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Progress Energy

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DIVISION OF AIR
RESOURCE MANAGEMENT

November 22, 2011

Mr. Jeff Koerner, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

Ms. Danielle Henry
Florida Department of Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926

RE: Progress Energy Florida – Crystal River Energy Complex
Air Construction Permit (Project No. 0170004-26-AV / PSD-FL-383D)
Request for Continued Temporary Operation of the Hydrated Lime Demonstration Project

Project No: 0170004-033-AC

Dear Mr. Koerner and Ms. Henry:

Per the requirements of Section 3, Conditions G.15 and 16 of Air Permit No. PSD-FL-383D (FDEP Project No. 017004-026-AC), please find enclosed documentation that provides the required supporting data and performance curves necessary to request written authorization from the Bureau of Air Regulation for the continued operation of the temporary hydrated lime sorbent injection system beyond the demonstration period. Included in the documentation is an operating protocol that demonstrates compliance with the BACT standard for SAM emissions.

Progress Energy Florida is requesting authorization for the continued use of the temporary hydrated lime injection system for SAM mitigation at Crystal River Units 4 and 5. The temporary system will remain in place while a permanent system is engineered, permitted and constructed.

If you have any questions regarding this information please contact Jamie Hunter at (727) 820-5764 or at John.Hunter@PGNmail.com.

Sincerely,

Robby A. Odom
Plant Manager
Crystal River Fossil Plant and Fuel Operations

Progress Energy Florida – Crystal River Energy Complex
Hydrated Lime Demonstration Project
May 31, 2011 Letter

Bureau of Air Regulation(FDEP) Certified mail: 7009-0080-0000-8148-8199

SW District FDEP Certified mail: 8182

Attachment 1a

Progress Energy

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

May 31, 2011

Mr. Jeff Koerner, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

Ms. Danielle Henry
Florida Department of Environmental Protection
Southwest District Office
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926

RE: Progress Energy Florida – Crystal River Energy Complex
Air Construction Permit (Project No. 0170004-26-AV / PSD-FL-383D)
Hydrated Lime Demonstration Project

Dear Mr. Koerner and Ms. Henry:

Per the requirements of Section 3, Condition G.18 of Air Permit No. PSD-FL-383D (FDEP Project No. 017004-026-AC), please find below information related to the temporary demonstration project for hydrated lime injection to control sulfuric acid mist (SAM) at Crystal River Unit 4. During the hydrated lime demonstration period, no other alternative sorbents or fuel additives will be in use. Should other alternative sorbent and/or fuel additive demonstration projects be planned for the future, additional information will be provided to the Department in advance.

The following provides the detailed information for the proposed evaluation of hydrated lime injection for sulfuric acid mist (SAM) mitigation at Crystal River Units 4 and 5.

The hydrated lime evaluation will be conducted on Crystal River Unit 4, which is representative of both units. Crystal River Units 4 and 5 each have a cold-side ESP, are equipped with SCRs for NO_x control and wet limestone scrubbers for sulfur dioxide (SO_2) control. Both units are subject to a SAM limit of 0.009 lb per million Btu (lb/MMBtu). In order to control SAM emissions an acid mist mitigation (AMM) system was implemented in Fall 2009 (Unit 5) and Spring 2010 (Unit 4). The AMM system incorporates injection of ammonia at the air heater outlet (upstream of the ESP) to convert the SAM to ammonium bisulfate (ABS) and/or ammonium sulfate (AS) which is subsequently captured in the ESP.

Fly ash that is captured in the ESP is either disposed of in the landfill on-site or marketed. In either case, fly ash needs to be handled by operators. ABS and AS present in the fly ash presents a risk in the form of ammonia releases during ash handling. Further, as the sulfur levels in the coal has increased; higher ammonia injection rates are required for SAM mitigation, causing the ammonia levels in the fly ash to increase.

Progress Energy Florida, Inc.
15760 W. Powerline Street
Crystal River, FL 34428

Progress Energy Florida – Crystal River Energy Complex
Hydrated Lime Demonstration Project
May 31, 2011 Letter

The main objective of this evaluation is to ascertain whether injection of hydrated lime in the unit instead of ammonia will result in a sufficient level of reduction in the SAM emissions, such that the SAM limit of 0.009 lb/MMBtu can be achieved consistently, while eliminating the effects of the ammonia in the fly ash.

A secondary objective is to ensure that the ESP performance is not adversely affected by the lime injection and evaluate the split of hydrated lime injection between air heater outlet and ESP outlet in order to obtain the optimal degree of SAM reduction and unit operation.

The initial installation of the hydrated lime system will take place in late May, as equipment and material arrives. The shakedown and operational testing of the equipment is expected to take place from late May through June 5, 2011. During the shakedown period, lime will be gradually injected at the ESP outlet to ensure that all components are working as desired. Because lime will be injected at the ESP outlet only during this period, it will not interfere with the current AMM system ammonia injection, which will continue to be in operation.

Upon completion of the shakedown, the evaluation will begin on June 6th. The proposed initial round of SAM stack testing is as follows:

June 8th – Low (or Mid) Load Test Run(s)

June 9th – Mid (or Low) Load Test Run(s)

June 10th – High Load Test Run(s)

It is anticipated that a second round of testing will be performed in order to develop the operational protocol injection rate curve; however, the schedule for this round of testing is not currently set.

If you have any questions regarding this information please contact Jamie Hunter at (727) 820-5764 or at John.Hunter@PGNmail.com.

Sincerely,

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

Attachment 1b

From: Hunter, John J (Jamie)
To: "Henry, Danielle D."; "Koerner, Jeff"
Cc: Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing
Date: Wednesday, October 12, 2011 9:07:00 AM

Preliminary results have been received from the most recent round of SAM testing referenced below. The baseline testing (without interference from ammonia or lime) did result in SAM levels measured at the stack approximately three times the permit standard. The remaining testing conducted at a reduced SCR removal efficiency (75%) and at various unit operating loads and hydrated lime injection rates demonstrated compliance with the SAM standard, with the exception of full load (>90%) unit operation, which fell a little short of compliance levels.

In an attempt to determine the necessary hydrated lime injection levels required for compliance at full load operation and to further evaluate the impacts of SCR operations on SAM emissions (between 75% and 90% SCR NOx removal efficiencies), another round of testing will be conducted on October 19th and 20th. This testing will be used to supplement the recent testing. Collectively, the test results will be used to develop a potential operational plan for continued use of the hydrated lime system.

Unit 4 is scheduled to enter a planned maintenance outage by the end of October. During this outage, the ductwork and other internal components will be examined for any impacts due to the use of hydrated lime. This information, along with the stack test results, will be used to determine if operation of the temporary hydrated lime system will continue following the Unit 4 outage. If it is determined that the hydrated lime system will continue to be used, this request along with the necessary supporting documentation will be provided to the Department. In addition, the necessary air construction permit application will be developed and submitted for a permanent hydrated lime based AMM system.

Thanks for your continued support.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Monday, September 19, 2011 7:49 AM
To: Hunter, John J (Jamie)
Cc: Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Mr. Hunter,

Thank you for the update.

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

Please consider the environment before printing this email.

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Friday, September 16, 2011 3:43 PM
To: Henry, Danielle D.
Cc: Schroeder, Bill; Hughes, Rhonda; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Please be advised that due to unavailability of the stack test contractor on September 27th, the Crystal River Unit 4 stack test schedule noted in the most recent notification below is being revised to begin the SAM stack testing on September 28th and continue through September 30th. The anticipated date to cease injection of the hydrated lime is now September 17th. In addition, in order to remove potential effects of ammonia slip from the SCR system, the ammonia flow to the SCR will be taken out of service approximately one week prior to the baseline SAM stack testing that is now scheduled to occur on September 28th. This temporary shutdown of the SCR system will in no way jeopardize compliance with this Unit's permitted NOx standards. Following successful baseline testing, both the SCR ammonia injection system and the hydrated lime injection system will be placed back in service for the remainder of the testing.

Thanks again for your continued support of this demonstration project.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Wednesday, September 14, 2011 2:51 PM
To: Hunter, John J (Jamie)
Cc: Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Thanks Mr. Hunter for providing the outline of upcoming testing and operating events. We appreciate your continued communication with the SWD.

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Wednesday, September 14, 2011 10:44 AM
To: Henry, Danielle D.
Cc: Hughes, Rhonda; Schroeder, Bill; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Based on the results of the SAM testing conducted (as referenced in the email string below), PEF requested, and was granted (per FDEP Project No. 0170004-32-AC), authorization to shut off all AMM system sorbent injection (hydrated lime in this demonstration project) for a period of up to 14 days in order to conduct baseline SAM stack testing. This notification is to inform the Department that PEF intends to stop the hydrated lime injection at Crystal River Unit 4 beginning on (or about) Friday, September 16th, in order to conduct baseline SAM stack testing. The baseline stack testing is scheduled to occur on Tuesday, September 27th. Several one-hour SAM stack test runs at various unit operating loads will be conducted on that day. Following the conclusion of the baseline testing, the hydrated lime system will be placed back in service and additional SAM stack testing will be conducted at various lime injection rates and various unit operating loads. This additional testing is scheduled to occur on Wednesday (September 28th) and Thursday (September 29th), with the possibility of some testing carrying over to Friday (September 30th).

In summary, SAM stack testing will occur at Crystal River Unit 4 from September 27th through September 30th.

Thanks.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]

Attachment 2

METHOD 8A - DETERMINATION OF SULFURIC ACID MIST EMISSIONS - RESULTS

Plant Name	PEF Crystal River	**Date**	08/02/11
Sampling Location	Unit 4 Stack	**Project #**	4785
Operator	Joe Conti	**Stack Type**	Circular

Historical Data						
Run Number		1	2	3	**Average**	
Run Start Time		7:59	12:10	15:17		hh:mm
Run Stop Time		8:59	13:10	16:17		hh:mm
Meter Calibration Factor	(Y)	1.011	1.011	1.011		
Fuel Factor	(F_d)	9780	9780	9780		
Stack Test Data						
Initial Meter Volume	$(V_m)_i$	292.522	331.855	368.481		ft^3
Final Meter Volume	$(V_m)_f$	313.146	352.428	388.912		ft^3
Total Meter Volume	(V_m)	20.624	20.573	20.431	20.543	ft^3
Total Sampling Time	(Θ)	60.0	60.0	60.0	60.0	min
Average Meter Temperature	$(t_m)_{avg}$	97.3	100.3	95.9	97.8	°F
Average Stack Temperature	$(t_s)_{avg}$	130.0	130.0	130.0	130.0	°F
Barometric Pressure	(P_b)	29.56	29.56	29.56	29.56	in Hg
Average Orifice Pressure Drop	$(\Delta H)_{avg}$	0.42	0.42	0.42	0.42	in H_2O
Absolute Meter Pressure	(P_m)	29.59	29.59	29.59	29.59	in Hg
Moisture Content Data						
Impingers 1-3 Water Volume Gain	(V_n)	79.0	94.7	89.7	87.8	ml
Impinger 4 Silica Gel Weight Gain	(W_n)	8.5	9.5	6.7	8.2	g
Total Water Volume Collected	(V_{lc})	87.5	104.2	96.4	96.0	ml
Standard Water Vapor Volume	$(V_w)_{std}$	4.119	4.906	4.538	4.521	scf
Standard Meter Volume	$(V_m)_{std}$	19.539	19.384	19.403	19.442	dscf
Calculated Stack Moisture	$(B_{ws(calc)})$	17.4	20.2	19.0	18.9	%
Saturated Stack Moisture	$(B_{ws(svp)})$	15.31	15.3	15.3	15.3	%
Reported Stack Moisture Content	(B_{ws})	15.3	15.3	15.3	15.3	%
Gas Analysis Data						
Carbon Dioxide Percentage	($\%CO_2$)	11.1	11.2	11.2	11.2	%
Oxygen Percentage	($\%O_2$)	8.5	8.2	8.2	8.3	%
Carbon Monoxide Percentage	(%CO)	0.0	0.0	0.0	0.0	%
Emission Rate Data						
Mass of Sulfuric Acid from Lab	(ug)	572.0	569.0	540.0	560.3	ug
Sulfuric Acid Concentration[a]	ppm	0.3	0.3	0.2	0.2	ppm
Sulfuric Acid Emission Rate[c]	lb/dscf	0.0000001	0.0000001	0.0000001	0.0000001	lb/dscf
Sulfuric Acid Emission Rate[e]	lb/mmBtu	**0.0011**	**0.0010**	**0.0010**	0.0010	lb/mmBtu

METHOD 8A - DETERMINATION OF SULFURIC ACID MIST EMISSIONS - RESULTS

Plant Name	PEF Crystal River	**Date**	08/02/11
Sampling Location	Unit 4 Stack	**Project #**	4785
Operator	Joe Conti	**Stack Type**	Circular

Historical Data						
Run Number		4	5		**Average**	
Run Start Time		17:23	19:30			hh:mm
Run Stop Time		18:23	20:30			hh:mm
Meter Calibration Factor	(Y)	1.011	1.011			
Fuel Factor	(F_d)	9780	9780			
Stack Test Data						
Initial Meter Volume	(V_m)$_i$	398.410	430.400			ft^3
Final Meter Volume	(V_m)$_f$	418.921	450.670			ft^3
Total Meter Volume	(V_m)	20.511	20.270		20.391	ft^3
Total Sampling Time	(Θ)	60.0	60.0		60.0	min
Average Meter Temperature	(t_m)$_{avg}$	96.5	96.1		96.3	°F
Average Stack Temperature	(t_s)$_{avg}$	130.0	130.0		130.0	°F
Barometric Pressure	(P_b)	29.56	29.56		29.56	in Hg
Average Orifice Pressure Drop	(ΔH)$_{avg}$	0.42	0.42		0.42	in H_2O
Absolute Meter Pressure	(P_m)	29.59	29.59		29.59	in Hg
Moisture Content Data						
Impingers 1-3 Water Volume Gain	(V_n)	88.9	89.8		89.3	ml
Impinger 4 Silica Gel Weight Gain	(W_n)	4.4	6.0		5.2	g
Total Water Volume Collected	(V_{tc})	93.3	95.8		94.6	ml
Standard Water Vapor Volume	(V_w)$_{std}$	4.392	4.510		4.451	scf
Standard Meter Volume	(V_m)$_{std}$	19.458	19.244		19.351	dscf
Calculated Stack Moisture	($B_{ws(calc)}$)	18.4	19.0		18.7	%
Saturated Stack Moisture	($B_{ws(svp)}$)	15.31	15.3		15.3	%
Reported Stack Moisture Content	(B_{ws})	15.3	15.3		15.3	%
Gas Analysis Data						
Carbon Dioxide Percentage	(%CO_2)	11.2	11.2		11.2	%
Oxygen Percentage	(%O_2)	8.2	8.2		8.2	%
Carbon Monoxide Percentage	(%CO)	0.0	0.0		0.0	%
Emission Rate Data						
Mass of Sulfuric Acid from Lab	(ug)	688.0	836.0		762.0	ug
Sulfuric Acid Concentration[a]	ppm	0.3	0.4		0.3	ppm
Sulfuric Acid Emission Rate[c]	lb/dscf	0.0000001	0.0000001		0.0000001	lb/dscf
Sulfuric Acid Emission Rate[e]	lb/mmBtu	**0.0013**	**0.0015**		0.0014	lb/mmBtu

a = (micrograms of sulfuric acid in sample/98.07)/[($Vm_{(std)}$*28.316)/24.056)]
where:

98.07 = Molecular weight of Sulfuric Acid
Vm(std) = Volume of gas sampled, standardised to temperature and pressure (68°F, 29.92 in. Hg), dscf
28.316 = Convert dscf to liters
24.056 = gas standard - molar gas volume at STP (68°F, 29.92 in. Hg)

c = ((micrograms of sulfuric acid in sample/1000000)*0.00220462)/$Vm_{(std)}$
where:

1000000 = conversion of microgram to grams
0.00220462 = conversion of grams to pounds
Vm(std) = Volume of gas sampled, standardised to temperature and pressure (68°F, 29.92 in. Hg), dscf

e = (lb/dscf of sulfuric acid * F_d * (20.9/20.9 - O_2)
where:

Fd = Fuel Factor
20.9 = O_2 concentration of air
O_2 = O_2 concentration of stack gas

Attachment 3

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

September 9, 2011

Electronically Sent – Received Receipt Requested

Mr. Robert Odom, Plant Manager
Progress Energy Florida
299 First Avenue North, CN77
St. Petersburg, FL 33701

Re: Project No. 0170004-032-AC
Supplements Permit No. 0170004-026-AC
Crystal River Power Plant, Units 4 and 5
Collection of Supplemental Baseline Sulfuric Acid Mist (SAM) Emissions Data
Letter of Authorization

Dear Mr. Odom:

The Department acknowledges receipt of the Crystal River Power Plant's email request (August 30, 2011) for authorization to temporarily discontinue lime injection for up to two weeks to establish a meaningful baseline SAM emission rate. In accordance with Permit No. 0170004-026-AC, the plant is in the process of evaluating the injection of lime (and other sorbents) to control SAM emissions. Previous authorizations allow the plant to discontinue ammonia injection for a period of time in order to purge residual ammonia and reestablish baseline SAM emissions with the only control being from the new wet flue gas desulfurization (FGD) system. Preliminary tests with lime injection show excellent results ranging from 0.0010 to 0.0015 lb/MMBtu, which is well below the permit limit of 0.009 lb/MMBtu. One of these runs was conducted with no ammonia or lime injection. This indicates that residual ammonia and/or lime may be interfering with establishing a true baseline SAM emission rate. This current request is similar to what has been previously authorized for temporarily discontinuing ammonia injection to establish baseline SAM emissions used to develop meaningful performance curves that identify the appropriate injection rate for mitigating SAM emissions.

The request is granted and the plant is authorized to temporarily discontinue the injection of ammonia and/or lime (or other previously authorized sorbets) for up to 14 days to establish a baseline SAM emission rate (prior to control by the acid mist mitigation systems). During this period, SAM emissions will continue to be reduced by the wet FGD system. The plant shall observe the Breen probes for estimated changes in the SAM emission rates. After this purging period, the plant will conduct stack tests as necessary to establish the baseline SAM emission rate and performance curves that identify the appropriate lime injection rates for given operational conditions. This authorization supplements the current permit requirements and previous authorizations for conducting SAM performance tests.

The Department will consider this action final unless a timely petition for an administrative hearing is filed pursuant to Sections 120.569 and 120.57, of the Florida Statutes (F.S.). Mediation under Section 120.573, F.S., will not be available for this proposed action.

A person whose substantial interests are affected by the proposed decision may petition for an administrative hearing in accordance with Sections 120.569 and 120.57, F.S. The petition must contain the information set forth

below and must be filed (received) in the Department's Office of General Counsel, MS #35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000. Petitions filed by the applicant or any of the parties listed below must be filed within 14 days of receipt of this notice. Petitions filed by any other person must be filed within 14 days of receipt of this proposed action. A petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C. A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner; the name, address and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when each petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, as well as the rules and statutes which entitle the petitioner to relief; (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the agency's proposed action; and, (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the agency to take with respect to the agency's proposed action.

A petition that does not dispute the material facts upon which the permitting authority's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301, F.A.C.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the permitting authority on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Any party to this order 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 in the Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station #35, 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 from the date this notice is filed with the Clerk of the permitting authority.

Executed in Tallahassee, Florida.

Jeffery F. Koerner, Program Administrator
Office of Permitting and Compliance
Division of Air Resource Management

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this authorization was sent by electronic mail (or a link to these documents made available electronically on a publicly accessible server) with received receipt requested before the close of business on 9-9-2011 to the persons listed below.

Mr. Robert Odom, Progress Energy Florida (robby.odom@pgnmail.com)
Mr. John Hunter, Progress Energy Florida (john.hunter@pgnmail.com)
Ms. Cindy Zhang-Torres, SWD Office (cindy.zhang-torres@dep.state.fl.us)
Ms. Danielle Henry, SWD Office (danielle.d.henry@dep.state.fl.us)
Ms. Cindy Mulkey, DEP Siting Office (cindy.mulkey@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. Anne Harvey, Earthjustice (aharvey@earthjustice.org)
Ms. Lynn Scearce, DEP OPC Reading File (lynn.scearce@dep.state.fl.us)

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52(7), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Lynn Scearce (Clerk) September 9, 2011 (Date)

Attachment 4

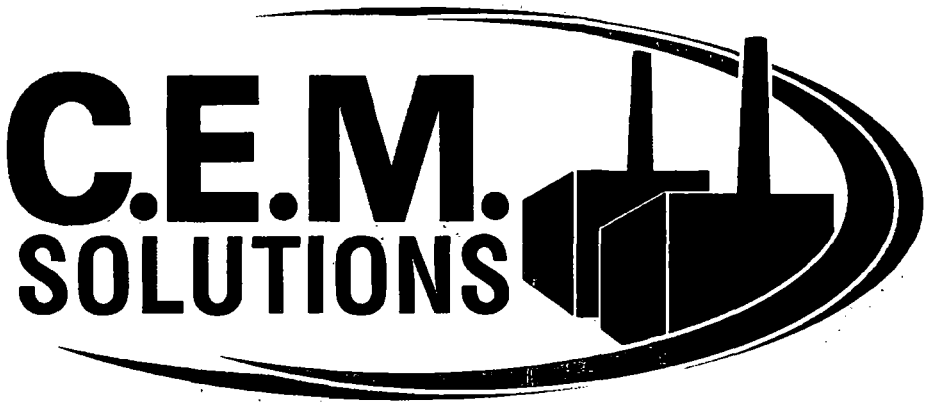
Sulfuric Acid Mist Performance Test Report

Completed for:

Progress Energy Florida, Inc.
Crystal River Energy Complex
Unit 4 (EU -004)

Test Report Number: 20-5035-04-001

Testing Completed: September 28, 2011 to October 20, 2011



1183 East Overdrive Circle • Hernando, FL 34442 • (352) 489-4337 • Fax: (352) 489-4801

Sulfuric Acid Mist Performance Test Report

Progress Energy Florida, Inc.
Crystal River Energy Complex, Unit 4 (EU -004)
Crystal River, FL

C.E.M. Solutions Project No. 5035

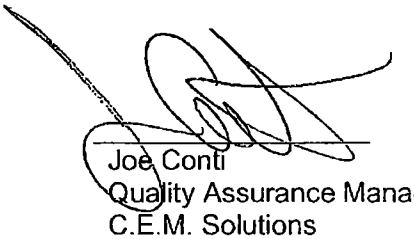
Testing Completed: September 28, 2011
through October 16, 2011

C.E.M. Solutions, Inc Report Number: 20-5035-05-001

C.E.M. Solutions, Inc.
1183 E. Overdrive Circle
Hernando, Florida 34442
Phone: 352-489-4337

Declaration of Conformance to ASTM D 7036-04: Standard Practice for Competence of Air Emission Testing Bodies

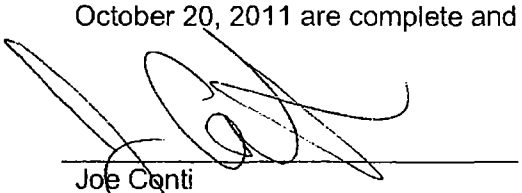
C.E.M. Solutions operates in conformance with the requirements of ASTM D 7036-04: Standard Practice for Competence of Air Emission Testing Bodies through the use of a quality system which incorporates a quality manual, internal audit system, systematic training of personnel and rigorous review of test methods and operating procedures.



Joe Conti
Quality Assurance Manager
C.E.M. Solutions

Statement of Validity

I hereby certify the information and data provided in this emissions test report for tests performed at the Progress Energy Florida Inc. Crystal River Energy Complex, Unit 4 (EU -004), conducted from September 28, 2011 through October 20, 2011 are complete and accurate to the best of my knowledge.



Joe Conti
Quality Assurance Manager,
C.E.M. Solutions, Inc.

Project Background

Name of Source Owner:	Progress Energy Florida, Inc.
Address of Owner:	One Power Plaza 299 First Avenue North St. Petersburg, Florida 33701
Source Identification:	Facility: 0170004 Emissions Unit: EU-004
Location of Source:	Citrus County, Florida
Type of Operation:	SIC Code: 4911
Tests Performed:	Method 1 – Traverse Points Method 3 – Determination of Oxygen and Carbon Dioxide Method 8A – Determination of Sulfuric Acid Mist Emission
Test Supervisor (QSTI):	Mr. Charles Horton
Test Technicians:	Mr. Joe Conti Mr. Josh Cooper Mr. Robert Douglas Mr. Pete Ensing Mr. Alex Housel Mr. Jeremy Johnson Mr. Derek Kopera Mr. Mike McDonald Mr. Mark Owens Mr. Pete Watson
Date(s) Tests Conducted:	September 28, 2011: 4 SAM and SO_3 runs, SCR outlet, ESP inlet, ESP outlet and stack September 29, 2011: 2 SAM runs, stack September 30, 2011: 5 SAM runs, stack October 3, 2011: 2 SAM runs, stack October 19, 2011: 3 SAM runs, stack October 20, 2011: 3 SAM runs, stack
Site Test Coordinator:	John Holler of Progress Energy
State Regulatory Observers:	No Observers Present

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Appendices

1.0 Introduction

Progress Energy Florida, Inc. retained C.E.M. Solutions, Inc. to perform emissions monitoring on the Crystal River Energy Complex Unit 4 Acid Mist Mitigation (AMM) System. The performance of the AMM system was evaluated by simultaneously collecting Sulfuric Acid Mist and Sulfur Trioxide from the SCR outlet, ESP inlet, ESP outlet and at the stack outlet. The AMM, SCR and hydrated lime system were operated at various injection rates during the testing program.

John Holler and Cynthia Wilkinson of Progress Energy coordinated plant operations throughout the monitoring program. All testing was conducted in accordance with test methods promulgated by the USEPA.

Table 1 summarizes the SAM and SO3 results of the test program. Tables 3 through 5 , located in Section 5.0, summarize the SAM and SO3 results with plant operating data.

1.1 Errors and Omissions

The temperature of the sample probe used at the SCR outlet was unable to maintain the desired 600°F. The facility coordinators approved using a probe that was maintained at 400°F.

Table 1: Summary of Results
Crystal River Power Plant
Unit 4

Run	Date	SCR Outlet		ESP Inlet		ESP Outlet		Stack
		SAM lb/mmBtu	SO_3 lb/mmBtu	SAM lb/mmBtu	SO_3 lb/mmBtu	SAM lb/mmBtu	SO_3 lb/mmBtu	SAM lb/mmBtu
1	9/28/2011	0.0902	0.004	0.0428	0.003	0.0103	0.008	0.0286
2	9/28/2011	0.0754	0.004	0.0398	0.003	0.0152	0.011	0.0334
3	9/28/2011	0.0676	0.003	0.0452	0.003	0.0187	0.006	0.0360
4	9/28/2011	0.0768	0.003	0.0452	0.002	0.0152	0.008	0.0351
5	9/29/2011	-	-	-	-	-	-	0.0023
6	9/29/2011	-	-	-	-	-	-	0.0136
7	9/30/2011	-	-	-	-	-	-	0.0039
8	9/30/2011	-	-	-	-	-	-	0.0018
9	9/30/2011	-	-	-	-	-	-	0.0056
10	9/30/2011	-	-	-	-	-	-	0.0073
11	9/30/2011	-	-	-	-	-	-	0.0072
12	10/3/2011	-	-	-	-	-	-	0.0113
13	10/3/2011	-	-	-	-	-	-	0.0170
1	10/19/2011	-	-	-	-	-	-	0.0079
2	10/19/2011	-	-	-	-	-	-	0.0051
3	10/19/2011	-	-	-	-	-	-	0.0033
4	10/20/2011	-	-	-	-	-	-	0.0105
5	10/20/2011	-	-	-	-	-	-	0.0082
6	10/20/2011	-	-	-	-	-	-	0.0060

2.0 Facility Description

Crystal River Unit 4 is a fossil fuel steam generator consisting of a dry bottom wall-fired boiler, rated at 760 MW, 7,200 MMBtu/hr. Primary fuel is bituminous coal or a bituminous coal and bituminous coal briquette mixture. Number 2 fuel oil and natural gas may be burned as a startup fuel and for low load flame stabilization.

2.1 Process Equipment

Fossil Fuel Steam Generator, Unit 4 is a pulverized coal, dry bottom, wall-fired boiler. Emissions are controlled from the unit with low NO_X burners, SCR, a flue gas desulfurization system, alkali injection and an electrostatic precipitator. Emissions are exhausted through a 550 ft. stack.

3.0 Test Program/Operating Conditions

Monitoring was conducted at High, Mid and Low MW loads varying the injection rates of the acid mist mitigation system and the cycling the SCR on and off. One ESP inlet duct was sampled for the performance test. The Unit 4 emission stack was sampled as the outlet.

Plant operation reports are located in Section 5 of this report.

4.0 Test Methods

All testing was performed in accordance with methods approved by the USEPA and FDEP. The following discusses the methods, as well as quality assurance and sample handling procedures.

Table 2 summarizes the EPA test methods utilized to complete the test program.

Table 2: Summary of EPA Reference Methods
Crystal River Energy Complex
Unit 4

EPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot)
3B	Gas Analysis for Determining Dry Molecular Weight (Instrument Analyzer Procedure)
4	Moisture Content in Stack Gases
8A	Determination of Sulfuric Acid Mist

4.1 Sample Traverse Points

The SCR outlet duct is a square duct with a depth of Approximately 120 inches. Testing was conducted at a single greater than 1 meter form the stack wall (the test probe was horizontally inserted from the side of the vertical duct).

The ESP inlet duct is a square duct with a depth of 153 inches. Testing was conducted at a single point approximately 36 inches from the insertion port (the test probe was vertically inserted from the top of the horizontal duct).

The ESP outlet duct is a square duct with a depth of approximately 144 inches. Testing was conducted at a single point approximately 48 inches from the insertion port (the test probe was vertically inserted from the top of the horizontal duct).

The inner stack diameter, at the sample location, of the Unit 4 exhaust stack is 31 feet (372"). A single point, approximately 84 inches from the stack wall was used during the conducted testing.

4.2 Sulfuric Acid Mist and Sulfur Trioxide (Method 8A)

Method 8A was used to determine the volume of sulfuric acid mist (SAM) and sulfur trioxide (SO_3) present in the flue gas. Each gas stream was sampled for one hour at a constant sample rate of 10 lpm.

The SAM and SO_3 was sampled using a Method 8A sample train consisting of a quartz glass probe, heated to 600°F ± 25 °F, a heated quartz filter (600°F ± 25 °F) used to filter particulate, a condenser (set to a temperature of 150°F ± 10°F) used to condense and capture H_2SO_4, and a quartz fiber filter used to condense and capture H_2SO_4. An impinger train, composed of the following impingers, followed the condenser. The SCR outlet, ESP inlet and ESP outlet impingers were set up as follows: the first two impingers contained isopropyl alcohol used to capture SO_3, the third impinger was empty and the final impinger contained a pre-weighed amount of indicating silica gel. During testing at the stack location, deionized water was substituted for the isopropyl alcohol (the stack was sampled for SAM only).

4.2.1 Sample Recovery and Analysis

A 15 minute purge with clean dry ambient air was conducted at the average sampling rate used during the sample run. After the purge, the H2SO4 condenser was rinsed multiple times with deionized water. The condenser wash was collected in a laboratory prepared polyethylene sample bottle. The probe and the quartz filter holder were rinsed with DI water and the rinse was discarded. At sample locations upstream of the FGD, the contents of the first two impingers were measured to the nearest 1ml and placed in a sample container. The two impingers were rinsed with DI water and the rinse was added to the initial impinge solutions.

Appendix E contains the analytical results for each run.

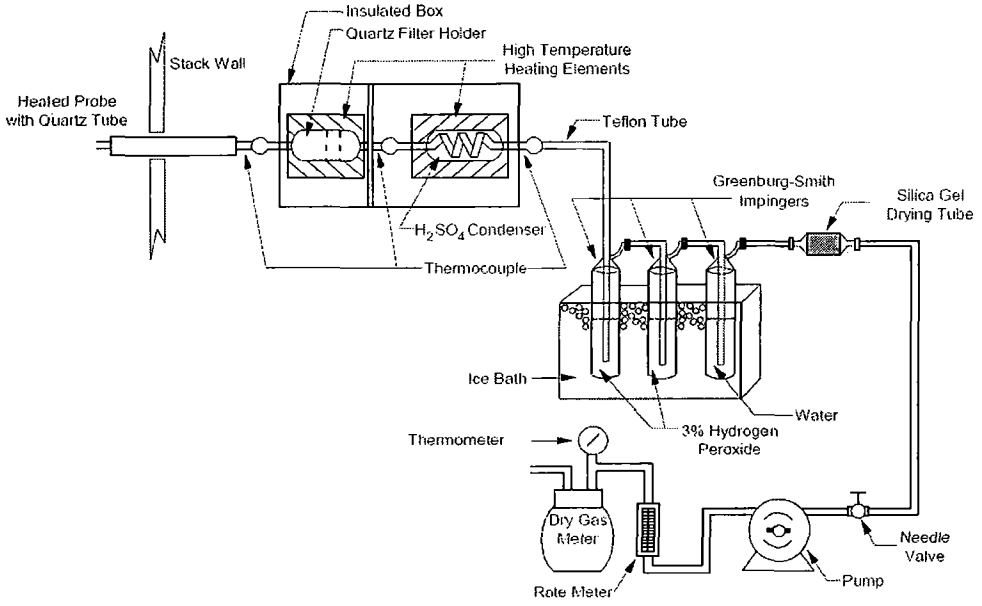
4.2.2 Quality Assurance/Quality Control Procedures

Before and after each test run, the manometer was leveled and zeroed.
Leak checks of the sampling train were conducted before and immediately after each test run.

The dry gas meter was fully calibrated within six months prior to the test program using a set of EPA critical orifices. Post test program dry meter checks were completed to verify the accuracy of the meter's Y_i.

Completed QA/QC forms are located in Appendix D.

Figure 1: Method 8A Sampling Train



4.3 Moisture Content Determination

Moisture content of the stack gas was determined by Method 4.

Stack gas was sampled at the single point, passed through the sulfuric acid mist condenser and pre-weighed or premeasured impingers and then through a calibrated dry gas meter. Moisture is removed from the sample gas in the pre-weighed impingers, which are submerged in an ice bath, and later analyzed for moisture weight gain. Moisture is determined based upon the amount of moisture volume and weight gain and sample gas collected.

Field moisture data sheets are also located in Appendix E.

4.3.1 Method 4 Quality Assurance/Quality Control Procedures

The moisture sampling train was leak checked prior to each test run at approximately 10" Hg and immediately after each run at a vacuum higher than the highest vacuum recorded during the respective test run. Results are recorded on the moisture field data sheets.

Weighing to determine moisture content was conducted with a balance having an accuracy of 0.1 grams. Volume measurements to determin moisture content were conducted with graduated cylinders having an accuracy of 1ml.

Gas temperature at the exit of the impingers was maintained at less than 68 degrees Fahrenheit.

4.4 CO_2 and O_2 Orsat Analyzer Method

Stack gas dry molecular weight was determined utilizing Method 3B.

Gas samples were taken at each sample traverse, stored in leak free Tedlar bags and analyzed for concentrations of Oxygen (O_2) and Carbon Dioxide (CO_2) using an Orsat analyzer.

4.4.1 Method 3B Quality Assurance/Quality Control Procedures

The orsat was leak checked prior to use and immediately following sample analysis. The sample gas was passed through the orsat system 3 times prior to analysis to ensure that a representative sample was in the orsat train. The sample was passed through the CO_2 and O_2 absorbent a minimum of 3 times for each analysis.

5.0 Emission Monitoring Results

The following presents the results of the monitoring program. Tables 3 through 5 summarize the test program results. Supporting RM field data and calculated values are presented in Appendix E.

Table 3: Summary of Results for Testing Conducted 9/28/2011 Crystal River Power Plant Unit 4

Run		Run 1	Run 2	Run 3	Run 4
Date		9/28/2011	9/28/2011	9/28/2011	9/28/2011
Start Time		12:35	15:35	18:22	20:52
End Time		13:35	16:35	19:22	21:52
Average Fuel Flow	*klbs/hr*	95.5	95.3	94.6	94.7
Unit Load	*MW*	753.7	750.4	751.4	753.7
Heat Content of Coal	*BTU/lb*	11,627	11,627	11,627	11,627
Calculated Heat Input	*mmBTU/hr*	6,662	6,648	6,599	6,606
Lime Injection Rate - ESP Outlet	*lb/hr*	0	0	0	0
Lime Injection Rate - AH Outlet	*lb/hr*	0	0	0	0
Lime Injection Rate - total	*lb/hr*	0	0	0	0
SCR Injection Rate	*lb/hr*	0	0	3,171	3,567
SCR Ammonia Injection Rate	*lb/hr*	0	0	853.1	959.4
SCR Outlet					
SAM	*lb/mmBtu*	0.0902	0.0754	0.0676	0.0768
SO3	*lb/mmBtu*	0.004	0.004	0.003	0.003
ESP Inlet					
SAM	*lb/mmBtu*	0.0428	0.0398	0.0452	0.0452
SO3	*lb/mmBtu*	0.003	0.003	0.003	0.002
ESP Outlet					
SAM	*lb/mmBtu*	0.0103	0.0152	0.0187	0.0152
SO3	*lb/mmBtu*	0.008	0.011	0.006	0.008
Stack					
SAM	*lb/mmBtu*	0.0286	0.0334	0.0360	0.0351

Table 4: Summary of Results for Testing Conducted
9/29/2011 – 10/3/2011
Crystal River Power Plant
Unit 4

Run		Run 5	Run 6	Run 7	Run 8	Run 9
Date		9/29/2011	9/29/2011	9/30/2011	9/30/2011	9/30/2011
Start Time		11:01	13:14	4:47	7:42	9:35
End Time		12:01	14:14	6:02	8:42	10:35
Average Fuel Flow	*klbs/hr*	64.8	94.5	39.4	39.6	40.3
Unit Load	*MW*	498.4	752.8	274.0	274.0	273.5
Heat Content of Coal	*BTU/lb*	11,782	11,782	11,589	11,589	11,589
Calculated Heat Input	*mmBTU/hr*	4,581	6,680	2,740	2,754	2,802
Lime Injection Rate - ESP Outlet	*lb/hr*	1,069	1,111	446	598	790
Lime Injection Rate - AH Outlet	*lb/hr*	0	0	0	0	0
Lime Injection Rate - total	*lb/hr*	1,069	1,111	446	598	790
SCR Injection Rate	*lb/hr*	1,226	2,612	803	761	734
SCR Ammonia Injection Rate	*lb/hr*	329.8	702.7	216.0	204.6	197.4
Stack						
SAM	*lb/mmBtu*	0.0023	0.0136	0.0039	0.0018	0.0056

Run		Run 10	Run 11	Run 12	Run 13
Date		9/30/2011	9/30/2011	10/3/2011	10/3/2011
Start Time		12:47	14:24	9:58	11:55
End Time		13:47	15:24	10:58	12:55
Average Fuel Flow	*klbs/hr*	65.8	65.9	91.5	91.5
Unit Load	*MW*	498.3	498.3	751.9	753.5
Heat Content of Coal	*BTU/lb*	11,589	11,589	12,089	12,089
Calculated Heat Input	*mmBTU/hr*	4,575	4,582	6,637	6,637
Lime Injection Rate - ESP Outlet	*lb/hr*	582	611	565	695
Lime Injection Rate - AH Outlet	*lb/hr*	0	0	0	0
Lime Injection Rate - total	*lb/hr*	582	611	565	695
SCR Injection Rate	*lb/hr*	1,171	1,208	2,152	2,140
SCR Ammonia Injection Rate	*lb/hr*	314.9	325.1	578.9	575.6
Stack					
SAM	*lb/mmBtu*	0.0073	0.0072	0.0113	0.0170

Table 5: Summary of Results for Testing Conducted 10/19/2011 & 10/20/2011 Crystal River Power Plant Unit 4

Run		Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
Date		10/19/2011	10/19/2011	10/19/2011	10/20/2011	10/20/2011	10/20/2011
Start Time		7:06	9:50	12:02	7:51	11:25	13:15
End Time		8:06	10:50	13:02	8:51	12:25	14:15
Average Fuel Flow	*klbs/hr*	97.7	98.5	98.1	97.7	98.4	98.2
Unit Load	*MW*	761.3	758.5	759.4	761.6	761.8	761.2
Heat Content of Coal	*BTU/lb*	11,661	11,661	11,661	11,287	11,287	11,287
Calculated Heat Input	*mmBTU/hr*	6,836	6,892	6,864	6,616	6,664	6,650
Lime Injection Rate - ESP Outlet	*lb/hr*	0	880	1,600	1,577	1,609	2,256
Lime Injection Rate - AH Outlet	*lb/hr*	1,553	1,550	1,550	0	0	0
Lime Injection Rate - total	*lb/hr*	1,553	2,430	3,150	1,577	1,609	2,256
SCR Injection Rate	*lb/hr*	2,487	2,837	2,757	2,575	3,637	3,503
SCR Ammonia Injection Rate	*lb/hr*	669.1	763.2	741.5	692.7	978.3	942.2
Stack							
SAM	*lb/mmBtu*	0.0079	0.0051	0.0033	0.0105	0.0082	0.0060

From:	Hunter, John J (Jamie)
To:	"Henry, Danielle D."; "Koerner, Jeff"
Cc:	Schroeder, Bill; Hughes, Rhonda
Subject:	RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing
Date:	Wednesday, October 12, 2011 9:07:00 AM

Preliminary results have been received from the most recent round of SAM testing referenced below. The baseline testing (without interference from ammonia or lime) did result in SAM levels measured at the stack approximately three times the permit standard. The remaining testing conducted at a reduced SCR removal efficiency (75%) and at various unit operating loads and hydrated lime injection rates demonstrated compliance with the SAM standard, with the exception of full load (>90%) unit operation, which fell a little short of compliance levels.

In an attempt to determine the necessary hydrated lime injection levels required for compliance at full load operation and to further evaluate the impacts of SCR operations on SAM emissions (between 75% and 90% SCR NOx removal efficiencies), another round of testing will be conducted on October 19th and 20th. This testing will be used to supplement the recent testing. Collectively, the test results will be used to develop a potential operational plan for continued use of the hydrated lime system.

Unit 4 is scheduled to enter a planned maintenance outage by the end of October. During this outage, the ductwork and other internal components will be examined for any impacts due to the use of hydrated lime. This information, along with the stack test results, will be used to determine if operation of the temporary hydrated lime system will continue following the Unit 4 outage. If it is determined that the hydrated lime system will continue to be used, this request along with the necessary supporting documentation will be provided to the Department. In addition, the necessary air construction permit application will be developed and submitted for a permanent hydrated lime based AMM system.

Thanks for your continued support.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Monday, September 19, 2011 7:49 AM
To: Hunter, John J (Jamie)
Cc: Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Mr. Hunter,

Thank you for the update.

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

Please consider the environment before printing this email.

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Friday, September 16, 2011 3:43 PM
To: Henry, Danielle D.
Cc: Schroeder, Bill; Hughes, Rhonda; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Please be advised that due to unavailability of the stack test contractor on September 27th, the Crystal River Unit 4 stack test schedule noted in the most recent notification below is being revised to begin the SAM stack testing on September 28th and continue through September 30th. The anticipated date to cease injection of the hydrated lime is now September 17th. In addition, in order to remove potential effects of ammonia slip from the SCR system, the ammonia flow to the SCR will be taken out of service approximately one week prior to the baseline SAM stack testing that is now scheduled to occur on September 28th. This temporary shutdown of the SCR system will in no way jeopardize compliance with this Unit's permitted NOx standards. Following successful baseline testing, both the SCR ammonia injection system and the hydrated lime injection system will be placed back in service for the remainder of the testing.

Thanks again for your continued support of this demonstration project.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Wednesday, September 14, 2011 2:51 PM
To: Hunter, John J (Jamie)
Cc: Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Thanks Mr. Hunter for providing the outline of upcoming testing and operating events. We appreciate your continued communication with the SWD.

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Wednesday, September 14, 2011 10:44 AM
To: Henry, Danielle D.
Cc: Hughes, Rhonda; Schroeder, Bill; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Additional SAM Testing

Based on the results of the SAM testing conducted (as referenced in the email string below), PEF requested, and was granted (per FDEP Project No. 0170004-32-AC), authorization to shut off all AMM system sorbent injection (hydrated lime in this demonstration project) for a period of up to 14 days in order to conduct baseline SAM stack testing. This notification is to inform the Department that PEF intends to stop the hydrated lime injection at Crystal River Unit 4 beginning on (or about) Friday, September 16th, in order to conduct baseline SAM stack testing. The baseline stack testing is scheduled to occur on Tuesday, September 27th. Several one-hour SAM stack test runs at various unit operating loads will be conducted on that day. Following the conclusion of the baseline testing, the hydrated lime system will be placed back in service and additional SAM stack testing will be conducted at various lime injection rates and various unit operating loads. This additional testing is scheduled to occur on Wednesday (September 28th) and Thursday (September 29th), with the possibility of some testing carrying over to Friday (September 30th).

In summary, SAM stack testing will occur at Crystal River Unit 4 from September 27th through September 30th.

Thanks.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]

Sent: Wednesday, August 10, 2011 10:13 AM
To: Hunter, John J (Jamie)
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 4

Mr. Hunter,

Thank you for the update.

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Tuesday, August 02, 2011 12:06 PM
To: Henry, Danielle D.
Cc: Hughes, Rhonda; Schroeder, Bill; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 4

FYI, the sulfuric acid mist (SAM) testing noted in the email string below is underway today as planned. Multiple full-load runs are being conducted at varying hydrated lime injection rates. All runs are expected to be completed today. As such, no SAM testing is currently anticipated for tomorrow or Thursday. At the conclusion of the current test runs, the hydrated lime system will remain in service at a level anticipated to be in compliance with the permitted SAM level until the test results are received. Once the test data has been evaluated, adjustments (as necessary) to the hydrated lime injection levels will be made and a plan for additional testing will be developed.

-----Original Message-----
From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Monday, July 18, 2011 3:24 PM
To: Hunter, John J (Jamie)
Cc: Hughes, Rhonda; Schroeder, Bill
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 4

Mr. Hunter,

Thank you for providing the cancellation notice and proposed reschedule date as noted below. The new test date and time are approved. Our test calendar has been updated accordingly.

Regards,

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

-----Original Message-----
From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]

Sent: Monday, July 18, 2011 3:11 PM
To: Henry, Danielle D.
Cc: Hughes, Rhonda; Schroeder, Bill; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 4

Crystal River Unit 4 was taken offline for a boiler tube leak this past weekend and is not expected to be online until later this afternoon. Due to this unexpected shutdown, along with other continuing difficulties getting this hydrated lime injection system up and running, we still have not run the hydrated lime system. Due to these difficulties, there will not be time to shakedown the hydrated lime system and optimize the flow rates by our previously scheduled test dates later this week (7/21 – 23).

Due to this additional delay in startup/shakedown, the scheduled testing planned for July 21 - 23 has been cancelled.

Based on the availability of the testing contractor, the testing has been re-scheduled for August 2 - 4.

Thanks again for your continued support during the challenges related to getting this demonstration completed...

From: Henry, Danielle D. [Danielle.D.Henry@dep.state.fl.us]
Sent: Friday, July 01, 2011 9:51 AM
To: Hunter, John J (Jamie)
Cc: Hughes, Rhonda; Schroeder, Bill
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 3

Mr. Hunter,

Thank you again for describing the difficulties you are facing with the hydrated lime injection trial project. We have updated our test calendar with the cancellation notice and rescheduled date.

Regards,

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

P Please consider the environment before printing this email.

From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Friday, July 01, 2011 9:24 AM
To: Henry, Danielle D.
Cc: Hughes, Rhonda; Schroeder, Bill; Koerner, Jeff
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 3

Due to continuing difficulties in procuring, receiving, and installing the necessary equipment to conduct the hydrated lime demonstration project, the initial hydrated lime injection system startup and shakedown is not expected to occur until sometime later next week.

Due to this additional delay in startup/shakedown, the scheduled testing planned for July 12-14 has been cancelled.

Based on the availability of the testing contractor, the testing has been re-scheduled for July 21-23.

Thanks again for your continued support during the challenges related to getting this demonstration completed...

From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Thursday, June 16, 2011 12:05 PM
To: Hunter, John J (Jamie)
Cc: Hughes, Rhonda; Schroeder, Bill
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 2

Mr. Hunter,

Thank you for providing the cancellation notice, rescheduled date and update on the hydrated lime injection trial project. We have updated our test calendar accordingly.

Regards,

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

P Please consider the environment before printing this email.

From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Wednesday, June 15, 2011 4:14 PM
To: Henry, Danielle D.
Cc: Koerner, Jeff; Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update 2

The hydrated lime trial demonstration project at Crystal River has continued to have issues with startup/shakedown. This has been largely the result of an inadequate air supply source for the injection of the lime material to the flue gas ductwork. Additional equipment has been ordered to support the project, but this equipment has not yet arrived onsite. The unit will continue to operate the existing ammonia based AMM system until the hydrated lime injection system is operating properly.

Due to this delay in startup/shakedown, the scheduled testing planned for next week, June 21-23 has been cancelled.

Based on the availability of the testing contractor, the testing has been re-scheduled for July 12-14.

Thanks for your continued support during the challenges related to getting this demonstration completed...

Jamie Hunter
Lead Environmental Specialist
Progress Energy Florida
Phone: (727) 820-5764
Cell: (727) 409-5829
John.Hunter@PGNmail.com

From: Henry, Danielle D. [mailto:Danielle.D.Henry@dep.state.fl.us]
Sent: Tuesday, June 07, 2011 11:04 AM
To: Hunter, John J (Jamie)
Cc: Koerner, Jeff; Schroeder, Bill; Hughes, Rhonda
Subject: RE: Crystal River Plant - Hydrated Lime Injection Trial Information - Update

Mr. Hunter,

Thank you for providing the Department the information and justification for the cancellation notice and request to reschedule the initial stack testing with the temporary hydrated lime injection system. The new proposed testing schedule is approved and our test calendar has been updated accordingly. The Department appreciates you keeping us informed during this installation. Feel free to contact me at any time if you run into any problems with the final installation, shakedown and/or full time operation.

Regards,

Danielle D. Henry
Environmental Compliance Manager
Florida Department of Environmental Protection
Division of Air Resource Management
Southwest District
Business Phone: 813-632-7600 ext. 104
Fax Number: 813-632-7668

P Please consider the environment before printing this email.

From: Hunter, John J (Jamie) [mailto:John.Hunter@pgnmail.com]
Sent: Tuesday, June 07, 2011 8:10 AM
To: Hunter, John J (Jamie); Koerner, Jeff; Henry, Danielle D.; Schroeder, Bill
Subject: RE: Crstal River Plant - Hydrated Lime Injection Trial Information - Update

As of Monday, June 6th , work was still being completed on the installation of the temporary hydrated lime injection system on Unit 4. As such, the start up and "shakedown" of the system has not has not occurred. Since there is not sufficient time to adequately shakedown and tune the system prior to starting the SAM stack testing that had originally been scheduled for this Wednesday – Friday (6/8 – 6/10). This week's testing has been cancelled. The next window that CEM Solutions has available for this testing is the week of June 20. The revised testing plan is for the initial stack testing to occur from Tuesday – Thursday (June 21 – 23). This should allow enough time to adequately shakedown and tune the hydrated lime system and fully transition the AMM system to lime injection in an effort to purge the excess ammonia from the system prior to initial testing.

Once the final installation of the hydrated lime system is completed, "shakedown" will begin. Once the "shakedown" is completed and the system has been proven to operate reliably, it will be placed into full time operation. The intent is that the AMM system ammonia flow would then be discontinued for the duration of the hydrated lime trial, a period of approximately 8 weeks. However, the ammonia system will be kept in a standby mode to be restarted on short notice in the event of problems with the hydrated lime system, or if opacity levels rise unacceptably, or if there are any other unforeseen negative impacts from running the hydrated lime system.

From: Hunter, John J (Jamie)
Sent: Wednesday, June 01, 2011 9:06 AM
To: 'Koerner, Jeff'; 'Danielle.Henry@dep.state.fl.us'; 'Schroeder, Bill'
Subject: Crstal River Plant - Hydrated Lime Injection Trial Information

Please find attached a letter (hard copy in mail) related to the hydrated lime injection demonstration project that is set to start-up on Crystal River Unit 4 starting June 6th. On June 6th it is anticipated that the Acid Mist Mitigation (AMM) system will be fully switched from ammonia injection to lime injection (AMM ammonia flow completely removed). Initial engineering stack test runs to evaluate SAM emission at the stack are anticipated to occur from June 8th – June 10th. The hydrated lime demonstration trial is

expected to run at least 30 days to allow for optimization, evaluation and testing of the system.

Please let me know if you have any concerns.

Thanks.

Jamie Hunter
Lead Environmental Specialist
Progress Energy Florida
Phone: (727) 820-5764
Cell: (727) 409-5829
John.Hunter@PGNmail.com

Acid Mist Mitigation System – Hydrated Lime Demonstration Project

"Summary of Crystal River Unit 4 Sulfuric Acid Mist Test Results and Operating Protocol for Continued Use of the Temporary Hydrated Lime System"

Progress Energy Florida – Crystal River Plant

(November 2011)

Background

In early 2011, Progress Energy Florida (PEF) requested authorization for the temporary installation and operation of a demonstration injection system at Crystal River Units 4 and/or 5 using alternative sorbents to evaluate additional methods for reducing Sulfuric Acid Mist (SAM) emissions. This authorization was issued May 16, 2011 by the Florida Department of Environmental Protection (FDEP) through a revision to Permit No. PSD-FL-383D (FDEP Project No. 0170004-026-AC). Specific conditions contained in Section 3.G. of the Permit were added to address requirements related to the "Temporary Demonstration Project". The first alternative sorbent chosen by PEF for demonstration, and the subject of this document, was hydrated lime. Following successful installation of the hydrated lime injection system, the ammonia feed to the existing AMM system was removed. The hydrated lime demonstration was conducted on Crystal River Unit 4 from late July through October 2011, when the unit was shut down for a routine maintenance outage. No fuel additive or other alternative sorbent testing was conducted during this time.

Section 3, Conditions G.15 and G.16 of the above referenced permit outline the requirements needed to request continued temporary authorization of a demonstrated alternative sorbent. The information contained in, and attached to this document, is intended to fulfill these requirements as they relate to the hydrated lime demonstration. The information provided below includes results of the SAM testing conducted and the operating protocol required for continued operation of the temporary hydrated lime injection system.

In addition, this document is intended to fulfill the requirements of Condition G.20, as it relates to the final report for the hydrated lime demonstration portion of the project.

SAM Testing Summary

Initial testing for SAM emissions related to the hydrated lime demonstration occurred August 2, 2011, following appropriate notification to the FDEP (see Attachments 1a and 1b for initial notification letter and additional email follow-up). Five one-hour SAM tests were performed with hydrated lime injection rates varying from zero to 1,000 lbs/hour. The results of the tests (Attachment 2) showed that the unit was significantly in compliance (<20% of standard) with the SAM emissions limitations, both with and without injection of the hydrated lime. These results were somewhat unexpected and questionable.

Since residual ammonia interference from operation of the ammonia-based AMM system was not expected to be of concern during testing due to the length of time since ammonia injection from the AMM system ceased, attention focused on potential residual effects of ammonia slip from the Selective Catalytic Reduction (SCR) system and/or the hydrated lime itself during the low and zero-flow hydrated lime stack test runs. Consequently, the SCR NOx removal efficiency was lowered to reduce the influence that ammonia slip may have had on the SO3/SAM emissions. Through monitoring of the Breen SO3 probes, it was concluded that reduction in the SCR ammonia slip

did reduce the bias on SO3/SAM emissions. Therefore, it is likely that the ammonia slip from the SCR may have influenced the August 2nd SAM tests, thus resulting in the lower than expected levels of SAM emissions. Based on the results of the August 2nd SAM testing, PEF requested, and was granted per FDEP Project No. 0170004-32-AC (Attachment 3), authorization to shut off all AMM system sorbent injection (hydrated lime in this demonstration project) for a period of up to 14 days in order to conduct true baseline SAM emissions stack testing.

A series of additional SAM emissions stack testing occurred from September 28th through October 3rd after ceasing the injection of the hydrated lime on September 17th. In addition, in order to remove potential effects of ammonia slip from the SCR system, the ammonia flow to the SCR was taken out of service approximately one week prior to the baseline SAM stack testing. (Note: The temporary shutdown of the SCR system does jeopardize compliance with the permitted NOx standards.) Following the baseline testing, both the SCR ammonia injection system and the hydrated lime injection system were placed back in service for the remainder of the testing. A total of 13 one-hour test samples were collected from the stack at varying operational loads and hydrated lime injection rates. The goal of this round of testing was to establish a true baseline SAM emission rate and to prove the efficacy of SO3/SAM removal using a hydrated lime-based AMM system. The testing was designed to prove the effectiveness of the AMM system while minimizing the influence from SCR ammonia slip.

Results from the September 28th – October 3rd round of SAM testing showed that baseline testing (without interference from ammonia or lime) did result in SAM emission levels measured at the stack that were approximately three times the permit standard. The remaining testing conducted at a reduced SCR removal efficiency (75%) and at various unit operating loads and hydrated lime injection rates demonstrated compliance with the SAM standard, with the exception of full load (>90%) unit operation, which fell a little short of compliance levels.

In order to determine the necessary hydrated lime injection levels required for compliance at full load operation and to further evaluate the impacts of SCR operations on SAM emissions (between 75% and 90% SCR NOx removal efficiencies), another round of testing was conducted on October 19th and 20th. This additional testing was used to supplement the previous round of testing. Collectively, the test results from both rounds of testing were incorporated into a formal stack test report (Attachment 4) and were used to develop the operational plan for continued use of the temporary hydrated lime system.

Summary of Crystal River Unit 4 Sulfuric Acid Mist Test Results and Operating Protocol for Continued Use of the Temporary Hydrated Lime System (November 2011)

The information below summarizes the test plan and presents the results:

Date	Milestone
Friday, 9/16	Hydrated Lime System Injection Discontinued
Tuesday, 9/20	SCR Ammonia Injection Discontinued
Tuesday, 9/27	Mobilization of CEMs Solutions
Wednesday, 9/28 – Monday 10/3	SAM Testing
Wednesday Mid-Day, 9/28	Re-establish SCR Ammonia Injection at 75% removal efficiency
Tuesday, 10/4	Increase SCR Removal Efficiency to 90%
Tuesday, 10/11	Reduce SCR Removal Efficiency to 75%
Wednesday 10/19 – Thursday 10/20	SAM Testing
Thursday 10/20	Increase SCR Removal Efficiency to 90%

Date	Time of Day	Load (MW)	# of Test Runs	SCR NOx Removal Efficiency (%)	Target Lime Injection Rate (#/hr)
28-Sep	07:00 – 11:00	Full Load	2	0	0
	11:00 – 15:00	Full Load	2	75	0
29-Sep	10:00 – 12:00	Mid (~500)	1	75	800 – 1000
	13:00 – 17:00	Full Load	1	75	1000 – 1200
30-Sep	04:00 – 06:00	Low (~275)	1	75	300 – 400
	07:00 – 09:00	Low (~275)	1	75	500 – 600
	10:00 – 12:00	Low (~275)	1	75	700 – 800
	13:00 – 15:00	Mid (~500)	1	75	400 – 500
	16:00 – 18:00	Mid (~500)	1	75	600 – 700
3-Oct	10:00 – 12:00	Full Load	1	75	400 – 500
	12:00 – 15:00	Full Load	1	75	700 – 800
19-Oct	07:00 – 09:00	Full Load	1	75	1500 – 1600
	10:00 – 12:00	Full Load	1	75	2200 – 2300
	13:00 – 15:00	Full Load	1	75	3000
20-Oct	07:00 – 09:00	Full Load	1	75	1500 – 1600
	10:00 – 12:00	Full Load	1	90	1500 – 1600
	13:00 – 15:00	Full Load	1	90	2200 - 2300

Coal Data (Averaged from 2 daily 'as-bunkered' samples for each day of testing)

Date	HHV (Btu/lb)	SO2 (lb/Btu)	Moisture (%)	Ash (%)	Volatile Matter (%)	Fixed Carbon (%)
28-Sept.	11,629	4.71	10.67	8.96	34.78	45.60
29-Sept.	11,739	4.89	9.96	9.16	34.66	46.24
30-Sept.	11,589	4.94	10.47	8.83	34.01	46.69
3-Oct.	12,123	4.28	9.08	8.42	35.55	49.96
19-Oct	11,644	4.85	11.89	8.68	34.94	44.49
20-Oct	11,397	4.84	12.59	9.04	33.93	44.45

Summary of Crystal River Unit 4 Sulfuric Acid Mist Test Results and
Operating Protocol for Continued Use of the Temporary Hydrated Lime System
(November 2011)

SAM Test Results (Lime Injection Rates shown are rates averaged over the test period)

Date	Time of Day	Load (MW)	SCR Removal Efficiency (%)	AH Outlet Injection Rate (lbs/hr)	ESP Outlet Injection Rate (lbs/hr)	Total Lime Injection Rate (lbs/hr)	Measured SAM at Stack (lb/mmBtu)
Wed 28-Sept	12:35 – 13:35	754	0	0	0	0	0.0286
	15:35 – 16:35	751	0	0	0	0	0.0334
	SCR Ammonia Injection Online – 16:43						
	18:22 – 19:22	751	75	0	0	0	0.0360
	20:52 – 21:52	754	75	0	0	0	0.0351
Thurs 29-Sept	*Hydrated Lime Injection at ESP Outlet – Approx. 09:00*						
	11:01 – 12:01	498	75	0	1,069	1,069	0.0023
	13:14 – 14:14	753	75	0	1,111	1,111	0.0136
Fri 30-Sept	04:47 – 06:02	274	75	*0*	446	446	0.0039
	07:42 – 08:42	274	75	*0*	598	598	0.0018
	09:35 - 10:35	273	75	*0*	790	790	0.0056
	12:47 – 13:47	498	75	*0*	582	582	0.0073
	14:25 – 15:25	498	75	0	611	611	0.0072
Mon 3-Oct	09:58 – 10:58	752	75	0	565	565	0.0113
	11:55 – 12:55	754	75	0	695	695	0.0170
Wed 19-Oct	07:06 – 08:06	761	75	1553	0	1553	0.0079
	09:50 – 10:50	758	75	1550*	880*	2380	0.0051
	12:02 – 13:02	759	75	1550*	1600*	3167	0.0033
Thurs 20-Oct	07:51 – 08:51	762	75	0	1577	1577	0.0105
	11:25 – 12:25	761	90	0	1609	1609	0.0082
	13:15 – 14:15	759	90	0	2256	2256	0.0060

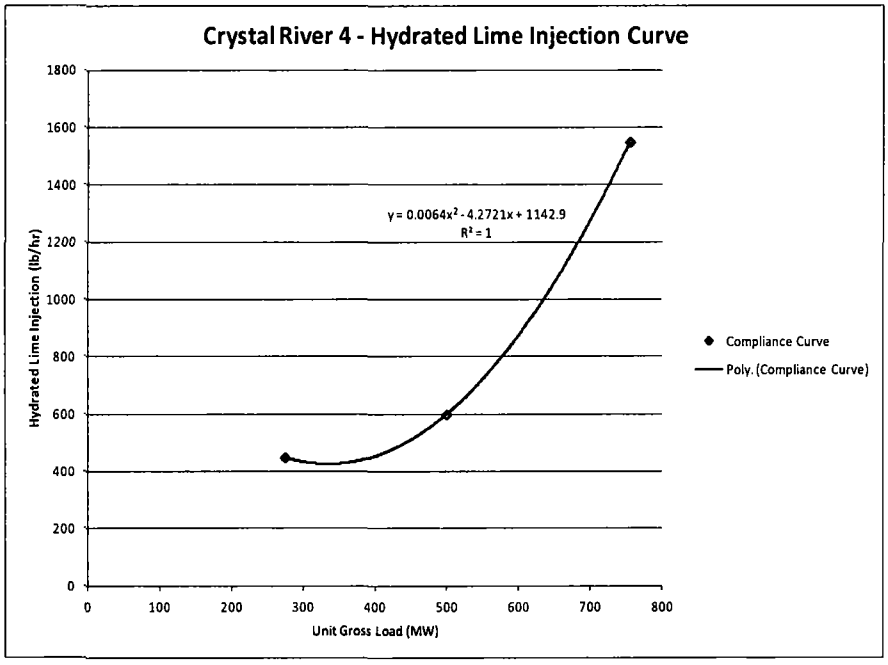
**** Lime injection rates are approximates***

Operating Protocol for Continued Operation of the Temporary Hydrated Lime AMM System

Sufficient testing was conducted that shows that compliance with the SAM emission standard is achievable for all operational loads. The table below shows compliance injection rates for hydrated lime and the corresponding SAM emission levels for each tested load point.

Load (MW)	Proposed Lime Injection Rate (lb/hr)	Actual Lime Injection Rate During SAM Testing (lb/hr)	Corresponding Stack SAM Measurement (lb/mmBtu)
275	450	446	0.0039
500	600	582	0.0073
755 (Full Load)	1550	1553	0.0079

Based on the information in the table above, the hydrated lime injection vs. unit load curve that demonstrates compliance with the permitted SAM emission limit is shown below. This curve is based on an average fuel sulfur content equivalent to 4.75 lbs SO2/MMBtu, which was the average value during the test period.



Gross Load (MW)	Lime Injection (lb/hr)*
<=400	450
450	520
550	730
650	1070
750	1550

*Approximate injection rates base on curve for 4.75 lbs/MMBtu fuel.

The above injection rate vs. load curve will be implemented for continued operation of the temporary hydrated lime AMM system. The curve will be adjusted for differing fuel sulfur content by multiplying the injection rate from the above curve by 4.75 and dividing by the SO2 content (lbs/MMBtu) of the fuel being burned.