periods of start-up and shut down. A seal air fan is included to seal the bypass when it is not in use.

Catalyst Warming System

During an extended boiler outage, the catalyst should be kept in a dry condition to prevent damage caused by moisture and catalyst poisoning constituents that may be present in the fly ash. Care must be taken to maintain the temperature of the catalyst above the dew point. Since an SCR bypass is supplied, the SCR reactor compartment can be isolated by closing the SCR inlet and SCR outlet dampers and opening both the SCR bypass dampers. After the SCR reactor has been isolated, a heat source should be utilized to keep the catalyst warm and dry. The heat source can take several forms, for example electric heaters can be temporarily located in the reactor compartment, or dehumidified, heated air from a plant source (if available), or a mobile source can be piped into the reactor. Given the infrequency of the need for a heated source, B&W has not included one in the proposed scope of supply. Instead, we recommend that, if adequate warm air is not available on site, a source be leased for use.

Aqueous (19%) Ammonia System

The aqueous ammonia flow control, vaporizer and air dilution skid contains an ammonia flow control valve, two 100% vaporizers, and an ammonia / dilution air mixer.

Liquid 19% aqueous ammonia from the storage tank is fed from the forwarding pump skid (both the tank and forwarding pumps are by the BUYER) to the flow control, vaporizer, and air dilution skid. The ammonia system is designed for 333 lb/hr of 19% aqueous ammonia.

The liquid ammonia flow is controlled by the ammonia flow control valve. Saturated plant steam is used to vaporize the aqueous ammonia inside the vaporizer. Once the ammonia is vaporized, it combines with dilution air from the Fluidizing Air fan inside the ammonia / dilution air mixer. The resulting mixture (approximately 5% ammonia by volume) has significantly more mass than that of the vapor alone. This added mass helps facilitate the distribution of the relatively small quantity of ammonia across a large area of flue work.

The ammonia / air mixture is then delivered to the ammonia injection system. This system consists of a manifold valve station and an ammonia injection grid.

The ammonia vapor / air mixture is fed into the flue gas through a unique "zone control" ammonia injection system that is comprised of a manifold valve station (MVS) external to the flue and an ammonia injection grid (AIG) internal to the flue.

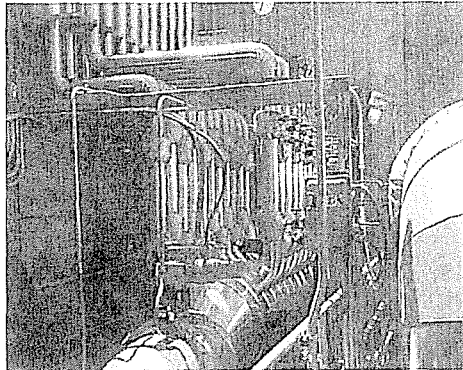
The MVS consists of an ammonia vapor / air manifold and supply headers ahead of the AIG. At the MVS (see figure below), each zone supply header is equipped with a manual throttling valve and flow orifice that is used to optimize the flow rate and balance of the ammonia vapor / air mixture to the AIG zone being fed.

Each supply header feeds a corresponding set of injection pipes located inside the flue. A set of injection pipes defines an ammonia injection grid zone. Other provisions for use during the system's optimization procedure include the SCR reactor inlet test ports, permanent SCR reactor outlet grids, and SCR outlet test ports

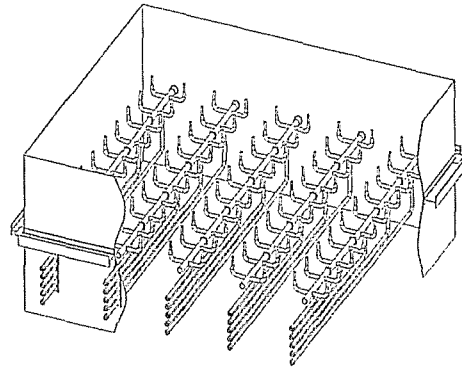
Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011



Ammonia Manifold Valve Station (MVS)



B&W Ammonia Injection Grid (AIG)

Successful and consistent removal of a high percentage of NO_x with a low concentration of residual ammonia requires close control of the distribution of ammonia. The use of multiple ammonia injection ports reduces the "Scale of Segregation" that naturally occurs when a concentrated fluid is injected in a stream flowing in a large chamber. This allows for intimate mixing of ammonia with the flue gas. The manual throttling valves are adjusted during commissioning to optimize ammonia-to-NO_x distribution.

The multiple zones are arranged horizontally in the flue cross-section to comprise the ammonia injection grid. The ammonia injection grid (see figure below) is designed to take into account the flue geometry and mixing distance upstream of the catalyst bed.

B&W's experience in this area indicates that in order to produce consistent NO_x reductions and to maximize the time between systems tuning, the AIG system needs to be flexible and custom designed for the intended unit. This results in minimal ammonia slip and consistent NO_x performance.

SCR Controls and Instrumentation

All controls for the SCR system will be handled by the plant Distributed Control System (DCS); therefore, system control equipment is not in the scope of this proposal. The NO_x Emissions Monitoring System (NEMS) will be furnished as a standalone package by Others. Junction boxes will be provided with all skid mounted equipment. The following engineering documents will be provided to enable the Owner to implement the recommended control strategy in the Distributed Control System:

- Process & Instrumentation Diagrams (P&ID's)
- I/O List
- System Requirement Specification (SRS)
- Sketches of the recommended graphic displays for the MMI.

Dry Sorbent Injection System

A dry sorbent injection system is provided to mitigate acid gases, primarily SO₂ and HCl. Multiple reagents can be used to control acid gases, including trona (sodium sesquicarbonate) and sodium bicarbonate. The dry sorbent injection system will be designed to process either of these reagents.

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky

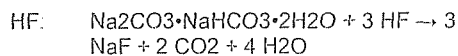
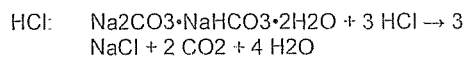
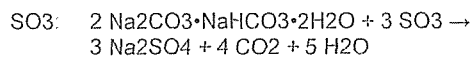
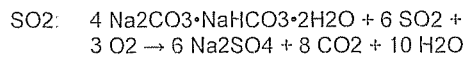


Proposal No P012754
May 11, 2011

The sorbent should be injected into the flue gas stream far enough upstream of the particulate control equipment, in this case a pulse jet fabric filter, to ensure that sufficient residence time and mixing is available. Residence time requirements will vary depending on the acid gases (SO₂, SO₃, HCl, etc.) to be reduced and the required acid gas removal requirements.

The reagent particles will be ground very fine to maximize the surface area of the particles. This will minimize reagent consumption and optimize acid gas removal efficiency. The finer the particles, the faster and more complete the reaction for a given injection rate. The neutralization reaction between the SO₂ (mild acid) and the reagent (mild base) takes place on the surface area of the particles.

The main chemical reactions using sodium sesquicarbonate (Trona) as the reagent are as follows:



The rates of these trona based reactions are dependent on injection temperature (325-900°F), fine particle size (-10 microns), and residence time (the time the acid gases are in contact with the sorbent).

The amount of sorbent injected into the flue gas divided by the amount of sorbent required to react with all of the acid gas is called the *normalized stoichiometric ratio (NSR)*. If the utilization (mixing) is complete and the amount injected is equal to the amount required, the NSR equals 1.0. Low efficiency systems can under-inject (NSR < 1.0). Higher efficiency systems will require higher NSR injection rates

(1.3 – 2.0). However, these ratios are much better than lime based systems which require NSR=>3.0.

The required sorbent consumption rates are dependent upon the type of sorbent used and particle size of the sorbent. The theoretical sorbent consumption for unmilled Trona would be between 520 and 785 lb/hr depending on the fuel moisture. Likewise, the theoretical sorbent consumption rates for milled Trona and Sodium Bicarbonate would be 405 to 595 lb/hr and 205 to 315 lb/hr respectively. For the theoretical consumption, it is assumed that all of the sulfur and chlorine in the fuel is converted to acid gas. It is expected that the actual acid gas concentration will be less and therefore the actual sorbent consumption rates will be less than those reported above.

The system equipment will include the following equipment:

- Truck unloading with dehumidifier for PD truck air intake
- Storage silo with vibrating bin bottom, bin bent filter and level indication
- Rotary feeder
- Gravimetric, variable speed feeder
- Vent Hopper
- Rotary Airlock
- Grinding mill
- PD blower and intake filter
- Ait-to-air after cooler
- Distribution manifold
- Lances

Baghouse

B&W is proposing pulse-jet fabric filter dust collector (FFDC) technology for particulate control.

Cinder carry-over will be reduced via over-fire air jet design and flue arrangement considerations (ash screens and a hopper will be incorporated to allow for heavy particle fall out and collection).

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

A pulse-jet fabric filter dust collector (FFDC) is used to remove fly ash entrained in the flue gas. The design assures operation of the system at an acceptable air-to-cloth ratio for maintaining the required level of particulate removal without excessive system pressure drop when one (1) compartment is out-of-service for maintenance.

The filter bags will be made from fiberglass with a PTFE membrane designed for operation of the pulse-jet FFDC at gas temperatures up to 475°F. This fabric has a demonstrated commercial history of meeting the required particulate emission levels in similar service.

The pulse-jet FFDC is designed for on-line cleaning of the filter bags. The filter bags are cleaned using moderate air pressure (80 psig maximum). Each pulse-jet FFDC will be equipped with a cleaning system consisting of a compressed air manifold, pulse valves and header pipes.

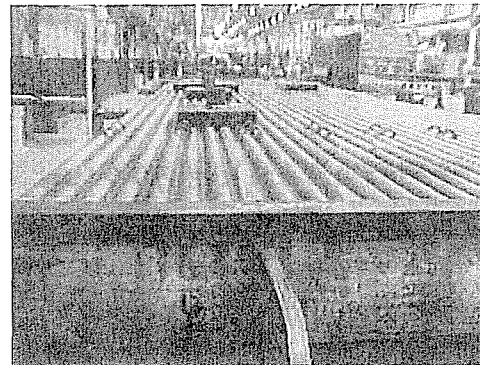
During cleaning of the bags, the ash will fall into compartment's dedicated hopper. Each hopper will contain heaters. The hoppers will be continuously emptied of the ash to prevent bag abrasion and ash re-entrainment. The ash will be taken away by the ash transport system which is provided by the BUYER.

A lift-door design to facilitate maintenance, bag installation and change out is included.

The pulse-jet FFDC system will also be equipped with two 100% pulse air rotary screw compressors where the air is fed to the air receiver until required for cleaning the baghouse. An air dryer has also been provided with the system.

For purpose of discussion the drawings in Appendices A and B should be consulted for reference.

The water wall panels will be fabricated with headers shop attached. Headers will include hand-holes that will be tacked or held in place with a jig for easy inspection prior to hydro. The panels will have 3/4 membrane at the panel splits beveled for one sided welding. Panels will have filler bars, buckstay clips, refractory pins and wallboxes shop attached to the extent reasonably possible.



Panel Assembly on Shop Floor

The steam drum will be provided with shop-installed steam drum internals including the cyclone steam separators and the primary and secondary scrubbers.

The superheaters will be shipped in individual pendants with scallop closure plates attached for the roof seal and alignment castings installed. Currently B&W is estimating tube-to-tube welds at the header stub connections, but there may be the need for an intermediate tube weld because of shipping constraints.

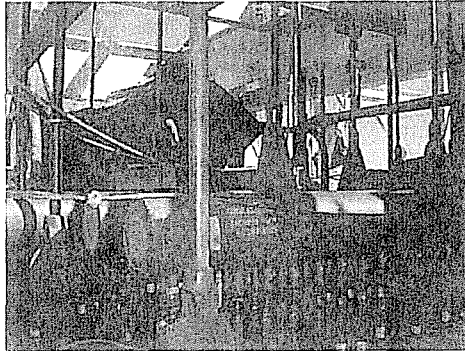
DESIGN FOR CONSTRUCTABILITY

Furnace

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky

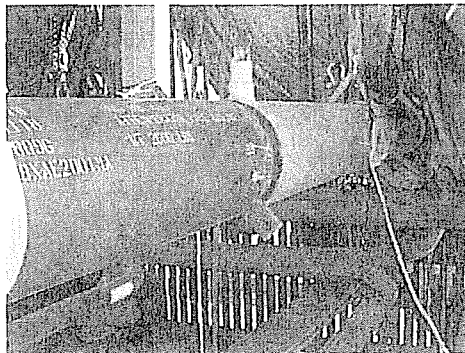


Proposal No P012754
May 11, 2011

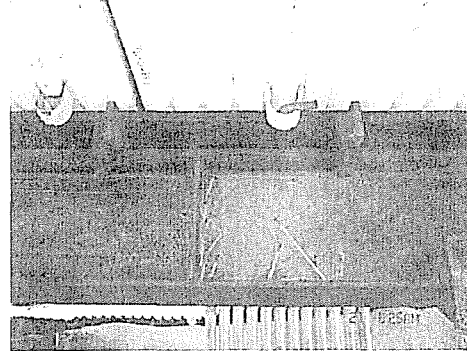


Superheater Headers with Tube Welds

Superheater headers and attemperator (interconnecting steam) piping will have alignment lugs shop attached where possible.



Attemperator Girth Weld



Field Buckstay Attachment

Buckstay attachment to the water wall panels will be via clips so that welding will be at the corner connections only. Seismic tie locations will be welded to shop applied filler bars where possible.

The main and Split Stream economizers will be modularized and provided in eight total modules, four for the main economizer and four for the Split Stream economizer. Each module will weigh approximately 95,000 to 130,000 lbs. The economizer will be modularized to the extent where it is reasonable to transport via flat bed. Pressure part connections would be via flanges or butt welds

The water coil air heaters (WCAHs) will be shipped in two modules. The final arrangement will be -two units used to heat both the air to the bed and the overfire air.

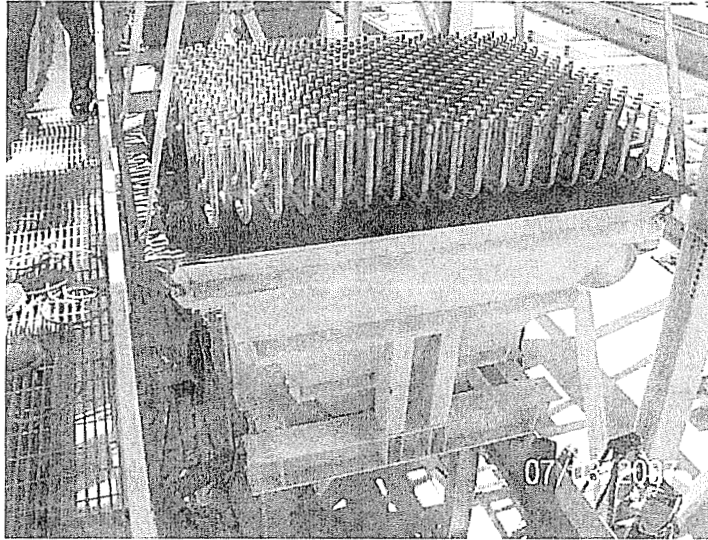
Air ducts will be shop assembled to the point where it is reasonable to transport via flat bed. The flues will be knocked down.

The BFB hoppers will be modularized in the shop. Three modules with two hoppers each will be provided. This will minimize the amount of welding to a nominal amount required for the seals.

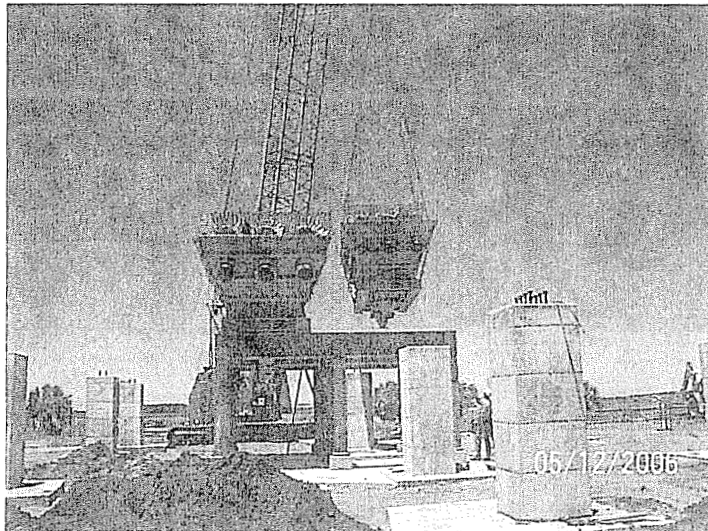
Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011



BFB Hopper Module Being Set in Place



BFB Hopper Module Being Set in Place

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No. P012754
May 11, 2011

2B. SCOPE OF SUPPLY – BFB BOILER & EQUIPMENT

B&W proposes to supply the following scope of materials, engineering and services, and construction in general accordance with the BUYER'S request for firm price proposal.

SCOPE OF MATERIALS

Bubbling Fluidized Bed (BFB) Boiler and Auxiliaries

- One-drum boiler with shop installed steam drum internals
- Furnace - Including all wall panels with headers, roof panels with headers, rear screen panels with headers, downcomers, supplies, and risers
- Shop installed pin studs for lower furnace refractory attachment
- Superheater - Including all tubes and headers, inter-stage spray water attemperators, interconnecting steam piping, and outlet steam piping
- Spray water piping, control valves, manual bypass and shut-off valves, and fittings
- Saturated connection tubes from drum to superheater inlet header and steam cooled enclosure inlet headers
- Continuous tube, helical finned main economizers and split-stream economizers – sections and headers
- Feedwater piping from terminal point to steam drum. Includes piping to and from the water coil air heaters
- Feedwater control valve with manual bypass valve and shut-off valves
- Feedwater stop and check valves
- Water coil air heaters (WCAHs)
- Buckstays, tie bars, lateral ties
- Boiler casing including tight roof casing, penthouse casing, economizer casing and hoppers
- Access and inspection doors and wallboxes
- Sootblowers for the superheater and

economizer – including motors, supports, piping, valves, fittings, and PLC control system

- Safety valves for drum and superheater including vent stack and silencers
- Main steam stop valve located at superheater outlet
- Boiler trim piping and valves
- Water columns and gauges, pressure gauges, etc., for steam drum
- Steam drum and header support rods

Fuel Firing Systems

- Four bed start-up burners (for propane gas firing) with combustion air connection, spark igniters, burner valve racks
- Flame safety system for start-up burners, including flame detectors
- Auxiliary fuel piping, valves, and instrumentation to local supply header
- Seal air and cooling air from terminal point
- Burner Management System (BMS) system

Fuel Feed -- Woody Biomass

- Two live bottom fuel bins with six screw feeders in each bin for feed control
- Fuel chutes with back-draft dampers
- Air swept fuel spouts with rotary dampers

Ducts / Air System

- Combustion air system from FD fan silencer inlet to boiler - including FD fan, motor, and drive, fluidizing air fan with motor and drive, ducts, velocity dampers for overfire air ports, expansion joints, air measuring devices, dampers, supports, test ports, and fan bearing cooling water piping (if required)

Section 2B
Scope of Supply – BFB Boiler & Equipment

Page 2B-1

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Flues / Gas System

- Flue gas system – including ID fan, motor, and drive, flues, dampers, flow measuring devices, expansion joints, supports, test ports, and fan bearing cooling water piping (if required)
- FGR system from ID fan outlet to fluidizing air fan inlet – including FGR fan, motor, and drive, flues, dampers, flow measuring devices, expansion joints, supports, and fan bearing cooling water piping
- SCR bypass system; flue and dampers

Sand System

- Sand reclaim system – includes piping/transport system, valves and instrumentation

Structural

- Building structural steel and anchoring
- Equipment support steel and anchoring
- Access platforms, stairways, etc.
- Monorails

SCR Catalyst

- Two layers of catalyst (6x5 catalyst block arrangement) One rake-type air sootblower per layer of catalyst including motors, supports, piping, valves, and fittings
- Seal air blower with reactor inlet and outlet isolation dampers and inlet and outlet bypass dampers for catalyst isolation during start-up and shutdown. Warming blankets or portable heaters should be used during times of extended outages
- Computational Fluid Dynamic (CFD) modeling

Ammonia System for SCR

- Ammonia flow control, vaporizer, and air dilution skid contains an ammonia flow control valve, two 100% vaporizers, and an ammonia / dilution air mixer
- Ammonia injection system with a manifold

valve station and an ammonia injection grid

Dry Sorbent Injection System

- Truck unloading
- Storage silo
- Material feeder system including rotary feeder, gravimetric feeder, vent hopper, rotary airlock and grinding mill
- Blowers
- Duct injection
- Controls

Baghouse

- System configuration is a half-height, walk-in clean air plenum
- Eight compartments
- Modular construction with pyramidal hoppers
- Pulse Jet Cleaning System for off-line cleaning
- Compressed air system including two 100% pulse air rotary screw compressors, one air receiver, and one air dryer
- Inlet and outlet manifolds
- Inlet butterfly and outlet poppet dampers
- Bypass dual poppet dampers
- Fiberglass/PTFE membrane filter bags
- Carbon steel cages
- Integral structural support steel including main access platforms, caged ladders, and stairway
- Hopper access platforms, supports, and ladders
- PLC control system
- Hopper heaters
- Maintenance enclosure

Instrumentation and Control Systems

- Boiler and auxiliary instrumentation (see P&ID's in Appendix C)
- System Requirement Specifications (SRS)
- ISA data sheets
- I/O list
- Motor list
- Equipment & Instrument list

Section 2B
Scope of Supply – BFB Boiler & Equipment

Page 2B-2

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Ash Systems

- Open bottom hoppers with bed hopper expansion joint, bubble caps, and fluidizing pipes. Each hopper has carbon steel downspout, manual gate and automatic gate valve with pneumatic operator and an expansion joint
- Conveyors under bed hoppers with speed switches
- Vibrating conveyor with speed switch and classification screen
- Bucket elevator with piping and valves to boiler
- Hopper under economizer

BRIL

- Lower furnace refractory material
- Specifications only for insulation and lagging for boiler, ducts, flues, piping, and auxiliary equipment (no materials)

Miscellaneous

- Boil-out support
- Witness of Performance Testing
- Operating and maintenance manuals (9 total sets)
- Start-up spare parts
- Classroom operator training – See following section on "Training"
- Project management
- General arrangement and Erection arrangement drawings
- Freight to job site

Notes

All pressure piping 3" and larger to be engineered and supplied shop fabricated to length. Piping under 3" will be field routed.

Training

The Babcock & Wilcox Company's Technical Training Services (BWTTS) proposes to provide the Operations training services in the following format based on the specification.

BWTTS will provide the Stone and Webster, Inc (a Shaw Group company) Project with two consecutive Operator Training Programs at the Buyer's facility. The Operation Training program proposed will be (8) eight days in length and will be conducted (2) two times consecutively and will consist of (8) eight hours of operations training per day of class. The training will address the Biomass Boiler and auxiliary systems. The class will include approximately (6) six hours of formal classroom training per day and approximately (2) two hours of plant system walk downs to familiarize the participants with the newly installed equipment. Instruction of the training program will be on-site at the Stone and Webster, Inc (a Shaw Group company) project facility. This proposal is based on (2) two, (40) forty hour presentations of the course for up to a maximum of (15) Fifteen participants per training session.

BWTTS proposes to provide the Mechanical Maintenance training services in the following format based on the specification. BWTTS will provide Stone and Webster, Inc (a Shaw Group company) with (1) one Mechanical Maintenance Training Programs at your facility. The Maintenance Training program proposed will be (5) five days in length and will be conducted (1) one time and will consist of (8) eight hours of maintenance training per day of class. The training will address the Biomass Boiler and auxiliary equipment. The class will include approximately (6) six hours of formal classroom training per day and approximately (2) two hours of plant system walk downs to familiarize the participants with the newly installed equipment. Instruction of the training program will be on-site at the Stone and Webster, Inc (a Shaw Group company) project facility.

This proposal is based on (1) one, (40) forty hour presentations of the course for up to a maximum of (15) Fifteen participants per training session.

Field Engineering Services

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No. P012754
May 11, 2011

B&W has included 1500 hrs for Field Engineering Services (FES). Additional FES will be offered at per diem rates. Refer to current service rates as shown in Section 4D of the proposal.

SCOPE OF SUPPLY BY OTHERS

To further define the overall scope of the project, SELLER has listed below the scope of supply by OTHERS

- Boiler feedwater system including deaerator, feed water tank, and feed water pumps
- Feed water flow meter
- HP feed water heaters
- Building cladding and roofing
- Roof drains
- HVAC
- LP chemical dosing station
- Waste bin for bed hopper material
- HP chemical dosing station
- Sampling station
- Fly ash removal system
- Fly ash silo
- Aqueous ammonia storage tank and pumps
- Dry sorbent unloading skid
- Steel stack
- Ladders and platform access on stack for emissions monitoring
- Concrete foundations and slabs
- Insulation and lagging of equipment (materials and installation)
- Field painting
- Fuel feed systems upstream of inlet to live bottom fuel bins
- Steam flow meter
- DCS and controls systems other than PLC systems specifically mentioned in the scope
- Instrumentation except as specifically included herein, specifically not included are stack CEMS, boiler outlet O₂, CO and SCR NO_x analyzers
- Purchased equipment service
- representative
- Internal, external, and emergency lighting systems
- Fire detection and suppression systems
- Power and control cable ways, cabling, marking
- Power supply panels in electrical room
- Buried earthing network
- Sub-distribution panel inside boiler for lighting, socket, tracing, HVAC, crane
- Maintenance sockets
- Heat tracing and freeze protection
- Cathodic protection
- Emergency push button per motor including wiring to electrical room
- Structural steel not listed specifically in the scope list
- Propane storage and piping to valve racks
- Service air piping and seal air piping
- Instrumentation racks, piping, and tubing
- Firewater system
- Lubrication oil system
- Process drains and collection tanks
- Painting of pressure parts
- Special erection tools
- Steam conditioning for reagent
- Piping between DSI system silo and flue injection location
- Engineering or supply of small OD piping not governed by Section I of ASME code
- Engineering or supply of valves located in small OD piping not governed by Section I of ASME code
- Civil work, architectural, geotech/survey and foundations
- All environmental and plant operating permits
- Spare parts (other than start-up spare parts). After Equipment vendors are selected for the contract, Contractor will provide a priced spare parts list.
- Performance testing
- Electrical installation
- Electrical equipment, including but not limited to switchgear, load centers, electrical distribution panels, transformers.

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

2C. DIVISION OF RESPONSIBILITIES

The Division of Responsibility shall be as shown below.

TASK	ENGINEER	SUPPLY
Boiler		
Steam drum and drum internals	B&W	B&W
Drum support rods	B&W	B&W
Furnace wall panels and headers	B&W	B&W
Header support rods and attachments	B&W	B&W
Water wall supply tubes to lower headers	B&W	B&W
Water wall riser tubes from upper headers to drum	B&W	B&W
Downcomers and manifold with supply tube stubs	B&W	B&W
Water wall drain piping (up to 2 nd valve)	B&W	B&W
Doors, wall boxes, buckstays, tie bars, refractory anchors, etc.	B&W	B&W
Lateral ties	B&W	B&W
Boiler casing (penthouse, tight-roof, etc.)	B&W	B&W
Superheater with headers	B&W	B&W
Safety valves, drum	B&W	B&W
Safety valves, SH	B&W	B&W
Vent stack and silencers for safety valves	B&W	B&W
Saturated connection tubes	B&W	B&W
Interconnecting piping	B&W	B&W
Inter-stage spray water attenuators	B&W	B&W
Spray water control valves	B&W	B&W
Steam outlet piping	B&W	B&W
Main steam stop valve (manual)	B&W	B&W
Water columns and water gauges	B&W	B&W
Drum pressure gauge	B&W	B&W
Drum level transmitters	B&W	B&W
Feed water		
Deaerator and feed water tank	SHAW	SHAW
LP chemical dosing station	SHAW	SHAW
Feed water pumps	SHAW	SHAW
HP heaters	SHAW	SHAW
Feed water control valve (FWCV) and bypass valves	B&W	B&W
Feed water stop valve and motor	B&W	B&W
Feed water check valve	B&W	B&W
Feed water piping upstream of FWCV	SHAW	SHAW
Drain System		
Continuous blowdown tank	SHAW	SHAW

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Intermittent blowdown tank	SHAW	SHAW
Drain piping	SHAW	SHAW
Fluid Bed Instrumentation		
Bed thermocouples with junction box and wiring	B&W	B&W
Bed differential pressure (sand level) pipe taps	B&W	B&W
Bed differential pressure transmitters	B&W	B&W
Bed differential pressure tubing to transmitters	SHAW	SHAW
Bed differential pressure – Electrical to I/O rack	SHAW	SHAW
BRIL (Brickwork, Refractory, Insulation, and Lagging)		
BRIL – Boiler Refractory (design/supply by B&W)	B&W	B&W
BRIL – Boiler	B&W	SHAW
BRIL – Ducts/Flues	B&W	SHAW
BRIL - Piping	B&W	SHAW
Fluidized Bed BOP Scope		
Fluid bed hopper expansion joint	B&W	B&W
Modularized fluid bed hoppers and air pipes	B&W	B&W
Bubble caps	B&W	B&W
Fluid bed hopper support steel	B&W	B&W
BFB hopper discharge pipes	B&W	B&W
BFB hopper discharge valves - manual	B&W	B&W
BFB hopper discharge valves - pneumatic	B&W	B&W
Automated valve wiring	SHAW	SHAW
Instrument air to automated hopper valves	SHAW	SHAW
Electrical to I/O rack	SHAW	SHAW
Bed Material Drain & Reclaim Systems		
BFB hopper chain conveyors with support legs and speed switches	B&W	B&W
Vibrating transfer conveyor with speed switch	B&W	B&W
Screens for vibrating transfer conveyor	B&W	B&W
Vibrating conveyor discharge to waste bin	B&W	B&W
Conveyor electrical/power	SHAW	SHAW
Speed switch wiring	SHAW	SHAW
Bucket elevator with speed switch and inlet chute	B&W	B&W
Bucket elevator electrical/power	SHAW	SHAW
Bucket elevator speed switch wiring	SHAW	SHAW
Belt magnet and mounting frame	SHAW	SHAW
Belt magnet electrical/power	SHAW	SHAW
Belt magnet speed switch wiring	SHAW	SHAW
Belt magnet discharge bin	SHAW	SHAW

Section 2C
 Division of Responsibilities

Page 2C-2

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Piping from bucket elevator discharge to boiler connection	B&W	B&W
Manual and rotary valve for sand feed into boiler	B&W	B&W
Rotary valve electrical/power	SHAW	SHAW
Building steel related to the bed material conveying and reclaim systems	B&W	B&W
Fly Ash Removal System		
Hopper discharge gate valves (manual)	SHAW	SHAW
Single strand drag conveyors	SHAW	SHAW
Single strand transfer conveyors	SHAW	SHAW
Bucket elevator	SHAW	SHAW
Flyash storage silo	SHAW	SHAW
Silo vent filter	SHAW	SHAW
Silo unloading equipment	SHAW	SHAW
Combustion Air System, FD Fans, and Ducts		
Two FD fans and drives (primary and fluidizing)	B&W	B&W
FD fan drive electrical/power	SHAW	SHAW
FD fan electrical, temperature and vibration	SHAW	SHAW
FD fan bearing cooling water piping	SHAW	SHAW
Foundations for Booster fan and drive	SHAW	SHAW
Foundations for Primary fan and drive	SHAW	SHAW
Inlet vane FD fan controls with actuator	B&W	B&W
Air ducts from primary FD fan to booster FD fan, bed burners, and OFA ports	B&W	B&W
Air ducts from booster FD fan to fluidizing air ducts	B&W	B&W
Combustion air duct dampers/actuators and expansion joints	B&W	B&W
Duct support steel, stiffeners, hangers, doors, etc.	B&W	B&W
Inlet vane actuator electrical/power	SHAW	SHAW
Over fire air headers and nozzles	B&W	B&W
Building steel related to the combustion air system	B&W	B&W
Aspirating air and cooling air piping for bed burner scanners, observation doors, and camera ports	B&W	B&W
Electrical/power for automated dampers	SHAW	SHAW
Electrical for automated dampers	SHAW	SHAW
Combustion air pressure, flow, and temperature elements/transmitters	B&W	B&W
Combustion air pressure, flow, and temperature element/transmitter electrical	SHAW	SHAW
Air duct test ports	B&W	B&W
Air Heater		
Water Coil Air Heater	B&W	B&W

Section 2C
 Division of Responsibilities

Page 2C-3

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Support steel	B&W	B&W
Flue Gas System		
ID fan and drive	B&W	B&W
ID fan drive electrical/power	SHAW	SHAW
ID fan electrical	SHAW	SHAW
ID fan bearing cooling water piping	SHAW	SHAW
ID fan and drive foundations/civil	SHAW	SHAW
Damper for ID fan control with actuator	B&W	B&W
ID fan control damper actuator electrical/power	SHAW	SHAW
ID fan control damper actuator electrical	SHAW	SHAW
Flues from boiler outlet to stack	B&W	B&W
Flues support steel	B&W	B&W
Flues stiffeners, hangers, doors, etc.	B&W	B&W
Flue expansion joints	B&W	B&W
Electrical/power for automated dampers	SHAW	SHAW
Flue gas pressure and temperature elements/transmitters	B&W	B&W
Flue gas pressure and temperature element/transmitter electrical	SHAW	SHAW
Flue test ports	B&W	B&W
Economizer		
Economizer sections and headers	B&W	B&W
Economizer support steel	B&W	B&W
Feed water piping downstream of FWCV	B&W	B&W
Baghouse		
Multi-compartment fabric filter	B&W	B&W
Inlet and outlet dampers	B&W	B&W
Structural steel for support and access	B&W	B&W
Pulse jet cleaning system with blower/compressor	B&W	B&W
PLC control system	B&W	B&W
Fly ash hoppers	B&W	B&W
Compressor piping	B&W	B&W
SCR		
Inlet/outlet flues	B&W	B&W
Catalyst blocks	B&W	B&W
Catalyst housing/frame, access doors	B&W	B&W
Truck unloading connection	B&W	B&W
Reagent storage tank	SHAW	SHAW
Reagent feed pump	SHAW	SHAW
Piping between reagent feed pump and skid	SHAW	SHAW

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Dilution air skid	B&W	B&W
Reagent injection grid	B&W	B&W
Sootblowers (air)	B&W	B&W
SCR bypass system	B&W	B&W
Support steel	B&W	B&W
Piping	B&W	B&W
Instrumentation	B&W	B&W
Electrical	SHAW	SHAW
Dry Sorbent Injection System		
Truck off-load / silo filling system	B&W	B&W
Sorbent storage silo	B&W	B&W
Material feeder system	B&W	B&W
Sorbent conveyance blowers	B&W	B&W
Duct injection	B&W	B&W
DCS control	B&W	SHAW
Electrical	SHAW	SHAW
Stack		
Stack (steel)	SHAW	SHAW
Test connections, lighting, etc.	SHAW	SHAW
Ladders, access platforms on stack for emissions testing	SHAW	SHAW
CEMS	SHAW	SHAW
Fuel Feed System		
Live bottom fuel bins with flow control	B&W	B&W
Fuel chutes with back-draft dampers	B&W	B&W
Rotary dampers for air-swept fuel spouts	B&W	B&W
Bin level indicators	B&W	B&W
Electrical/power for fuel bins	SHAW	SHAW
Electrical for fuel bins level device	SHAW	SHAW
Building steel for the fuel bin system	B&W	B&W
Start-Up Burners, Auxiliary Fuel System, and Burner Management System		
Start-up (bed) burners (for auxiliary fuel)	B&W	B&W
Burner igniters	B&W	B&W
Start-up burner front valve racks and local supply header valves and instrumentation	B&W	B&W
Piping for auxiliary fuel local supply headers	SHAW	SHAW
Auxiliary fuel piping to local supply headers, instrumentation, and valves	B&W	B&W
Burner Management System (BMS)	B&W	SHAW

Section 2C
 Division of Responsibilities

Page 2C-5

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Instrumentation air piping to burners	SHAW	SHAW
Start-up burner instrumentation	B&W	B&W
Start-up burner electrical	SHAW	SHAW
Building steel related to the start-up burner systems	B&W	B&W
Flame scanners	B&W	B&W
FGR System		
Flue Gas Recirculation (FGR) fan and drive	B&W	B&W
FGR fan drive electrical/power	SHAW	SHAW
FGR fan electrical	SHAW	SHAW
FGR fan bearing cooling water piping	SHAW	SHAW
Foundations FGR fan/drive	SHAW	SHAW
FGR flues from source through FGR fan to fluidizing air duct and fuel spouts	B&W	B&W
Building steel related to the FGR system	B&W	B&W
FGR dampers/actuators and expansion joints	B&W	B&W
Electrical/power for automated dampers	SHAW	SHAW
Electrical for automated dampers	SHAW	SHAW
FGR pressure, flow, and temperature elements/transmitters	B&W	B&W
Pressure, flow, and temperature electrical	SHAW	SHAW
Sootblowing system		
Sootblowers w/motors	B&W	B&W
Sootblower supports	B&W	B&W
Sootblower piping, valves, fittings, drains, etc.	B&W	B&W
Sootblower seal air	B&W	B&W
PLC control system	B&W	B&W
Electrical and wiring	SHAW	SHAW
Structural Steel, Platforms, and Foundations		
Building structure including monorails	B&W	B&W
Access platforms, stairways, etc.	B&W	B&W
Foundations	SHAW	SHAW
Building roofing material (structure by Seller)	SHAW	SHAW
Piping, Valves, Instrumentation		
Miscellaneous boiler	B&W	B&W
Continuous and intermittent blowdown piping	SHAW	SHAW
Boiler vent piping after 2 nd valve	SHAW	SHAW
Attenuator spray water piping	B&W	B&W
Propane piping and valves	SHAW	SHAW
SH and drum thermocouples wired to junction box	B&W	B&W
Miscellaneous valves	B&W	B&W

Section 2C
 Division of Responsibilities

Page 2C-6

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No. P012754
 May 11, 2011

TASK	ENGINEER	SUPPLY
Other – General		
Controls	SHAW	SHAW
Sampling station	SHAW	SHAW
HP chemical dosing station	SHAW	SHAW
HVAC	SHAW	SHAW
Internal and external lighting	SHAW	SHAW
Emergency lighting (self-powered)	SHAW	SHAW
Maintenance sockets	SHAW	SHAW
Heat tracing	SHAW	SHAW
Cathodic protection	SHAW	SHAW
Local safety switch (close to motor)	B&W	B&W
Emergency push button per motor (3 contacts per PB), including wiring to electrical room	SHAW	SHAW
Local control boxes (wired to instrument field junction boxes or device)	B&W	B&W
Field Instrumentation (wired to instrument field junction boxes or device)	B&W	B&W
Power and control cable ways, cabling, marking	SHAW	SHAW
Sub-distribution panel inside boiler for lighting, socket, tracing, HVAC, crane	SHAW	SHAW
Power supply panels in electrical room	SHAW	SHAW
Buried earthing network	SHAW	SHAW
Earthing of mechanical equipment and steel parts	SHAW	SHAW
Fire detection system	SHAW	SHAW
Fire water columns and hose reels	SHAW	SHAW
Fire extinguishers	SHAW	SHAW
Other fire protection	SHAW	SHAW
Eye wash stations , showers and other personnel protection	SHAW	SHAW
Service water system	SHAW	SHAW
Instrument air and plant air system	SHAW	SHAW
Painting of all supplied equipment	B&W	B&W
Engineering & Erection Services		
Erection of boiler island	SHAW	SHAW
Combustion control description	B&W	B&W
P&ID's	B&W	B&W
Boil-out support	B&W	B&W
Steam blow equipment and material	SHAW	SHAW
Commissioning and start-up support	B&W	B&W
O&M manuals	B&W	B&W
Operator training	B&W	B&W
Performance Testing	SHAW	SHAW

Section 2C
 Division of Responsibilities

Page 2C-7

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No. P012754
May 11, 2011

TASK	ENGINEER	SUPPLY
Spare parts	SHAW	SHAW
3-D model	B&W	B&W

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No.P012754
May 11, 2011

2D. TERMINAL POINTS

TERMINAL POINTS

The Terminal Points List is intended to further define the scope of equipment the SELLER intends to supply. The SELLER will furnish all materials within these terminal points which are required to fulfill its contractual obligation. Where Terminal Points are not suitable for this purpose, scope of equipment is indicated.

Combustion Air

- FD fan silencer inlet
- Instrument, power and control connections, as required

Flue Gas

- Stack inlet
- Instrument, power and control connections, as required

Steam, Feedwater, and Piping

- Main steam - single connection 3 feet inside boiler building at elevation
- Feedwater piping – From feedwater control valve no further than 10 ft from the economizer inlet header
- Safety valve exhausts and vent stacks 10 feet above the roof, including silencer and drip pan components
- Blowdown piping - outlet of second stop valve close connected to drum
- Superheater spray piping - inlet of attemperators inlet isolation valve upstream of control valves
- Auxiliary steam - 3 feet outside of casing
- Vent piping – second valve outlet from headers no further than 3 feet from boiler lagging
- Drain piping - second Boiler Code valve outlet, no further than 3 feet from boiler lagging

- Sampling connections - outlet of second Boiler Code valve no further than 3 feet from boiler lagging
- Chemical feed piping - inlet of the first of two valves close-connected to the drum, no further than 3 feet from boiler lagging

Auxiliary Fuel

- Propane gas piping – connections at local burner valve racks
- Instrumentation connections – at local panels

Biomass

- Inlet to live bottom fuel bins (inside boiler structural steel)
- Instrumentation connections – mounted instruments on B&W supplied equipment

Ash and Dust

- Flyash – hopper flanges
- Bed material – discharge of vibrating conveyor to waste bin

Aqueous Ammonia

- Inlet of ammonia vaporization skid

Dry Sorbent Injection

- Outlet of the dry sorbent unloading skid

Baghouse

- Drain outlets of the pulse air rotary screw compressors and pulse air receiver for PJFF
- Vent outlet of the pulse air receiver for PJFF

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
May 11, 2011

Utilities

- Service water – inlet at each individual user
- Cooling water in/out – inlet at each individual user
- Compressed air – Single connection point for each piece of equipment/skid
- Atmospheric drains – continuous blowdown line outlet, superheater drain outlets, and water coil air heater (WCAH) drain outlet
- Service air – Single connection point for each piece of equipment/skid
- Instrument air – Single connection point for each piece of equipment/skid
- Steam service for ammonia process
- Condensate return service from ammonia process

Electrical & Controls

- Power – Motor terminal
- Instrument – Junction boxes or devices inside the boiler system
- Grounding – Connection provided with buried network inside civil work by others
- Emergency push button – Junction boxes inside the boiler system
- PLC data networks – at PLC I/O rack for SB and PJFF only

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

2E. BASIS OF DESIGN

The following is the basis for which the equipment design has been set for the bubbling fluidized bed (BFB) boiler:

1. Firing a woody biomass fuel with a design moisture of 36.7% and overall moisture range of 30-50%, Tables 1-3 show the corresponding fuel analyses at these moisture levels.

Table 1: Fuel Analysis – 36.7% Design

Fuel Composition	Wgt %
Carbon	31.22%
Hydrogen	3.66%
Nitrogen	0.12%
Chloride	0.00%
Oxygen	26.45%
Sulfur	0.02%
Ash	1.81%
Water	36.72%
Total	100.00%
HHV (Btu/lb)	5,108

Table 2: Fuel Analysis – 30% Min.

Fuel Composition	Wgt %
Carbon	34.54%
Hydrogen	4.05%
Nitrogen	0.13%
Chloride	0.00%
Oxygen	29.26%
Sulfur	0.02%
Ash	2.00%
Water	30.00%
Total	100.00%
HHV (Btu/lb)	5,605

Table 3: Fuel Analysis – 50% Max.

Fuel Composition	Wgt %
Carbon	24.67%
Hydrogen	2.89%
Nitrogen	0.09%
Chloride	0.00%
Oxygen	20.90%
Sulfur	0.02%
Ash	1.43%
Water	50.00%
HHV (Btu/lb)	4,036

2. Sootblowing steam sourced from the primary 1 superheater outlet.
3. A fuel heat input of 742.6 mmBtu/hr (HHV) when firing 36.7% moisture fuel.
4. A steam pressure of 1725 psig and temperature of 968°F leaving the superheater.
5. A feed water temperature of 464°F.
6. Two superheater spray attemperators sourced from feedwater at the main economizer outlet.
7. A continuous blowdown of 1%.
8. An air temperature entering the boiler at 450°F.
9. Fuel used for startup burners is propane gas.
10. A flue gas temperature at the stack of 317°F.
11. A site elevation of 1270 ft MSL.
12. Heat loss in material leaving the bed drains considered negligible.

Stone and Webster, Inc (a Shaw Group company)
Biomass Boiler Island – Hazard, Kentucky



Proposal No.P012754
May 11, 2011

13. An ambient air temperature of 77.4°F
14. An O₂ of 4% (wet).
15. A design barometric pressure of
28.503 in Hg.
16. A design moisture in air content of
0.013 lb H₂O/lb dry air.
17. The control load is 70% of MCR
(394,607 lb/hr).

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

2F. EQUIPMENT DATA SHEETS

	Units	Proposed
Boiler/Furnace		
Technology Type		BFB
Circulation Type		Natural
Draft Type		Balanced
Furnace Dimensions – d x w x h	Ft	35'-11" x 24' x 80'-8½"
Furnace Construction		Solid Membrane
Furnace volume heat release	MMBtu/cuft-hr	0.0106
Drum		
Dimensions – dia x length of straight	Inches x Ft.	66" ID x 28'-0"
Design Pressure	Psig	2200
Design Temperature	°F	700
Operating Pressure at MCR	Psig	2025
Material		SA-299
Drum Internals - Type		Cyclones, primary and secondary chevron type scrubbers and dry pan
Circulator Tube Connections (expanded or welded)		Welded
Safety Valves		
Quantity -- Drum/SH		2 / 1
Set Pressure – Drum (each)	Psig	2200/2266
Set Pressure SH (each)	Psig	1845
Superheater(s)		
Quantity		3
Heating Surface (each) PRI 1 / PRI 2 / SEC	Sq Ft.	31,444 / 16,038 / 14,176
Tube Diameter (each)	In.	2.0 / 2.0 / 2.5
Material		Carbon and Croloy Steels
Economizer		
Heating Surface (effective surface)	Sq. Ft.	267,036
Tube Diameter	In.	2.0
Material - Casing/Tubes		Carbon Steel
Tube Design Pressure	psig	2400
Tube Operating Pressure	psig	2250
Direction of Water Flow		Up
Gas Velocity	Ft/sec	< 50

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

	Units	Proposed
Air Heater(s)		
Quantity		2
Type		WCAH
Material - Casing/Tubes		Carbon Steel
Direction of Air Flow		horizontal
Fans		
Forced Draft Air Fan:		
Quantity		1
Type		Centrifugal
Control		Variable Inlet Vane
Flow at Design/Test Block	lb/hr	706,200 / 812,200
Static Pressure Rise – Design/Test Block	In. wc	29.1 / 33.7
Rated (Name Plate) Motor HP	HP	1500
Inlet Silencer		Installed on inlet to fan
Lubrication (type/forced or self lube)		Sleevoil / water cooled
Fluidizing Air Fan:		
Quantity		1
Type		Centrifugal
Control		Variable Inlet Vane
Flow at Design/Test Block	lb/hr	376,200 / 413,800
Static Pressure Rise – Design/Test Block	In. wc	32.7 / 41.7
Rated (Name Plate) Motor HP	HP	1500
Lubrication (type/forced or self lube)		Sleevoil / water cooled
Induced Draft Fan:		
Quantity		1
Type		Centrifugal
Control		Inlet Damper
Flow at Design/Test Block	lb/hr	1,018,900 / 1,171,700
Static Pressure Rise – Design/Test Block	In. wc	25.8 / 32.9
Rated (Name Plate) Motor HP	HP	3000
Lubrication (type/forced or self lube)		Sleevoil / water cooled
FGR Fan:		
Quantity		1
Type		Centrifugal
Control		Variable Inlet Vane
Flow at Design/Test Block	lb/hr	159,100 / 175,000
Static Pressure Rise – Design/Test	In. wc	25.7 / 29.7
Rated (Name Plate) Motor HP	HP	500
Lubrication (type/forced or self lube)		Sleevoil / water cooled
Other:		
Service		Seal Air Fan
Quantity		1
Type		Heavy Duty Backward Incline

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No P012754
 May 11, 2011

	Units	Proposed
Control		Seal Air
Flow	ACFM	7,800
Static Pressure Rise	In. wc	2
Rated Motor HP	HP	7 ½
Lubrication (type/forced or self lube)		self lube
Sootblowers		
Retractable:		
Quantity		6 (SH Banks) & 2 SCR
Manufacturer		Diamond Power
Length	<u>ft.</u>	24' (SH Banks) & 6'-4" (SCR)
Rotary:		
Quantity		20
Manufacturer		Diamond Power
Location		Economizer
Biomass Fuel Feed System		
Fuel Storage Type/Quantity		Live Bottom Bin x 2
Total Storage Capacity	Cu. Ft.	4040
Bed Material Handling System		
No. of Hoppers		6
Conveyor Types		Vibrating
Conveyor Quantity		3
Bucket Elevator Quantity		1
Flue Gas Treatment Systems		
Fabric Filter Manufacturer/Model		Babcock & Wilcox PJFF
Fabric Filter No of Compartments		8
Fabric Filter Air/Cloth Ratio		4.03 with one compartment off-line
Fabric Filter Bag Material		Fiberglass with PTFE membrane
Fabric Filter Design Pressure/Temperature	In. wc/deg. F	+10/-35 / 500
Bag Diameter	In	6
Bag Length	m	8
Fabric Filter Material		Fiberglass with PTFE membrane
Casing Material and Thickness		ASTM A 36 – 3/16in
Estimated Pressure Drop	inwg	7.6 after 36 months with one compartment out of service
Expected Bag Life	years	3
SCR catalyst – quantity/type		80 m ³ / Honeycomb

Stone and Webster, Inc (a Shaw Group company)
 Biomass Boiler Island – Hazard, Kentucky



Proposal No.P012754
 May 11, 2011

	Units	Proposed
Number of Catalyst Layers		2
Catalyst Block Dimensions	ft	3.17 x 6.27 x 3.74
Catalyst Module Weight	lb	1,950
Catalyst Weight with All Layers Full	lb	117,000
Ammonia Reagent		19% Aqueous Ammonia
Ammonia Consumption	lb/hr	333 as 19% aqueous ammonia
Dry Sorbent Storage Silo Capacity		
Startup Burners		
Quantity		4
Size		40 mmbtu/hr