Progress Energy

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Crystal River Fossil Plant & Fuel Operations

March 10, 2011

Mr. Jeffery Koerner, Administrator
New Source Review Section
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 5000
Tallahassee, Florida 32399-2400

Re: **Request for Additional Information (RAI) Response**
Project No. 0170004-026-AC (PSD-FL-383D)
Progress Energy Florida, Inc., Crystal River Power Plant
Request for Alternative Acid Mist Mitigation Trials

Dear Mr. Koerner:

Progress Energy Florida (PEF) has reviewed the Department's Request for Additional Information (RAI) dated February 1, 2011. The Department's RAI was issued in an effort to obtain clarifying information regarding PEF's permit application submittal dated December 29, 2010. The Department's specific issues are repeated below followed by PEF's responses in bold.

1. Issue: Condition 8e in Permit No. 0170004-023-AC (PSD-FL-383C) specifies the following emissions standards for particulate matter (PM) based on the Best Available Control Technology (BACT):

   - As determined by EPA Method 5 or 5b, PM emissions shall not exceed 0.03 lb/MMBtu and 216.0 lb/hour based on a 3-run test average conducted at permitted capacity; and
   - As determined by EPA Method 9, the stack opacity shall not exceed 10% based on a 6-minute block average, except for one 6-minute period per hour of not more than 20%.

   Request: The application requests an increase of the opacity standard to 15% based on a 6-minute block average, except for one 6-minute period per hour of not more than 20%.

   Questions: The application indicates actual PM emissions of 0.0066 and 0.0074lb/MMBtu for units 4 and 5 based on compliance stack testing. Corresponding opacity levels were indicated as 7.7% and 6.9%, respectively. The tests demonstrate compliance with the both the PM and opacity BACT standards.

   a) Were these tests conducted after successful completion of the ESP modifications?

   PEF Response:

   Yes, the referenced tests were conducted following the complete installation of all the air pollution control upgrades and conversion to the new stack configuration; however, the information for Unit 5 should be revised to reflect actual PM emissions of 0.005lb/MMBtu and 5.0% opacity.

b) Was opacity determined by EPA Method 9? Are there continuous opacity monitoring systems (COMS) installed on either Unit 4 or 5?

PEF Response:

Yes, the stack opacity values referenced were determined by EPA Method 9, as required by Condition 8.e. of the current permit (PSD-FL-383C).

Continuous opacity monitoring systems are installed on both Units 4 and 5; however, due to the wet stack, the COMS are installed in the ductwork after the ESP and prior to the wet FGD system (as noted in Condition 13). Opacity readings from the COMS during the referenced tests were significantly lower than the corresponding Method 9 readings.

c) Please provide any additional information that indicates technical reasons for difficulty in complying with the current opacity standard.

PEF Response:

Information was provided in the permit application package regarding the physical and technical difficulties related to conducting Method 9 observations at the stack for these units.

In addition, a possible cause for the observed stack plume may be the formation of fine ammonium sulfate and/or ammonium chloride particles in the flue gas and/or atmosphere. These particles would be too small to be collected by either the ESP or the FGD but would be in the size range to refract light in the atmosphere (i.e., cause a visible plume). The fine size of these particles may keep them air-borne longer, with dissipation dependent on wind currents, moisture and/or other atmospheric conditions. If ammonium sulfate and/or ammonium chloride are in the flue gas exiting the stack, the concentration(s) may be reduced by lowered AMM system ammonia injection. The testing of the AMM system recommended to address the fly ash ammonia issue may also offer the possibility of improving the visual plume.

Based on the above, along with the additional BACT information provided in the application package, PEF firmly believes that the current opacity limitation is excessive and should be modified as requested.

2. Issue: Condition 8c in Permit No. 0170004-023-AC (PSD-FL-383C) specifies the following emissions standards for sulfuric acid mist (SAM) based on the Best Available Control Technology (BACT), "As determined by EPA Method 8 or 8A, SAM emissions shall not exceed 0.009 lb/MMBtu and 64.8 lb/hour based on a 3-run test average conducted at permitted capacity. This standard applies at all times except during periods of maintenance and repair as authorized by this permit." The technology selected and implemented by Progress Energy Florida, Inc. was an alkali injection system, which injects ammonia after the SCR system and before the ESP and wet scrubber. Although the system successfully mitigates SAM emissions, it has greatly increased the ammonia concentration of fly ash collected by the ESP. Fly ash has beneficial re-use in the production of Portland cement; however, cement plants have begun rejecting fly ash with high concentrations of ammonia due to worker issues.

Request: To investigate further reductions of SAM emissions, the application requests:

- Authorization to apply the following fuel additives directly to coal prior to combustion to reduce the sulfur trioxide (SO_3) from the boiler furnace: Coaltreat 500, Coaltreat 700, magnesium oxide and magnesium hydroxide. The proposed fuel additives are predicted to reduce SO_3 emissions directly as SO_3 sorbents and indirectly by reducing furnace slag, which can increase SO_3 formation.
- As an initial demonstration project, authorization to install temporary equipment to inject the following alternative materials: sodium bicarbonate, calcium hydroxide (hydrated lime), Trona, dry magnesium oxide, sodium bisulfate (SBS), calcium carbonate, micronized limestone and ammonia. The purpose of the trial period is to evaluate successful SAM reduction methods that will improve the fly ash quality for beneficial re-use. During the trial period, the plant requests flexibility from the requirement to comply with the SAM emissions standards. In addition, the application requests authorization to operate the final selected option with the temporary equipment until permanent equipment is installed under a subsequent permit authorizing the new option and equipment.

Questions:

a) Please provide a brief summary of the SAM emissions test results for each test run conducted to date on Units 4 and 5 including: date of test, test run number, unit capacity (MMBtu/hour), coal blend sulfur content, actual SO_2 emissions rate, ammonia injection rate and actual SAM emissions.

PEF Response:

Please see Attachment 1a to this response (Summary of AMM Performance Test Results) that provides a summary of the initial SAM testing conducted in April 2010 on Unit 5 to originally establish the ammonia injection rates for the acid mist mitigation (AMM) system. This testing was conducted at various loads while burning 1.4% sulfur coal. Attachments 1b through 1e contain summary information from the compliance stack testing conducted on both Units 4 and 5 at the 1.4% coal sulfur level (August 2010 and May 2010, respectively), as well as compliance stack testing conducted on both Units 4 and 5 at the 2.0% coal sulfur level (October 2010 and November 2010, respectively). The compliance stack testing was conducted at full load and 100% ammonia injection levels.

b) Will fuel additive trials be conducted separately from trials of ammonia alternative injection materials?

PEF Response:

Fuel additive trails may be conducted independently, or in conjunction with alternative AMM system injection material trials.

c) Describe how SAM emission reductions will be measured and evaluated with regard to the following trials: fuel additives; ammonia alternative injection materials; and combinations of fuel additives in conjunction with ammonia alternative injection materials.

PEF Response:

Since the fuel additives are only expected to have a positive effect on reducing the overall SAM emissions, it is expected that, once approved, these trials can occur without compliance stack test verification requirements. The potential beneficial effects of the fuel

additive will be largely evaluated through the use of operational and/or parametric data (see response to item f below) collected during the trial.

Once a trial alternative AMM injection material system is installed and working properly, stack testing will be conducted pursuant to the requirements of Condition 16 of permit PSD-FL-383C (as revised by the January 14, 2011 letter from the Department) to establish a base injection rate that is in compliance with the SAM emissions limit. The remaining trial period will be conducted at, or above, this established compliance injection rate. Additional variations to the injection rate (above the compliance rate) will be evaluated through the use of operational and/or parametric data collected during the trial.

SAM emissions stack testing conducted for purposes of determining compliance injection levels related to an alternative AMM injection material will only occur during periods when no fuel additive trial is running. Should subsequent testing of fuel additives occur during the alternative AMM injection material trial period, efforts will be made to quantify the amount of reduction due to each individual trial. This will largely rely on the use of the operational and/or parametric data collected during the trial period to ascertain the individual contributions of each trial system.

d) Define the period of time requested for each defined trial during which the unit may not be able to comply with the SAM BACT emissions limit.

PEF Response:

There will be intermittent periods of un-controlled and/or under-controlled emissions of SAM that will occur during the transition between operation of the current AMM system and the trial AMM system(s). These periods may be required to install and calibrate the trial system components, as well as work through any initial operational issues which may occur. This initial "shakedown" period for the trial system is not expected to occur for longer than a cumulative time of 168 hours. This time covers the periods where the current AMM system will be removed from service and the trial AMM system will be providing intermittent levels of control. In addition, as currently allowed by the terms of Condition 16, PEF is exempt from the SAM emissions standards of the permit while collecting data during the performance stack testing to establish the compliance injection rate. The time attributable to performance testing of the trial system to establish a compliance curve would not contribute to the 168 hours.

With regard to the fuel additive trials, since the additives are only expected to have a positive effect on reducing the overall SAM emissions, there will be no periods of time that the SAM emission will not be in compliance, as long as the primary AMM system is in operation.

e) Estimate the predicted increase in SAM emissions from this proposed project.

PEF Response:

Based on historical emissions data it is estimated that the uncontrolled SAM emission (vs. controlled emissions) would be range from approximately 175 lb/hr to approximately 275 lb/hr depending on the fuel sulfur level of the coal being burned during the trial period.

As noted above, there are periods of time during the transitions from the existing ammonia based AMM to the trial material based AMM system that SAM emissions may be un-controlled or under-controlled. It is expected that completely un-controlled emissions of SAM will occur for only minimal amounts of time during the trial period. The majority of the transition time between the two systems should involve a significant amount of SAM emissions control provided by the trial system. To ensure that the material injection levels of the trial AMM system are adequate, confirmatory stack testing will be conducted to establish the material injection rate curve as soon after the switch as practicable. Once the initial stack testing has been completed, the trial system will be taken out of service (and the primary AMM system placed back in service) while awaiting the results of the stack testing. After evaluation of the stack test results and establishment of a material injection rate curve confirming compliance with the SAM emissions limit, the trial AMM system will be placed back in service and operated in conjunction with the injection rate curve during the remainder of the trial period.

f) Other than the EPA Method 8 or 8A stack test, identify other available techniques for continuously measuring and evaluating SAM emission reductions during the trials.

PEF Response:

Breen Environmental Solutions has developed and commercialized an instrument capable of detecting process parameters associated with vapor condensables in utility flue gas streams. The term condensables applies here to any of the H2O/SO3 derived vapors present in the flue gas stream. These vapors include water, sulfuric acid, ammonium bisulfate, sodium bisulfate and hybrid combinations of one or more gases.

The instrument consists of a 2 meter long probe with a sensor tip for condensation detection on one end. The sensor tip has a glass surface with a thermocouple and a circular electrode embedded in the center. Compressed air is directed from the flanged end of the probe through an internal tube to cool the sensor tip in a controlled manner.

In operation, the instrument varies the temperature of the sensor tip by varying the cooling air flow to the probe. Three different temperatures are determined: the formation, evaporation and dew point temperatures. The hot probe is precisely cooled until a condensation current is detected. This is defined as the formation temperature. During this time, the condensation is greater than the evaporation. After the condensation current is detected, the probe is allowed to heat until the current goes below a predetermined threshold. This is defined as the evaporation temperature. During the approach to the evaporation temperature, the evaporation is greater than the condensation. The point at which the condensation and evaporation are equal is defined as the equilibrium dew point, or dew point temperature.

At temperatures below 400°F, the dewpoint can be directly correlated with SO3 concentrations using long standing, industry accepted calculations.

Numerous comparisons have been conducted plotting traditional controlled condensate measurements with acid vapor measurements taken with the Breen Instrument. At temperatures consistent with the outlet of the ESP, average differentials between the methods are less than 1 ppm.

PEF has recently installed several of the above referenced Breen probes at various locations in the flue gas path on Unit 4 to monitor levels of acid gases. These probes are currently undergoing initial evaluation and collecting baseline information. It is expected that these probes will be further calibrated during upcoming SAM emission stack testing and then provide ongoing operational information to evaluate changes in the current AMM system injection rates, as well as track acid gas levels during the proposed fuel additive and alternative AMM material injection trials.

g) You are proposing to run multiple trials during a six to eight month period of time. If the demonstration project is successful and Progress Energy of Florida (PEF) chooses to convert some of the successful components to a permanent system, the Department will require a modification to the permit prior to the permanent system being installed. Please comment.

PEF Response:

PEF understands the need for a future permit modification should components of the trial program be requested to become part of the permanent operations of the facility. The reason for the extended length of the trial period is so that the necessary permitting and installation of any successful components can be accomplished while the trial is still running.

h) Previous conversations with Jamie Hunter indicated that the plant would be revising this application to include a revised carbon monoxide (CO) BACT emissions standard pursuant to Condition 9 in Permit No. 0170004-023-AC. In addition, this request should address the spike in CO emissions from Unit 5, which appeared to peak in July of 2010.

PEF Response:

The request to revise this application to include a revised CO BACT emissions standard was provided to the Department via letter from Rob Odom, Crystal River Plant Manager dated January 27, 2011.

The increase in CO emissions noted above appears to have occurred due to varying oxygen conditions in the boiler during that timeframe. Detailed evaluation of the information confirms that no data was excluded for reasons of startup/shutdown or malfunction and no exceedance of the current CO limits occurred. Based on this data being considered part of normal operation of the unit, PEF feels that it is appropriate to consider this data in the evaluation of the revised "final" CO limit. While steps have been taken to reduce the likelihood of its reoccurrence, elevated CO emissions due to these types of normal operation may occur from time-to-time and should be taken into consideration when establishing the permit limit.

As requested, hourly emissions data from Units 4 and 5 used to evaluate the proposed final CO BACT standard is being provided (electronically) as an enclosure to this response. Three Excel spreadsheets are provided. Two files relate to Unit 4 (old and new stack) and the third relates to Unit 5 (new stack).

If you have any questions regarding this submittal, please contact PEF Environmental Services Section staff Jamie Hunter by telephone at (727) 820-5764 or by email at John.Hunter@PGNmail.com.

Best regards,

Robby A. Odom
Plant Manager, Crystal River Fossil Plant & Fuel Operations

Enclosures

This letter was sent to the following people by electronic mail only:

Ms. Tammy McWade, DEP NSR Section (tammy.mcwade@dep.state.fl.us)
Mr. Jamie Hunter, Progress Energy Florida (john.hunter@pgnmail.com)
Mr. Scott H. Osbourn, P.E., Golder Associates, Inc. (sosbourn@golder.com)
Ms. Cindy Zhang-Torres, SWD Office (cindy.zhang-torres@dep.state.fl.us)
Mr. Mike Halpin, DEP Siting Office (mike.halpin@dep.state.fl.us)
Ms. Kathleen Forney, EPA Region 4 (forney.kathleen@epa.gov)
Ms. Heather Abrams, EPA Region 4 (abrams.heather@epa.gov)
Ms. Ana M. Oquendo, EPA Region 4 (oquendo.ana@epa.gov)
Ms. Vickie Gibson, DEP BAR Reading File (victoria.gibson@dep.state.fl.us)

Request for Additional Information (RAI) Response
Project No. 0170004-026-AC (PSD-FL-383D)
Attachment 1a

SUMMARY OF AMM PERFORMANCE TEST RESULTS

Unit 5
1.4% Sulfur Coal
April 2010

CONDITION	LOAD LEVEL	SCR INJECTION	LB/HR INJECTION RATE			LB/MMBTU EMISSION RATE			
			BASELINE %	AMM	NH3	SO_3	SAM		
						ESP INLET	ESP INLET	STACK	PERMIT
1	HIGH	ON	0	0	0	0.002	0.050	0.0182	
2	HIGH	OFF	0	0	0	0.006	0.050	0.0161	
3A	HIGH	ON	30	113	30	0.003	0.039	Not Tested	
3B	HIGH	ON	100	393	106	0.003	0.041	0.0003	
4	HIGH	OFF	100	393	106	0.004	0.045	0.0034	
5	HIGH	ON	120	470	126	0.002	0.035	Not Tested	
6	HIGH	ON	80	320	86	0.003	0.036	Not Tested	**0.009**
7	MID	ON	100	260	70	0.003	0.031	0.0027	
8	MID	ON	120	310	83	0.005	0.029	0.0006	
9	MID	ON	80	212	57	0.003	0.030	0.0004	
10	LOW	ON	100	133	36	0.005	0.022	0.0003	
11	LOW	ON	120	160	43	0.003	0.025	0.0014	
12	LOW	ON	80	108	29	0.004	0.028	0.0012	

NOTE
1. For this project, high load = 755-760 MW, mid load = 500-505 MW, and low load = 255-265 MW. On a heat input basis of the coal fired at the time of testing, high load = ~6,500 mmBtu/hr, mid load = ~4,500 mmBtu/hr, and low load = ~2,600 mmBtu/hr.

5.0 Test Results

The following presents the results of the test program. Supporting calculations and field data summaries are presented in Appendix B and E, respectively.

Table 5 summarizes the results of the test program.

5.1 Particulate Matter

The three-run average particulate matter emissions during the test program was 0.0066 lb/mmBtu and 45.3 lb/hr, passing the permitted emission limits of 0.030 lb/mmBtu and 216 lb/hr.

5.2 Ammonia Slip (NH_3)

The three-run average for ammonia slip during the test program was 2.1 ppmvd, passing the permitted emission limit of 5 ppmvd.

5.3 Sulfuric Acid Mist (SAM)

The three-run average for SAM during the test program was 0.0011 lb/mmBtu and 7.2 lb/hr passing the permitted emission limits of 0.009 lb/mmbtu and 64.8 lb/hr.

5.4 Visible Emissions

The highest six-minute average visible emissions observed from the Unit 4 stack during the 60 minute visible emission observation was 7.7 percent opacity, passing the 10 percent emission limit.

Table 5: Compliance Test Summary
Crystal River Energy Complex
Unit 4

Parameter	Run 1	Run 2	Run 3	Average	Limit
PM	0.0135 93.2	0.0030 19.1	0.0032 23.6	0.0066 lb/mmBtu 45.3 lb/hr	0.030 lb/mmBtu 216 lb/hr
NH3	1.9	2.0	2.3	2.1 ppmvd	5 ppmvd
SAM	0.0018 12.1	0.0003 2.3	0.0009 6.0	0.0011 lb/mmBtu 7.2 lb/hr	0.009 lb/mmBtu 64.8 lb/hr
VE	7.7 %	N/A	N/A	7.7%	≤10 %

5.0 Test Results

The following presents the results of the test program. Supporting calculations and field data summaries are presented in Appendix B and E, respectively.

Table 5 summarizes the results of the test program.

5.1 Particulate Matter

The three-run average particulate matter emissions during the test program was 0.0037 lb/mmBtu and 26.9 lb/hr, passing the permitted emission limits of 0.030 lb/mmBtu and 216 lb/hr.

5.2 Ammonia Slip (NH_3)

The three-run average for ammonia slip during the test program was 2.1 ppmvd, passing the permitted emission limit of 5 ppmvd.

5.3 Sulfuric Acid Mist (SAM)

The three-run average for SAM during the test program was 0.0003 lb/mmBtu and 1.9 lb/hr passing the permitted emission limits of 0.009 lb/mmbtu and 64.8 lb/hr.

5.4 Visible Emissions

The highest six-minute average visible emissions observed from the Unit 4 stack during the 60 minute visible emission observation was 1.25 percent opacity, passing the 10 percent emission limit.

Table 5: Compliance Test Summary
Crystal River Energy Complex
Unit 4

Parameter	Run 1	Run 2	Run 3	Average	Limit
PM	0.0051 37.6	0.0034 24.3	0.0026 18.8	0.0037 lb/mmBtu 26.9 lb/hr	0.030 lb/mmBtu 216 lb/hr
NH3	2.0	2.1	2.1	2.1 ppmvd	5 ppmvd
SAM	0.0003 1.7	0.0003 2.0	0.0003 2.0	0.0003 lb/mmBtu 1.9 lb/hr	0.009 lb/mmBtu 64.8 lb/hr
VE	1.25 %	N/A	N/A	1.25 %	≤10 %

5.0 Test Results

The following presents the results of the test program. Supporting calculations and field data summaries are presented in Appendix B and E, respectively.

Table 5 summarizes the results of the test program.

5.1 Particulate Matter

The three-run average particulate matter emissions during the test program was 0.0005 lb/mmBtu and 3.7 lb/hr, passing the permitted emission limits of 0.030 lb/mmBtu and 216 lb/hr.

5.2 Ammonia Slip (NH_3)

The three-run average for ammonia slip during the test program was 1.1 ppmvd, passing the permitted emission limit of 5 ppmvd.

5.3 Sulfuric Acid Mist (SAM)

The three-run average for SAM during the test program was 0.0003 lb/mmBtu and 2.43 lb/hr, passing the permitted emission limits of 0.009 lb/mmBtu and 64.8 lb/hr.

5.4 Visible Emissions

The highest six-minute average visible emissions observed from the Unit 5 stack during the 60 minute visible emission observation was 5.0 percent opacity, passing the 10 percent emission limit.

Table 5: Compliance Test Summary
Crystal River Energy Complex
Unit 5

Parameter	Run 1	Run 2	Run 3	Average	Limit
PM	0.0002 2.2	0.000 0.0	0.0012 8.9	0.0005 lb/mmBtu 3.7 lb/hr	0.030 lb/mmBtu 216 lb/hr
NH3	1.0	1.1	1.1	1.1 ppmvd	5 ppmvd
SAM	0.0006 4.06	0.0001 0.80	0.0001 0.82	0.0003 Lb/mmBtu 2.43 lb/hr	0.009 lb/mmBtu 64.8 lb/hr
VE	5.0 %	N/A	N/A	5.0%	≤10 %

5.0 Test Results

The following presents the results of the test program. Supporting calculations and field data summaries are presented in Appendix B and E, respectively.

Table 5 summarizes the results of the test program.

5.1 Particulate Matter

The three-run average particulate matter emissions during the test program was 0.0026 lb/mmBtu and 18.8 lb/hr, passing the permitted emission limits of 0.030 lb/mmBtu and 216 lb/hr.

5.2 Ammonia Slip (NH_3)

The three-run average for ammonia slip during the test program was 3.0 ppmvd, passing the permitted emission limit of 5 ppmvd.

5.3 Sulfuric Acid Mist (SAM)

The three-run average for SAM during the test program was 0.0003 lb/mmBtu and 1.9 lb/hr passing the permitted emission limits of 0.009 lb/mmbtu and 64.8 lb/hr.

5.4 Visible Emissions

The highest six-minute average visible emissions observed from the Unit 5 stack during the 60 minute visible emission observation was 0.0 percent opacity, passing the 10 percent emission limit.

Table 5: Compliance Test Summary
Crystal River Energy Complex
Unit 5

Parameter	Run 1	Run 2	Run 3	Average	Limit
PM	0.0017 11.9	0.0041 30.3	0.0019 14.2	0.0026 lb/mmBtu 18.8 lb/hr	0.030 lb/mmBtu 216 lb/hr
NH3	2.5	3.2	3.3	3.0 ppmvd	5 ppmvd
SAM	0.0002 1.5	0.0002 1.7	0.0003 1.8	0.0002 lb/mmBtu 1.6 lb/hr	0.009 lb/mmBtu 64.8 lb/hr
VE	0.0 %	N/A	N/A	0.0 %	≤10 %