



Larry E. Hatcher
Manager, Crystal River
Fossil Plant & Fuel Operations

February 25, 2009

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

RECEIVED

MAR 02 2009

BUREAU OF AIR REGULATION

Re: **Request for Additional Information**
Progress Energy Florida, Crystal River Power Plant
Project No. 01700004-022-AC (PSD-FL-383B)
Miscellaneous Permit Revisions

Dear Mr. Koerner:

This letter is written in response to your request for additional information regarding the subject permit application. In order to most clearly provide responses to your questions, we have reiterated the questions in *italics*, along with some of the introductory statements and topic headings.

Installation of the Carbon Monoxide (CO) Continuous Emissions Monitoring Systems (CEMS)

Construction was delayed substantially from the preliminary schedule. Low-NOx burners (LNB) were installed on Unit 4 in December of 2008. The CO CEMS has also been installed. The permit requires certification of the CO CEMS within 60 calendar days of achieving permitted capacity, but no later than 180 calendar days after initial startup. The permit also requires initial stack tests for volatile organic compounds (VOC) to be conducted within 60 days of installing the LNB. The installation of LNB on Unit 5 is scheduled for May of 2009. However, the outage to tie in the flue gas desulfurization (FGD) system is not scheduled until October of 2009. The permanent CO CEMS is intended to be installed on the new stack after the FGD system. Therefore, there will be a 5-month delay to install the CO CEMS on Unit 5; otherwise a temporary CEMS must be installed.

(1) *Does the above discussion properly summarize this issue?*

Response: In general it does. Please note that the currently scheduled date for the start of the Unit 5 fall outage (during which the FGD and new stack tie-ins will occur) has been adjusted to November 9, 2009. Although no significant further delays are anticipated, construction conditions and contingencies are not always predictable and some additional schedule slip is possible.

(2) *Is it likely that the CO CEMS for Unit 4 will be certified by the end of February? Has Unit 4 achieved 90% of the maximum permitted heat input rate after installing the LNB?*

Response: Unit 4 achieved greater than 90% of the unit capacity on January 2, 2009. We anticipate that certification of the CO CEMS will be completed within the required 60 day period.

(3) *The application indicates that an additional stack test will be conducted on Unit 5 in accordance with EPA Method 10 to demonstrate that initial CO emissions will be below the numerical portion of the permitted CO*

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

emissions standard (0.17lb/MMBtu of heat input and 1156.0 lb/hour based on a 30-day rolling average). See suggested permit revision below. What is the current schedule for conducting the additional CO test on Unit 5? Until the CO CEMS is installed and certified for Unit 5, you intend to demonstrate compliance by: the additional stack test data, the Relative Accuracy Test Assessment (RATA) data from the Unit 4 CEMS, and data collected from the Unit 4 CEMS once it is certified. Is this correct?

Response: Comments on the suggested permit language are below (See response to question 4). Progress Energy plans to complete the additional Method 10 compliance test within 60 days of completing installation of the low-NOx burners on Unit 5. The current schedule calls for this installation to be complete in mid-May 2009, therefore it is expected that this test would be conducted in the early part of July. Progress Energy's proposal for providing reasonable assurance of compliance during the interim period is as stated in your question, by the stack test and by the data provided from Unit 4, both in the initial RATA and the ongoing CEMS data.

CEMS Applicability Trigger and Consistent Timeframes for Installation and Startup of Air Pollution Control Systems

(4) *The application identifies confusion with several permit conditions that establish initial compliance requirements for the coal-fired units. The Department's original intent was to require that the CEMS be installed and certified within 60 days of completing construction on the related air pollution control device. Monitoring data collected from the CEMS would be used to demonstrate compliance with the new emissions standards after completing shakedown of the air pollution control equipment and reestablishing "normal" operation. To clarify this issue, the Department suggests the following revisions:*

6. Authorized Fuels:

- a. In addition to the currently authorized fuels, this air construction permit authorizes Units 4 and 5 to fire a blend of bituminous coal and sub-bituminous coal of up to 20% sub-bituminous coal upon issuance of this permit. Once initial shakedown of the FGD system is complete, coal fuel blends shall not exceed a maximum sulfur content of 3.13% by weight.

14. CO CEMS Installation: For Units 4 and 5, the permittee shall properly install, calibrate, operate and maintain CEMS to measure and record CO emissions in the terms of the applicable standard. Each CEMS shall be installed such that representative measurements of emissions or process parameters from the facility are obtained. The permittee shall locate the CEMS by following the procedures contained in the applicable performance specification of 40 CFR Part 60, Appendix B. The permittee shall install each CEMS required by this permit and conduct the appropriate performance specification for each CEMS within 60 calendar days of completing installation of the low-NOx burners and achieving permitted capacity as defined in Rule 62-297.310(2), F.A.C., but no later than 180 calendar days after initial startup. As an option for Unit 5 verifiable construction delays, the permittee may delay installation of the CO CEMS until the Unit 5 exhaust is tied into the new FGD system and stack but not to exceed 180 days from completing installation of the low-NOx burners. If this option is selected, the permittee shall conduct an initial CO stack test in accordance with EPA Method 10 within 60 days of completing installation of the low-NOx burners that demonstrates compliance with a CO emissions standard of 0.17 lb/MMBtu of heat input based on a 3 run test average. In addition CEMS data collected from similar Unit 4 shall be used as a surrogate to show compliance until the Unit 5 CEMS is installed. Based on the Unit 4 CEMS data the Compliance Authority may require special tests in accordance with Rule 62-297.310(7)(b) F.A.C. [Rules 62-4.070(3), 62-297.310(7)(b) and 62-212.400(BACT), F.A.C.]

15. Compliance by CEMS: Compliance with the standards for opacity and emissions of CO, NOx, and SO2 shall be demonstrated with data collected from the required continuous monitoring systems. Within 60 days of ~~reestablishing commercial operation of~~ completing construction on the related air pollution control device for each unit, the permittee shall certify proper operation of each required monitor. The permittee shall comply with the conditions of Appendix F (Standard Continuous Monitoring Requirements) of this permit as the compliance method for the corresponding emissions standards. The permittee shall begin demonstrating compliance with the CO CEMS emissions standards once a monitor is certified. The permittee shall begin demonstrating compliance with the opacity, NOx and SO2 COMS/CEMS emissions standards after completing initial shakedown of the associated air pollution control device, but no later than 180 days after certifying the

corresponding COMS/CEMS. Within 10 days of completing initial shakedown for an air pollution control device, permittee shall notify the compliance authority of the following: the air pollution control device; the date that shakedown was completed; the monitoring data being collected to demonstrate continuous compliance; and the status of other air pollution control devices. [Rules 62-4.070(3) and 62-212.400(BACT), F.A.C.]

No changes are proposed for Specific Condition Nos. 16 and 19. Please comment.

Response: In general, PEF believes that the language proposed here will meet our requirements. We have suggested changes on two points in these conditions.

In Condition 6.a., the Department has suggested adding the clause "Once initial shakedown of the FGD system is complete". PEF's understanding is that the effect of this clause would be to limit the Units to firing coals of less than 0.68 % sulfur until the FGD shakedown is complete and the units comply with the new permit limit. In order to retain flexibility to test the FGD on some higher sulfur fuels, PEF suggests the following milestones:

- From start up of the FGD system until certification of the FGD SO₂ CEMS, PEF will be required to fire coals with a sulfur percentage of less than 0.68%. This period is limited to 60 days following completion of installation of the FGD system by Condition 15.
- Following certification of the CEMS but prior to the completion of the FGD shakedown period, PEF will demonstrate via the CEMS that the sulfur dioxide exiting the stack is no greater than 1.2 lb/mmBtu as required by Condition B.5.a. of the existing Title V permit. This period is limited to 180 days by Condition 15.
- Following completion of the shakedown period, the units will comply with the new SO₂ limit of 0.27 lb/mmBtu.

This proposed approach provides PEF with flexibility to test additional coal mixtures during the shakedown period with the understanding that the FGD system will provide reduction in SO₂ emissions although it may not reach the design removal efficiency until the completion of the shakedown activities.

In the proposed language for Condition 14, PEF recognizes and intends to comply with the agency's desire to limit the period of Unit 5 operation with the alternate method of compliance to no more than 180 days. However, because of the anticipated length of the fall 2009 Unit 5 outage (for the tie in to the new stack), PEF expects that the total time from restart of unit 5 with the low-NOx burners to the certification of the new CO CEMS will be greater than 180 days. PEF proposes that the period of operation of Unit 5 with the alternate method of compliance prior to tie-in to the new stack be limited to 180 days, but that PEF have the 60 day period following restart of the unit with the new stack to accomplish certification of the new CEMS.

Suggested permit language covering each of these topics is presented here. We have "accepted" all the previous changes from FDEP before marking additional additions in underscore and deletions in ~~strike through~~.

6. Authorized Fuels:

- a. In addition to the currently authorized fuels, this air construction permit authorizes Units 4 and 5 to fire a blend of bituminous coal and sub-bituminous coal of up to 20% sub-bituminous coal upon issuance of this permit. Once initial shakedown of the FGD system is complete, coalCoal fuel blends shall not exceed a maximum sulfur content of 3.13% by weight.

14. CO CEMS Installation: For Units 4 and 5, the permittee shall properly install, calibrate, operate and maintain CEMS to measure and record CO emissions in the terms of the applicable standard. Each CEMS shall be installed such that representative measurements of emissions or process parameters from the facility are obtained. The permittee shall locate the CEMS by following the procedures contained in the applicable performance specification of 40 CFR Part 60, Appendix B. The permittee shall install each CEMS required by this permit and conduct the appropriate performance specification for each CEMS within 60 calendar days of completing installation of the low-NOx burners and achieving permitted capacity as defined in Rule 62-297.310(2), F.A.C., but no later than 180 calendar days after initial startup. As an option for Unit 5 verifiable construction delays, the permittee may delay installation of the CO CEMS until the Unit 5 exhaust is tied into the new FGD system and stack but not to exceed 180 days from completing installation of the low NOx burners.

If this option is selected, the permittee shall conduct an initial CO stack test in accordance with EPA Method 10 within 60 days of completing installation of the low-NOx burners that demonstrates compliance with a CO emissions standard of 0.17 lb/MMBtu of heat input based on a 3 run test average. In addition CEMS data collected from similar Unit 4 shall be used as a surrogate to show compliance until the Unit 5 CEMS is installed. Based on the Unit 4 CEMS data the Compliance Authority may require special tests in accordance with Rule 62-297.310(7)(b) F.A.C. The period of alternate compliance shall not last longer than 180 days. Within 60 days following the tie in of Unit 5 to the new stack, the permittee shall certify the operation of the new CEMS. [Rules 62-4.070(3), 62-297.310(7)(b) and 62-212.400(BACT), F.A.C.]

15. **Compliance by CEMS:** Compliance with the standards for opacity and emissions of CO, NOx, and SO2 shall be demonstrated with data collected from the required continuous monitoring systems. Within 60 days of completing construction on the related air pollution control device for each unit, the permittee shall certify proper operation of each required monitor. The permittee shall comply with the conditions of Appendix F (Standard Continuous Monitoring Requirements) of this permit as the compliance method for the corresponding emissions standards. The permittee shall begin demonstrating compliance with the CO CEMS emissions standards once a monitor is certified. The permittee shall begin demonstrating compliance with the opacity, NOx and SO2 COMS/CEMS emissions standards after completing initial shakedown of the associated air pollution control device, but no later than 180 days after certifying the corresponding COMS/CEMS. During the period between certification of the SO2 CEMS and the completion of initial shakedown of the FGD, the unit will comply with SO2 emissions limits set forth in existing Title V permit condition B.5.a.(2) {Permit #017004-015-AV} Within 10 days of completing initial shakedown for an air pollution control device, permittee shall notify the compliance authority of the following: the air pollution control device; the date that shakedown was completed; the monitoring data being collected to demonstrate continuous compliance; and the status of other air pollution control devices. [Rules 62-4.070(3) and 62-212.400(BACT), F.A.C.]

Changes to On Site Limestone/Gypsum Handling and Storage Systems

- (5) *The application indicates that the limestone operations will be subject to the New Source Performance Standards in Subpart 000 of 40 CFR 60. Please identify how the affected activities will be controlled to comply with the NSPS requirements.*

Response: PEF has identified that the New Source Performance Standards in Subpart 000 of 40 CFR 60 will apply to the limestone handling and processing operations at the site. PEF believes that no additional controls are required and that the additional requirements of Subpart 000 are for specific testing, recordkeeping and reporting procedures. PEF has already proposed stringent baghouse and bin vent filter controls on limestone processing operations and transfer points, as well as enclosures and other dust suppression measures at other process emission points. These measures will meet the requirements of Subpart 000.

Subpart 000 requires particulate testing (Method 5/17) for baghouse discharge points and Opacity (Method 9) testing using a certified observer for most controlled and uncontrolled drop points such as hopper to conveyor or from conveyor to conveyor. NSPS Subpart 000 determines compliance with the particulate matter and opacity standards in §60.672(a) as follows:

On and after the date on which the performance test required to be conducted by §60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any transfer point on belt conveyors or from any other affected facility any stack emissions which:

- (1) Contain particulate matter in excess of 0.05 g/dscm (0.022 gr/dscf); and
- (2) Exhibit greater than 7 percent opacity, unless the stack emissions are discharged from an affected facility using a wet scrubbing control device.

On and after the sixtieth day after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup as required under §60.11 of this part, no owner or operator subject to the provisions of this subpart shall cause to be discharged into the atmosphere from any transfer point on belt conveyors or from any other affected facility any fugitive emissions which exhibit greater than 10 percent opacity, except as provided in paragraphs (c), (d), and (e) of this section.

In addition, the Subpart A requirement under §60.7(a)(2) for notification of the anticipated date of initial startup of an affected facility shall be waived for owners or operators of affected facilities regulated under this subpart. Further, a notification of the actual date of initial startup of each affected facility shall be submitted to the Administrator and, finally, for a combination of affected facilities in a production line that begin actual initial startup on the same day, a single notification of startup may be submitted by the owner or operator to the Administrator. The notification shall be postmarked within 15 days after such date and shall include a description of each affected facility, equipment manufacturer, and serial number of the equipment, if available.

- (6) *The application indicates that gypsum will not be transferred to the wallboard plant by conveyor, but by truck; however, these emissions were conservatively considered in the modeling analysis. Please identify and explain the estimated potential emissions increase of particulate matter (<1 ton/year).*

Response: Following a review of the modeling conducted, PEF has recognized that the modeling performed for the initial application included some 150 truck trips associated with the transfer of gypsum to the wall board plant. At that time, the conveyor was not a certainty and PEF modeling included the truck traffic to be conservative. Golder has reviewed this modeling and the associated emissions assumptions and has updated the overall particulate emissions. This update, which estimated a difference of less than one ton per year, includes emissions associated with the additional handling and storage of the gypsum at the proposed onsite handling pad. No update to the emissions associated with truck traffic was required as these were included in the original estimate. Based on these changes, the total change in particulate matter emissions are estimated to be less than one ton per year. The estimation of these emissions is documented in two calculation sheets attached, one for the transfer and one for the wind erosion from the pile.

- (7) *How long will gypsum be stored on site? Describe the changes to the proposed gypsum storage building. What measures will be taken to control fugitive dust emissions from the gypsum storage area?*

Response: The gypsum storage pad will be capable of handling approximately 32,000 tons of gypsum which represents approximately 12 days of operational capacity. There is no gypsum storage building. A lined concrete handling pad, with the capacity described previously, will be constructed. This pad will contain any runoff and will send the runoff back in to the FGD process. Water sprays will be used to control dusting from the pad. After initial wetting it is expected that a crust will form on the pile and only the working face will require continuous attention.

Table 1. Emissions Limit Applicability

- (8) *This table summarizes Progress Energy's understanding of the applicability dates and triggers for the new limits imposed by the permit. For clarity, please identify the permit condition that you believe to be the controlling requirement as well as any other conditions that might be considered in conflict with the controlling requirement.*

Response: A revised Table 1 is attached. Please note the PEF has corrected the PM and Opacity applicability to show that the new limits are dependent on the operation of the FGD for each unit. Note that approval of the requested language changes in question #4 above will result in minor changes to this table.

Alkali Injection System

- (9) *Please provide supporting information from the equipment vendor regarding: the proposed maintenance schedule; the amount of time needed for shutdown to conduct the maintenance; the shared or common equipment; the cost of the shared or common equipment; the cost to install redundant shared or common equipment; and a detailed description of the operational control of the alkali injection system.*

Response: PEF is working with the vendor and our EPC contractor to develop this information. We will provide this information to the agency as soon as it is available. Please see our response to Question 11, below, regarding severance of this issue from the other issues addressed in this letter.

(10) The Department understands that scheduled maintenance on the alkali injection system will be performed when at least one unit (Unit 4 or 5) is shutdown. However, during this period, the alkali system must also be shutdown since the systems share critical common equipment. Please estimate the sulfuric acid mist (SAM) emissions rate during this shutdown for maintenance (one unit in operation without control by alkali injection). Please describe the measures that will be taken to minimize excess emissions during these periods.

Response: As presented in Table B-1 of the application, the calculated emissions rate for SAM is 0.009 lb/mmBtu. This is also the limit expressed in the permit. Based on the maximum hourly heat input rate of 7,200 MMBtu/hr, this represents a maximum emission of 65.4 lb/hr with the system in operation. Progress calculates that the maximum emission with the ammonia injection off line will be 503.8 lb/hr (per unit). Based on the understanding that the ammonia system would be off line for a maximum of 10 days per year during which time one unit would be off line, this represents a maximum increase in emissions (potential to emit) of 5.26 tons per year from the unit that is operating (per unit). The calculations are shown in the table below.

Operation	Units	AMM System On	AMM System Off
Maximum Coal Sulfur Content	%	3.13	3.13
Coal Heat Content	Btu/lb	11375	11375
Uncontrolled SO2 Emissions	lb/mmBtu	5.5	5.5
Combustion Factor		0.011	0.011
SAM from Combustion	lb/mmBtu	0.093	0.093
SCR factor		0.005	0.005
SAM produced by SCR	lb/mmBtu	0.042	0.042
SAM leaving SCR	lb/mmBtu	0.135	0.135
Air Heater Factor		0.9	0.9
SAM leaving Air Heater	lb/mmBtu	0.121	0.121
ESP w/ AMM system		0.1	0.77
SAM leaving ESP	lb/mmBtu	0.012	0.093
FGD System Factor		0.75	0.75
SAM Leaving FGD	lb/mmBtu	0.009	0.070
Heat Input	mmbtu/hr	7200	7200
SAM Emission Rate (lb/hr)	lb/hr	65.4	503.8
Potential Emissions for 10 days per year	TPY	0.79	6.05
Change in Emissions (PTE)	TPY		5.26

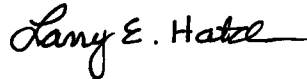
(11) Since this issue may be more complicated to resolve than the other items, please advise the Department whether you would like to split this issue off as a separate permit request.

Response: As PEF anticipates that it will take some time to generate the information requested regarding the AMM system (see response to question #9 above), and as PEF must make a decision on the purchase of the interim CEMS for Unit 5 immediately, we appreciate the department's willingness to address this issue separately in order to allow the other issues to move forward in a more timely manner.

Mr. Jeffrey Koerner
February 25, 2009
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PEF looks forward to working with you regarding this matter. For additional information or to discuss any issues regarding this application, please contact Mr. David Meyer in our St. Petersburg office by telephone at (727) 820-5295 or via email at dave.meyer@pgnmail.com.

Sincerely,

A handwritten signature in black ink that reads "Larry E. Hatcher". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Larry E. Hatcher

Plant Manager/Responsible Official

TABLE 1 – EMISSIONS LIMIT APPLICABILITY

Emissions Type	Current Permit Limit	New Permit Limit	Unit 4 New Limit Date	Unit 5 New Limit Date	Notes	Permit Condition¹
Nitrogen Oxide (NO _x)	0.50 lb/MMBTU	0.47 lb/mmbtu	End of Unit 4 2008 fall outage measured at existing CEMS	End of Unit 5 2009 Spring Outage by existing CEMS	Based upon a 12 month <u>rolling</u> average	9.a. (15)
Sulfur Dioxide (SO ₂)	1.2 lb/MMBTU	0.27 lb/mmbtu - Including SU/SD/M 1944.0 lb/hr - Excluding SU/SD/M	Within 60 days of Construction Completion of FGD (End of Unit 4 2010 spring outage) measured at new CEMS	Within 60 days of Construction Completion of FGD(End of Unit 5 2009 Fall outage) measured by new CEMS	mmBtu/hr based upon a 30 day <u>rolling</u> average lb/hr based on a 24 hour (midnight to midnight) rolling block average	9.b. (15)
Sulfuric Acid Mist (SAM)	none	0.009 lb/mmbtu <u>and</u> 64.8 lb/hr	Within 60 days of Construction Completion of AMM (End of Unit 4 2010 spring outage) measured Compliance Stack test	Within 60 days of Construction Completion of AMM (End of Unit 5 2009 Spring outage) measured Compliance Stack test	This new limit is in effect because current SAM emissions will increase by greater than 7 tons/year due to burning higher sulfur coal. Annual test required to determine compliance. No continuous monitor. Retest with each 0.5% sulfur increase. Required to develop SAM estimation curves, and AMM Monitoring Plan	8.c. (16)
Particulate Matter	0.1 lb/MMBTU	0.030 lb/mmbtu <u>and</u> 216.0 lb/hour	Within 60 days of Construction Completion of FGD (End of Unit 4 2010 spring outage) measured at new Stack	Within 60 days of Construction Completion of FGD (End of Unit 5 2009 Fall outage) measured at New Stack	Annual test required to determine compliance. No continuous monitor. PM Compliance Stack Test required after LNB installation, but at existing limit (0.1).	8.b (19.a)

Emissions Type	Current Permit Limit	New Permit Limit	Unit 4 New Limit Date	Unit 5 New Limit Date	Notes	Permit Condition ¹
Opacity	20%	10%	Within 60 days of Construction Completion of FGD (End of Unit 4 2010 spring outage) measured at new Stack	Within 60 days of Construction Completion of FGD (End of Unit 5 2009 Fall outage) measured at New Stack	Limit is based upon a 6 minute average, except one six minute block per hour can be as high as 20 percent opacity	8.e. (15, 19.a.)
Ammonia Slip	none	5 ppmv	Within 60 days of Construction Completion of SCR (End of Unit 4 2010 spring outage) measured Compliance Stack test	Within 60 days of Construction Completion of SCR (End of Unit 5 2009 Spring outage) measured Compliance Stack test	Annual test required to determine compliance. No <u>continuous compliance</u> monitor. Monitoring plan for Ammonia injection rate.	8.a. (19.a)
Carbon Monoxide (CO)	none	0.17 lb/MMBtu excluded SU/SD/M 1156.0 lb/hr Including SU/SD/M	End of Unit 4 2008 fall outage measured at existing Interim CEMS	Seeking exemption for interim CO CEMS, Then end of Unit 5 Fall outage with New CO CEMS at new Stack	Based upon a 30 day rolling average. New compliance monitors to be installed.	8.c. (14)
VOC		.004 lb/MMBtu and 28.8 lb/hour	Within 60 days of Construction Completion (End of Unit 4 2008 fall outage) measured Compliance Stack test	Within 60 days of Construction Completion (End of Unit 5 2009 Spring outage) measured Compliance Stack test	3 run test average at permitted capacity	8.d. (19.a)

Permit conditions are listed with the condition for the limit followed by the condition covering the testing in (parentheses).

TABLE A-1
ESTIMATION OF PM EMISSION FACTORS AND RATES FOR THE GYPSUM HANDLING SYSTEM
FROM BATCH/CONTINUOUS DROP OPERATIONS AT TRANSFER POINTS

Parameters	Operations	
	Gypsum Handling Truck to Conveyor; Conveyor to Pile	
Emission Point/Area	TR-1, TR-2	
Operational Data		
Activity, hours	Daily	24
days	Annual	365
Material Handling Data		
Material type		Gypsum
Material throughput, ton/hr (design)	Hourly	83.3
ton/day	Daily	2,750
ton/yr	Annual	1,003,750
Moisture content (M), % (nominal)		10
Number of transfers		2
General/ Site Characteristics		
Mean wind speed, mph	Daily	16.4
	Annual	8.2
Particle size multiplier, PM (k)		0.74
Particle size multiplier, PM10 (k)		0.35
Emission Control Data		
Emission control method	High moisture content (included in emission factor)	
Emission control removal efficiency, %		0
Emission Factor (EF) Equations		
Uncontrolled EF (UEF) Equation	$UEF (lb/ton) = k \times (0.0032) \times (U / 5)^{1.3} / [(M / 2)^{1.4}]$	
Controlled EF (CEF) Equation	$CEF (lb/ton) = UEF (lb/ton) \times [100\% - \text{Removal efficiency} (\%)]$	
Calculated PM Emission Factor (EF)		
Uncontrolled EF, lb/ton	Short term	0.001165
	Annual	0.000473
Controlled EF, lb/ton	Short term	0.001165
	Annual	0.000473
Calculated PM10 Emission Factor (EF)		
Uncontrolled EF, lb/ton	Short term	0.000551
	Annual	0.000224
Controlled EF, lb/ton	Short term	0.000551
	Annual	0.000224
Estimated Emission Rate (ER)		
PM ER lb/hr (daily basis)		0.267
TPY		0.475
PM10 ER lb/hr (daily basis)		0.126
TPY		0.225

Source: USEPA, 1995; AP-42, Section 13.2.4 for Aggregate Handling and Storage Piles.

TABLE A-2
ESTIMATION OF PM EMISSION FACTORS AND RATES
FOR WIND EROSION FROM ACTIVE GYPSUM STORAGE PILES

Parameters	Operations	
	Gypsum handling	Gypsum Stockout Pile
Emission Point/Area		
Storage Pile Data		
Material Type	Gypsum	
Pile Description (shape)	Oval	
Average Storage (ton)		
Average Pile Height (ft)	40	
Average Pile Length (ft)	400	
Average Pile Width (ft)	90	
Size, ft ²	36,000	
Size, acres	0.83	
General/ Site Characteristics		
Days of precipitation greater than or equal to 0.01 inch (p)	Short term	0
	Annual	103
Time (%) that unobstructed wind speed exceeds 5.4 m/s at mean pile height (f)	Short term	60
	Annual	10
Silt content (s), %		3
Particle size multiplier, PM (k)		1.00
Particle size multiplier, PM10 (k)		0.50
Emission Control Data		
Emission control method	None (high moisture content)	
Emission control removal efficiency, %		0
Emission Factor (EF) Equation		
Uncontrolled EF (UEF) Equation	$\text{UEF (lb/day/acre)} = k \times 1.7 \times (s/1.5) \times ((365 - p)/235) \times (f/15)$	
Controlled (Final) EF (CEF) Equation	$\text{CEF (lb/day/acre)} = \text{UEF (lb/day/acre)} \times (100 - \text{Removal efficiency (\%)})$	
Calculated PM Emission Factor (EF)		
Uncontrolled EF, lb/day/acre	Short term	21.12
	Annual	2.53
Controlled EF, lb/day/acre	Short term	21.12
	Annual	2.53
Calculated PM10 Emission Factor (EF)		
Uncontrolled EF, lb/day/acre	Short term	6.80
	Annual	0.81
Controlled EF, lb/day/acre	Short term	6.80
	Annual	0.81
Estimated Emission Rate (ER)		
PM ER lb/hr (daily basis)		0.73
TPY		0.382
PM10 ER lb/hr (daily basis)		0.234
		0.123
TPY		

Source: USEPA, 1992 (Fugitive Dust Background and Technical Information Document for Best Available Control Measures, Section 2.3.1.3.3, Wind Emissions from Continuously Active Piles)