

21 West Church Street
Jacksonville, Florida 32202-3139

RECEIVED

AUG 28 2008

August 25, 2008

BUREAU OF AIR REGULATION



Ms. Trina L. Vielhauer, Chief
Bureau of Air Regulation
Division of Air Resource Management
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

ELECTRIC

RE: Northside Generating Station ^{023-AC}
Title V Permit No. 0310045-~~016-AV~~, Construction Permit No. PSD-FL-265
Units 1 and 2 Circulating Fluidized Bed Boilers (CFBs)

WATER

Dear Ms. Vielhauer:

SEWER

The purpose of this correspondence is to request permit revisions to the above referenced permits with regard to the use of fuel additives to assist in the reliable operation of the above referenced units.

These units are permitted to burn coal and/or pet coke in any combination and were designed to be able to burn up to 100% pet coke. Since pet coke is a less expensive fuel than coal, we have attempted to maximize the amount of pet coke burned in these units, but to date have only been able to achieve reliable operation while burning 90% or less pet coke. Coal is necessary to provide ash and kaolinite (or kaolin) to prevent agglomeration of the bed material.

Agglomeration in the boiler reduces bed circulation and, if left unchecked, will solidify in the boiler resulting in the unit having to be taken off-line for long durations in order to clean out the boiler.

The attached reports on coals and ash show numerous trace materials that occur naturally in varying amounts in coal. Investigation and research into the composition of coal and their effects on CFB operation have determined that ash and kaolinite are key constituents in coal for the prevention of agglomeration of the bed material.

Currently, if insufficient quantities of kaolinite are present in the coal, small amounts of raw kaolinite are added to the fuel to prevent agglomeration. However, a less expensive source of kaolinite is available in the form of high kaolinite ash from previously burned coal.

We request approval to obtain coal bed ash from outside sources, such as Cedar Bay Generating Station, for the purpose of using the material as a fuel additive to prevent agglomeration and increase reliability. This should allow us to reliably burn a higher percentage of pet coke in the CFBs than in the past.

Ms. Vielhauer
August 25, 2008
Page Two

This bed ash (as well as the kaolinite) is essentially inert and will not affect PM or other emissions, and constitutes a beneficial reuse of coal ash. Stack testing has been performed on these units while burning 100% coal (with the resulting higher levels of ash and kaolinite in the bed material), 100% pet coke, and various combinations of coal and pet coke. No significant differences were found with respect to particulate emissions due to the state-of-the-art bag-houses employed by these units. The only effect the addition of bed ash and/or kaolinite has is to mimic the use of higher percentages of coal in the boilers, which is already permitted.

We request a construction permit revision be issued as soon as possible allowing the use of bed ash from outside sources as well as kaolinite and/or other constituents in accordance with the suggested permit language below.

Also, the Title V permit for this facility is currently in the renewal process and we request that the fuel additive language be added to the Title V permit as part of the regular renewal cycle. It is requested that the follow footnote be added to the construction permit under General Condition #4 related to fuels and to the Title V permit at the beginning of Subsection H (this is similar to what is already in the permit for Unit 3 at the beginning of Subsection A):

“Fuel additives such as naturally occurring clays containing kaolinite, montmorillonite, olivine, bauxite, granite, and/or other inert constituents in the form of a raw material and/or as a component of coal bed ash are used to prevent agglomeration in the boiler. The Department will be notified any time a new source of fuel additives is employed.”

While it is expected that less than 100 tons per day total per unit of all fuel additives combined will be used, up to 200 tons per day could be necessary to control agglomeration in the boiler.

Per the Department's request, we are also attaching a baseline summary showing the highest 24-month annual average particulate emissions for each unit.

If you have any questions regarding this submittal, please contact Bert Gianazza of my staff at 904-665-6247.

Sincerely,



James M. Chansler, P.E., D.P.A.,
Chief Operating Officer
Responsible Official

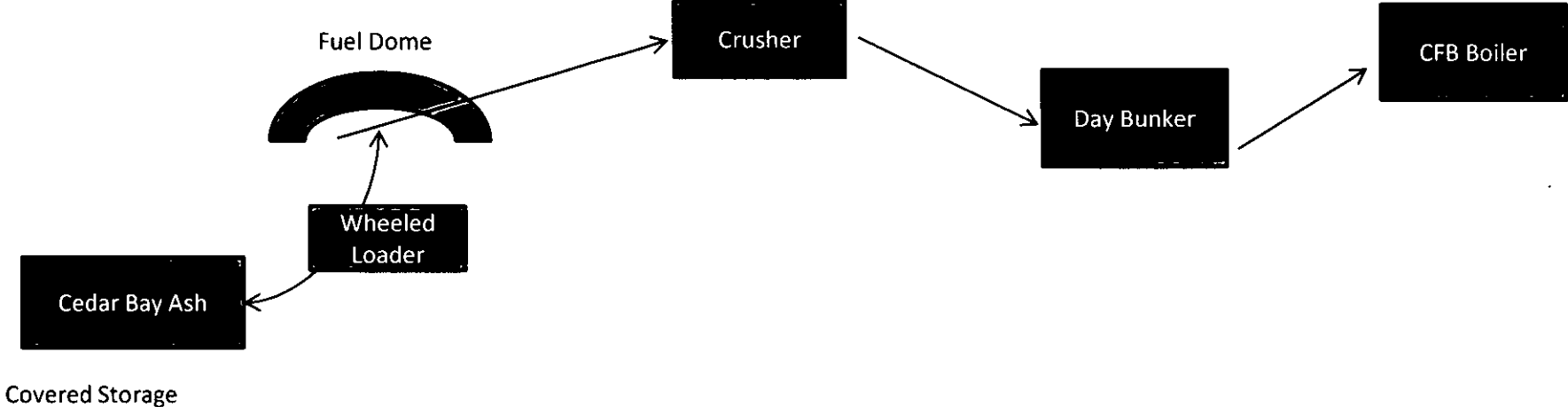


Attachments: As Noted.

cc: Syed Arif, P.E., DEP
Bruce Mitchell, DEP
Steve Pace, P.E., EQD

	NS STEAM				PARTICULATE EMISSIONS							
	NS-1 emissions (tons)			annual average	NS-2 emissions (tons)			12 month total	24 month average	annual average	maximum 24mth average	maximum ending month
	Monthly	12 month total	24 month average		maximum 24mth average	maximum ending month	12 month total					
Sep-03	4.35	-----	-----	-----	.	.	3.01	-----	-----	-----	.	.
Oct-03	4.90	-----	-----	-----	.	.	3.70	-----	-----	-----	.	.
Nov-03	3.54	-----	-----	-----	.	.	1.01	-----	-----	-----	.	.
Dec-03	1.18	-----	-----	-----	.	.	4.64	-----	-----	-----	.	.
Jan-04	4.74	-----	-----	-----	.	.	4.29	-----	-----	-----	.	.
Feb-04	4.55	-----	-----	-----	.	.	1.00	-----	-----	-----	.	.
Mar-04	4.99	-----	-----	-----	.	.	1.38	-----	-----	-----	.	.
Apr-04	5.41	-----	-----	-----	.	.	0.00	-----	-----	-----	.	.
May-04	5.54	-----	-----	-----	.	.	3.06	-----	-----	-----	.	.
Jun-04	4.56	-----	-----	-----	.	.	2.10	-----	-----	-----	.	.
Jul-04	1.81	-----	-----	-----	.	.	3.70	-----	-----	-----	.	.
Aug-04	3.65	49.21	-----	-----	.	.	4.59	32.48	-----	-----	.	.
Sep-04	4.75	49.61	-----	-----	.	.	3.60	33.07	-----	-----	.	.
Oct-04	2.80	47.52	-----	-----	.	.	2.70	32.08	-----	-----	.	.
Nov-04	4.15	48.12	-----	-----	.	.	0.09	31.15	-----	-----	.	.
Dec-04	1.06	48.00	-----	-----	.	.	3.18	29.69	-----	-----	.	.
Jan-05	3.75	47.01	-----	-----	.	.	2.76	28.16	-----	-----	.	.
Feb-05	3.00	45.46	-----	-----	.	.	3.71	30.88	-----	-----	.	.
Mar-05	2.31	42.78	-----	-----	.	.	4.43	33.93	-----	-----	.	.
Apr-05	3.45	40.81	-----	-----	.	.	2.97	36.90	-----	-----	.	.
May-05	3.63	38.90	-----	-----	.	.	3.51	37.35	-----	-----	.	.
Jun-05	3.76	38.11	-----	-----	.	.	3.42	38.67	-----	-----	.	.
Jul-05	2.82	39.12	-----	-----	.	.	3.63	38.60	-----	-----	.	.
Aug-05	2.88	38.35	3.65	43.78	43.78	Aug-05	4.13	38.13	2.94	35.30	.	.
Sep-05	2.95	36.55	3.59	43.08	.	.	4.42	38.95	3.00	36.01	.	.
Oct-05	2.92	36.67	3.51	42.09	.	.	3.07	39.32	2.97	35.70	.	.
Nov-05	2.36	34.88	3.46	41.50	.	.	0.51	39.74	2.95	35.45	.	.
Dec-05	1.91	35.72	3.49	41.86	.	.	4.19	40.75	2.94	35.22	.	.
Jan-06	1.90	33.87	3.37	40.44	.	.	4.23	42.22	2.93	35.19	.	.
Feb-06	2.59	33.47	3.29	39.46	.	.	3.81	42.31	3.05	36.59	.	.
Mar-06	0.99	32.15	3.12	37.46	.	.	3.83	41.72	3.15	37.82	.	.
Apr-06	0.18	28.88	2.90	34.84	.	.	3.68	42.43	3.31	39.66	.	.
May-06	0.02	25.26	2.67	32.08	.	.	3.59	42.50	3.33	39.93	.	.
Jun-06	0.82	22.32	2.52	30.22	.	.	2.61	41.70	3.35	40.18	40.18	Jun-06
Jul-06	0.92	20.42	2.48	29.77	.	.	3.53	41.60	3.34	40.10	.	.
Aug-06	0.98	18.52	2.37	28.44	.	.	3.85	41.33	3.31	39.73	.	.
Sep-06	0.93	16.50	2.21	26.53	.	.	3.25	40.15	3.30	39.55	.	.
Oct-06	0.60	14.19	2.12	25.43	.	.	2.63	39.71	3.29	39.51	.	.
Nov-06	0.87	12.71	1.98	23.79	.	.	0.00	.	.	0.00	.	.
Dec-06	1.24	12.04	1.99	23.88	.	.	2.60	37.61	3.27	39.18	.	.
Jan-07	0.98	11.11	1.87	22.49	.	.	3.75	37.13	3.31	39.67	.	.
Feb-07	0.94	9.46	1.79	21.46	.	.	2.82	36.14	3.27	39.22	.	.
Mar-07	0.77	9.24	1.72	20.69	.	.	3.00	35.30	3.21	38.51	.	.
Apr-07	0.10	9.16	1.58	19.02	.	.	3.55	35.17	3.23	38.80	.	.
May-07	0.97	10.11	1.47	17.69	.	.	2.85	34.43	3.21	38.46	.	.
Jun-07	0.97	10.26	1.36	16.29	.	.	3.54	35.35	3.21	38.53	.	.
Jul-07	0.99	10.33	1.28	15.38	.	.	1.12	32.95	3.11	37.27	.	.
Aug-07	0.91	10.26	1.20	14.39	.	.	3.78	32.87	3.09	37.10	.	.
Sep-07	0.99	10.33	1.12	13.42	.	.	4.10	33.73	3.08	36.94	.	.
Oct-07	0.98	10.71	1.04	12.45	.	.	2.71	33.82	3.06	36.76	.	.
Nov-07	0.62	10.46	0.97	11.58	.	.	1.62	35.43	3.11	37.32	.	.
Dec-07	0.95	10.17	0.93	11.11	.	.	3.77	36.60	3.09	37.11	.	.
Jan-08	0.92	10.12	0.88	10.62	.	.	3.28	36.13	3.05	36.63	.	.
Feb-08	0.84	10.02	0.81	9.74	.	.	3.32	36.64	3.03	36.39	.	.
Mar-08	0.75	10.00	0.80	9.62	.	.	4.23	37.87	3.05	36.59	.	.
Apr-08	0.91	10.81	0.83	9.98	.	.	1.00	35.33	2.94	35.25	.	.
May-08	0.55	10.39	0.85	10.25	.	.	1.98	34.46	2.87	34.44	.	.
Jun-08	0.89	10.32	0.86	10.29	.	.	2.85	33.77	2.88	34.56	.	.
Jul-08	3.81	13.13	0.98	11.73	.	.	2.47	35.12	2.84	34.03	.	.
Aug-08	0.00	.	.	0.00	.	.	0.00	.	.	0.00	.	.
Sep-08	0.00	.	.	0.00	.	.	0.00	.	.	0.00	.	.
Oct-08	0.00	.	.	0.00	.	.	0.00	.	.	0.00	.	.

Cedar Bay Ash Addition Process Drawing



CHARACTERIZATION AND COMPARISON OF FUELS

Report prepared for

Greg Graham
Jacksonville Electric Authority
PO Box 4910
Jacksonville, FL 32201-4910

Report prepared by

Steven A. Benson, Ph.D., President
Margaret L. Laumb, Research Engineer
Arthur L. Ruud, Research Scientist
Microbeam Technologies Inc.

November 27, 2007

Report No. 991 - final

Shipping:
4200 James Ray Drive, Ste. 191
Grand Forks, ND 58203

Mailing:
PO Box 14758
Grand Forks, ND 58208-4758

Phone: 701-777-6530
Fax: 701-777-6532
info@microbeam.com

CHARACTERIZATION AND COMPARISON OF FUELS

EXECUTIVE SUMMARY

Jacksonville Electric Authority (JEA) submitted two coal samples to Microbeam Technologies, Inc. (MTI) for characterization. The goal of the characterization effort was to identify characteristics in the two fuels that would affect their use in a CFB and to make recommendations as to which coal would be better suited for use in JEA's CFB.

Based on the results of the analyses, each coal characterized has positive and negative attributes, as follows:

- **Columbian coal – positive:** The “low ash” Columbian coal has the potential to form significant deposits, but the deposits will be relatively weak. It also has a lower pyrite content.
- **Columbian coal – negative:** The Columbian coal has very low kaolinite content – kaolinite is a beneficial mineral that typically weakens deposits. Also, its higher illite content can lead to high-temperature deposition problems.
- **Patriot coal – positive:** The Patriot coal will form smaller deposits in the higher temperature regions of the CFB. It does contain higher levels of kaolinite clay, which will help weaken deposits.
- **Patriot coal – negative:** The high pyrite content will lead to the formation of high strength in the deposit; although the deposits will be smaller than those that are formed from Columbian coal, they will be strong. In addition, the higher level of illite will contribute to the formation of deposits.

Overall, the Columbian coal appears to be a slightly better choice than the Patriot coal relative to deposit strength development and a lower likelihood to form very high-temperature (2000-3000°F) deposits (“wall slagging”). However, the low level of kaolinite in the Columbian coal, combined with the higher level of illite, is a concern. If possible, it is recommended that other options be investigated.

CHARACTERIZATION AND COMPARISON OF FUELS

INTRODUCTION AND BACKGROUND

Jacksonville Electric Authority (JEA) submitted two coal samples to Microbeam Technologies, Inc. (MTI) for characterization. The goal of the characterization effort was to identify characteristics in the two fuels that would affect their use in a CFB and to make recommendations as to which coal would be better suited for use in JEA's CFB.

Table 1. Samples submitted for analysis.

MTI #	Description	Analysis Requested
07-287	Patriot coal – Pittsburgh #8 seam, Transcor Energy	Grinding, ultimate, ash composition, CCSEM
07-289	Columbian Coal No. 101007-B	Grinding, ultimate, ash composition, CCSEM

METHODS AND MATERIALS

The coal samples were ground to about 70% to 80% passing 200 mesh. The ground samples were prepared for CCSEM analysis by mixing two grams of coal with three grams of melted carnauba wax. This mixture was poured into a small rubber mold and, after solidifying, was topped off with epoxy. The epoxy was allowed to cure overnight, and the mounted sample was then polished to a one-micron grit. The polished samples were cleaned and coated with carbon to improve conductivity in the electron microscope.

The prepared samples were analyzed to determine size, composition, and abundance of mineral grains using computer-controlled scanning electron microscopy (CCSEM). The elemental compositions and mineral sizes determined with CCSEM analysis are used to categorize individual coal mineral particles by size and type.

Standard ASTM bulk analysis methods, ultimate and ash composition, were also used to characterize the samples and were used, along with CCSEM analysis, to calculate performance indices for the coals.

Performance Indices for Coal

Performance predictions were made for the two coal samples using MTI's Coal Quality Management System (CQMS), a software package for calculating advanced indices to relate coal characteristics to ash behavior in a coal-fired utility boiler. Certain indices may also be applied to the formation of deposits or agglomerates in a circulating fluidized bed (CFB) combustion system. Performance indices have not been developed for petroleum coke fuel, as deposit formation and strength development for petroleum coke is affected by different minerals and mechanisms than for coal, and currently there exists insufficient data to develop accurate performance predictions.

Fuel performance for coal can be estimated in terms of abrasion and erosion wear, deposit formation at various temperature ranges, and strength development of deposits, as follows:

- Sulfation Index: Indicates the propensity to form convective pass low-temperature sulfate-based deposits at temperatures between 1000 and 1750°F. This index is based on the availability of alkali (Na and K) and alkaline earth (Ca and Mg) elements to react with SO₂ and SO₃ to form sulfate, which is the primary material that causes particle-to-particle bonding in high-calcium coals. Sulfates are thermodynamically stable at temperatures below about 1650°F. Index values range from 1-low to 10-severe.
- Silication Index: Indicates the propensity of deposits to form in convective pass at temperatures from 1600 to 2400°F. This index is related to the formation of high-temperature deposits in which silicates are the primary accumulating materials and the primary bonding component. Information used to derive the index includes the size of minerals such as quartz and clay, availability of alkali and alkaline earth elements, and the viscosity of the silicate liquid phase. This index is used in combination with the strength index. Values range from 1-low to 200-severe.
- Wall Slagging Index: Indicates the propensity of deposits to form at very high temperatures of 2000 to 3000°F. The slagging index is based on mineral size (especially illite, quartz, and pyrite), association of calcium (calcite can contribute to slagging), and viscosity of the silicate-based liquid phase. This index is used in combination with the strength index to assess slag deposit characteristics. Values range from 1-low to 20-severe.
- Strength Index: This index predicts the strength of deposited material. Index values of less than 0.25 indicate weak deposits. Values of 0.25 to 0.34 denote low to moderate strength, and values of 0.34 to 0.41 indicate strong deposits. Index values greater than 0.41 correspond to fully liquid material of very high strength.
- Wear Indices
 - Abrasion Index: This index indicates the potential for wear of fuel preparation and handling equipment, as related to the hardness of minerals in the coal. The primary minerals of concern are quartz and pyrite. Values range from 0.1-low to 10-severe.
 - Erosion Index: This index indicates the potential for wear of boiler parts due to the impaction of fly ash particles, particularly those containing hard minerals such as quartz. The erosion index is dependent upon particle size and velocity. Values range from 0.1-low to 1.0-severe.

RESULTS AND DISCUSSION

Ultimate, ash composition, and CCSEM analyses were performed on the two coal samples. The results of the ultimate analysis are presented in Table 2. The “lower-ash” Columbian coal sample had a moisture content of about 15 wt% (as-received) and a high ash content, at about 18 wt% (dry basis). The Patriot coal had a moisture content of about 6.6 wt%, and a lower ash content of about 8 wt% (dry basis).

Table 2. Ultimate analysis results for Patriot coal (MTI 07-287) and “low ash” Columbian coal (MTI 07-289).

Ultimate Analysis (wt. %)	Patriot (MTI 07-287)		“Low ash” Columbian Coal (MTI 07-289)	
	As-rec'd	Dry	As-rec'd	Dry
Total moisture	6.64		14.79	
Ash	7.65	8.19	15.18	17.81
Carbon	72.81	77.99	56.69	66.53
Hydrogen	5.77	5.38	5.56	4.58
Nitrogen	1.19	1.27	1.14	1.34
Total sulfur	2.60	2.78	0.74	0.87
Oxygen by difference	9.98	4.37	20.69	8.87

Ash composition analyses for the fuels are shown in Table 3. The “low-ash” Columbian coal had high silica (as SiO₂) content, at about 63 wt% (in ash). Both coals (Patriot and Columbian) had alumina (as Al₂O₃) contents of about 21.35 wt%. The Patriot coal had high iron, at 16 wt% (Fe₂O₃); the Columbian coal contained about 6 wt% iron. Both coals had low base-to-acid ratios; the Patriot base-to-acid ratio was 0.38 and the Columbian coal base-to-acid ratio was 0.14.

Table 3. Ash composition analysis results for Patriot coal (MTI 07-287) and “low ash” Columbian coal (MTI 07-289).

	Patriot (MTI 07-287)	Low-Ash Columbian Coal (MTI 07-289)
SiO ₂	45.31	62.99
Al ₂ O ₃	21.34	21.35
TiO ₂	0.85	0.83
Fe ₂ O ₃	15.97	6.11
CaO	5.55	1.48
MgO	1.47	1.65
K ₂ O	1.43	2.23
Na ₂ O	1.07	0.76
SO ₃	5.92	1.92
P ₂ O ₅	0.64	0.35
SrO	0.15	0.03
BaO	0.12	0.08
MnO ₂	0.04	0.06
SiO ₂ /Al ₂ O ₃	2.12	2.95
Base/acid	0.38	0.14

The CCSEM analysis results (on a mineral basis) for the Patriot coal (MTI 07-287) are shown in Table 4. The Patriot coal contained about 11 wt% quartz and 4 wt% silica-rich minerals. The pyrite content was high, at 24 wt% pyrite. Kaolinite, a beneficial mineral relative to fouling, was present at 8.3 wt%. The coal contained 3.9 wt% montmorillonite and 6.6 wt% illite (potassium aluminosilicate). Other mixed layered clays comprised about 9 wt% of the minerals characterized and unclassified minerals made up about 20 wt%. Illite and other mixed clay materials will contribute to the formation of deposits at higher temperatures.

Table 4. CCSEM analysis results for Patriot coal (MTI 07-287). Results expressed as weight percent on a mineral basis.

	Size bin, microns						TOTALS
	1 TO 2.2	2.2 TO 4.6	4.6 TO 10	10 TO 22	22 TO 46	46 TO 400	
QUARTZ	0.6	3.6	3	2.1	1.2	0.7	11.1
IRON OXIDE	0.1	0.4	0.7	0.8	0	0	2.1
PERICLASE	0	0	0	0	0	0	0
RUTILE	0	0	0.1	0	0	0	0.1
ALUMINA	0	0	0.1	0.1	0	0	0.2
CALCITE	0.1	0.1	0.5	0.5	0.6	0.1	1.9
DOLOMITE	0	0.2	0.2	0.4	0.1	0	0.9
ANKERITE	0	0	0	0	0	0	0
KAOLINITE	0.6	2.4	2.5	1.5	1	0.4	8.3
MONTMORILLONITE	0.5	1.4	0.8	0.5	0.2	0.5	3.9
K AL-SILICATE	0.4	1.9	1.7	1.5	0.9	0.2	6.6
FE AL-SILICATE	0.3	0.5	0.2	0.1	0.2	0	1.3
CA AL-SILICATE	0.2	0.4	0.4	0.2	0.2	0	1.4
NA AL-SILICATE	0.2	0.5	0.8	0.1	0.3	0.3	2.3
ALUMINOSILICATE	0.1	0.2	0.5	0.3	0.4	0.2	1.7
MIXED AL-SILICA	0.4	1.2	0.6	0.2	0.3	0.1	2.8
FE SILICATE	0	0	0	0	0	0	0
CA SILICATE	0	0	0.1	0	0	0	0.1
CA ALUMINATE	0	0	0	0	0	0	0
PYRITE	0.3	1.7	2.8	4.7	7.8	6.7	24.0
PYRRHOTITE	0	0.6	0.2	0.4	0.2	0.3	1.7
OXIDIZED PYRRHO	0	0	0.3	0	0.1	0.1	0.5
GYPNUM	0	0	0.1	0.1	0.2	0	0.4
BARITE	0	0	0	0	0	0	0
APATITE	0	0	0	0	0	0.4	0.4
CA AL-P	0	0	0	0	0	0	0
KCL	0	0	0	0	0	0	0
GYPNUM/BARITE	0	0	0	0	0	0	0
GYPNUM/AL-SILIC	0.3	0.3	0.1	0.1	0.2	0.1	1.1
SI-RICH	0.6	1.3	1.1	0.7	0.6	0.3	4.6
CA-RICH	0.1	0.4	0.3	0.8	0.5	0.2	2.2
CA-SI RICH	0	0	0	0.1	0	0	0.1
UNKNOWN	3.5	6	3.5	2.6	3	1.6	20.1
TOTALS	8.4	23.1	20.6	17.7	18	12.3	100

The CCSEM analysis results for the “low-ash” Columbian coal (MTI 07-289) are shown in Table 5. The coal contained about 31 wt% quartz, about 6 wt% silica-rich minerals and 8 wt% pyrite. Kaolinite was present at 4.6 wt%. The coal also contained 11.7 wt% illite, 4 wt% montmorillonite at 4 wt%, and other mixed layered clays (about 9 wt%). These mixed clays will contribute to deposition at higher temperatures. The unclassified (minerals that do not fit into a specific phase) comprised 18 wt% of the material analyzed.

Table 5. CCSEM analysis results for “low-ash” Columbian coal (MTI 07-289). Results expressed as weight percent on a mineral basis.

	<i>Size bin, microns</i>						TOTALS
	1 TO 2.2	2.2 TO 4.6	4.6 TO 10	10 TO 22	22 TO 46	46 TO 400	
QUARTZ	1.9	6.7	6.4	6.6	4.6	4.6	30.8
IRON OXIDE	0.1	0	0.1	0	0	0	0.2
PERICLASE	0	0	0	0	0	0	0
RUTILE	0	0.3	0.1	0.3	0	0.2	0.9
ALUMINA	0	0	0	0	0	0	0
CALCITE	0	0	0	0.6	0.1	0.1	0.8
DOLOMITE	0	0	0.2	0.2	0.3	0.1	0.9
ANKERITE	0	0	0	0	0.1	0	0.1
KAOLINITE	0.5	1.2	1	0.8	0.6	0.4	4.6
MONTMORILLONITE	0.3	1	1	1.4	0.3	0	4
K AL-SILICATE	1.2	2.7	2.9	3	1.5	0.5	11.7
FE AL-SILICATE	0.2	0.7	0.9	0.4	0.4	0.3	2.9
CA AL-SILICATE	0.1	0.2	0	0.3	0.1	0	0.7
NA AL-SILICATE	0.1	0.3	0.2	0.3	0.3	0	1.1
ALUMINOSILICATE	0.1	0.4	0.4	0.5	0.2	0.2	1.8
MIXED AL-SILICA	0.4	0.8	0.5	0.3	0.2	0.2	2.4
FE SILICATE	0	0.2	0.1	0	0.1	0	0.3
CA SILICATE	0	0	0	0	0	0	0
CA ALUMINATE	0	0	0	0	0	0	0
PYRITE	0.5	1	2.1	1.9	1.5	1.2	8.1
PYRRHOTITE	0.2	0.3	0.3	0.6	0.1	0	1.4
OXIDIZED PYRRHO	0.1	0.1	0	0.2	0	0.2	0.6
GYPNUM	0	0	0.2	0.6	0.4	0.1	1.4
BARITE	0	0	0	0	0	0	0
APATITE	0	0	0.1	0.5	0	0	0.6
CA AL-P	0	0	0	0	0	0	0
KCL	0	0	0	0	0	0	0
GYPNUM/BARITE	0	0	0	0	0	0	0
GYPNUM/AL-SILIC	0	0	0	0	0	0	0
SI-RICH	0.6	1.3	1.5	1.3	1	0.7	6.4
CA-RICH	0	0.1	0.1	0	0	0	0.3
CA-SI RICH	0	0	0	0	0	0	0
UNKNOWN	1.5	4.3	3.7	4.5	2.1	1.9	18
TOTALS	7.8	21.5	21.9	24.2	13.9	10.7	100

The performance indices for the fuels are shown in Table 6. Indices calculated included wear (abrasion of fuel handling equipment and erosion of tube surfaces and other boiler parts), deposition (low temperature sulfate-based fouling; moderate-temperature silicate-based fouling; and high-temperature slagging), and strength development potential. Both coals had similar low wear indices, with abrasion indices between 3.1 and 3.9 and erosion indices between 0.17 and 0.21. The sulfation index (low-temperature fouling) for both coals was also low. The Patriot coal had a low silication index at 18; the Columbian coal had a high silication index of 72.5. This high silication index indicates a higher potential to form deposits at temperatures between 1600 and 2400°F, and is likely due to its high ash content and high level of mixed layered clays. The Columbian coal had a low strength index of 0.22; the strength index for Patriot coal was 0.34 - moderate to high, and is likely due to the high level of pyrite and the presence of calcium.

Table 6. Predictive indices calculated for coal sample (MTI 07-279), based on CCSEM analysis results, ultimate, and ash composition.

Sample	MTI #	Abrasion	Erosion	Sulfation (1000-1750°F)	Silication (1600-2400°F)	Wall Slagging (2000-3000°F)	Strength
Patriot	07-287	3.10	0.17	0.00	17.89	2.85	0.34
Columbian	07-289	3.89	0.21	0.01	72.50	1.44	0.22

Notes:

Abrasion index indicates the potential for wear of fuel preparation and handling equipment. Values range from 0.1 (low) to 20 (severe).

Erosion index indicates the potential for wear of boiler parts due to impaction of fly ash particles. Values range from 0.1 (low) to 1.0 (severe).

Convective pass sulfation index indicates the propensity of deposits to form in the convective pass at 1000° to 1750°F. Values range from 0.1 (low) to 10 (severe).

Convective pass silication index indicates the propensity of deposits to form in the convective pass at 1600° to 2400°F. Values range from 1 (low) to 200 (severe).

Wall slagging index indicates the propensity of deposits to form on the radiant walls from 2000° to 3000°F. Values range from 1 (low) to 20 (severe).

Strength index indicates the ability of the deposited material to develop strength. Values of less than 0.25 indicate weak deposits; values of 0.25 to 0.34 denote low to moderate strength; and values of 0.34 to 0.41 indicate moderately strong deposits. Values greater than 0.41 indicate flowing slag.

SUMMARY AND CONCLUSIONS

Based on the results of the analyses, each coal characterized has positive and negative attributes, as follows:

- **Columbian coal – positive:** The “low ash” Columbian coal has the potential to form significant deposits, but the deposits will be relatively weak. It also has a lower pyrite content.
- **Columbian coal – negative:** The Columbian coal has very low kaolinite content – kaolinite is a beneficial mineral that typically weakens deposits. Also, its higher illite content can lead to high-temperature deposition problems.
- **Patriot coal – positive:** The Patriot coal will form smaller deposits in the higher temperature regions of the CFB. It does contain higher levels of kaolinite clay, which will help weaken deposits.
- **Patriot coal – negative:** The high pyrite content will lead to the formation of high strength in the deposit; although the deposits will be smaller than those that are formed from Columbian coal, they will be strong. In addition, the higher level of illite will contribute to the formation of deposits.

Overall, the Columbian coal appears to be a slightly better choice than the Patriot coal relative to deposit strength development and a lower likelihood to form very high-temperature (2000-3000°F) deposits (“wall slagging”). However, the low level of kaolinite in the Columbian coal, combined with the higher level of illite, is a concern. If possible, it is recommended that other options be investigated.

**CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT**

Report prepared for

Gregg Graham
Jacksonville Electric Authority
PO Box 4910
Jacksonville, FL 32201-4910

Report prepared by

Steven A. Benson, Ph.D., President
Margaret L. Laumb, Research Engineer
Arthur L. Ruud, Research Scientist
Microbeam Technologies Inc.

June 27, 2008

Report No. 1032 – Final

Shipping:
4200 James Ray Drive, Ste. 191
Grand Forks, ND 58203

Mailing:
PO Box 14758
Grand Forks, ND 58208-4758

Phone: 701-777-6530
Fax: 701-777-6532
info@microbeam.com

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

EXECUTIVE SUMMARY

Jacksonville Electric Authority (JEA) submitted samples of two fuels, limestone, a heat recovery area (HRA) deposit, and two candidate CFB bed materials to Microbeam Technologies, Inc. (MTI) for characterization.

Fuel Analysis Results

The two fuel samples were characterized using the ultimate, ash composition, morphological, and CCSEM analyses.

The April 24, 2008 petcoke sample (08-0687, MTI 08-079) ultimate analysis showed fairly high sulfur content (6.78 wt%) and low ash content (0.66 wt%). The petroleum coke ash contained 39 wt% silicon, 10 wt% aluminum, 24 wt% vanadium, 7 wt% potassium, and 4 wt% sodium. The morphological analysis of the mineral and other ash forming components found that most of the included and excluded minerals found consisted of quartz. Minor amounts of calcium sulfate and iron sulfate/sulfide were found. Sulfur was the only element noted to a significant degree in the organic matrix of the petcoke.

The April 27, 2008 coal sample (08-0695, MTI 08-078) was fairly high in ash content (17.55 wt%). The coal ash contained 63 wt% silicon, 19 wt% aluminum, 6 wt% iron, and less than 3 wt% calcium, magnesium, potassium and sodium (all reported as equivalent). The morphological analysis of the mineral grains and other ash forming components found that the minerals included within the coal matrix were of the following: potassium aluminosilicate, potassium-iron aluminosilicate, pyrite, and aluminosilicate. Excluded minerals were of the same types. The organically associated elements were identified by probing the organic matrix (dark-appearing in micrographs) of the coal. The coal matrix contained varying levels of magnesium, aluminum, silicon, sulfur, chlorine, and calcium.

CCSEM analyses for the coal and petroleum coke provided by JEA was used to determine the size, composition, and abundance of mineral grains.

The coal CCSEM analysis found that the coal contained 23 wt% quartz, most of which was present in the middle-to-large size bins (greater than 4.6 μm). The coal also contained 13 wt% illite (potassium aluminosilicate) and 10.7% Silicon-rich materials. The coal contained low levels of pyrite and kaolinite and montmorillonite clays. Unknown materials made up another 23 wt% of the minerals analyzed.

The petroleum coke CCSEM analysis results contained 32 wt% quartz and 37 wt% unclassified or unknown materials (on a mineral basis). The petroleum coke also contained

small amounts of kaolinite, illite, and other clay minerals. Small amounts of iron and nickel sulfides were found in the sample.

Limestone Analysis Results

Morphological analysis was used to characterize the April 24, 2008 limestone sample (08-0690, MTI 08-080) to determine the bulk composition and microstructural characteristics. Bulk composition results obtained by both the JEA laboratory and the MTI contract laboratory showed that the limestone is primarily composed of calcium (carbonate). Both also showed a presence of sodium at about 0.2 to 0.3 wt% and magnesium of about 0.6 to 0.7 wt%. The "unknown" material in the XRF analysis is the carbonate portion of the limestone.

The morphological results indicated that the limestone was composed largely of calcium carbonate. Some point and area analyses contained around 3 wt% sodium in addition to the calcium. Chlorine was also present at levels up to 4 wt%. No potassium-bearing materials were found.

HRA Deposit Analysis Results

The HRA deposit was characterized using morphology and SEMPC analysis to determine the bonding phases in the deposit. The morphological analysis results for the HRA deposit found a highly porous deposit that contained evidence of liquid sintering or bonding between materials. The bonding phases (or "necks") generally contained calcium sulfate with some containing high levels of sodium and potassium.

Results of the SEMPC analysis for the HRA deposit were mainly composed of calcium sulfate phases, ranging from fully sulfated anhydrite (37% of points) to partially sulfated calcium (22% of points). The unclassified phase made up about 41% of the SEMPC points for the HRA deposit. The bulk Unit 1 HRA deposit composition was 46 wt% SO₃, 35 wt% CaO, 8 wt% SiO₂ and 3 wt% Al₂O₃. The amorphous materials in the HRA deposit contained mainly silicon (44 wt% SiO₂), aluminum (18 wt%), calcium (15 wt%), potassium (9 wt%), sodium (6 wt%) and vanadium (5 wt%). The bonding phase was enriched in potassium and sodium.

Cedar Bay CFB Bed Ash Analysis Results

The Cedar Bay CFB Bed Ash (MTI 08-083) was characterized using morphological and SEMPC analysis to determine the chemical and physical properties of the ash for possible use as a bed material additive or inert. The results of the morphological analysis indicated that the Cedar Bay CFB bed ash contained calcium (limestone), silicon (quartz), and aluminosilicate bed particles that were coated with thin layers of calcium aluminosilicate. The aluminum-to-silicon ratio of the particle coatings was consistent with kaolinite. The Cedar Bay CFB bed ash unclassified phase (32% of points) was mainly composed of silicon (53 wt%) and aluminum (33 wt%). The St. John's River bottom ash unclassified phase, which made up over 75% of the material analyzed, contained 58 wt% silicon, 25 wt% aluminum, and 8 wt% iron. The Cedar Bay

CFB bed ash contained about 11% crystalline phases – gehlenite and anorthite. The bed ash also contained about 17% quartz and 16% calcium oxide or calcium carbonate. The Cedar Bay ash contained 7.4% kaolinite and 15.4% kaolinite derived phases. The bulk Cedar Bay CFB ash composition was 53 wt% SiO₂, 26 wt% Al₂O₃, and 13 wt% CaO. The amorphous component of the ash contained a similar level of silicon (51 wt%), more aluminum (38 wt%), little calcium (0.8 wt%) and slightly higher potassium (3 wt%). These phases will likely have higher melting points and be resistant to agglomeration.

St. John's River Power Plant Bottom Ash Results

The St. John's River Power Plant PC bottom ash (MTI 08-084) was also characterized using morphological and SEMPC analysis to determine the chemical and physical properties of the ash for use as a bed material. The morphological analysis showed that the bottom ash was fairly homogeneous and highly porous. It contained some bright (iron-containing) particles. The matrix material was an iron aluminosilicate material (5 wt% iron, 22 wt% aluminum, and 32 wt% silicon). Potassium and sodium were slightly enriched in the necks or bonding material.

The bottom ash from the St. John's River PC-fired plant contained mainly amorphous phases. The other major phase present was classified as quartz (14 wt%). The St. John's River pulverized coal bottom ash contained iron (7.2 wt% as Fe₂O₃), silicon (63 wt%) and aluminum (22 wt%) on average ("bulk"). The amorphous component was similar in composition, with slightly lower silicon (58 wt%) and higher aluminum (27 wt%). The higher iron will result in a lower melting point of the ash. If high temperature excursion occurs, this material has the potential to melt quickly when combined with calcium from limestone bed material.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

INTRODUCTION

Jacksonville Electric Authority (JEA) submitted samples of two fuels, limestone, a deposit, and two candidate CFB bed materials to Microbeam Technologies, Inc. (MTI) for characterization. The deposit was taken from the heat recovery area (HRA).

Table 1 lists the samples submitted by JEA, and the analyses requested.

Table 1. List of samples submitted by JEA and analyses requested.

MTI #	Description	Analyses Requested
08-078	Coal 08-0695 4-27-08	Ultimate, ash composition, morphology, CCSEM
08-079	Petcoke 08-0687 4-24-08	Ultimate, ash composition, morphology, CCSEM
08-080	Limestone 08-0690 4-24-08	Ash composition, morphology, XRF
08-082	Unit 1 HRA Deposit 5-5-08	Morphology, SEMPC
08-083	Cedar Bay CFB Bed Ash	Morphology, SEMPC
08-084	SJRPP PC Bottom Ash	Morphology, SEMPC

METHODS AND MATERIALS

Fuel Samples

The coal and petcoke samples were ground to about 80% passing 200 mesh. The ground samples were prepared for CCSEM analysis by mixing two grams of sample with three grams of melted carnauba wax. This mixture was poured into a small rubber mold and, after solidifying, was topped off with epoxy. The epoxy was allowed to cure overnight, and the mounted sample was then polished to a one-micron grit. The polished samples were cleaned and coated with carbon to improve conductivity in the electron microscope.

The prepared fuel samples were analyzed to determine size, composition, and abundance of mineral grains using computer-controlled scanning electron microscopy (CCSEM). The elemental compositions and mineral sizes determined with CCSEM analysis are used to categorize individual coal mineral particles by size and type.

Standard ASTM bulk analysis methods, ultimate and ash composition, were also used to characterize the fuel samples. A morphological analysis was also performed on the coal and petcoke samples to provide information on the presence of organically associated elements (such as calcium, sodium, iron, and other elements that are contained along with the carbon in the organic matrix) that are not detected by CCSEM analysis. Information on the association of other minerals within the coal is also provided using morphological analysis.

Limestone, deposit and bed material samples

A representative portion from each sample was selected for scanning electron microscope (SEM) morphological analysis. Several grams of each sample were mixed with epoxy resin and

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

cross-sectioned. The mounted, cross-sectioned samples were then polished to a one-micron grit, and coated with carbon to provide a conductive surface for improved SEM imaging.

Scanning electron microscopy (SEM) morphological and point count (SEMP) analyses were performed on the samples. Morphological analysis was performed to obtain high-magnification images and chemical compositions of selected features in the deposits. Such features might include: coatings on bed or ash particles; entrained metals; fine-sized bonding material; liquid bonding material; and other features of interest. Chemical compositions were obtained by performing x-ray analysis on the features identified; the x-ray spectra were quantified using reference files of standard analyses.

SEMP analysis is an automated SEM technique, in which x-ray spectra are obtained at points along a grid pattern on the surface of the polished sample. The size of the grid, and spacing between analysis points, is set up by the SEM operator; the remainder of the analysis proceeds automatically. Only the mounted deposit is analyzed; the epoxy mounting medium that surrounds and penetrates the deposit is excluded from the analysis automatically. The data produced by the SEMPC technique consists of up to three hundred chemical analyses that correspond to specific locations on the grid. The SEMPC data is "crunched" using MTI's database of the most commonly occurring chemical phases in deposits. The crunched data is then used to report on the frequency (or weight percent) of chemical phases (including quartz, calcium silicate crystalline phases, carbonates, sulfates, and mixed aluminosilicate amorphous phases). The crunched data is also used to determine the degree of sulfation (for sulfate-based deposits) and the viscosity pattern of liquid bonding phases (for silicate-based deposits).

RESULTS AND DISCUSSION

FUEL SAMPLES

Ultimate, ash composition, morphological, and CCSEM analyses were performed on the two fuel samples. The results of the ultimate and ash composition analyses are presented in Table 2. The petcoke sample (MTI 08-079) had a fairly high sulfur content (6.78 wt%) and low ash content (0.66 wt%). The coal sample was fairly high in ash content (17.55 wt%).

The ash produced by ashing the coal contained 63 wt% silicon, 19 wt% aluminum, 6 wt% iron, and less than 3 wt% calcium, magnesium, potassium and sodium (all reported as equivalent). The petroleum coke ash also contained silicon, at 39 wt%, 10 wt% aluminum, 24 wt% vanadium, 7 wt% potassium, and 4 wt% sodium.

**CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT**

Table 2. Ultimate and ash composition analysis results for coal and petcoke samples.

	Coal 08-0695 4-27-08 (MTI 08-078)		Petcoke 08-0687 4-24-08 (MTI 08-079)	
	<i>As-rec'd</i>	<i>Dry</i>	<i>As-rec'd</i>	<i>Dry</i>
Ultimate (wt.%)				
Total moisture	3.10		0.39	
Ash	17.01	17.55	0.66	0.66
Carbon	63.35	65.38	86.24	86.58
Hydrogen	4.81	4.61	4.00	3.97
Nitrogen	1.29	1.33	1.61	1.62
Total sulfur	0.98	1.01	6.75	6.78
Oxygen by difference	12.56	10.12	0.74	0.40
Chlorine (ppm)	194	200	157	158
Ash composition (wt.%)		<i>Dry</i>		<i>Dry</i>
SiO ₂		63.41		39.00
Al ₂ O ₃		18.70		9.78
TiO ₂		0.94		0.35
Fe ₂ O ₃		6.33		3.89
CaO		1.22		1.73
MgO		1.94		1.59
K ₂ O		2.99		6.67
Na ₂ O		1.27		4.38
SO ₃		1.45		1.50
P ₂ O ₅		0.59		1.07
SrO		0.03		0.02
BaO		0.12		0.05
MnO ₂		0.06		0.03
V ₂ O ₅		-		24.33
NiO		-		5.64
SiO ₂ /Al ₂ O ₃		3.39		3.99
Base/Acid		0.17		0.37

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Morphological Analysis

Table 3 contains the morphological analysis results for the April 27, 2008 coal sample (08-0695, MTI 08-078). Corresponding scanning electron micrographs are provided in Figures 1 and 2. Both “included” and “excluded” minerals were analyzed. Included minerals are contained within the coal matrix (or surrounded by the combustible organic material). Excluded minerals are separate from any organic material.

The minerals included within the coal were of the following types: potassium aluminosilicate (points 3, 5), potassium-iron aluminosilicate (point 1), pyrite (point 12), and aluminosilicate (points 2, 11). Excluded minerals were of the same types.

The organically associated elements were identified by probing the organic matrix (dark-appearing in micrographs) of the coal. The coal matrix contained varying levels of magnesium, aluminum, silicon, sulfur, chlorine, and calcium.

Table 3. Morphological analysis results for April 27, 2008 coal (MTI 08-078). Results expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	S	Cl	K	Ca	Ti	Fe	O
1	1	Included mineral	0.0	0.0	15.6	53.3	0.0	0.0	18.1	3.3	0.0	9.8	0.0
	2	Included mineral	0.0	0.0	11.9	57.7	1.0	0.0	0.0	0.0	0.0	1.3	28.1
	3	Included mineral	0.0	0.0	36.9	54.8	0.0	0.0	7.4	0.0	0.0	0.9	0.0
	4	Coal matrix*	0.0	6.9	0.0	10.8	71.0	0.0	0.0	11.3	0.0	0.0	0.0
	5	Included mineral	0.0	0.0	18.0	38.0	0.0	0.0	5.6	0.5	0.0	0.0	38.0
	6	Excluded mineral	1.4	0.0	25.9	29.7	0.0	0.0	11.5	0.0	0.0	1.9	29.7
2	7	Excluded mineral	0.0	0.0	2.1	2.4	48.3	0.0	0.0	0.0	0.0	36.8	10.4
	8	Excluded mineral	0.0	0.0	18.4	25.0	0.9	0.0	3.0	0.0	0.0	26.6	26.1
	9	Excluded mineral	0.0	0.0	14.7	40.8	0.0	0.0	2.2	0.0	0.0	1.5	40.8
	10	Coal matrix*	0.0	0.0	21.0	52.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0
	11	Included mineral	0.0	0.0	23.1	31.2	2.7	0.0	2.6	0.0	2.3	0.8	37.4
	12	Included mineral	0.0	0.0	3.0	3.7	59.1	0.0	1.1	1.0	0.0	32.1	0.0
Average		All	0.1	0.6	15.9	33.3	15.3	2.3	4.3	1.4	0.2	9.3	17.5
		Included minerals	0.0	0.0	18.1	39.8	10.5	0.0	5.8	0.8	0.4	7.5	17.2
		Excluded minerals	0.4	0.0	15.3	24.5	12.3	0.0	4.2	0.0	0.0	16.7	26.7
		Coal matrix	0.0	3.5	10.5	31.4	35.5	13.5	0.0	5.7	0.0	0.0	0.0

*Spectrum contained a large carbon peak that was not quantified.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

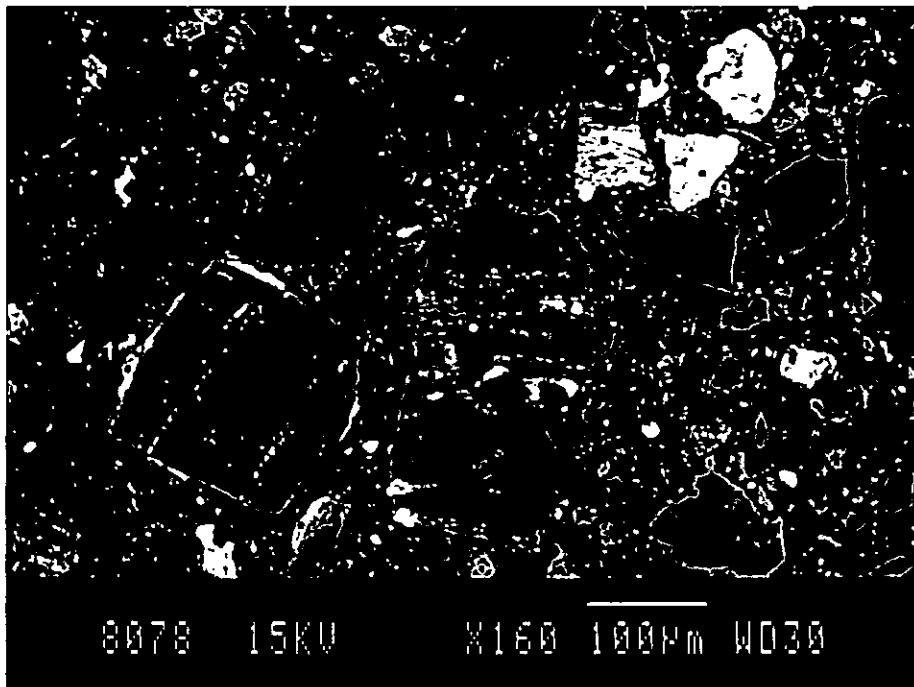


Figure 1. Backscattered electron image of April 27, 2008 coal (MTI 08-078), showing analysis points 1 through 6.

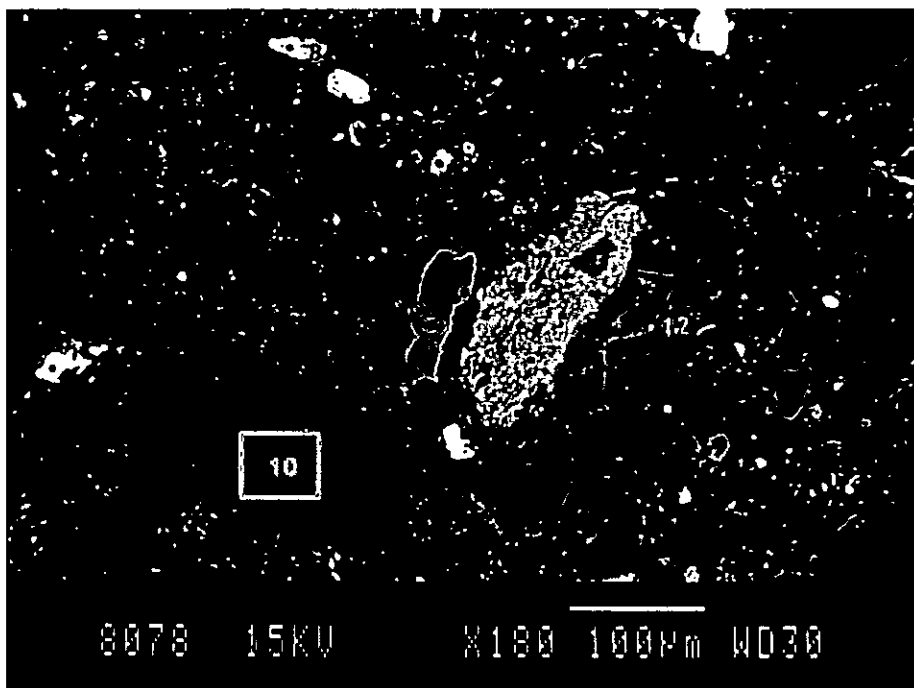


Figure 2. Backscattered electron image of April 27, 2008 coal (MTI 08-078), showing analysis points and areas 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Table 6 contains the morphological analysis results for the April 24, 2008 petcoke sample (08-0687, MTI 08-079). Corresponding scanning electron micrographs are provided in Figures 3 and 4. Both “included” and “excluded” minerals were analyzed. Included minerals are contained within the organic matrix (or surrounded by the combustible organic material). Excluded minerals are separate from any organic material.

Most of the included and excluded minerals analyzed were quartz. One included mineral (analysis point 10) was calcium sulfate, and one excluded mineral was iron sulfate. Sulfur was the only element noted to a significant degree in the organic matrix of the petcoke.

Table 4. Morphological analysis results for April 24, 2008 petcoke (MTI 08-079). Results are expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	P	S	Cl	K	Ca	Ti	Fe	Ba	O
3	1	Excluded mineral	0.0	0.0	0.0	99.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
	2	Excluded mineral	0.0	0.0	0.0	98.6	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0
	3	Included mineral	1.5	0.0	0.0	98.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	Excluded mineral	0.0	0.0	0.0	92.8	0.0	0.0	0.0	0.0	0.0	3.5	3.7	0.0	0.0
	5	Excluded mineral	0.0	0.0	0.0	100.	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0
	6	Coke matrix*	0.0	0.0	0.0	2.4	0.0	95.5	0.0	2.1	0.0	0.00	0.0	0.0	0.0
4	7	Excluded mineral	0.0	1.0	0.0	0.0	0.0	49.5	0.0	0.0	0.0	0.00	49.5	0.0	0.0
	8	Light coke matrix*	0.0	0.0	0.0	3.3	0.0	94.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0
	9	Included mineral	9.2	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	11.0	71.2
	10	Included mineral	0.0	0.0	0.0	0.4	0.0	25.8	0.0	0.0	42.7	0.0	0.0	0.0	31.1
	11	Included mineral	0.0	0.0	3.4	64.4	0.0	0.0	2.4	0.8	0.0	0.0	0.0	0.0	29.0
	12	Included mineral	0.0	0.0	0.00	95.7	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	All		0.9	0.1	0.3	54.6	0.7	22.5	0.2	0.3	3.6	0.5	4.6	0.9	10.9
	Included minerals		2.1	0.0	0.7	51.8	1.7	6.0	0.5	0.2	8.5	0.0	0.0	2.2	26.3
	Excluded minerals		0.0	0.2	0.0	78.1	0.0	9.9	0.0	0.2	0.0	0.7	10.9	0.0	0.0
	Coke matrix		0.0	0.0	0.0	2.8	0.0	95.2	0.0	1.1	0.0	0.9	0.0	0.0	0.0

*Spectrum contained a large carbon peak that was not quantified.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

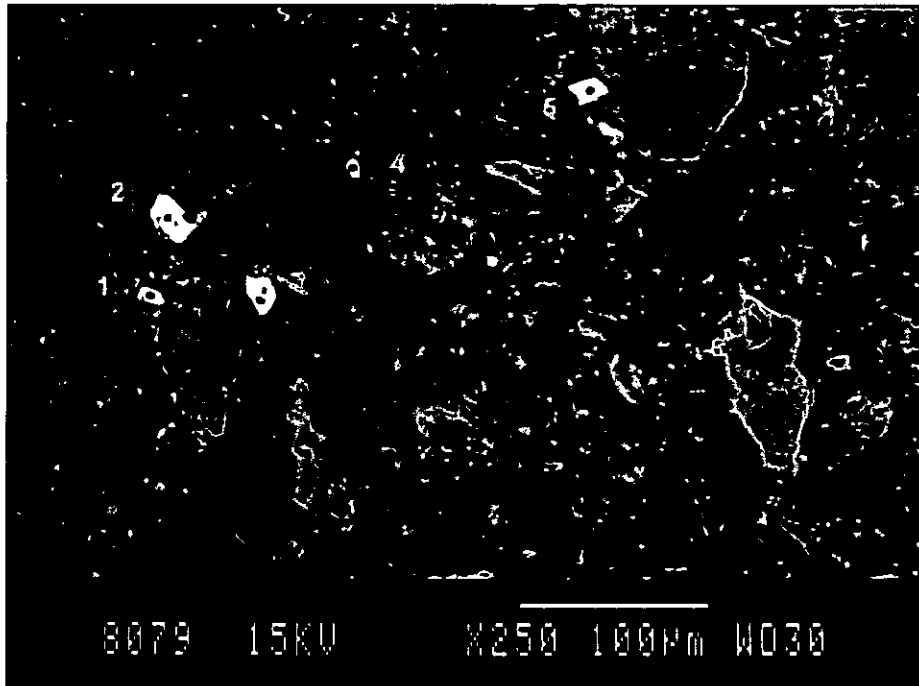


Figure 3. Backscattered electron image of April 24, 2008 petcoke (MTI 08-079), showing analysis points 1 through 6.

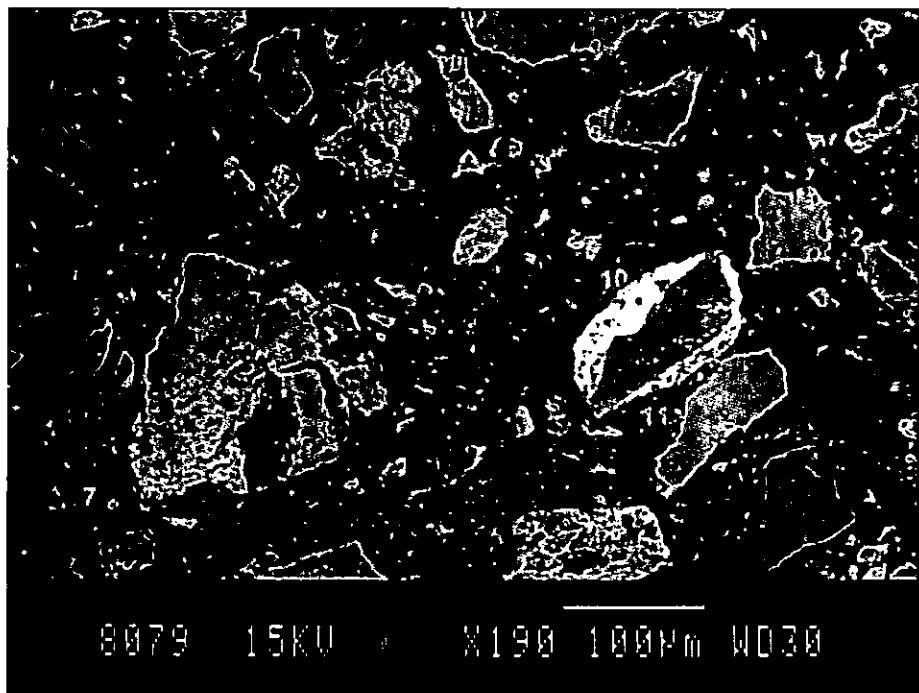


Figure 4. Backscattered electron image of April 24, 2008 petcoke (MTI 08-079), showing analysis points 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

CCSEM Analysis

Tables 5 and 6 contain the results of the CCSEM analyses for the coal and petroleum coke provided by JEA. The coal CCSEM analysis is presented in Table 5. The coal contained 23 wt% quartz, most of which was present in the middle-to-large size bins (greater than 4.6 μm). The coal also contained 13 wt% illite (potassium aluminosilicate) and 10.7% Si-rich materials. The coal contained low levels of pyrite and kaolinite and montmorillonite clays. Unknown materials made up another 23 wt% of the minerals analyzed.

Table 5. CCSEM analysis results for the April 27, 2008 coal (MTI 08-078). Results expressed as weight percent on a mineral basis.

	<i>Size bin, microns</i>						TOTALS
	1. to 2.2	2.2 to 4.6	4.6 to 10	10 to 22	22 to 46	46 to 400	
QUARTZ	1.1	2.8	4.9	4.1	5	5.3	23.3
IRON OXIDE	0	0	0	0	0	0	0.1
PERICLASE	0	0	0	0	0	0	0
RUTILE	0.1	0	0	0.7	0	0	0.8
ALUMINA	0	0	0	0	0	0	0
CALCITE	0	0.1	0.1	0	0	0	0.2
DOLOMITE	0	0	0	0	0	0.1	0.1
ANKERITE	0	0	0	0	0.1	0	0.1
KAOLINITE	0.2	0.9	1.4	1.4	0.6	0.3	4.8
MONTMORILLONITE	0.2	0.7	1.3	1.1	0.4	0.3	3.9
K AL-SILICATE	0.3	1.9	3.1	4.5	2.2	1.4	13.4
FE AL-SILICATE	0.1	0.4	1	1	0.3	0.2	3.1
CA AL-SILICATE	0.1	0.3	0.3	0.6	0.1	0.1	1.4
NA AL-SILICATE	0.1	0.1	0.3	0.7	0.3	0.1	1.6
ALUMINOSILICATE	0	0.4	0.7	0.6	0.5	0.8	3.1
MIXED AL-SILICA	0.2	0.8	1.1	1.3	0.4	0.8	4.5
FE SILICATE	0	0	0.1	0	0	0.1	0.3
CA SILICATE	0	0	0.1	0	0	0	0.1
CA ALUMINATE	0	0	0	0	0	0	0
PYRITE	0.1	0.8	1.1	1.1	0.3	0.2	3.7
PYRRHOTITE	0	0	0.1	0	0	0.1	0.2
OXIDIZED PYRRHOTITE	0	0.1	0	0	0	0	0.1
GYPSUM	0	0.1	0.1	0	0.3	0.1	0.5
BARITE	0	0	0	0	0	0	0
APATITE	0	0	0	0	0	0	0
CA AL-P	0	0	0	0	0	0	0
KCL	0	0	0	0	0	0	0
GYPSUM/BARITE	0	0	0	0	0	0	0
GYPSUM/AL-SILICATE	0.1	0.3	0.2	0.4	0.1	0	1.1
SI-RICH	0.5	0.8	2.3	2.4	2.5	2.1	10.7
CA-RICH	0	0	0	0	0	0	0.1
CA-SI RICH	0	0	0	0	0	0	0
UNKNOWN	2	5.5	6	5.1	2.5	1.8	23.0
TOTALS	5.2	16.1	24.3	25.1	15.6	13.7	100

**CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT**

Results for the petroleum coke CCSEM analysis are presented in Table 6. The petcoke contained 32 wt% quartz (on a mineral basis), along with 37 wt% unclassified or unknown materials. The petroleum coke also contained small amounts of kaolinite, illite, and other clay minerals. Small amounts of iron and nickel sulfides were found in the sample.

Table 6. CCSEM analysis results for the April 24, 2008 petcoke (MTI 08-079). Results expressed as weight percent on a mineral basis.

	<i>Size bin, microns</i>						TOTALS
	1. to 2.2	2.2 to 4.6	4.6 to 10	10 to 22	22 to 46	46 to 400	
QUARTZ	0.9	0.6	9.2	16.3	3.6	1.4	32.0
IRON OXIDE	0	0	0	0	0	0	0
PERICLASE	0	0	0	0	0	0	0
VANADIUM OXIDE	0	0	0	0	0	0	0
ALUMINA	0	0	0.7	0	0.4	0	1.0
CALCITE	0	0	0	0	0.3	0	0.3
DOLOMITE	0	0	0	0	0	0	0
ANKERITE	0	0	0	0	0	0	0
KAOLINITE	0	0	0.2	0	0.4	1	1.6
MONTMORILLONITE	0	0	0	0	0	0	0
K AL-SILICATE	0	0	0.3	0	0	3	3.3
FE AL-SILICATE	0	0	0	0	0	0	0
CA AL-SILICATE	0	0	0	0	0	0	0
NA AL-SILICATE	0	0	0.2	2.6	0	0	2.8
ALUMINOSILICATE	0	0	0	0	1.2	1.1	2.3
MIXED AL-SILICA	0	0	0	0	0	0	0
FE SILICATE	0	0	0	0	0.8	0	0.8
CA SILICATE	0	0	0.2	0	0	0	0.2
CA ALUMINATE	0	0	0	0	0	0	0
PYRITE	0	0	1.1	2.1	0	0	3.2
PYRRHOTITE	0	0	0.7	0	0	0	0.7
OXIDIZED PYRRHOTITE	0	0	0	0	0	0	0
GYPSUM	0	0	0.5	0	0.4	0	0.9
NICKEL SULFIDE	0.3	3.6	1.3	0	0	0	5.2
APATITE	0	0	0	0	0	0	0
CA AL-P	0	0	0	0	0	0	0
KCL	0	0	0	0	0	0	0
GYPSUM/NIS	0	0	0	0	0	0	0
GYPSUM/AL-SILICATE	0.8	0	0	0	0	0	0.8
SI-RICH	0.2	3.1	1.3	0	1.5	0	6.1
CA-RICH	0	0	0.6	0	0.7	0	1.3
CA-SI RICH	0	0	0	0	0	0	0
UNKNOWN	5.8	15.5	11	0	3.9	1.1	37.4
TOTALS	8	22.7	27.4	21	13.2	7.7	100

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

LIMESTONE

Ash composition, morphology, and XRF were performed on the limestone sample. The results of the analyses are shown in Table 7. Ash composition is performed by first ashing the sample (this may result in partial or total calcination of limestone) and then digesting the remaining material and performing atomic absorption spectroscopy. X-ray fluorescence is performed on intact, unaltered samples.

The analyses both showed that the limestone is primarily composed of calcium (carbonate). Both also showed a presence of sodium at about 0.2 to 0.3 wt% and magnesium at about 0.6 to 0.7 wt%. The "unknown" material in the XRF analysis is the carbonate portion of the limestone.

Table 7. Ash composition and x-ray fluorescence results for limestone sample 08-0690, 4-24-08 (MTI 08-080). Results are expressed as weight percent on a dry basis.

	Ash composition (ASTM D3682)	X-ray fluorescence
SiO ₂	<2.14	2.25
Al ₂ O ₃	<0.38	0.628
TiO ₂	<0.03	0.043
Fe ₂ O ₃	<0.29	
CaO	80.92	56.67
MgO	0.70	0.582
K ₂ O	0.17	0.018
Na ₂ O	0.22	0.284
SO ₃	0.05	
P ₂ O ₅	<0.04	0.022
SrO	0.26	0.169
BaO	<0.02	0.039
MnO ₂	<0.05	
Cl		0.22
Cr		0.104
Unknown*		38.949

**Unknowns are carbonate.*

**CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT**

Morphology

The April 24, 2008 limestone sample (08-0690, MTI 08-080) morphological analysis results are listed in Table 8. Scanning electron micrographs are shown in Figures 5 through 8. The limestone was generally composed of calcium (carbonate – carbon not quantified). Some analyses (points 7 and 11, Figure 6; points 13, 15, 18, Figure 7; points 22 and 23, Figure 8) contained around 3 wt% sodium in addition to the calcium. Chlorine was also present at levels up to 4 wt%. No potassium bearing materials were found.

Table 8. Morphological analysis results for April 24, 2008 limestone sample (08-0690, MTI 08-080). Results expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	Cl	Ca	Ti	Fe	Ba	O
5	1	Overall particle	0.0	0.7	0.0	0.6	0.7	74.2	0.0	0.0	0.0	23.8
	2	Overall particle	0.0	0.8	0.0	0.4	0.0	72.1	0.0	0.0	4.9	21.7
	3	Dark edge	0.0	0.5	0.0	0.0	4.2	93.8	0.0	1.6	0.0	0.0
	4	Overall particle	0.0	0.0	0.0	0.0	0.9	76.1	0.6	0.0	0.0	22.4
	5	Overall particle	0.0	0.0	0.0	0.5	1.6	74.9	0.9	0.0	0.0	22.1
	6	Overall particle	0.0	0.0	0.0	0.0	0.0	78.3	0.0	0.0	0.0	21.7
6	7	Dark material	3.2	0.9	0.0	1.9	3.3	90.8	0.0	0.0	0.0	0.0
	8	Overall particle	1.6	0.0	0.0	0.8	0.6	71.6	0.0	0.0	0.0	25.5
	9	Dark material	0.0	0.0	0.0	1.5	3.8	94.7	0.0	0.0	0.0	0.0
	10	Dark material	0.0	0.0	0.0	1.0	2.7	68.2	0.7	0.0	0.0	27.4
	11	Overall particle	2.1	0.0	0.8	0.0	0.0	74.9	0.0	0.0	0.0	22.1
	12	Overall particle	0.0	0.0	0.0	2.6	0.7	96.8	0.0	0.0	0.0	0.0
	13	Overall particle	2.4	0.0	0.0	0.6	0.0	76.4	0.0	0.0	0.0	20.7
	14	Dark material	0.0	0.0	0.0	1.2	2.6	96.2	0.0	0.0	0.0	0.0
7	15	Dark material	2.2	0.0	0.0	1.3	2.9	65.5	0.0	0.0	0.0	28.2
	16	Dark material	0.0	0.0	0.0	0.8	2.1	62.1	0.0	0.0	0.0	35.0
	17	Overall particle	0.0	0.0	0.0	1.0	1.2	73.7	0.0	0.0	0.0	24.1
	18	Dark material	2.6	0.0	0.0	1.8	2.8	91.4	0.0	1.4	0.0	0.0
	19	Overall particle	0.0	0.0	0.0	0.4	0.7	73.5	0.0	0.0	0.0	25.4
	20	Overall particle	0.0	0.0	0.0	1.0	0.9	67.3	0.0	0.0	3.5	27.3
	21	Dark material	1.1	0.0	0.0	0.4	2.4	96.2	0.0	0.0	0.0	0.0
	22	Dark material	2.0	0.0	1.1	1.8	1.5	67.1	0.6	0.0	0.0	25.9
8	23	Dark material	3.1	0.0	0.0	1.4	2.6	93.0	0.0	0.0	0.0	0.0
	24	Dark material	0.0	0.0	0.0	2.0	2.1	67.9	0.0	0.0	0.0	28.0
	Average	All	0.8	0.1	0.1	1.0	1.7	79.0	0.1	0.1	0.4	16.7
		Dark materials	1.2	0.1	0.1	1.3	2.7	82.2	0.1	0.3	0.0	12.0
Overall particles		0.5	0.1	0.1	0.7	0.6	75.8	0.1	0.0	0.7	21.4	

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

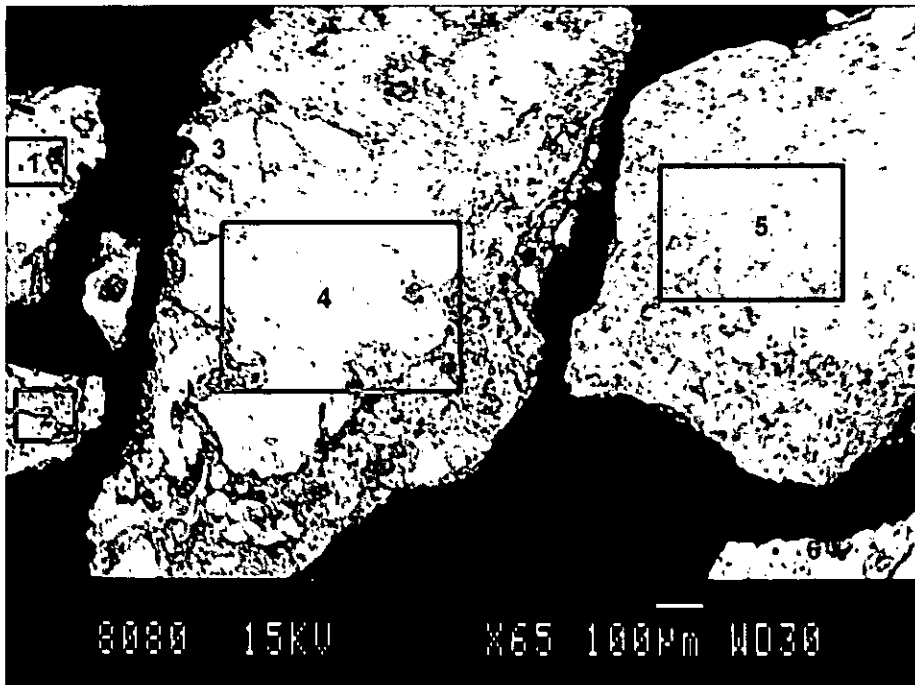


Figure 5. Backscattered electron micrograph of April 24, 2008 limestone sample (08-0690, MTI 08-080), showing analysis points and areas 1 through 6.

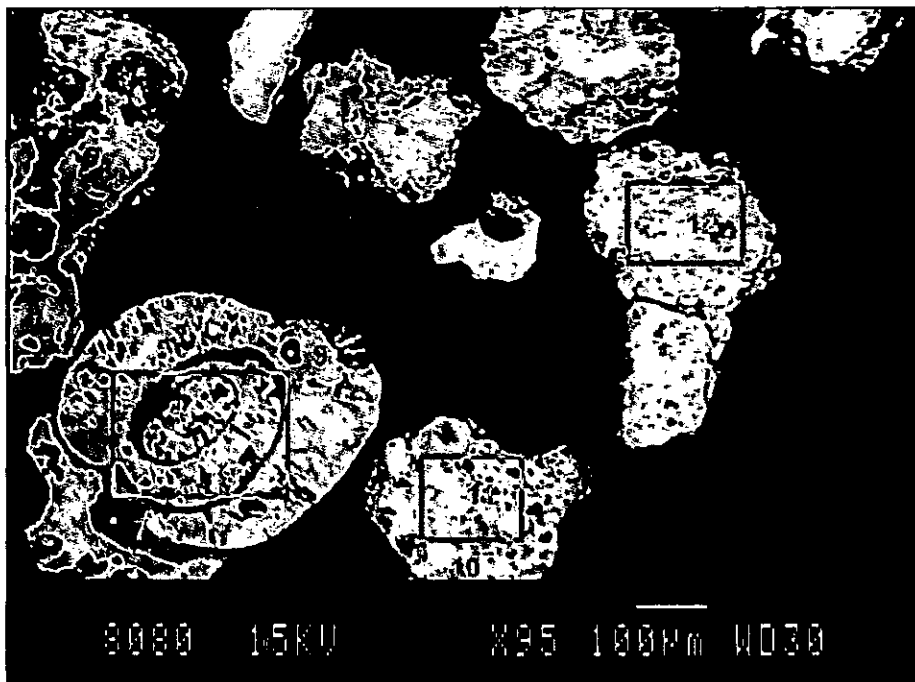


Figure 6. Backscattered electron micrograph of April 24, 2008 limestone sample (08-0690, MTI 08-080), showing analysis points and areas 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

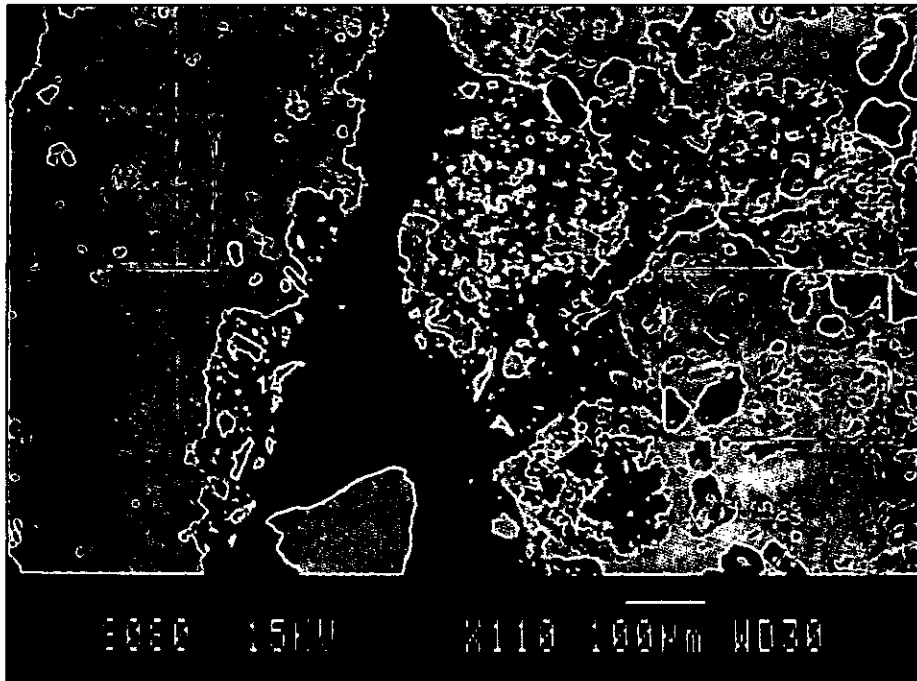


Figure 7. Backscattered electron micrograph of April 24, 2008 limestone sample (08-0690, MTI 08-080), showing analysis points and areas 13 through 18.

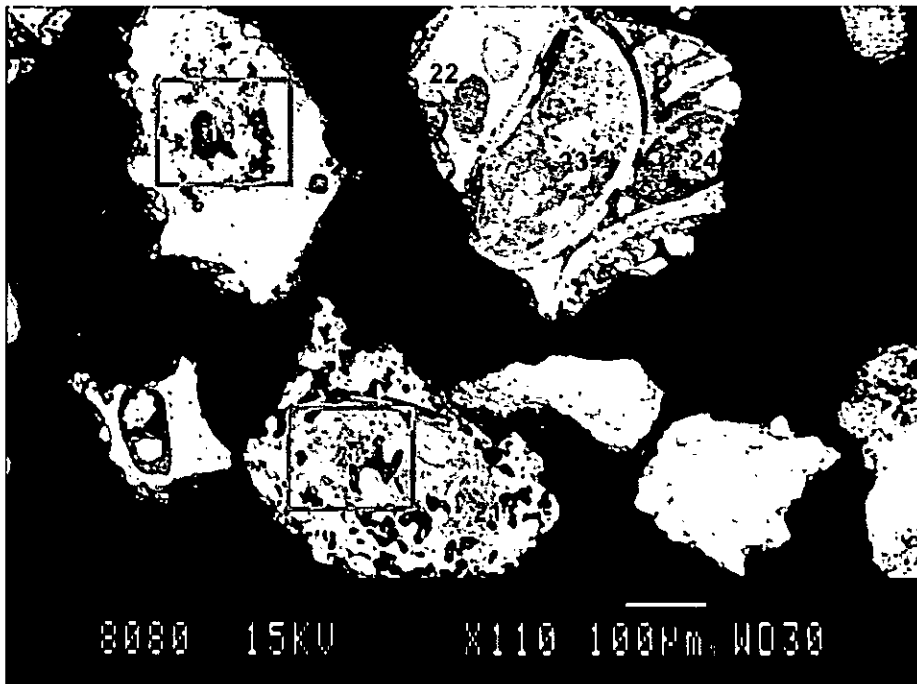


Figure 8. Backscattered electron micrograph of April 24, 2008 limestone sample (08-0690, MTI 08-080), showing analysis points and areas 19 through 24.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

HRA DEPOSIT AND BED MATERIALS

Morphology

The morphological analysis results for the HRA deposit (MTI 08-082) are listed in Table 9, with corresponding SEM micrographs in Figures 9 and 10. The HRA deposit was a highly porous deposit that contained evidence of liquid sintering or bonding between materials. The bonding phases (or "necks") generally contained calcium sulfate with some containing high levels of sodium and potassium. One neck (analysis point 1, Figure 9) was enriched in sodium and potassium, as was the material analyzed in point 6 (Figure 9) and area 10 (Figure 10). Iron-rich particles (which appear brighter than surrounding material in the micrographs) were distributed throughout the deposit.

Table 9. Morphological analysis results for Unit 1 HRA deposit 5-5-08 (MTI 08-082). Results expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	S	K	Ca	Ti	Fe	O
9	1	Neck	6.7	0.0	0.0	0.0	27.0	7.1	29.3	0.0	0.0	29.9
	2	Overall deposit	0.0	0.9	0.7	0.6	33.9	1.0	46.0	0.0	0.0	16.9
	3	Neck	0.0	0.0	0.0	1.0	37.0	0.5	61.5	0.0	0.0	0.0
	4	Bright material	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	66.8	32.8
	5	Overall deposit	2.4	0.0	0.0	2.5	29.7	1.1	45.3	0.0	0.0	19.0
	6	Medium dark material	17.1	0.0	0.0	0.0	36.1	8.8	14.5	0.0	1.4	22.1
10	7	Neck	0.0	0.0	0.0	0.8	27.7	1.6	69.9	0.0	0.0	0.0
	8	Medium dark material	1.1	0.0	12.2	22.7	13.8	19.8	4.0	1.1	2.8	22.7
	9	Neck	0.0	0.0	0.0	0.0	37.4	0.0	48.3	0.0	0.0	14.4
	10	Overall deposit	13.0	0.0	1.1	3.3	37.0	3.4	19.6	0.0	0.8	19.6
	11	Light material	0.0	0.5	0.0	0.5	30.2	0.0	52.1	0.0	0.0	16.6
	12	Light material	0.0	0.0	0.6	0.3	29.3	0.0	69.8	0.0	0.0	0.0
Average		All	3.4	0.1	1.2	2.6	28.3	3.6	38.4	0.1	6.0	16.2
		Necks	1.7	0.0	0.0	0.4	32.3	2.3	52.3	0.0	0.0	11.1
		Dark materials	9.1	0.0	6.1	11.4	24.9	14.3	9.2	0.6	2.1	22.4
		Light/bright materials	0.0	0.2	0.3	0.3	19.9	0.0	40.6	0.0	22.3	16.5

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

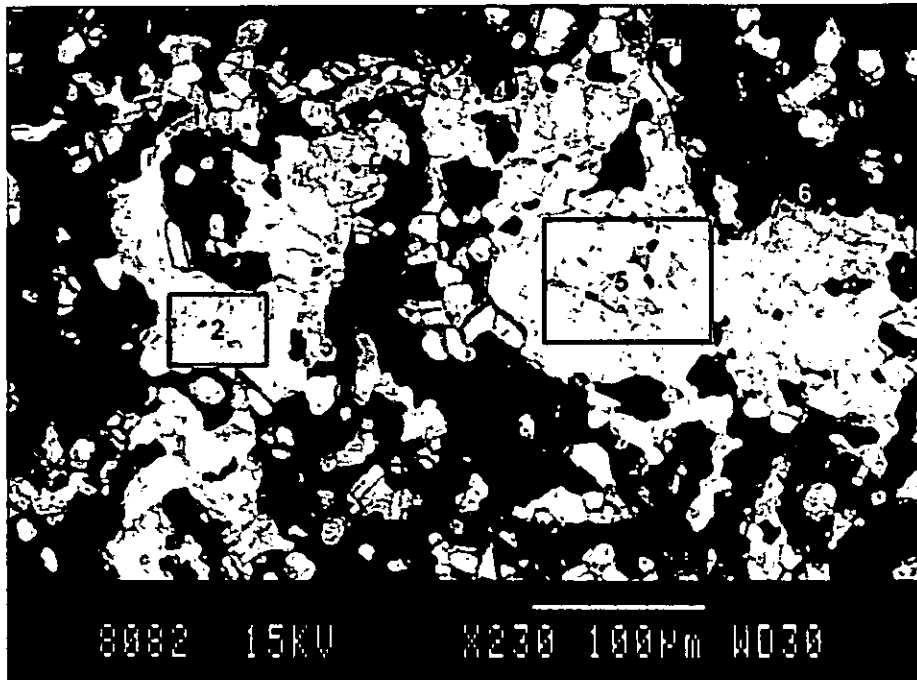


Figure 9. Backscattered electron micrograph of Unit 1 HRA deposit (MTI 08-082), showing analysis points and areas 1 through 6.

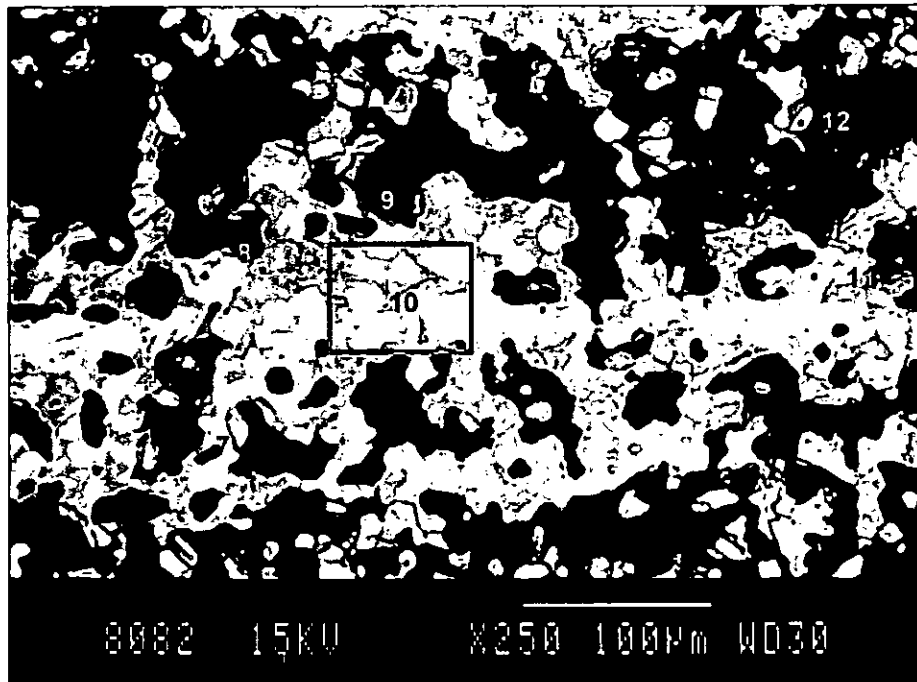


Figure 10. Backscattered electron micrograph of Unit 1 HRA deposit (MTI 08-082), showing analysis points and areas 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Table 10 contains the results of the morphological analysis for the Cedar Bay CFB bed ash (MTI 08-083); corresponding SEM micrographs are provided in Figures 11 and 12. The Cedar Bay CFB bed ash contained calcium (limestone), silicon (quartz) and aluminosilicate bed particles that were coated with thin layers of calcium aluminosilicate. The aluminum contents some of the points analyzed are consistent with kaolinite precursor materials.

Table 10. Morphological analysis results for Cedar Bay CFB bed ash (MTI 08-083). Results expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	S	Cl	K	Ca	Ti	Mn	Fe	Ba	O
11	1	Dark particle	0.0	0.0	0.0	1.5	0.0	1.8	0.0	96.7	0.0	0.0	0.0	0.0	0.0
	2	Particle coating	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.5	0.0	3.6	0.0	0.0	0.0
	3	Particle	0.0	1.3	0.0	67.9	1.8	0.0	0.0	0.0	0.0	0.0	1.2	0.0	27.9
	4	Particle coating	0.0	0.0	12.8	16.6	0.0	0.0	0.0	66.5	1.4	0.0	2.8	0.0	0.0
	5	Particle coating	0.0	0.0	13.2	17.7	0.0	0.0	0.0	42.3	0.5	0.6	1.4	0.0	24.4
	6	Particle	1.4	0.0	19.3	33.8	0.0	0.0	7.5	1.9	0.7	0.0	1.6	0.0	33.8
12	7	Porous particle	1.4	0.0	20.9	34.6	0.0	0.0	6.1	0.0	0.0	0.8	1.6	0.0	34.5
	8	Particle coating	0.0	0.0	15.7	18.2	0.0	0.0	0.0	44.3	1.6	0.0	1.9	0.0	18.2
	9	Particle coating	0.0	0.0	13.3	16.9	0.0	0.7	0.0	49.3	0.6	0.0	2.1	0.0	17.1
	10	Particle coating	0.0	0.0	13.5	17.3	0.0	0.0	0.0	49.8	0.9	0.0	1.9	0.0	16.6
	11	Particle coating	0.0	0.0	15.2	16.4	1.1	0.0	0.0	43.4	0.0	0.0	4.0	3.6	16.4
	12	Bright particle	0.0	0.0	7.2	21.9	0.0	0.9	3.2	2.4	0.0	1.3	41.2	0.0	21.9
Average	All		0.2	0.1	10.9	21.9	0.2	0.3	1.4	41.1	0.5	0.5	5.0	0.3	17.6
	Bed particles		0.6	0.3	9.5	31.9	0.4	0.5	3.4	20.2	0.1	0.4	9.1	0.0	23.6
	Coatings		0.0	0.0	12.0	14.7	0.2	0.1	0.0	56.0	0.7	0.6	2.0	0.5	13.3

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

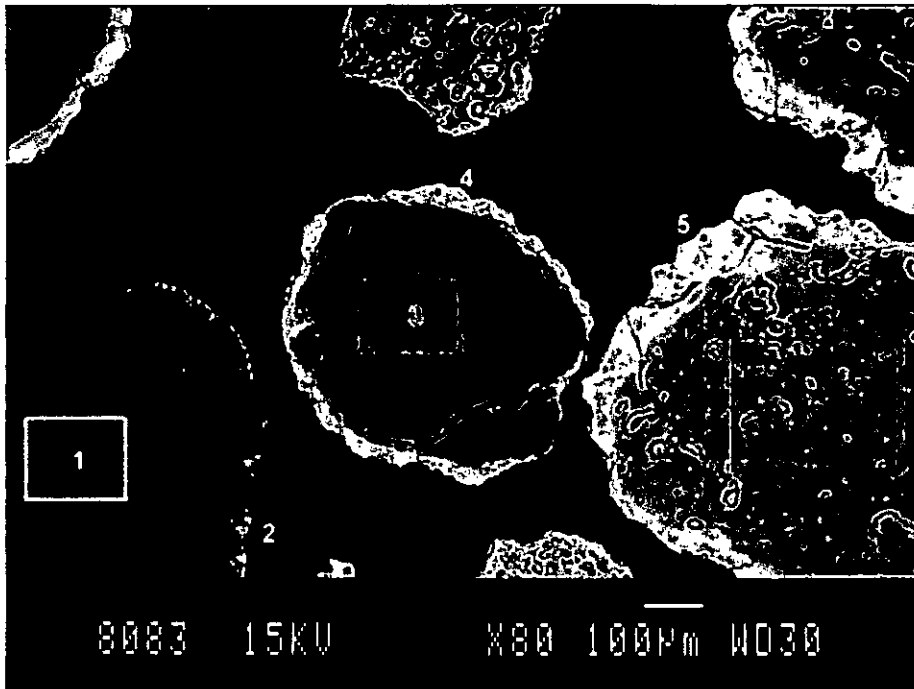


Figure 11. Backscattered electron micrograph of Cedar Bay CFB bed ash (MTI 08-083), showing analysis points and areas 1 through 6.

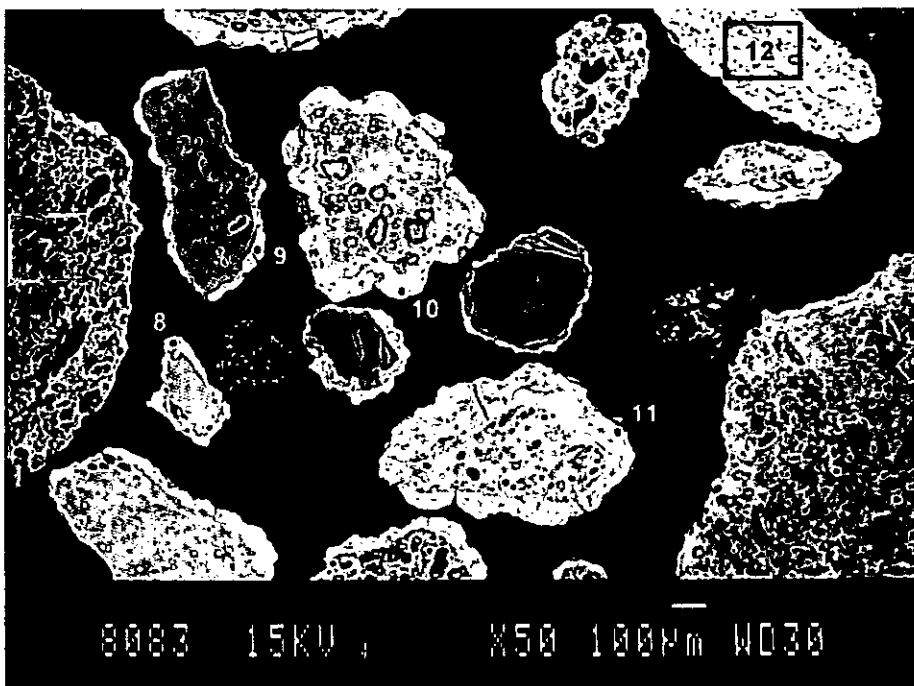


Figure 12. Backscattered electron micrograph of Cedar Bay CFB bed ash (MTI 08-083), showing analysis points and areas 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Table 11 contains the results of the morphological analysis for the St. John's River Power Plant PC bottom ash (MTI 08-084); corresponding SEM micrographs are provided in Figures 13 and 14. The bottom ash was fairly homogeneous and highly porous. It contained some bright (iron-containing) particles. The bonding material was an iron aluminosilicate material (5 wt% iron, 22 wt% aluminum, and 32 wt% silicon). Potassium and sodium were slightly enriched in the necks or bonding material.

Table 11. Morphological analysis results for SJRPP PC bottom ash (MTI 08-084). Results expressed as weight percent, normalized to 100%.

Fig.	Point	Description	Na	Mg	Al	Si	K	Ca	Ti	Fe	Ba	O
13	1	Neck	0.0	0.0	27.4	28.8	3.9	2.7	1.9	6.5	0.0	28.8
	2	Overall ash particle	2.7	0.0	16.6	32.5	3.2	3.1	0.0	6.5	2.9	32.5
	3	Neck	2.9	0.0	28.5	28.5	0.0	1.9	1.9	8.0	0.0	28.5
	4	Light spot	0.0	0.0	5.2	0.6	0.0	0.0	3.8	72.9	0.0	17.6
	5	Light spot	0.0	0.0	5.3	0.4	0.4	0.0	3.4	70.5	0.0	19.6
	6	Bright spot	0.0	0.0	4.4	4.8	0.4	0.0	2.4	66.8	0.0	21.3
14	7	Light material	2.5	0.0	8.8	13.2	1.2	1.0	0.0	52.5	0.0	20.9
	8	Bright spot	0.0	3.7	3.5	1.6	0.0	0.0	0.0	72.5	0.0	18.6
	9	Neck	4.0	0.0	10.3	37.6	4.2	2.1	0.0	0.0	0.0	41.8
	10	Overall ash particle	0.0	0.0	10.5	38.4	3.6	2.7	0.0	6.4	0.0	38.4
	11	Dark material	0.0	0.0	0.0	74.4	0.7	0.7	0.0	1.5	0.0	22.7
	12	Overall medium light material	0.0	0.0	17.7	29.3	2.9	9.3	0.0	11.5	0.0	29.3
Average	All		1.0	0.3	11.5	24.2	1.7	2.0	1.1	31.3	0.2	26.7
	Bonding material (necks)		2.3	0.0	22.1	31.6	2.7	2.2	1.3	4.8	0.0	33.0

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT
1 HRA DEPOSIT

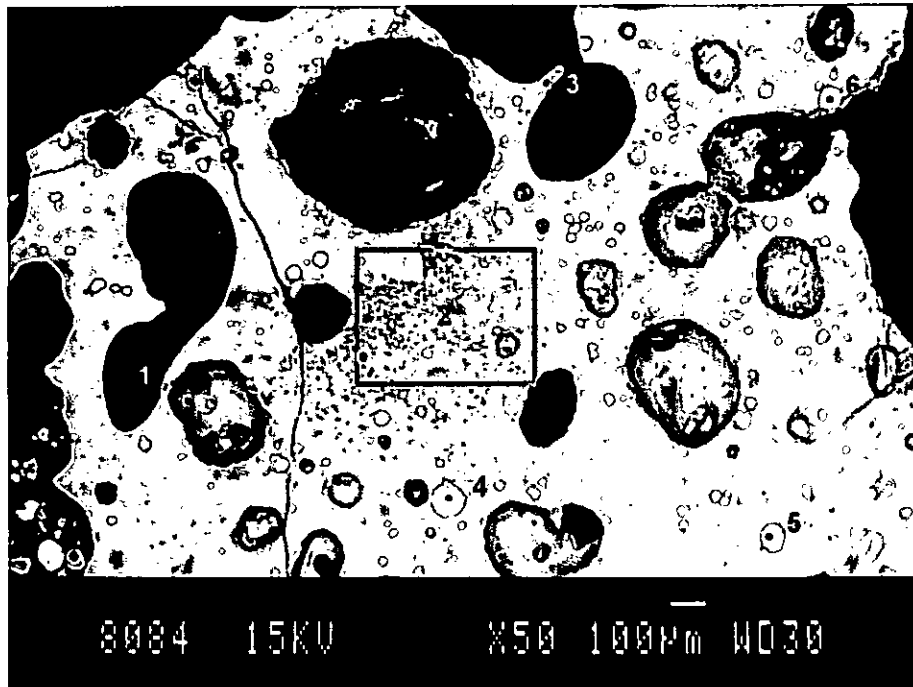


Figure 13. Backscattered electron micrograph of SJRPP PC bottom ash (MTI 08-084), showing analysis points and areas 1 through 6.

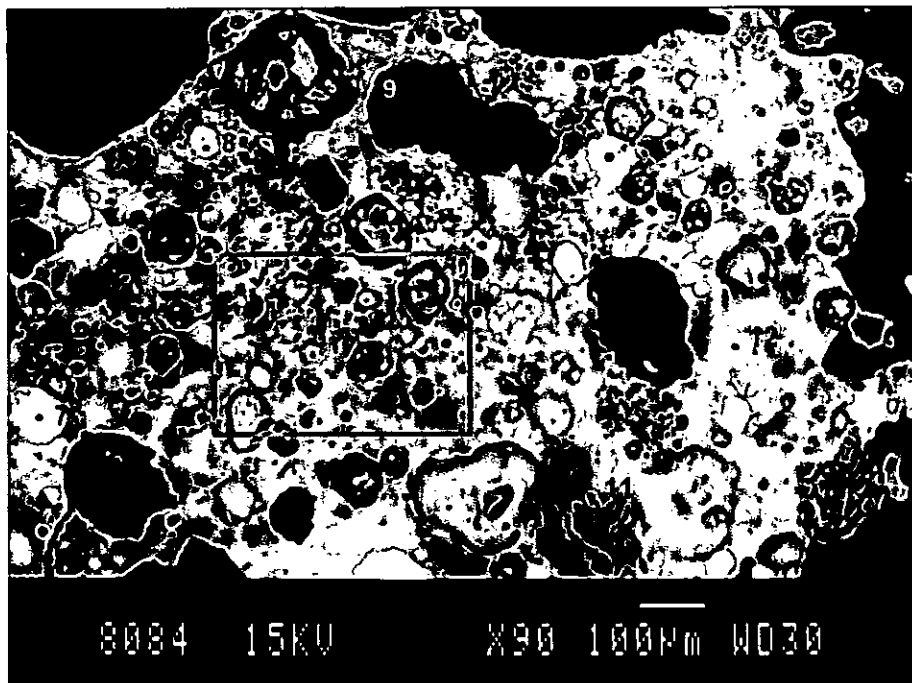


Figure 14. Backscattered electron micrograph of SJRPP PC bottom ash (MTI 08-084), showing analysis points and areas 7 through 12.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

SEMP

Results of the SEMPC analysis for the HRA deposit and bed materials are shown in Table 12. The HRA deposit was mainly composed of calcium sulfate phases, ranging from fully sulfated anhydrite (37% of points) to partially sulfated calcium (22% of points). The unclassified phase made up about 41% of the SEMPC points for the HRA deposit.

The Cedar Bay CFB bed ash contained about 11% crystalline phases – gehlenite and anorthite. The bed ash also contained about 17% quartz and 16% calcium oxide or calcium carbonate. The Cedar Bay ash contained 7.4% kaolinite and 15.4% kaolinite derived phases. These phases will likely have higher melting points and be more resistant to agglomeration. Amorphous and/or unclassified phases made up the remainder of the ash.

The bottom ash from the St. John's River PC-fired plant contained mainly amorphous phases. The other major phase present was classified as quartz (14%).

Table 12. SEMPC analysis results for the HRA deposit and bed material samples.

	Unit 1 HRA Deposit MTI 08-082	Cedar Bay CFB Bed Ash MTI 08-083	SJRPP PC Bottom Ash MTI 08-084
<i>SILICATE AND OTHER CRYSTALLINE PHASES</i>			
Gehlenite	0	8.7	0
Anorthite	0	2.3	0
Albite	0.7	0	0
Spinel	0.03	0	0.3
<i>OXIDE OR CARBONATE PHASES</i>			
Quartz	0	17.4	13.7
Iron oxide	0	0	1.3
Calcium oxide	0	15.7	0
<i>SULFATE AND SULFIDE PHASES</i>			
Anhydrite	36.5	0	0
<i>UNCLASSIFIED AND DESIGNATED AMORPHOUS PHASES</i>			
Unclassified	40.8	31.8	76.3
Pure kaolinite (amorp)	0	7.4	3.0
Kaolinite derived	0	15.4	5.0
Illite (amorp)	0	1.3	0.3
<i>CALCIUM DERIVED POINTS</i>			
Partially sulfated	21.7	0	0

The average compositions of the unclassified phases for each sample were calculated based on the x-ray analysis results from the SEMPC. Table 13 contains the average compositions (expressed as weight percent equivalent oxide, normalized to 100%). The unclassified phase of the Unit 1 HRA deposit, which comprised 41% of the points analyzed, contained calcium (17 wt% as CaO), sulfur (24 wt%), silicon (29 wt%), aluminum (12 wt%), potassium (5.5 wt%), and sodium (4 wt%). The Cedar Bay CFB bed ash unclassified phase (32% of points) was mainly composed of silicon (53 wt%) and aluminum (33 wt%). The St.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

John's River bottom ash unclassified phase, which made up over 75% of the material analyzed, contained 58 wt% silicon, 25 wt% aluminum, and 8 wt% iron.

Table 13. Average composition of unclassified phase, based on x-ray analysis results from the SEMPC analysis. Compositions expressed as weight percent, normalized to 100%.

	Unit 1 HRA Deposit MTI 08-082	Cedar Bay CFB Bed Ash MTI 08-083	SJRPP PC Bottom Ash MTI 08-084
Na₂O	6.1	2.6	2.3
MgO	0.8	0.4	1.2
Al₂O₃	8.7	32.9	24.7
SiO₂	20.8	52.7	58.3
P₂O₅	0.0	0.2	0.4
SO₃	33.7	0.3	0.3
Cl₂O₇	2.1	0.3	0.8
K₂O	5.5	2.8	1.6
CaO	18.3	4.0	1.7
V₂O₅	1.3	0.3	0.3
Cr₂O₃	0.5	0.2	0.3
Fe₂O₃	1.3	2.9	7.7
NiO	0.8	0.4	0.4

Composition of the bulk (all points) and amorphous phases were calculated based on the SEMPC x-ray analysis results and classifications, as shown in Table 14. The bulk Unit 1 HRA deposit composition was 46 wt% SO₃, 35 wt% CaO, 8 wt% SiO₂ and 3 wt% Al₂O₃. The amorphous materials in the HRA deposit contained mainly silicon (44 wt% SiO₂), aluminum (18 wt%), calcium (15 wt%), potassium (9 wt%), sodium (6 wt%) and vanadium (5 wt%).

The bulk Cedar Bay CFB ash composition was 53 wt% SiO₂, 26 wt% Al₂O₃, and 13 wt% CaO. The amorphous component of the ash contained a similar level of silicon (51 wt%), more aluminum (38 wt%), little calcium (0.8 wt%) and slightly higher potassium (3 wt%).

The St. John's River pulverized coal bottom ash contained iron (7.2wt% as Fe₂O₃), silicon (63 wt%), and aluminum (22 wt%) on average ("bulk"). The amorphous component was similar in composition, with slightly lower silicon (58 wt%) and higher aluminum (27 wt%).

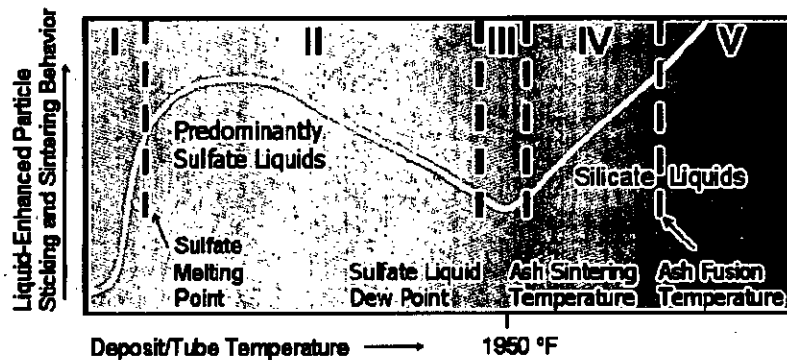
CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Table 14. Bulk and amorphous phase compositions for the JEA deposits, based on the SEMPC analysis results. Results expressed as weight percent equivalent oxide, normalized to 100%.

	Unit 1 HRA Deposit MTI 08-082		Cedar Bay CFB Bed Ash MTI 08-083		SJRPP PC Bottom Ash MTI 08-084	
	BULK	AMORP.	BULK	AMORP.	BULK	AMORP.
SiO ₂	8.1	43.8	52.8	51.1	63.1	58.2
Al ₂ O ₃	3.2	18.1	25.9	38.3	22.2	27.0
Fe ₂ O ₃	0.6	1.5	1.9	2.5	7.2	7.4
V ₂ O ₅	1.1	4.7	0.5	0.5	0.5	0.7
P ₂ O ₅	0.0	0.1	0.2	0.2	0.3	0.4
CaO	35.4	15.0	13.3	0.8	1.4	1.1
MgO	0.4	1.0	0.4	0.4	1.0	1.1
Na ₂ O	2.5	6.2	2.1	2.7	1.9	2.2
K ₂ O	2.1	8.9	2.1	3.2	1.3	1.5
SO ₃	45.6	0.0	0.4	0.0	0.3	0.0
NiO	0.2	0.4	0.1	0.1	0.1	0.1
Cr ₂ O ₃	0.3	0.4	0.2	0.2	0.3	0.3
ClO	0.5	0.0	0.1	0.0	0.4	0.0

Bonding Phases

Figure 7 shows the general type of phases responsible for bonding, as a function of temperature. Typically, sulfate bonding is dominant at lower temperatures (below about 900°C or 1650°F), while silicate phases cause bonding at higher temperatures.



Deposition Regimes:

- I. Dry-sticking regime: no glue
- II. Vapor or thermophoretically deposited liquid glue
- III. Glue produced by heterogeneous chemical reactions at vapor-ash interface
- IV. Ash particle softening on impact
- V. Wet limit (sticking coefficient nearly unity)

Figure 15. Bonding phases in ash deposits.

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

Calcium-to-sulfur ratio distributions for the three samples analyzed are shown in Figure 8. Sulfation of calcium to calcium sulfate is maximized at a calcium-to-sulfur molar ratio of 1; this correlates to a calcium-to-sulfur mass ratio of 1.25. Generally, above this ratio, there is more calcium available that has not fully sulfated, and below this ratio, there is more sulfur available. The Unit 1 HRA deposit from the Northside CFB is the only sample characterized that was calcium-sulfate based; it was highly sulfated, with over 40% of points having a calcium-to-sulfur molar ratio of 1 to 1.25.

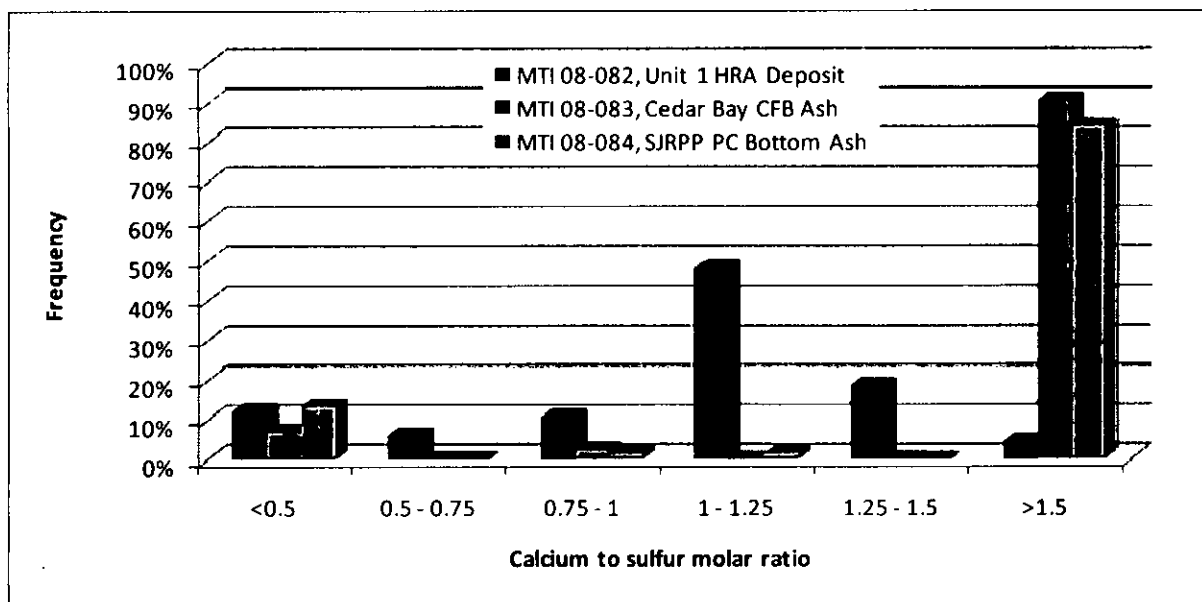


Figure 16. Calcium-to-sulfur ratio distribution for JEA samples. Sulfation is maximized at calcium-to-sulfur molar ratio of 1.

SUMMARY AND CONCLUSIONS

Fuel Analysis Results

The two fuel samples were characterized using the ultimate, ash composition, morphological, and CCSEM analyses.

The April 24, 2008 petcoke sample (08-0687, MTI 08-079) ultimate analysis showed fairly high sulfur content (6.78 wt%) and low ash content (0.66 wt%). The petroleum coke ash contained 39 wt% silicon, 10 wt% aluminum, 24 wt% vanadium, 7 wt% potassium, and 4 wt% sodium. The morphological analysis of the mineral and other ash forming components found that most of the included and excluded minerals found consisted of quartz. Minor amounts of calcium sulfate and iron sulfate/sulfide were found. Sulfur was the only element noted to a significant degree in the organic matrix of the petcoke.

The April 27, 2008 coal sample (08-0695, MTI 08-078) was fairly high in ash content (17.55 wt%). The coal ash contained 63 wt% silicon, 19 wt% aluminum, 6 wt% iron, and less

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

than 3 wt% calcium, magnesium, potassium and sodium (all reported as equivalent). The morphological analysis of the mineral grains and other ash forming components found that the minerals included within the coal matrix were of the following: potassium aluminosilicate, potassium-iron aluminosilicate, pyrite, and aluminosilicate. Excluded minerals were of the same types. The organically associated elements were identified by probing the organic matrix (dark-appearing in micrographs) of the coal. The coal matrix contained varying levels of magnesium, aluminum, silicon, sulfur, chlorine, and calcium.

CCSEM analyses for the coal and petroleum coke provided by JEA was used to determine the size, composition, and abundance of mineral grains.

The coal CCSEM analysis found that the coal contained 23 wt% quartz, most of which was present in the middle-to-large size bins (greater than 4.6 μm). The coal also contained 13 wt% illite (potassium aluminosilicate) and 10.7% Silicon-rich materials. The coal contained low levels of pyrite and kaolinite and montmorillonite clays. Unknown materials made up another 23 wt% of the minerals analyzed.

The petroleum coke CCSEM analysis results contained 32 wt% quartz and 37 wt% unclassified or unknown materials (on a mineral basis). The petroleum coke also contained small amounts of kaolinite, illite, and other clay minerals. Small amounts of iron and nickel sulfides were found in the sample.

Limestone Analysis Results

Morphological analysis was used to characterize the April 24, 2008 limestone sample (08-0690, MTI 08-080) to determine the bulk composition and microstructural characteristics. Bulk composition results obtained by both the JEA laboratory and the MTI contract laboratory showed that the limestone is primarily composed of calcium (carbonate). Both also showed a presence of sodium at about 0.2 to 0.3 wt% and magnesium of about 0.6 to 0.7 wt%. The "unknown" material in the XRF analysis is the carbonate portion of the limestone.

The morphological results indicated that the limestone was composed largely of calcium carbonate. Some point and area analyses contained around 3 wt% sodium in addition to the calcium. Chlorine was also present at levels up to 4 wt%. No potassium-bearing materials were found.

HRA Deposit Analysis Results

The HRA deposit was characterized using morphology and SEMPC analysis to determine the bonding phases in the deposit. The morphological analysis results for the HRA deposit found a highly porous deposit that contained evidence of liquid sintering or bonding between materials. The bonding phases (or "necks") generally contained calcium sulfate with some containing high levels of sodium and potassium.

Results of the SEMPC analysis for the HRA deposit were mainly composed of calcium sulfate phases, ranging from fully sulfated anhydrite (37% of points) to partially sulfated calcium

CHARACTERIZATION OF FUELS, LIMESTONE, BED MATERIALS, AND JEA UNIT 1 HRA DEPOSIT

(22% of points). The unclassified phase made up about 41% of the SEMPC points for the HRA deposit. The bulk Unit 1 HRA deposit composition was 46 wt% SO_3 , 35 wt% CaO , 8 wt% SiO_2 and 3 wt% Al_2O_3 . The amorphous materials in the HRA deposit contained mainly silicon (44 wt% SiO_2), aluminum (18 wt%), calcium (15 wt%), potassium (9 wt%), sodium (6 wt%) and vanadium (5 wt%). The bonding phase was enriched in potassium and sodium.

Cedar Bay CFB Bed Ash Analysis Results

The Cedar Bay CFB Bed Ash (MTI 08-083) was characterized using morphological and SEMPC analysis to determine the chemical and physical properties of the ash for possible use as a bed material additive or inert. The results of the morphological analysis indicated that the Cedar Bay CFB bed ash contained calcium (limestone), silicon (quartz), and aluminosilicate bed particles that were coated with thin layers of calcium aluminosilicate. The aluminum-to-silicon ratio of the particle coatings was consistent with kaolinite. The Cedar Bay CFB bed ash unclassified phase (32% of points) was mainly composed of silicon (53 wt%) and aluminum (33 wt%). The St. John's River bottom ash unclassified phase, which made up over 75% of the material analyzed, contained 58 wt% silicon, 25 wt% aluminum, and 8 wt% iron. The Cedar Bay CFB bed ash contained about 11% crystalline phases – gehlenite and anorthite. The bed ash also contained about 17% quartz and 16% calcium oxide or calcium carbonate. The Cedar Bay ash contained 7.4% kaolinite and 15.4% kaolinite derived phases. The bulk Cedar Bay CFB ash composition was 53 wt% SiO_2 , 26 wt% Al_2O_3 , and 13 wt% CaO . The amorphous component of the ash contained a similar level of silicon (51 wt%), more aluminum (38 wt%), little calcium (0.8 wt%) and slightly higher potassium (3 wt%). These phases will likely have higher melting points and be resistant to agglomeration.

St. John's River Power Plant Bottom Ash Results

The St. John's River Power Plant PC bottom ash (MTI 08-084) was also characterized using morphological and SEMPC analysis to determine the chemical and physical properties of the ash for use as a bed material. The morphological analysis showed that the bottom ash was fairly homogeneous and highly porous. It contained some bright (iron-containing) particles. The matrix material was an iron aluminosilicate material (5 wt% iron, 22 wt% aluminum, and 32 wt% silicon). Potassium and sodium were slightly enriched in the necks or bonding material.

The bottom ash from the St. John's River PC-fired plant contained mainly amorphous phases. The other major phase present was classified as quartz (14 wt%). The St. John's River pulverized coal bottom ash contained iron (7.2 wt% as Fe_2O_3), silicon (63 wt%) and aluminum (22 wt%) on average ("bulk"). The amorphous component was similar in composition, with slightly lower silicon (58 wt%) and higher aluminum (27 wt%). The higher iron will result in a lower melting point of the ash. If high temperature excursion occurs, this material has the potential to melt quickly when combined with calcium from limestone bed material.

APPENDIX MODIFICATION



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

May 23, 2001

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. N. Bert Gianazza, P.E.
Environmental Permitting & Compliance
JEA
21 West Church Street
Jacksonville, Florida 32202-3139

Re: Northside Generating Station
DEP File No. 0310045-007-AC, PSD-FL-265A

Dear Mr. Gianazza:

The Department reviewed your letter and application dated March 22, 2001 requesting changes to the design of the fly and bed ash handling systems at the referenced facility. This request is acceptable to the Department. Permit PSD-FL-265 is hereby modified as follows:

SPECIFIC CONDITION 24.

Standards: The materials handling sources at Northside shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

- (a) The following materials handling sources shall be equipped with fabric filter controls and visible emissions shall not exceed 5 percent opacity:

- Crusher house (EU29)
- Boiler fuel silos (EU31)
- Limestone receiving bins (EU32)
- Limestone crusher conveyor transfers (EU34)
- Limestone feed silos (EU35)
- Fly ash waste bins (EU36)
- Fly ash transfer and storage systems (EU37)
- Bed ash transfer and storage systems (EU38)
- ~~Bed ash truck loadout systems (EU40)~~

"More Protection, Less Process"

Printed on recycled paper.

~~Fly ash truck loadout systems (EU41)~~

Pebble lime silo (EU42)

Fly ash silo pre-mixers (EU51)

Bed ash silo mixers (EU52)

Bed ash surge hoppers (EU53)

- (b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

Transfer towers (EU28c, EU28g, EU28i, EU28o and EU28q)

Coal and petroleum coke storage building (EU28h)

Stacker/reclaimers (EU28)

Limestone lowering well (EU28d)

Conveyors (EU28)

~~Ash hydrator loadouts (EU28r)~~

- (c) The following materials handling sources shall use wet suppression, water spray, partial enclosures, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 10 percent opacity:

Northside dock ship unloading operations – shiphold and receiving hoppers (EU28a)

Northside dock receiving conveyor (EU28a)

Limestone storage pile (EU28p) -

Limestone reclaim hopper (EU28p)

- ~~(d) The fly ash and bed ash silo hydrators (EU39) shall use a venturi scrubber and visible emissions shall not exceed 5 percent opacity.~~

- ~~(e)~~(d) The limestone dryer/mill building shall have no visible emissions (other than from a baghouse vent).

- ~~(f)~~(e) The maximum particulate matter emissions from the following operations shall not exceed 0.01 grains per dry standard cubic foot:

Limestone receiving bins (EU32)

Limestone crusher conveyor transfers (EU34)

Limestone feed silos (EU34)

SPECIFIC CONDITION 41.

Materials Handling Operations: Visible emissions tests shall be conducted on the material handling operations to determine compliance with applicable limits, as follows:

Emissions Units at Northside	EPA Method(s)	Duration of VE Test	Frequency	Material
Shiphold (EU 28a)	9	30 min	I only	C or PC
Ship Unloader & Spillage Conveyors (EU 28a)	9	3 hr	I only	C & LS
Conveyors (EU 28)	9	3 hr	I only	C & LS
Transfer Towers (EU 28c, 28g, 28i, 28q)	9	3 hr	I only	C & LS
Fuel Storage Building (EU28h)	9	30 min	I only	C or PC
Fuel Storage Pile - Stacking & Reclaiming (EU28)	9	30 min	I only	C or PC
Limestone Storage Pile (EU28p)	9	30 min	I only	LS
Hydrator Truck Loadout - 1 per silo @ Discharge (EU28r)	9	30 min	I only	Bed & Fly Ash
NSPS - OOO				
Limestone Receiving Bins - Baghouse Exhaust (EU32)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Crusher Conveyor Transfer - Baghouse Exhaust (EU34)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Feed Silos - Baghouse Exhaust (EU35)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Dryer Building	22	IVE - 75 min	I only	LS
NSPS - Y				
Crusher House - Baghouse Exhaust (EU29)	9	IVE - 3 hr RVE - 30 min	I & R	C
Boiler Feed Silos - Baghouse Exhaust (EU31)	9	IVE - 3 hr RVE - 30 min	I & R	C
Other				
Fly Ash Waste Bin - Baghouse Exhaust (EU36)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Silos - Baghouse Exhaust (EU37)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Silos - Baghouse Exhaust (EU38)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Hydrators - Scrubber Exhaust (15 min/hydrator) (EU39)	9	IVE - 60 min RVE - 60 min	I & R	Ash
Bed Ash Hydrators - Scrubber Exhaust (15 min/hydrator) (EU39)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Truck Loadout - Baghouse Exhaust (EU41)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Truck Loadout - Baghouse Exhaust (EU40)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Pebble Lime Silo - Baghouse Exhaust (EU42)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly ash silo pre-mixers (EU51)	9	IVE - 60 min RVE - 60 min	I & R	Ash
Bed ash silo mixers (EU52)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed ash surge hoppers (EU53)	9	IVE - 60 min RVE - 60 min	I & R	Ash

C - Coal

I - Initial R - Renewal (once every 5 years)

IVE - Initial Visible Emissions Test, RVE - Renewal Visible Emissions Test

LS - Limestone; PC-Petroleum Coke

A copy of this letter shall be filed with the referenced permit and shall become part of the permit. This permit modification is issued pursuant to Chapter 403, Florida Statutes. Any party to this order (permit modification) has the right to seek judicial review of it under Section 120.68, F.S., by the filing of a Notice of Appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the Clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station 35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000, and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within (thirty) days after this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.



for Howard L. Rhodes, Director
Division of Air Resources

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this PERMIT MODIFICATION was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 5/25/01 to the person(s) listed:

- B. Gianazza, P.E., JEA*
- G. Worley, EPA
- J. Bunyak, NPS
- C. Kirts, DEP NED
- H. Oven, PPS
- J. Manning, RESD
- L. Sherrill, P.E., Black & Veatch Corp.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Charlotte J. Hayes 5/25/01
(Clerk) (Date)



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

October 31, 2003

CERTIFIED MAIL – Return Receipt Requested

Mr. James M. Chansler, P.E., D.P.A.
V.P., Operations and Maintenance and Responsible Official
JEA
21 West Church Street
Jacksonville, Florida 32202

Re: Final Air Construction Permit No.: 0310045-012-AC/PSD-FL-010E/PSD-FL-265B
JEA: Northside Generating Station and St. Johns River Power Park

Dear Mr. Chansler:

This letter (permit) will (1) allow coal coated with latex to be burned in the Northside Generating Station (NGS) circulating fluidized bed (CFB) Boilers Nos. 1 and 2; (2) modify some language of some federally enforceable specific conditions (SCs) established in some previously issued air construction (AC) permits for clarity purposes; (3) remove two emissions units from the NGS Materials Handling and Storage Operations that were never constructed and rename some of the emissions units that were constructed without changing any of their limits and compliance requirements; and, (4) recognize that an operation at St. Johns River Power Park (SJRPP) identified in two tables, specifically Revised Table 2 and Revised Table 6 (PSD-FL-010, amended October 28, 1986), has been removed from service. Therefore, the following are changed as follows:

1. SCs III.4., 23. & 24.(b), 0310045-003-AC/PSD-FL-265. With the addition of coal coated with latex being allowed as a fuel for the NGS CFB Boilers Nos. 1 and 2, then the following are changed:

FROM:

a. SC III.4.:

4. Fuels: Only coal, petroleum coke, No. 2 fuel oil (maximum sulfur content of 0.05 percent by weight), and natural gas, shall be fired in Units 1 and 2. Only No. 2 fuel oil (maximum sulfur content of 0.05 percent by weight) and natural gas shall be fired in the three limestone dryers. [Rule 62-210.200(228), F.A.C.]

b. SC III.23.:

23. Throughput rates: The materials handling and usage rates for coal, petroleum coke, and limestone at Northside shall not exceed the following (for Northside Units 1 and 2 combined), assuming a moisture content of 5.5% or less:

<u>Material</u>	<u>Handling/Usage Rate</u>
	<u>Tons Per Year</u>
Coal/Petroleum Coke	2.42 million
Limestone	1.45 million

"More Protection, Less Process"

Printed on recycled paper.

c. SC III.24.(b):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- (1) Transfer towers (EU-028c, EU-028g, EU-028i, EU-028o and EU-028q)
- (2) Coal and petroleum coke storage building (EU-028h)
- (3) Stacker/reclaimers (EU-028)
- (4) Limestone lowering well (EU-028d)
- (5) Conveyors (EU-028)

TO:

a. SC III.4:

4. Fuels: Only coal, coal coated with latex, petroleum coke, No. 2 fuel oil (maximum sulfur content of 0.05 percent by weight), and natural gas, shall be fired in Units 1 and 2. Only No. 2 fuel oil (maximum sulfur content of 0.05 percent by weight) and natural gas shall be fired in the three limestone dryers.

[0310045-003-AC/PSD-FL-265; and, 0310045-012-AC/PSD-FL-265B]

b. SC III.23:

23. Throughput rates: The materials handling and usage rates for coal, coal coated with latex, petroleum coke, and limestone at Northside shall not exceed the following (for Northside Units 1 and 2 combined), assuming a moisture content of 5.5% or less:

<u>Material</u>	<u>Handling/Usage Rate</u> <u>Tons Per Year</u>
Coal/Coal coated with latex/Petroleum Coke	2.42 million
Limestone	1.45 million

[0310045-003-AC/PSD-FL-265; and, 0310045-012-AC/PSD-FL-265B]

c. SC III.24.(b):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- (1) Transfer towers (EU-028c, EU-028g, EU-028i, EU-028o and EU-028q)
- (2) Coal, coal coated with latex and petroleum coke storage building (EU-028h)
- (3) Stacker/reclaimers (EU-028)
- (4) Limestone lowering well (EU-028d)
- (5) Conveyors (EU-028)

2. SCs III.24.(b) and 41., 0310045-003-AC/PSD-FL-265. Since the fuel reclaimers/stackers were installed inside the fuel storage buildings, the Fuel Storage Domes A & B (EU-028h), then any fugitive particulate matter emissions should be included as part of the fuel storage buildings and there should not be any visible emissions standards applicable except for the ones applicable to the fuel storage buildings; therefore, the fuel reclaimers/stackers have been included with the emissions unit identified as EU-028h as "Fuel Storage Domes A & B (includes fuel reclaimers/stackers)". In addition, EU-028, identified as "Conveyors", has been changed to "Belt Conveyor No. 1". Therefore, the following are changed:

FROM:

a. SC III.24.(b):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- (1) Transfer towers (EU-028c, EU-028g, EU-028i, EU-028o, and EU-028q)
- (2) Coal, coal coated with latex and petroleum coke storage building (EU-028h)
- (3) Stacker/reclaimers (EU-028)
- (4) Limestone lowering well (EU-028d)
- (5) Conveyors (EU-028)

b. SC III.41:

41. Materials Handling Operations: Visible emissions shall be conducted on the material handling operations to determine compliance with their applicable limits, as follows:

Emissions Units at NGS	EPA Method(s)	Duration of VE Test	Frequency	Material
Shiphold (EU-028a)	9	30 min	I only	C or PC
Ship Unloader & Spillage Conveyors (EU-028a)	9	3 hr	I only	C & LS
Conveyors (EU-028)	9	3 hr	I only	C & LS
Transfer Towers (EU-028c, -028g, -028i, -028q)	9	3 hr	I only	C & LS
Fuel Storage Building (EU-028h)	9	30 min	I only	C or PC
Fuel Storage Pile - Stacking & Reclaiming (EU-028)	9	30 min	I only	C or PC

TO:

a. SC III.24.(b):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- (1) Transfer towers (EU-028c, EU-028g, EU-028i, EU-028o, EU-028q and EU-028v)
- (2) Coal, coal coated with latex and petroleum coke storage building (EU-028h)
- (3) Limestone lowering well (EU-028d)
- (4) Belt Conveyor No. 1 (EU-028)

[0310045-003-AC/PSD-FL-265; and, 0310045-012-AC/PSD-FL-265B]

b. SC III.41.:

41. Materials Handling Operations: Visible emissions shall be conducted on the material handling operations to determine compliance with their applicable limits, as follows:

Emissions Units at NGS	EPA Method(s)	Duration of VE Test	Frequency	Material
Shiphold (EU-028a)	9	30 min	I only	C or PC
Ship Unloader & Spillage Conveyors (EU-028a)	9	3 hr	I only	C & LS
Belt Conveyor No.1 (EU-028)	9	3 hr	I only	C & LS
Transfer Towers (EU-028c, -028g, -028i, -028q)	9	3 hr	I only	C & LS
Fuel Storage Building (EU-028h)	9	30 min	I only	C or PC

[0310045-003-AC/PSD-FL-265; 0310045-007-AC/PSD-FL-265A; 0310045-012-AC/PSD-FL-265B; 40 CFR 60.11(b); and, 40 CFR 60, Appendix A]

3. SCs III.24.(a), (c), (d) & (f), and 41., 0310045-003-AC/PSD-FL-265. The permittee has requested that several emissions units identified in the PSD permit be changed to a different name, with no change in limits or compliance requirements (EU-029 thru EU-053); and, the permittee asked that emissions units EU-032 and EU-039 be deleted from the permit's text, for they were never constructed. The requests are acceptable and the following are changed:

FROM:

a. SC III.24.(a), (b), (c), (d) & (f):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(a) The following materials handling sources shall be equipped with fabric filter controls and visible emissions shall not exceed 5 percent opacity:

- Crusher house (EU-029)
- Boiler fuel silos (EU-031)
- Limestone receiving bins (EU-032)
- Limestone crusher conveyor transfers (EU-034)
- Limestone feed silos (EU-035)
- Fly ash waste bins (EU-036)
- Fly ash transfer and storage systems (EU-037)
- Bed ash transfer and storage systems (EU-038)
- Pebble lime silo (EU-042)
- Fly ash silo pre-mixers (EU-051)
- Bed ash silo mixers (EU-052)
- Bed ash surge hoppers (EU-053)

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- Transfer towers (EU28c, EU28g, EU28i, EU28o and EU28q)
- Coal and petroleum coke storage building (EU28h)
- Stacker/reclaimers (EU28)
- Limestone lowering well (EU28d)
- Conveyors (EU28)
- Ash hydrator loadouts (EU28r)

(c) The following materials handling sources shall use wet suppression, water spray, partial enclosures, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 10 percent opacity:

- NGS dock ship unloading operations - ship hold and receiving hoppers (EU-028a)
- NGS dock receiving conveyor (EU-028a)
- Limestone storage pile (EU-028p)
- Limestone reclaim hopper (EU-028p)

(d) The fly ash and bed ash silo hydrators (EU-039) shall use a venturi scrubber and visible emissions shall not exceed 5 percent opacity).

(f) The maximum particulate matter emissions from the following operations shall not exceed 0.01 grains per dry standard cubic foot:

- Limestone receiving bins (EU-032)
- Limestone crusher conveyor transfers (EU-034)
- Limestone feed silos (EU-035)

b. SC III.41.:

41. Materials Handling Operations: Visible emissions shall be conducted on the material handling operations to determine compliance with their applicable limits, as follows:

Emissions Units at NGS	EPA Method(s)	Duration of VE Test	Frequency	Material
Shiphold (EU-028a)	9	30 min	I only	C or PC
Ship Unloader & Spillage Conveyors (EU-028a)	9	3 hr	I only	C & LS
Belt Conveyor No. 1 (EU-028)	9	3 hr	I only	C & LS
Transfer Towers (EU-028c, -028g, -028i, -028q)	9	3 hr	I only	C & LS
Fuel Storage Building (EU-028h)	9	30 min	I only	C or PC
Limestone Storage Pile (EU-028p)	9	30 min	I only	LS
<u>NSPS - OOO</u>				
Limestone Receiving Bins - Baghouse Exhaust (EU-032)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Crusher Conveyor Transfer - Baghouse Exhaust (EU-034)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Feed Silos - Baghouse Exhaust (EU-035)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Dryer Building (EU-033)	22	IVE - 75 min	I only	LS
<u>NSPS - Y</u>				
Crusher House - Baghouse Exhaust (EU-029)	9	IVE - 3 hr RVE - 30 min	I & R	C
Boiler Feed Silos - Baghouse Exhaust (EU-031)	9	IVE - 3 hr RVE - 30 min	I & R	C
<u>Other</u>				
Fly Ash Waste Bin - Baghouse Exhaust (EU-036)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Silos - Baghouse Exhaust (EU-037)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Silos - Baghouse Exhaust (EU-038)	9	IVE - 30 min RVE - 30 min	I & R	Ash

Pebble Lime Silo - Baghouse Exhaust (EU-042)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Silo Pre-mixers - Baghouse Exhaust (EU-051)	9	IVE - 60 min RVE - 60 min	I & R	Ash
Bed Ash Silo Mixers - Baghouse Exhaust (EU-052)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Surge Hoppers - Baghouse Exhaust (EU-053)	9	IVE - 60 min RVE - 60 min	I & R	Ash

C - Coal

I - Initial R - Renewal (once every 5 years)

IVE - Initial Visible Emissions Test, RVE - Renewal Visible Emissions Test

LS - Limestone; PC-Petroleum Coke

Note: No methods other than the ones identified above may be used for compliance testing unless prior DEP or RESD approval is received in writing.

[0310045-003-AC/PSD-FL-265; 0310045-007-AC/PSD-FL-265A; 0310045-012-AC/PSD-FL-265B; 40 CFR 60.11(b); and, 40 CFR 60, Appendix A]

TO:

a. SC III.24.(a), (c), (d) & (f):

24. Standards. The materials processing sources at NGS shall be regulated as follows, and the emission limits and standards shall apply upon completion of the initial compliance tests for each of the units or activities.

(a) The following materials handling sources shall be equipped with fabric filter controls and visible emissions shall not exceed 5 percent opacity:

- Crusher house building baghouse exhaust (EU-029)
- Fuel silos dust collectors (EU-031)
- Limestone prep building dust collectors (EU-034)
- Limestone silos bin vent filters (EU-035)
- Fly ash transport blower discharge (EU-036)
- Fly ash silos bin vents (EU-037)
- Bed ash silos bin vents (EU-038)
- AQCS pebble lime silo (EU-042)
- Fly ash slurry mix system vents (EU-051)
- Bed ash slurry mix system vents (EU-052)
- Bed ash surge hopper bin vents (EU-053)

(b) The following materials handling sources shall use wet suppression, water spray, coverings, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 5 percent opacity:

- Transfer towers (EU28c, EU28g, EU28i, EU28o, EU28q and EU28v)
- Coal and petroleum coke storage building (EU28h)
- Stacker/reclaimers (EU28)
- Transfer Building 5 and limestone loadout chute (EU28d)
- Conveyors (EU28)
- Ash hydrator loadouts (EU28r)

(c) The following materials handling sources shall use wet suppression, water spray, partial enclosures, and/or conditioned materials to control particulate emissions as needed, and visible emissions shall not exceed 10 percent opacity:

- NGS dock vessel unloading operations - vessel hold (EU-028a)
- NGS dock vessel unloading operations - vessel unloader & spillage conveyors (EU-028a)
- Limestone storage pile (EU-028p)
- Limestone reclaim hopper (EU-028p)

(d) Deleted.

(f) The maximum particulate matter emissions from the following operations shall not exceed 0.01 grains per dry standard cubic foot:

Limestone prep building dust collectors (EU-034)

Limestone silo bin vent filters (EU-035)

[0310045-003-AC/PSD-FL-265; 0310045-007-AC/PSD-FL-265A; and, 0310045-012-AC/PSD-FL-265B]]

b. SC III.41:

41. Materials Handling Operations: Visible emissions shall be conducted on the material handling operations to determine compliance with their applicable limits, as follows:

Emissions Units at NGS	EPA Method(s)	Duration of VE Test	Frequency	Material
Vessel Hold (EU-028a)	9	30 min	I only	C or PC
Vessel Unloader & Spillage Conveyors (EU-028a)	9	3 hr	I only	C & LS
Belt Conveyor No. 1 (EU-028)	9	3 hr	I only	C & LS
Transfer Towers (EU-028c, -028g, -028i, -028o, -028q & -028v)	9	3 hr	I only	C & LS
Fuel Storage Building (EU-028h)	9	30 min	I only	C or PC
Limestone Storage Pile (EU-028p)	9	30 min	I only	LS
NSPS - OOO				
Limestone Prep Building Dust Collectors - Baghouse Exhaust (EU-034)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Silos Bin Vent Filters - Baghouse Exhaust (EU-035)	9-VE 5-PM	IVE - 60 min RVE - 30 min	Meth 9: I & R Meth 5: I only	LS
Limestone Dryer/Mill Building (EU-033)	22	IVE - 75 min	I only	LS
NSPS - Y				
Crusher House Building Baghouse Exhaust (EU-029)	9	IVE - 3 hr RVE - 30 min	I & R	C
Fuel Silos Dust Collectors - Baghouse Exhaust (EU-031)	9	IVE - 3 hr RVE - 30 min	I & R	C
Other				
Fly Ash Transport Blower Discharge - Baghouse Exhaust (EU-036)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Fly Ash Silos Bin Vents - Baghouse Exhaust (EU-037)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Silos Bin Vents - Baghouse Exhaust (EU-038)	9	IVE - 30 min RVE - 30 min	I & R	Ash
AQCS Pebble Lime Silo - Baghouse Exhaust (EU-042)	9	IVE - 30 min RVE - 30 min	I & R	Ash

Fly Ash Slurry Mix System Vents - Baghouse Exhaust (EU-051)	9	IVE - 60 min RVE - 60 min	I & R	Ash
Bed Ash Slurry Mix System Vents - Baghouse Exhaust (EU-052)	9	IVE - 30 min RVE - 30 min	I & R	Ash
Bed Ash Surge Hopper Bin Vents - Baghouse Exhaust (EU-053)	9	IVE - 60 min RVE - 60 min	I & R	Ash

C – Coal and/or Coal coated with latex

I – Initial R - Renewal (once every 5 years)

IVE – Initial Visible Emissions Test, RVE - Renewal Visible Emissions Test

LS – Limestone; PC-Petroleum Coke

Note: No methods other than the ones identified above may be used for compliance testing unless prior DEP or RESD approval is received in writing.

[0310045-003-AC/PSD-FL-265; 0310045-007-AC/PSD-FL-265A; 0310045-012-AC/PSD-FL-265B; 40 CFR 60.11(b); and, 40 CFR 60, Appendix A]

4. SCs III.14.(c) and 33.(c), 0310045-003-AC/PSD-FL-265. Since the existing Boiler No. 1 has been retired and removed from service, then any references to this retired boiler and associated text has been deleted because they are obsolete; in addition, references to existing Unit 3 will be changed to existing Boiler No. 3 and references to Units 1 and 2 will be changed to CFB Boilers Nos. 1 and 2 for clarity purposes in these SCs. Therefore, the following has been changed:

FROM:

a. SC III.14.(c):

14.(c). Sulfur Dioxide.

c. Sulfur dioxide emissions from existing Unit 1 shall not exceed 0.14 lb/MMBtu (24-hour block average), effective upon startup of Repowered Unit 2.

b. SC III.33.(c):

33. Particulate Matter:

(c) Compliance with the annual particulate matter (PM) emissions limit in Condition 16(c) shall be determined using the following formula. This formula shall be used for each fuel consumed by each of Units 1, 2 and 3, and the resulting PM emissions summed to obtain a 12-month total for Units 1, 2, and 3.

$$\text{PM Emissions} = (\text{Fuel Usage}^a) \times (\text{Emission Factor}^b) \times \text{unit conversion factors}$$

^a The "Fuel Usage" shall be measured by calibrated fuel flow meters (± 5 percent accuracy) and recorded daily when a unit is operated.

^b An "Emissions Factor" of $[(9.19 \times \text{weight percent sulfur content}) + 3.22]$ pounds per thousand gallons (lbs/10³ gal) shall be used for fuel oil burned in existing Units 1 and 3. The weight percent sulfur content shall be determined based on an analysis of a representative sample of the fuel oil being consumed. The analysis shall be performed using either ASTM D2622-92, ASTM D4294-90, both ASTM D4057-88 and ASTM D129-91, or the latest edition. An "Emissions Factor" of 5 pounds per million cubic feet (lb/MCF) shall be used for natural gas burned in existing Units 1 and 3. For Repowered Units 1 and 2, the "Emissions Factor" shall be based on particulate matter stack test results using EPA Methods 5, 5B, 8, 17, or 29 for the individual units, and shall apply to the quantities of fuel consumed in the individual units during the period immediately following the stack tests for the respective units until subsequent stack tests are completed.

TO:

a. SC III.14.(c):

14.(c). Sulfur Dioxide.

c. Deleted.

[Applicant Request; and, 0310045-003-AC/PSD-FL-265]

b. SC III.33.(c):

33. Particulate Matter:

- (c) Compliance with the annual particulate matter (PM) emissions limit in Condition 16(c) shall be determined using the following formula. This formula shall be used for each fuel consumed by each of CFB Boilers Nos. 1 and 2 and existing Boiler No. 3, and the resulting PM emissions summed to obtain a 12-month total for CFB Boilers Nos. 1 and 2 and existing Boiler No. 3.

$$\text{PM Emissions} = (\text{Fuel Usage}^a) \times (\text{Emission Factor}^b) \times \text{unit conversion factors}$$

^a The "Fuel Usage" shall be measured by calibrated fuel flow meters (± 5 percent accuracy) and recorded daily when a unit is operated.

^b An "Emissions Factor" of $[(9.19 \times \text{weight percent sulfur content}) + 3.22]$ pounds per thousand gallons (lbs/10³ gal) shall be used for fuel oil burned in existing Boiler No. 3. The weight percent sulfur content shall be determined based on an analysis of a representative sample of the fuel oil being consumed. The analysis shall be performed using either ASTM D2622-92, ASTM D4294-90, both ASTM D4057-88 and ASTM D129-91, or the latest edition. An "Emissions Factor" of 5 pounds per million cubic feet (lb/MCF) shall be used for natural gas burned in existing Boiler No. 3. For Repowered Units 1 and 2, the "Emissions Factor" shall be based on particulate matter stack test results using EPA Methods 5, 5B, 8, 17, or 29 for the individual units, and shall apply to the quantities of fuel consumed in the individual units during the period immediately following the stack tests for the respective units until subsequent stack tests are completed.

5. SCs in 0310045-003-AC/PSD-FL-265. Where the text refers to Units 1 and 2, the text will be changed to CFB Boilers Nos. 1 and 2 in the Title V Air Operation Permit Renewal, where the air construction permit for these emissions unit is being incorporated; and, where the text refers to Units 1 or 2, the text will be changed to CFB Boiler No. 1 or No. 2 in the Title V Air Operation Permit Renewal, where the air construction permit for these emissions unit is being incorporated.

6. SC 4. AC16-85951. This AC permit was issued for the NGS Auxiliary Boiler No.1 and included a fuel oil usage cap for NGS Boilers Nos. 1, 2 & 3 and Auxiliary Boiler No. 1. Since the existing NGS Boilers Nos. 1 and 2 and Auxiliary Boiler No. 1 have been retired and no longer in service, then the Department agrees that a fuel oil cap related to these emissions units and the remaining existing NGS Boiler No. 3 is not pertinent and, essentially, obsolete. Some of the original SC was split into two SCs in Section III. Subsection A. 0310045-008-AV, specifically in SCs Nos. A.3.b. and A.41. Therefore, the following have been changed:

FROM:

a. SC 4.: AC16-85951.

4. The boiler shall be operational when at least one of the three larger (+ 2000-E6 Btu/hr) steam generating units has been shut down or is in the start-up mode of operation prior to being put on line. Compliance shall be determined by requiring that when any of boilers NS#1, NS#2, and NS#3 are shut down, that it be recorded in the proposed boiler operating log. When electrical power demand requires all three main units to be on line, the total station residual fuel oil consumption will be recorded for each four hour period whenever the auxiliary steam generator is operating. The total station fuel consumption must not exceed 1,440,000 pounds in any consecutive three (3) hour period. The recorded fuel consumption data will be retained for at least two years.

b. SC A.3.b.: 0310045-008-AV.

A.3. Methods of Operation - Fuels.

b. The total station (NGS Boiler No. 3 residual fuel oil consumption must not exceed 1,440,000 pounds in any consecutive three (3) hour period.

[Rule 62-213.410, F.A.C.; 40 CFR 271.20(e)(3); AO16-194743, AO16-178094 and AO16-207528; AC16-85951 and BACT; and, applicant request dated June 14, 1996]

c. SC A.41.: 0310045-008-AV.

A.41. When electrical power demand requires all three main NGS boilers to be on line, the total station residual (No. 6) fuel oil consumption shall be recorded for each four-hour period whenever the NGS auxiliary steam generator (boiler) is operating. The recorded fuel consumption data shall be retained for at least five (5) years. [Rule 62-213.440, F.A.C.; and, AC16-85951]

TO:

a. SC 4.: AC16-85951.

4. Deleted.

b. SC A.3.b.: 0310045-008-AV.

A.3. Methods of Operation - Fuels.

b. Reserved.

[Rule 62-213.410, F.A.C.; 40 CFR 271.20(e)(3); AO16-194743, AO16-178094 and AO16-207528; AC16-85951 and BACT; applicant request dated June 14, 1996; and, 0310045-012-AC/PSD-FL-265B]

c. SC A.41.: 0310045-008-AV.

A.41. Reserved.

7. Revised Tables 2 and 6. PSD-FL-010 (amendment dated October 28, 1986). This AC/PSD permit change is being made to recognize that an operation, which is identified as #17 in Revised Table 2 and #18 in Revised Table 6, has been removed from service. Therefore, any reference to #17 in Revised Table 2 and #18 in Revised Table 6 will be removed from the Title V permit's text and recognized as changed in the amended federal PSD permit, PSD-FL-010, dated October 28, 1986; and, they are located in Section III. Subsection F. Specific Conditions F.1, F.3., F.4., F.5. and F.10., 0310045-008-AV (last revision), and Conditions . Therefore, the following have been changed:

FROM:

a. SC F.1. 0310045-008-AV; and, Conditions.

F.1. Revised Tables 2 and 6, PSD-FL-010, are incorporated by reference (attached) for emissions units 17 thru 18 and 18 thru 19, respectively.

b. SC F.3. 0310045-008-AV.

F.3. Controls. The permittee shall maintain and continue to use the control systems and control techniques established to minimize particulate matter emissions from emissions units 17 and 18 in Revised Table 2, PSD-FL-010.

[Rules 62-4.070 and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; and, PSD-FL-010]

c. SC F.4. 0310045-008-AV.

F.4. Visible Emissions. Visible emissions shall not exceed the following:

- a. Limestone and flyash handling systems 10% opacity
- b. Limestone transfer points 10% opacity
- c. Limestone silo 10% opacity
- d. Limestone unloading (rail dumper) 10% opacity
- e. Flyash silos 10% opacity

[PSD-FL-010 and PA 81-13]

d. SC F.5. 0310045-008-AV.

F.5. Particulate Matter. Particulate matter emissions shall not exceed the following:

- a. Limestone silo 0.05 lb/hr
- b. Limestone hopper/transfer conveyors 0.65 lb/hr
- c. Limestone transfer points 0.4 lb/hr
- d. Limestone unloading (rail dumper) 0.1 lb/hr
- e. Flyash handling system 0.2 lb/hr

[Rule 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; and, PSD-FL-010 and PA 81-13]

e. SC F.10. 0310045-008-AV.

F.10. Particulate Matter. In accordance with Chapter 62-297, F.A.C., EPA Method 5 shall be used to determine compliance with the particulate matter emission limitations established in Revised Table 6, PSD-FL-010, for emissions units 18 and 19 that exhaust through a stack. If the opacity limits are not met for those emissions units that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate tests.

[Rules 62-4.070 and 62-213.440, F.A.C.; Part V, Rule 2.501, JEPB; and, PSD-FL-010]

TO:

a. SC F.1. 0310045-008-AV.

F.1. Revised Tables 2 and 6, PSD-FL-010, amended October 28, 1986, are incorporated by reference (attached) for emissions unit 18 (Table 2) and emissions unit 19 (Table 6).

[PSD-FL-010; PSD-FL-010, amended 10/28/1986; and, 0310045-012-AC/PSD-FL-010E]

b. SC F.3. 0310045-008-AV.

F.3. Controls. The permittee shall maintain and continue to use the control systems and control techniques established to minimize particulate matter emissions from emissions unit 18 in Revised Table 2, PSD-FL-010, amended October 28, 1986.

[Rules 62-4.070 and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010; PSD-FL-010, amended 10/28/1986; and, 0310045-012-AC/PSD-FL-010E]

c. SC F.4. 0310045-008-AV.

F.4. Visible Emissions. Visible emissions shall not exceed the following:

- a. Limestone and flyash handling systems 10% opacity
- b. Limestone transfer points 10% opacity
- c. Limestone silo 10% opacity
- d. Reserved.
- e. Flyash silos 10% opacity

[PSD-FL-010 and PA 81-13; and, 0310045-012-AC/PSD-FL-010E]

d. SC F.5. 0310045-008-AV.

F.5. Particulate Matter. Particulate matter emissions shall not exceed the following:

- a. Limestone silo 0.05 lb/hr
- b. Limestone hopper/transfer conveyors 0.65 lb/hr
- c. Limestone transfer points 0.4 lb/hr
- d. Reserved.
- e. Flyash handling system 0.2 lb/hr

[Rule 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010 and PA 81-13; and, 0310045-012-AC/PSD-FL-010E]

Mr. James M. Chansler
JEA: Northside Generating Station and St. Johns River Power Park
0310045-012-AC/PSD-FL-010E/PSD-FL-265B
Page 12 of 12

e. SC F.10. 0310045-008-AV.

F.10. Particulate Matter. In accordance with Chapter 62-297, F.A.C., EPA Method 5 shall be used to determine compliance with the particulate matter emission limitations established in Revised Table 6, PSD-FL-010, amended October 28, 1986, for emissions unit 19 that exhaust through a stack. If the opacity limits are not met for those emissions units that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate tests.

[Rules 62-4.070 and 62-213.440, F.A.C.; Part V, Rule 2.501, JEPB; PSD-FL-010; PSD-FL-010, amended October 28, 1986; and, 0310045-012-AC/PSD-FL-010E]

8. SC 31. 0310045-003-AC/PSD-FL-265. Since the SC is silent on the minimum number of data points required to establish a valid 24-hour average using a continuous emissions monitoring system (CEMS) for sulfur dioxide, the following "Permitting Note" has been added for clarity purposes:

{Permitting Note: At least three (3) hours of data are required to establish a 24-hour average for CEMS data.}

This permit (letter) is issued pursuant to Chapter 403, Florida Statutes (F.S.). Any party to this order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The notice must be filed within thirty days after this order is filed with the clerk of the Department.

Executed in Tallahassee, Florida.

Sincerely,



Michael G. Cooke
Director
Division of Air Resource Management

MGC/sms/bm

cc: Mr. Bert Gianazza, P.E., JEA, Application Contact
Mr. Richard Robinson, RESD
Mr. Hamilton Owen, DEP-SCO
Mr. Gregg Worley, U.S. EPA, Region 4



Department of Environmental Protection

Jeb Bush
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Colleen M. Castille
Secretary

April 6, 2006

CERTIFIED MAIL – Return Receipt Requested

Mr. James M. Chansler, P.E., D.P.A.
V.P., Operations and Maintenance and Responsible Official
JEA
21 West Church Street
Jacksonville, Florida 32202

Re: Final Air Construction (AC) Permit Project Nos.: 0310045-015-AC/PSD-FL-010G/PSD-FL-265C
Affected AC Permits Nos.: 0310045-003-AC/PSD-FL-010/PSD-FL-265, PSD-FL-010C, and 0310045-012-AC/
PSD-FL-010E
Affected Siting Permit No.: PA 81-13
JEA: Northside Generating Station and St. Johns River Power Park

Dear Mr. Chansler:

The subject of this permit (letter) is to:

1. Revise "Revised Table 6 – Part B" (PSD-FL-010C), as follows:
 - a. Better describe the fugitive and minor source emissions units/points and to remove the emissions limits for PM/PM₁₀, including those controlled by a baghouse control system, because they were imposed from values established for the modeling evaluation; in addition and due to this direction, changes will be made to some conditions established in AC permit No. 0310045-012-AC/PSD-FL-010E;
 - b. Change the visible emission limit from "10% opacity" to "5% opacity" for those minor emissions units/points controlled by a baghouse control system;
 - c. Add minor emission units/points to the table that have been identified by the applicant that were built and exist in these operations, but had not yet been identified in previous permits (in the table, see those emission units/points identified in "*Italics*");
 - d. Allow a change to the Rotary Railcar Unloader & Transfer Points operation within the Rotary Railcar Dumper Building (RRDB) at the JEA's St. Johns River Power Park (SJRPP) [specifically, allow the removal of a baghouse associated with the four transfer points within the RRDB and continue the current practice of using wet suppression to control emissions of particulate matter when handling, loading and unloading materials; in addition, the RRDB is domed and mostly enclosed]; and,
 - e. Establish that the visible emission limits established in Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations shall be used for compliance purposes.
2. Recognize the opacity changes related to the emissions units in the permit, No. PSD-FL-010, and the Revised Table 6 – Part B (PSD-FL-010C); also, the specific condition (#3) will establish that the visible emissions tests shall be used for compliance purposes.
3. Change the excess emissions language related to the JEA's NGS CFB Units Nos. 1 and 2 that was established in the AC permit No. 0310045-003-AC/PSD-FL-265 (see condition No. 26); and,
4. Change the specific conditions related to compliance demonstration for SO₂ and NO_x for the JEA's NGS CFB Units Nos. 1 and 2, specifically remove the use of missing data substitution, which is acceptable for purposes for Acid Rain allowances, to avoid the conflict when determining the compliance average with the emission limit and the associated timeframe that was established in AC permit, No. 0310045-003-AC/PSD-FL-265 [see conditions Nos. 31.(a) and 32.(a), respectively].

"More Protection, Less Process"

Printed on recycled paper.

Therefore, the following are changed:

1. PSD-FL-010C: Table 6 – Part B (SJRPP) and associated text in 0310045-011-AV pursuant to PSD-FL-010.

The Department finds the following requests acceptable because there are no apparent changes in actual emissions and the changes that are being recommended are more reflective of what actually exists at the JEA's SJRPP facility for the materials handling and storage operations:

- a. Change the title of the table from "Table 6 – Part B" to "Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations" (attached) and adding other minor emission units/points to the table that have been identified by the applicant that were built and exist in these operations, but had not yet been identified in previous permits (in the table, see those emission units/points identified in "*Italics*");
- b. Removal of the PM/PM₁₀ emissions limits for the emissions units/points 4 thru 19 [Revised Table 6: PSD-FL-010 (10/28/86)], including those controlled by a baghouse control system, because they were imposed from values established for a modeling evaluation;
- c. Change the allowable visible emissions limits from "10% opacity" to "5% opacity" for those minor emissions units/points controlled by a baghouse control system;
- d. Continue the air quality control system requirement of "wet suppression" for fugitive PM emissions control from the Rotary Railcar Unloader – Fuel Transfer Points (formerly DC-1) [see Emissions Unit No. -023a (formerly #19 (Revised Table 6: PSD-FL-010 (10/28/86))]. In addition, the "Railcar Rotary Dumper – Building Emissions" and the "Rotary Railcar Unloader – Fuel Transfer Points (formerly DC-1)" will be combined and be considered as one emissions unit operation (EU No. -023a) and renamed as the "Rotary Railcar Dumper Building – Unloading and Transfer Points"; and,
- e. Establish that the visible emission limits are to be used for compliance purposes (see foot notes).

Therefore, the following are changed:

FROM:

Table 6 – Part B (SJRPP PSD Permit: PSD-FL-010C). (attached)

TO:

Revised Table 6 – Part B. SJRPP: Materials Handling and Storage Operations. (attached)

In addition and for purposes of continuity, the Department is also going to reflect changes of Title V specific conditions that are due to the miscellaneous changes requested for the table and are derived from PSD permit, No. PSD-FL-010, as follows:

FROM:

1. SC E.1. of 0310045-011-AV.

E.1. Revised Tables 2 and 6, PSD-FL-010, amended October 28, 1986, are incorporated by reference (attached) for emissions units 1 thru 16 and 4 thru 17, respectively.
[PSD-FL-010, amended October 28, 1986]

2. SC E.3. of 0310045-011-AV.

E.3. Controls. The permittee shall maintain and continue to use the control systems and control techniques established to minimize particulate matter emissions from emissions units 4 thru 17 in Revised Table 2, PSD-FL-010, amended October 28, 1986.
[Rules 62-4.070 and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010; and, PSD-FL-010, amended October 28, 1986]

3. SC E.4. of 0310045-011-AV.

E.4. Visible Emissions. An owner or operator shall not cause to be discharged into the atmosphere from any coal processing and conveying equipment, coal storage system, or coal transfer and loading system processing coal, visible emissions greater than 10 percent opacity, as established in Revised Table 6, PSD-FL-010, amended October 28, 1986.
[PSD-FL-010 and BACT; PA 81-13; and, PSD-FL-010, amended October 28, 1986]

4. SC E.5. of 0310045-011-AV.

E.5. Particulate Matter. Particulate matter emissions shall not exceed the limits established in Revised Table 6, PSD-FL-010, amended October 28, 1986.

[Rules 62-4.070 and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; and, PSD-FL-010, amended October 28, 1986]

5. SC E.9. of 0310045-011-AV.

E.9. Visible Emissions. EPA Method 9 and the procedures in 40 CFR 60.11 shall be used to determine opacity compliance pursuant to Chapter 62-297, F.A.C., and 40 CFR 60, Appendix A. If the opacity limits are not met for those emissions units that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate tests. See specific condition E.10.

[40 CFR 60.252(c); and, PSD-FL-010 and PA 81-13]

6. SC E.10. of 0310045-011-AV.

E.10. Particulate Matter. In accordance with Chapter 62-297, F.A.C., EPA Method 5 shall be used to determine compliance with the particulate matter emission limitations established in Revised Table 6, PSD-FL-010, for emissions units 4 thru 17 that exhaust through a stack. If the opacity limits are not met for those emissions units that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate tests. See specific condition E.9.

[Rules 62-4.070 and 62-213.440, F.A.C.; Part V, Rule 2.501, JEPB; and, PSD-FL-010, amended October 28, 1986]

7. SC F.1. of 0310045-011-AV.

F.1. Revised Tables 2 and 6, PSD-FL-010, amended October 28, 1986, are incorporated by reference (attached) for emissions unit 18 (Table 2) and emissions unit 19 (Table 6).

[PSD-FL-010; PSD-FL-010, amended 10/28/1986; and, 0310045-012-AC/PSD-FL-010E]

8. SC F.3. of 0310045-011-AV.

F.3. Controls. The permittee shall maintain and continue to use the control systems and control techniques established to minimize particulate matter emissions from emissions unit 18 in Revised Table 2, PSD-FL-010, amended October 28, 1986.

[Rules 62-4.070 and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010; PSD-FL-010, amended 10/28/1986; and, 0310045-012-AC/PSD-FL-010E]

9. SC F.4. of 0310045-011-AV.

F.4. Visible Emissions. Visible emissions shall not exceed the following:

- a. Limestone and flyash handling systems 10% opacity
- b. Limestone transfer points 10% opacity
- c. Limestone silo 10% opacity
- d. Reserved.
- e. Flyash silos 10% opacity

[PSD-FL-010 and PA 81-13; and, 0310045-012-AC/PSD-FL-010E]

10. SC F.5. of 0310045-011-AV.

F.5. Particulate Matter. Particulate matter emissions shall not exceed the following:

- a. Limestone silo 0.05 lb/hr
- b. Limestone hopper/transfer conveyors 0.65 lb/hr
- c. Limestone transfer points 0.4 lb/hr
- d. Reserved.
- e. Flyash handling system 0.2 lb/hr

[Rule 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010 and PA 81-13; and, 0310045-012-AC/PSD-FL-010E]

Mr. James M. Chansler
JEA: Northside Generating Station and St. Johns River Power Park
0310045-015-AC/PSD-FL-010G/PSD-FL-265C
Page 4 of 8

11. SC F.9. of 0310045-011-AV.

F.9. Visible Emissions. EPA Method 9 shall be used to determine opacity compliance pursuant to Chapter 62-297, F.A.C., and 40 CFR 60, Appendix A.
[Rule 62-213.440, F.A.C.; Part V, Rule 2.501, JEPB; and, PSD-FL-010 and PA 81-13]

12. SC F.10. of 0310045-011-AV.

F.10. Particulate Matter. In accordance with Chapter 62-297, F.A.C., EPA Method 5 shall be used to determine compliance with the particulate matter emission limitations established in Revised Table 6, PSD-FL-010, amended October 28, 1986, for emissions unit 19 that exhaust through a stack. If the opacity limits are not met for those emissions units that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate tests.
[Rules 62-4.070 and 62-213.440, F.A.C.; Part V, Rule 2.501, JEPB; PSD-FL-010; PSD-FL-010, amended October 28, 1986; and, 0310045-012-AC/PSD-FL-010E]

TO:

1. SC E.1. of 0310045-011-AV.

E.1. Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations, is incorporated by reference (attached).
[PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended 10/28/1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

2. SC E.3. of 0310045-011-AV.

E.3. Air Quality Control Systems (AQCS). The permittee shall maintain and continue to use the AQCS established in Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations, to minimize particulate matter emissions.
[Rules 62-4.070(3) and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended October 28, 1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

3. SC E.4. of 0310045-011-AV.

E.4. Visible Emissions. Visible emissions shall be used for compliance purposes and not exceed the opacity limits established in Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations.
[PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended October 28, 1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

4. SC E.5. of 0310045-011-AV.

E.5. Reserved.
[0310045-015-AC/PSD-FL-010G]

5. SC E.9. of 0310045-011-AV.

E.9. Visible Emissions. Visible emissions tests shall be performed for the affected emissions points in Revised Table 6 - Part B, SJRPP: Materials Handling and Storage Operations for compliance purposes, in accordance with the testing frequency established in the table, and while using EPA Method 9, 40 CFR 60, Appendix A; and Chapter 62-297, F.A.C.
[PSD-FL-010; PA 81-13; Part V, Rule 2.501, JEPB; and, 0310045-015-AC/PSD-FL-010G]

6. SC E.10. of 0310045-011-AV.

E.10. Reserved.
[0310045-015-AC/PSD-FL-010G]

7. SC F.1. of 0310045-011-AV.

F.1. Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations, is incorporated by reference (attached). [PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended October 28, 1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

8. SC F.3. of 0310045-011-AV.

F.3. Air Quality Control Systems (AQCS). The permittee shall maintain and continue to use the AQCS established in Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations, to minimize particulate matter emissions. [Rules 62-4.070(3) and 62-212.400(6), F.A.C.; Part IV, Rule 2.401, JEPB; PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended October 28, 1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

9. SC F.4. of 0310045-011-AV.

F.4. Visible Emissions. Visible emissions shall be used for compliance purposes and not exceed the opacity limits established in Revised Table 6 – Part B, SJRPP: Materials Handling and Storage Operations. [PSD-FL-010; BACT; PA 81-13; PSD-FL-010, amended October 28, 1986; PSD-FL-010C, clerked July 29, 1999; 0310045-012-AC/PSD-FL-010E; and, 0310045-015-AC/PSD-FL-010G]

10. SC F.5. of 0310045-011-AV.

F.5. Reserved.
[0310045-015-AC/PSD-FL-010G]

11. SC F.9. of 0310045-011-AV.

F.9. Visible Emissions. Visible emissions tests shall be performed for the affected emissions points in Revised Table 6 - Part B, SJRPP: Materials Handling and Storage Operations for compliance purposes, in accordance with the testing frequency established in the table, and while using EPA Method 9, 40 CFR 60, Appendix A, and Chapter 62-297, F.A.C. [PSD-FL-010; PA 81-13; Part V, Rule 2.501, JEPB; and, 0310045-015-AC/PSD-FL-010G]

12. SC F.10. of 0310045-011-AV.

F.10. Reserved.
[0310045-015-AC/PSD-FL-010G]

2. PSD-FL-010 & PSD-FL-010C: Condition 3.

(1) 1st Paragraph: no change.

(2) 2nd Paragraph: The additional new condition will establish that the visible emissions standard will be used for compliance purposes and the compliance test method to be used is EPA Method 9, in accordance with 40 CFR 60, Appendix A, and Chapter 62-297, F.A.C. Therefore, the following is changed:

FROM:

Opacity tests shall be performed for the emissions points in Part C of revised Table 6 for compliance purposes, initial only using a Method 9 test. If the opacity limits are not met for those sources that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate test. In addition to these initial tests, a Method 9 test shall be conducted annually for the limestone silos, nonsaleable ash silos, and saleable ash silos.

TO:

Visible emissions tests shall be performed for the emissions points in Revised Table 6 - Part B, SJRPP: Materials Handling and Storage Operations for compliance purposes, in accordance with the testing frequency established in the table, and while using EPA Method 9, 40 CFR 60, Appendix A, and Chapter 62-297, F.A.C. The air quality control system requirements established in the table for each emissions point shall be used to minimize particulate matter emissions. See the following tables, which are attached: 1) PSD-FL-010: Tables 2 and 6. Allowable Emission Limits [Revised: From PSD Permit (dated October 28, 1986)]; 2) PSD-FL-010C: Table 6 - Part B (clerked July 29, 1999); and, 3) Revised Table 6 - Part B, SJRPP: Materials Handling and Storage Operations.

Visible emissions tests shall be performed for the emissions points in Part C of Revised Table 6 for compliance purposes, initial only using EPA Method 9, 40 CFR 60, Appendix A. If the opacity limits are not met for those sources that exhaust through a stack, permit compliance shall be determined on the basis of mass emission rate test using EPA Methods 1 - 5, 40 CFR 60, Appendix A. See the following table, which is attached: PSD-FL-010C: Table 6 - Part C (clerked July 29, 1999).

3. 0310045-003-AC/PSD-FL-265: Condition 26. (SC H.21.: 0310045-011-AV).

The Department finds the request to revise the excess emissions terms and conditions related to startups, shutdowns, and upsets/malfunctions of the JEA's Northside Generating Station (NGS) CFB Units 1 and 2 acceptable. The issue relates to the inertia associated with the large mass of bed material (typically on the order of 300 tons) that results in a longer response time than a traditional solid fuel unit. Both Excess Emissions regulations at Rules 62-210.700(1) and (5), F.A.C., allows the Department to evaluate emissions units on a case-by-case basis and consider operational variations in types of industrial equipment operations and to adjust maximum and minimum factors to provide reasonable and practical regulatory controls consistent with the public interests. Therefore, the following changes are made:

FROM:

26. Authorized Emissions. Notwithstanding other emission limits and standards established by this permit, excess emissions resulting from startup, shutdown, or malfunction shall be permitted provided that best operational practices are adhered to and the duration of excess emissions shall be minimized but in no case exceed twelve (12) hours in any 24-hour period for a startup on CFB Boilers Nos. 1 and 2 (which shall not be started up at the same time) or two (2) hours in any 24-hour period for other reasons unless specifically authorized by DEP or the ERMD-EQD for longer duration. The permittee shall submit a written procedure summarizing the current best operational practices to be followed and the anticipated emissions for startup and shutdown conditions within one year after initial startup of CFB Boiler No. 2, and shall update this document every 5 years (at operating permit renewal). The twelve (12) hours duration of excess emissions may be reduced through a permit revision based on the operating experience on CFB Boilers Nos. 1 and 2.
[Rule 62-210.700, F.A.C.; and, 0310045-003-AC/PSD-FL-265]

TO:

26. Authorized Emissions. Notwithstanding other emission limits and standards established by this permit, excess emissions resulting from startup, shutdown, or malfunction shall be permitted provided (1) that best operational practices are adhered to and (2) the duration of excess emissions shall be minimized but not exceed sixty (60) hours in any calendar month per emissions unit (CFBs Units Nos. 1 and 2). The permittee shall keep operational records necessary to demonstrate compliance with this restriction. Emissions data collected during periods of startup, shutdown, and malfunction shall be included when determining compliance with annual emission limits. The CFB Units shall not be started up at the same time. The permittee shall update the written procedure summarizing the current best operational practices to be followed every 5 years (at operating permit renewal).

Pursuant to Rule 62-210.200, F.A.C., Definitions, the following are defined:

- a. Startup: The commencement of operation of any emissions unit which has shut down or ceased operation for a period of time sufficient to cause temperature, pressure, chemical or pollution control device imbalances, which result in excess emissions.
- b. Shutdown: The cessation of the operation of an emissions unit for any purpose.

c. Malfunction: Any unavoidable mechanical and/or electrical failure of air pollution control equipment or process equipment or of a process resulting in operation in an abnormal or unusual manner.

In case of excess emissions resulting from malfunctions, each owner or operator shall notify the Department or appropriate Local Program in accordance with Rule 62-4.130, F.A.C. A full written report on the malfunctions shall be submitted in a quarterly report, if requested by the Department or appropriate Local Program.

[Rules 62-210.200 and 62-210.700(1), (5) & (6), F.A.C.; and, 0310045-015-AC/PSD-FL-265C]

4. 0310045-003-AC/PSD-FL-265. Conditions 31.(a) and 32.(a) (SCs of H.28.a. and H.29.a., respectively: 0310045-011-AV).

The Department finds the request acceptable to change the specific conditions related to compliance demonstration for SO₂ and NO_x for the JEA's NGS CFB Units Nos. 1 and 2, specifically remove the use of missing data substitution, which is acceptable for purposes for Acid Rain allowances, to avoid the conflict when determining the compliance average with the emission limit and the associated timeframe that was established.

FROM:

31. Sulfur Dioxide:

(a) Compliance with sulfur dioxide (SO₂) emissions limits in Conditions 14(a) and 14(c) shall be demonstrated with Continuous Emissions Monitoring Systems (CEMS's) installed, certified, operated and maintained in accordance with 40 CFR Part 75, based on 24-hour block and 30-day rolling averages, as applicable, and excluding periods of startup, shutdown, and malfunction. When monitoring data are not available, substitution for missing data shall be handled as required by the federal Acid Rain Program. Emissions recorded in parts per million shall be converted to lb/MMBtu using an appropriate F-factor for purposes of determining compliance with the emission limits in Conditions 14(a) and 14(c).

{Permitting Note: At least three (3) hours of data are required to establish a 24-hour average for CEMS data.}

[Applicant request; 0310045-003-AC/PSD-FL-265; and, 0310045-012-AC/PSD-FL-265B]

32. Oxides of Nitrogen:

(a) Compliance with the oxides of nitrogen (NO_x) emissions limit in Condition 15(a) shall be demonstrated with a CEMS's installed, certified, operated and maintained in accordance with 40 CFR Part 75, based on a 30-day rolling average and excluding periods of startup, shutdown and malfunction. When monitoring data are not available, substitution for missing data shall be handled as required by the federal Acid Rain Program to calculate the 30-day rolling average.

[Applicant request; and, 0310045-003-AC/PSD-FL-265]

TO:

31. Sulfur Dioxide:

(a) Compliance with sulfur dioxide (SO₂) emissions limits in Conditions 14(a) and 14(c) shall be demonstrated with Continuous Emissions Monitoring Systems (CEMSs) installed, certified, operated and maintained in accordance with 40 CFR Part 75, based on 24-hour block and 30-day rolling averages, as applicable, and excluding periods of startup, shutdown, and malfunction. Emissions recorded in parts per million shall be converted to lb/MMBtu using an appropriate F-factor for purposes of determining compliance with the emission limits in Conditions 14(a) and 14(c).

{Permitting Note: At least three (3) hours of data are required to establish a 24-hour average for CEMS data.}

[Applicant's request; 0310045-012-AC/PSD-FL-265B; and, 0310045-015-AC/PSD-FL-265C]

Mr. James M. Chansler
JEA: Northside Generating Station and St. Johns River Power Park
0310045-015-AC/PSD-FL-010G/PSD-FL-265C
Page 8 of 8

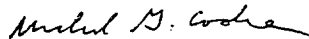
32. Oxides of Nitrogen:

(a) Compliance with the oxides of nitrogen (NO_x) emissions limit in Condition 15(a) shall be demonstrated with a CEMS's installed, certified, operated and maintained in accordance with 40 CFR Part 75, based on a 30-day rolling average and excluding periods of startup, shutdown and malfunction. The 30-day rolling averages will be determined based on hourly values calculated in accordance with Appendix F of 40 CFR Part 75.
[Applicant's request; and, 0310045-015-AC/PSD-FL-265C]

This permit (letter) is issued pursuant to Chapter 403, Florida Statutes (F.S.). Any party to this order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The notice must be filed within thirty days after this order is filed with the clerk of the Department.

Executed in Tallahassee, Florida.

Sincerely,



Michael G. Cooke
Director
Division of Air Resource Management

MGC/sms/bm

cc: Mr. Bert Gianazza, P.E., JEA, Application Contact
Mr. Richard Robinson, ERMD-EQD
Mr. Hamilton Owen, DEP-SCO
Mr. Gregg Worley, U.S. EPA, Region 4

Draft Permit

PERMITTEE:

JEA
21 West Church Street
Jacksonville, Florida 32202

Permit No. 0310045-021-AC
NGS/SJRPP/STI
Facility ID No. 0310045
Air Construction Permit Revision

PROJECT AND LOCATION

This permit revises a specific condition of air construction permit 0310045-003-AC/PSD-FL-265, clarifying that tests may be conducted on the current blend of coal and/or petroleum coke and not require that the fuel be switched to 100% coal for the test. The previously issued Permit No. 0310045-003-AC/PSD-FL-265 allowed the use of petroleum coke in CFB Boiler Nos. 1 & 2 and the materials handling operation. The existing NGS/SJRPP/STI is located at 4377 Heckshire Drive, Jacksonville, in Duval County. UTM Coordinates are: Zone 17, 446.90 km East and 3359.150 km North. Latitude is: 30° 21' 52" North; and, Longitude is: 81° 37' 25" West.

STATEMENT OF BASIS

This air pollution construction permit revision is issued under the provisions of Chapter 403 of the Florida Statutes (F.S.), and Chapters 62-4, 62-204, 62-210, 62-212, 62-296, and 62-297 of the Florida Administrative Code (F.A.C.). The permittee is authorized to install the proposed equipment in accordance with the conditions of this permit and as described in the application, approved drawings, plans, and other documents on file with the Department.

CONTENTS

Section III. Emissions Units and Specific Conditions

(DRAFT)

Joseph Kahn, Director
Division of Air Resource Management

(Date)

SECTION III. EMISSIONS UNITS AND SPECIFIC CONDITIONS.

Emissions Units -029 & -031

Specific Condition III.41. from PSD-FL-265/0310045-003-AC is hereby changed

From:

41. Materials Handling Operations. Visible emissions tests shall be conducted on the materials handling operations to determine compliance with applicable limits, as follows:

Emissions Units at Northside	EPA Method(s)	Duration of VE Test	Frequency	Material
------------------------------	---------------	---------------------	-----------	----------

...

XX. NSPS - Y				
Crusher House Building Baghouse Exhaust (EU-029)	9	IVE - 3 hr RVE - 30 min	I & R	C
Fuel Silos Dust Collectors - Baghouse Exhaust (EU-031)	9	IVE - 3 hr RVE - 30 min	I & R	C

...

C – Coal and/or Coal coated with latex

I – Initial R - Renewal (once every 5 years)

IVE – Initial Visible Emissions Test, RVE - Renewal Visible Emissions Test

LS – Limestone; PC-Petroleum Coke

To:

41. Materials Handling Operations. Visible emissions tests shall be conducted on the materials handling operations to determine compliance with applicable limits, as follows:

Emissions Units at Northside	EPA Method(s)	Duration of VE Test	Frequency	Material
------------------------------	---------------	---------------------	-----------	----------

...

XXI. NSPS - Y				
Crusher House Building Baghouse Exhaust (EU-029)	9	IVE - 3 hr RVE - 30 min	I & R	C &/or PC
Fuel Silos Dust Collectors - Baghouse Exhaust (EU-031)	9	IVE - 3 hr RVE - 30 min	I & R	C &/or PC

...

C – Coal and/or Coal coated with latex

I – Initial R - Renewal (once every 5 years)

IVE – Initial Visible Emissions Test, RVE - Renewal Visible Emissions Test

LS – Limestone; PC-Petroleum Coke