

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Southwest Regional Office

MEMO

TO Air Quality Permit File PA-32-00055I

FROM Alan A. Binder *AAB*
Air Quality Engineering Specialist
Air Quality Program

THROUGH Mark R. Gorog, P.E. *MRG*
Regional Manager
Air Quality Program

DATE June 9, 2015

RE Plan Approval Application
Homer City Generation, L.P.
Homer City Generating Station
Black Lick and Center Townships, Indiana County
APS # 865047, Auth # 1063313, PF # 262713

BACKGROUND

Homer City Generation, L.P. ("HCG") has submitted a plan approval application received by the Department of Environmental Protection ("Department") on February 27, 2015, to establish alternative short term SO₂ emission limits for Units 1, 2 & 3 at Homer City Generating Station ("Homer City GS") located in Black Lick and Center Townships, Indiana County. Alternative short term SO₂ emission limits are proposed for intermittent periods that may only occur during a Unit 1 or Unit 2 startup, and/or module transition within the Novel Integrated Desulfurization ("NID") dry scrubber systems designed to control Units 1 & 2. HCG has not proposed any modifications to current limitations or conditions of other active air quality authorizations for Homer City GS.

PA-32-00055H was issued on April 2, 2012, for the construction and subsequent temporary operation of NID systems including fabric filters and associated support equipment to control SO₂ emissions from Units 1 & 2 at Homer City GS. Three plan approval modifications have subsequently been processed due to design changes of the lime and byproduct handling system, inclusion of a combined hourly SO₂ emissions limit of 6,360 lbs/hr on Units 1, 2 & 3, and clarifying the Units 1 & 2 startup definition. PA-32-00055H currently expires on April 16, 2016. Construction of the NID systems is currently in progress and nearing completion with tie-ins expected during the 4th quarter of 2015 and 2nd quarter of 2016.

Air dispersion modeling conducted in accordance with Section C Conditions #010 and #011 of the as-issued original plan approval resulted in the inclusion of the 6,360 lbs/hr combined SO₂ emission limit on Units 1, 2, & 3. This combined hourly SO₂ limit was determined to protect against a violation of the SO₂ National Ambient Air Quality Standards ("NAAQS"). However; new data supports that compliance with this combined hourly SO₂ limit may not be achievable

for intermittent periods during startup of a Unit controlled by a NID system and during NID system module transitions. Effective operating temperature was originally projected at 200°F but may be near to 235°F, which would allow for a longer period of uncontrolled SO₂ emissions during a startup. NID system module transitions also may result in a short term fluctuation of SO₂ control efficiency (primarily when a new module is opened during load changes), which would allow for a temporary period of elevated SO₂ emissions during a transition.

HCG has conducted and submitted additional air dispersion modeling in support of the proposed alternative SO₂ limits, and to demonstrate that Homer City GS will not violate the SO₂ NAAQS during these intermittent Unit 1 or Unit 2 startups and/or NID system module transitions. HCG has also conducted and submitted a Monte Carlo analysis to further supplement and support the air dispersion modeling results. A technical review of HCG's air quality analysis (including both the air dispersion modeling and Monte Carlo analysis) has been completed by Andrew Fleck, Environmental Group Manager of the Department's Air Quality Modeling Section.¹ Mr. Fleck's conclusions are documented in a separate review memorandum which can be found below in Attachment 1.

This authorization does not directly affect any requirement of PA-32-00055H other than the 6,360 lb/hr combined SO₂ emission limit on Units 1, 2, & 3 (for up to 500 hours per year). Unit-specific SO₂ emission limits of 0.2 lb/MMBtu on a 30-day rolling average, and 5,950 tons in any consecutive 12-month period for Units 1 & 2 remain unchanged. Alternative SO₂ emission limits will be limited not to exceed 500 hours per year consistent with U.S. EPA's guidance for qualifying intermittent operation. Homer City GS will be required to monitor and record each hour during which Unit 1 or Unit 2 is operating in startup or has experienced a NID system module transition. SO₂ continuous emission monitoring systems ("CEMS") currently operating on each Unit are capable of demonstrating compliance with the alternative SO₂ emission limits.

RECOMMENDATIONS

Homer City Generation, L.P. has demonstrated that Homer City Generating Station will not violate the SO₂ NAAQS during intermittent Unit 1 or Unit 2 startups and/or NID system module transitions, and proposed appropriate alternative SO₂ emission limits consistent with that demonstration. I recommend issuance of a Plan Approval with an expiration date of April 16, 2016, (coinciding with PA-32-00055H for these same sources and controls) subject to the standard conditions in Section B of all plan approvals along with the special conditions below.

SPECIAL CONDITIONS

1. This Plan Approval is to authorize alternative short term SO₂ emission limits for Units 1, 2 & 3 during periods of Unit 1 or Unit 2 startup and/or NID system module transition at the Homer City Generating Station located in Black Lick and Center Townships, Indiana County [25 Pa. Code §127.12b].
2. When Unit 1 or Unit 2 is operating in startup, emissions of SO₂ shall not exceed the following alternative limits [25 Pa. Code §127.12b]:

¹ Pennsylvania Department of Environmental Protection, *Air Quality Analysis of Sulfur Dioxide Emissions*, Homer City Generation, L.P., Application for Plan Approval PA-32-00055I, Andrew W. Fleck, June 3, 2015.

- 9,000 lbs/hr from the Unit (1 or 2) in startup;
- 1,913 lbs/hr from the Unit (1 or 2) not in startup; and
- 2,720 lbs/hr from Unit 3.

[This condition supersedes the combined 6,360 lbs/hr SO₂ limit of Section C Condition #001 of PA-32-00055H as revised December 16, 2013, and expiring April 16, 2016, as an alternative limit for up to 500 hours per 12-month rolling period combined with the NID system module transition alternative emission limit.]

3. Startup for Units 1 & 2 is defined as beginning upon firing fuel in a boiler after a shutdown event for any purpose and ending when the flue gas temperature entering the NID system is above the minimum effective operating temperature. Startup duration may not exceed the time necessary to reach the minimum effective operating temperature of the NID system [25 Pa. Code §127.12b].
4. The Owner/Operator shall monitor and record NID system operating parameters to determine when minimum effective operating temperature and flow rates have been reached [25 Pa. Code §127.12b].
5. Units 1 & 2 shall not operate in startup simultaneously [25 Pa. Code §127.12b].
6. Units 1 & 2 individual startups shall not exceed 24 consecutive hours [25 Pa. Code §127.12b].
7. When a NID system module is operating in transition, combined emissions of SO₂ from Units 1, 2 & 3 shall not exceed the alternative limit of 7,300 lbs/hr [25 Pa. Code §127.12b].

[This condition supersedes the combined 6,360 lbs/hr SO₂ limit of Section C Condition #001 of PA-32-00055H as revised December 16, 2013, and expiring April 16, 2016, as an alternative limit for up to 500 hours per 12-month rolling period combined with the Unit 1 & 2 startup alternative emission limits.]

8. NID system module transition is defined as beginning upon opening a previously closed NID system module or closing a previously opened NID system module to flue gas flow from Unit 1 or Unit 2. The initial opening of NID system modules upon startup of Unit 1 or Unit 2 is excluded from this definition. Individual NID system module transition duration may not exceed 1 hour per transition [25 Pa. Code §127.12b].
9. Startup and NID system module transitions with combined emission rates exceeding 6,360 lbs/hr may not exceed 500 hours in any 12-month rolling period [25 Pa. Code §127.12b].
10. Startup and NID system module transition alternative SO₂ emission limits may only be applied to individual block hours occurring during a Unit 1 or Unit 2 startup or NID system module transition [25 Pa. Code §127.12b].
11. The Owner/Operator shall monitor and record each hour during which Unit 1 or Unit 2 is operating in startup or has experienced a NID system module transition [25 Pa. Code §127.12b].

12. The Owner/Operator shall achieve minimum effective operating temperatures and flow rates as expeditiously as possible consistent with good air pollution control practices when starting up Unit 1 or Unit 2 or transitioning between NID system modules [25 Pa. Code §127.12b].
13. Upon determination by the Owner/Operator that the source(s) covered by this Plan Approval are in compliance with all conditions of the Plan Approval the Owner/Operator shall contact the Department's reviewing engineer and schedule the Initial Operating Permit Inspection [25 Pa. Code §127.12b].
14. Upon completion of the Initial Operating Permit Inspection and determination by the Department that the source(s) covered by this Plan Approval are in compliance with all conditions of the Plan Approval the Owner/Operator shall submit either a Title V Operating Permit ("TVOP") administrative amendment application or a revision to a pending TVOP application for this Facility [25 Pa. Code §127.12b].
15. If, at any time, the Department has cause to believe that air contaminant emissions from the sources listed in this Plan Approval may be in excess of the limitations specified in, or established pursuant to this plan approval or the permittee's operating permit, the permittee may be required to conduct test methods and procedures deemed necessary by the Department to determine the actual emissions rate. Such testing shall be conducted in accordance with 25 Pa. Code Chapter 139, where applicable, and in accordance with any restrictions or limitations established by the Department at such time as it notifies the company that testing is required [25 Pa. Code §127.12b].

Attachment 1

Air Quality Analysis of Sulfur Dioxide Emissions Review



pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

MEMO

TO Alan A. Binder
Air Quality Engineering Specialist
New Source Review Section
Southwest Regional Office

FROM Andrew W. Fleck/*AWF*
Environmental Group Manager
Air Quality Modeling Section
Division of Air Resource Management

DATE June 3, 2015

RE Air Quality Analysis of Sulfur Dioxide Emissions
Homer City Generation, L.P.
Application for Plan Approval 32-00055I
Homer City Generating Station
Black Lick Township and Center Township, Indiana County

The Pennsylvania Department of Environmental Protection (DEP) received a Plan Approval Application on February 27, 2015, from Homer City Generation, L.P. (Homer City). Homer City seeks to establish alternate sulfur dioxide (SO₂) emission limits at the Homer City Generating Station in Black Lick Township and Center Township, Indiana County. The DEP notified Homer City on March 27, 2015, that the Plan Approval Application was administratively complete.¹ The Plan Approval Application was prepared by Environmental Resources Management (ERM), on behalf of the applicant.

Homer City's alternate SO₂ emission limits would apply for up to 500 hours per year when Unit 1 or Unit 2 are in startup and/or when the Novel Integrated Desulfurization (NID) systems are in transition. The NID systems are currently being installed on Unit 1 and Unit 2. Homer City's Plan Approval Application contains an air quality analysis of SO₂ emissions consisting of air dispersion modeling and a Monte Carlo analysis. The DEP's technical review concludes that Homer City's air quality analysis demonstrates that Homer City's SO₂ emissions would not cause air pollution in violation of the 1-hour SO₂ National Ambient Air Quality Standard (NAAQS) with the alternate SO₂ emission limits proposed in the Plan Approval Application for periods of Unit 1 or Unit 2 startup and/or NID systems transition.

Air Dispersion Modeling

Homer City's air dispersion modeling is consistent with the U.S. Environmental Protection Agency's (EPA) *Guideline on Air Quality Models*² and the EPA's relevant air quality modeling

¹ Letter from Alan A. Binder, DEP to Gary R. Cline, Homer City. March 27, 2015.

² *Code of Federal Regulations*. 40 CFR 51, Appendix W.

guidance. Additionally, Homer City's air dispersion modeling is consistent with the methods and procedures described in Homer City's modeling protocol³ established with the DEP.⁴

The air dispersion modeling utilized the EPA's recommended near-field dispersion model, the American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD).⁵ AERMOD was executed with regulatory default options.

Homer City's emissions of SO₂ are emitted to the atmosphere via unobstructed vertical stacks, which were characterized in AERMOD as point sources. These point sources include stacks for Unit 1, Unit 2, Unit 3, the Auxiliary Boiler, the Units 1 and 2 Emergency Generator, the Unit 3 Emergency Generator, and the Emergency Fire Pump. Direction-specific downwash parameters, calculated by the EPA's Building Profile Input Program modified for the Plume Rise Model Enhancements algorithms (BPIPPEM), were entered in AERMOD for Homer City's point sources. Additionally, appropriate SO₂ background data from the DEP's State College monitor (Site ID: 42-027-0100) for 2009 – 2011, with temporal variability by season and hour-of-day, were entered in AERMOD.

Receptors were entered in AERMOD at locations defined to be ambient air⁶ to a distance of approximately 20 kilometers from the Homer City facility. The extent and density of AERMOD's receptor domain is adequate to determine the location and magnitude of the maximum concentrations. Receptor elevations and hill height scales were calculated by the AERMOD terrain preprocessor (AERMAP) using the U.S. Geological Survey's National Elevation Dataset (NED).

AERMOD utilized a 5-year (2006 – 2010) meteorological dataset derived from primary surface data from Johnstown – Cambria County Airport and upper air data from Pittsburgh International Airport. This dataset allowed AERMOD to construct a representative vertical structure of the planetary boundary layer within the modeling domain under both convective and stable conditions in order to properly characterize plume transport and dispersion. The meteorological dataset was processed with the AERMOD meteorological preprocessor (AERMET).

Monte Carlo Analysis

Homer City's Monte Carlo analysis was conducted to simulate the intermittent operation of Unit 1 or Unit 2 in startup and/or when the NID systems are in transition to determine the likelihood that worst-case emissions during these periods would coincide with worst-case meteorological conditions, resulting in a violation of the 1-hour SO₂ NAAQS:

³ EME Homer City Generation LP, Homer City Generating Station. Indiana, PA. Units 1 and 2 Flue Gas Desulfurization System Project. Air Quality Modeling Protocol for SO₂. Revised October 2012.

⁴ Letter from Andrew W. Fleck, DEP to Mark E. Garrison, ERM. November 19, 2012.

⁵ *Code of Federal Regulations*. 40 CFR 51, Appendix W. Guideline on Air Quality Models. Subsections 4.2.2(b) and 4.2.2(c).

⁶ *Code of Federal Regulations*. 40 CFR 50(e)(1).

The 1-hour SO₂ NAAQS has a probabilistic form⁷ that is reasonably stable because it mitigates the impact that outliers in a concentration distribution might have on the design value. According to the EPA's guidance,⁸ the agency is "concerned that assuming continuous operations for intermittent emissions would effectively impose an additional level of stringency beyond that intended by the level of the standard itself." By assuming continuous operation for intermittent emissions, there would potentially be a significant overestimation of impacts because these emissions would coincide with worst-case meteorological conditions. More recent EPA guidance⁹ has suggested that probability analyses, similar to a Monte Carlo analysis, are appropriate for setting emission limits and assessing compliance with the 1-hour SO₂ NAAQS.

The Monte Carlo analysis relied on the following three datasets: (1) a concentration dataset resulting from air dispersion modeling assuming operation of Unit 1, Unit 2, and Unit 3 at full capacity with total emissions of 6,360 pounds per hour; (2) a concentration dataset resulting from air dispersion modeling for each of 42 startups of Unit 1 and Unit 2 that occurred between January 2010 and June 2013 (startup emission data were adjusted to reflect future NID systems operation); and (3) a concentration dataset that was scaled upwards to reflect the increase in emission rate when Unit 1 and/or Unit 2 experience a NID systems transition.

Each Monte Carlo simulation randomly and conservatively selected, for each month in the 5-year meteorological data period, (1) a date and time for five startups per month from the dataset of 42 startups which range in duration from 7 to 31 hours, and (2) a date and time for 40 NID system transitions per month, assuming that each transition lasts one hour. For the remainder of the meteorological data period in the simulation, the Homer City facility was assumed to operate Unit 1, Unit 2, and Unit 3 at full capacity with fully functional NID systems and total emissions of 6,360 pounds per hour.

The Monte Carlo program ran 1,000 simulations, each covering the entire 5-year meteorological data period. The Monte Carlo analysis demonstrates that the SO₂ emissions from Unit 1 or Unit 2 during periods of startup and/or transition of the NID systems, with the alternate SO₂ emission limits proposed in the Plan Approval Application, would not be frequent enough or continuous enough to contribute significantly to the annual distribution of daily maximum 1-hour SO₂ concentrations. None of these Monte Carlo simulations predicted a violation of the 1-hour SO₂ NAAQS; therefore, a 1-hour SO₂ NAAQS violation is not expected based on this analysis.

If you have any questions regarding the DEP's review of Homer City's air quality analysis of SO₂ emissions, you may contact me by e-mail at afleck@pa.gov or by telephone at 717.783.9243.

⁷ *Federal Register*. 75 FR 35520. Primary National Ambient Air Quality Standard for Sulfur Dioxide; Final Rule. June 22, 2010.

⁸ EPA, 2011. Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard. Memorandum from Tyler Fox, Air Quality Modeling Group, to Regional Air Division Directors. March 1, 2011. Page 9 under Treatment of Intermittent Emissions. Page 1 states this memo "should apply equally to the 1-hour SO₂ standard."

⁹ EPA, 2014. Guidance for 1-Hour SO₂ Nonattainment Area SIP Submissions. April 2014. Page B-3.

cc: Joyce Epps, BAQ Director
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