pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

TO Alexander Sandy
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FROM Andrew W. Fleck AWF
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DATE April 27, 2020

RE Summary of Air Quality Analyses for Prevention of Significant Deterioration
Robinson Power Company, LLC
Application for Modification to Plan Approval 63-00922D
Revised Design Plans for Proposed Beech Hollow Energy Facility
Robinson Township, Washington County

Background

The Pennsylvania Department of Environmental Protection (DEP) received a Plan Approval Application[1] on February 8, 2019, from Robinson Power Company, LLC (Robinson Power) that requests revisions to Plan Approval 63-00922D. The Plan Approval Application was prepared by Burns & McDonnell, on behalf of Robinson Power. On March 28, 2019, the DEP's Southwest Regional Office (SWRO) notified Robinson Power that the Plan Approval Application was administratively complete.[2]

Plan Approval 63-00922D, initially issued by the DEP on October 27, 2017, and later modified on October 4, 2018, allows the construction and temporary operation of the Beech Hollow Energy facility, a proposed natural gas combined cycle electric power generation facility with a nominal capacity of 1,000 megawatts in Robinson Township, Washington County. Robinson Power has revised its design plans for the Beech Hollow Energy facility which, in turn, necessitated revisions to the air quality analyses included in Robinson Power's initial application for Plan Approval 63-00922D.

[1] Letter with attachments from Raymond J. Bologna, Robinson Power to Mark Gorog, DEP SWRO. February 4, 2019.
[2] Letter from Alexander Sandy, DEP SWRO to Raymond J. Bologna, Robinson Power. March 28, 2019.

PSD Requirements

The Beech Hollow Energy facility would be a new major stationary source. Robinson Power's application for Plan Approval 63-00922D was therefore subject to the Prevention of Significant Deterioration (PSD) regulations codified in 40 CFR § 52.21. These federal PSD regulations are adopted and incorporated by reference in their entirety in 25 *Pa. Code* § 127.83 and the Commonwealth's State Implementation Plan codified in 40 CFR § 52.2020.

The Beech Hollow Energy facility's potential to emit would equal or exceed the PSD significant emission rates[3] (SER) for carbon monoxide (CO), nitrogen oxides (NO_X), particulate matter less than or equal to 2.5 micrometers in diameter (PM-2.5), particulate matter less than or equal to 10 micrometers in diameter (PM-10), and sulfuric acid mist (H_2SO_4). Robinson Power's Plan Approval Application therefore contains revisions to the following air quality analyses which were included in its application for Plan Approval 63-00922D:

- Analyses pursuant to 40 CFR § 52.21(k) through (n) for emissions of CO, NO_X, PM-2.5, and PM-10;

- Analyses pursuant to 40 CFR § 52.21(o) for visibility, soils, and vegetation that account for growth associated with the project; and

- Initial screening calculations for analyses pursuant to 40 CFR § 52.21(p) for air quality related values (AQRV) and visibility in nearby federal Class I areas.

Model Selection and Options

Robinson Power's air dispersion modeling was conducted with the American Meteorological Society (AMS) / U.S. Environmental Protection Agency's (EPA) Regulatory Model (AERMOD) v18081. AERMOD is the EPA's required near-field air dispersion model for a wide range of regulatory applications in all types of terrain and for aerodynamic building downwash.[4] Robinson Power utilized Providence/Oris proprietary software, BEEST Suite version 11.14, to execute AERMOD and provided a test case example to demonstrate that the modeled concentrations were not affected by using this software.

AERMOD was executed with regulatory default options. In the 1-hour nitrogen dioxide (NO_2) analyses, the Ambient Ratio Method 2 (ARM2) option was selected with default upper and lower limits on the ambient NO_2/NO_X ratio applied to the modeled NO_X concentration of 0.9 and 0.5, respectively.

Source Data Input

The Beech Hollow Energy facility would consist of the following emission sources:

[3] *Code of Federal Regulations*. 40 CFR § 52.21(b)(23)(i).
[4] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). Subsection 4.2.2.1.

- Two General Electric HA.02 combined cycle combustion turbines fueled with natural gas, each with a heat recovery steam generator also fueled with natural gas;
- One auxiliary boiler fueled with natural gas;
- Two dew point gas heaters fueled with natural gas; and
- One emergency fire water pump fueled with ultra-low sulfur diesel.

The Beech Hollow Energy facility's emissions of CO, NO_X, PM-2.5, and PM-10 would be emitted to the atmosphere via typical unobstructed vertical stacks which were characterized in AERMOD as point sources.

The emission rates and associated parameters entered in AERMOD are consistent with the those provided in Robinson Power's Plan Approval Application.

The following emission rates were adjusted by an operating factor to account for operation over periods greater than 1 hour:

- In the annual NO_2, annual PM-2.5, and annual PM-10 analyses, the emission rates entered in AERMOD for the auxiliary boiler were adjusted by an operating factor of 2,000 hours per year (hr/yr). Robinson Power's Plan Approval should therefore contain a condition restricting the operation of the auxiliary boiler.

- In the 24-hour PM-2.5 and 24-hour PM-10 analyses, the emission rates entered in AERMOD for the emergency fire water pump were adjusted by an operating factor of 1 hour per day (hr/dy). In the annual NO_2, annual PM-2.5, and annual PM-10 analyses, the emission rates entered in AERMOD for the emergency fire water pump were adjusted by an operating factor of 100 hr/yr. Robinson Power's Plan Approval should therefore contain conditions restricting the operation of the emergency fire water pump during testing.

In all the analyses, the emission rates and exit velocities entered in AERMOD for the dew point heaters, when both are operating, were based on operation at 50% of capacity, i.e., 50% load. Robinson Power's Plan Approval should therefore contain a condition restricting the operation capacity of the dew point heaters when both are operating.

According to the EPA's guidance,[5] an intermittent emission source or intermittent emission scenario would likely not be continuous enough or frequent enough to affect 1-hour NO_2 design concentrations. In the 1-hour NO_2 analysis, emission data associated with the emergency fire water pump, considered to be an intermittent source, were not included in AERMOD. Robinson Power's Plan Approval should therefore contain conditions restricting the magnitude, duration, and frequency of the emergency fire water pump's emissions during testing based on information provided in the Plan Approval Application. Likewise, in the 1-hour NO_2 analysis, emission data associated with startup and shutdown of the combustion turbines, considered to be intermittent

[5] Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard. EPA memorandum from Tyler Fox, Air Quality Modeling Group to Regional Air Division Directors. March 1, 2011. Pages 8-11.

emission scenarios, were not included in AERMOD. Robinson Power's Plan Approval should therefore contain conditions restricting the magnitude, duration, and frequency of the emissions associated with startup and shutdown of the combustion turbines based on information provided in the Plan Approval Application.

To account for secondary PM-2.5 formation due to the Beech Hollow Energy facility's emissions of PM-2.5 precursors, i.e., NO_X and sulfur dioxide (SO_2), the results of the 24-hour and annual PM-2.5 analyses were appropriately adjusted upward based on the EPA's guidance.[6]

The stack height entered in AERMOD for each Beech Hollow Energy facility point source does not exceed Good Engineering Practice (GEP) stack height.[7] Direction-specific downwash parameters, calculated by the EPA's Building Profile Input Program for the Plume Rise Model Enhancements algorithm (BPIPPRM) v04274, were entered in AERMOD for each Beech Hollow Energy facility point source.

The PM-2.5 minor source baseline date[8] was established as March 14, 2016,[9] for the PM-2.5 baseline area[10] consisting of all of Washington County, by Robinson Power's application for Plan Approval 63-00922D. The DEP did not identify any actual emissions[11] from any major stationary source on which construction commenced after the major source baseline date of October 20, 2010,[12] or any actual emissions increases and decreases at any stationary source occurring after the minor source baseline date of March 14, 2016, that would affect PM-2.5 Class II PSD increment in the area that would be affected by the Beech Hollow Energy facility.

Receptor Data Input

Receptors were entered in AERMOD at locations defined to be ambient air.[13] The extent and density of AERMOD's receptor domain were 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) v11103[14] using the U.S. Geological Survey's (USGS) National Elevation Dataset (NED), except along the Beech Hollow Energy facility's ambient air boundary, i.e., fence line, in which case, the receptor data were determined from a site plan since regrading is planned.

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[6] Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ under the PSD Permitting Program (EPA-454/R-19-003, April 2019).
[7] "Good Engineering Practice stack height" defined in 40 CFR § 51.100(ii).
[8] "Minor source baseline date" for PM-2.5 defined in 40 CFR § 52.21(b)(14)(ii).
[9] Robinson Power submitted a complete PSD application for Plan Approval 63-00922D on March 14, 2016. The date, April 22, 2016, stated in the April 26, 2017, memorandum from John M. La Rosa, DEP Air Quality Modeling Section to Alan A. Binder, P.E., DEP SWRO as the minor source baseline date was incorrect and was the date the SWRO determined Robinson Power's application for Plan Approval 63-00922D to be administratively complete.
[10] "Baseline area" defined in 40 CFR § 52.21(b)(15)(i).
[11] "Actual emissions" defined in 40 CFR § 52.21(b)(21).
[12] "Major source baseline date" for PM-2.5 defined in 40 CFR § 52.21(b)(14(i)(c).
[13] "Ambient air" defined in 40 CFR § 50(e)(1).
[14] Subsection 1.3.4 of Robinson Power's modeling document incorrectly states that AERMAP v18081 was utilized.

Meteorological Data Input

AERMOD utilized a 5-year meteorological dataset consisting of hourly records from January 1, 2013, through December 31, 2017, derived from surface data and upper air data from Pittsburgh International Airport (KPIT).

The meteorological dataset was processed by the DEP with the AERMOD meteorological preprocessor (AERMET) v18081 and its associated preprocessors, AERMINUTE v15272 and AERSURFACE v13016. In AERMET, the surface friction velocity adjustment (ADJ_U*) option was used in regulatory default mode. This option is intended to address concerns regarding AERMOD's performance, i.e., overprediction of concentrations during stable low wind speed meteorological conditions, by adjusting the surface friction velocity based on Qian and Venkatram (2011).[15]

The fully processed dataset was appropriate for AERMOD to construct realistic boundary layer profiles to adequately represent plume transport and dispersion under both convective and stable conditions within the modeling domain.

Existing Ambient Air Quality

Existing ambient PM-2.5 air quality was established for the area that the Beech Hollow Energy facility's emissions of PM-2.5 and PM-2.5 precursors would affect by utilizing representative 24-hour and annual PM-2.5 design values based on data measured at the DEP's Florence monitor (Site ID: 42-125-5001) from January 1, 2016, through December 31, 2018. These PM-2.5 design values were used to support the conclusion that the impacts of the Beech Hollow Energy facility's emissions of PM-2.5 and PM-2.5 precursors, which were calculated to be below the PM-2.5 National Ambient Air Quality Standards (NAAQS) significant impact levels (SIL), would not cause or contribute to violations of the NAAQS, without having to conduct cumulative impact analyses. Furthermore, trends in the 24-hour and annual PM-2.5 concentrations since the major source baseline date and minor source baseline date were used to support the conclusion that the impacts of the Beech Hollow Energy facility's emissions of PM-2.5 and PM-2.5 precursors, which were calculated to be below the PM-2.5 Class II PSD increment SILs, would not cause or contribute to violations of the Class II PSD increments, without having to conduct cumulative impact analyses.

The DEP is hereby exempting Robinson Power from the PSD pre-application ambient monitoring requirements[16] for CO, NO_2, and PM-10 since the impacts of the Beech Hollow Energy facility's emissions were calculated by AERMOD to be less than the 8-hour CO, annual NO_2, and 24-hour PM-10 significant monitoring concentrations (SMC).[17] Furthermore, there are currently no ambient monitors statewide with measured CO, NO_2, or PM-10 concentrations in which the NAAQS are threatened, even in areas with emissions that are greater than the emissions in the area that would be affected by the Beech Hollow Energy facility. This finding

[15] Qian, W., and A. Venkatram, 2011. Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions. *Boundary Layer Meteorology*, 138, 475-491.
[16] *Code of Federal Regulations*. 40 CFR § 52.21(m).
[17] *Code of Federal Regulations*. 40 CFR § 52.21(i)(5).

was used by the DEP to support the conclusion that the impacts of the Beech Hollow Energy facility's emissions of CO, NO_X, and PM-10, which were calculated to be below the respective SILs, would not cause or contribute to violations of the NAAQS, without having to conduct cumulative impact analyses.

The DEP is also hereby exempting Robinson Power from the PSD pre-application ambient monitoring requirements for H_2SO_4 since the EPA has not established an SMC for H_2SO_4.[18]

SIL Analyses Results

The impacts of the Beech Hollow Energy facility's emissions were calculated by AERMOD to be less than the following:

- The EPA's 1-hour CO and 8-hour CO NAAQS SILs;[19]
- The EPA's 1-hour NO_2 interim NAAQS SIL;[20,21]
- The EPA's annual NO_2 NAAQS SIL;[22]
- The EPA's 24-hour PM-2.5 and annual PM-2.5 NAAQS SILs;[23]
- The EPA's 24-hour PM-10 NAAQS SIL;[24]
- The EPA's annual NO_2, 24-hour PM-10, and annual PM-10 Class II PSD increment SILs;[25] and
- The EPA's 24-hour PM-2.5 and annual PM-2.5 Class II PSD increment SILs.[26]

Cumulative impact analyses were therefore not necessary for the 1-hour CO, 8-hour CO, 1-hour NO_2, annual NO_2, 24-hour PM-2.5, annual PM-2.5, and 24-hour PM-10 NAAQS, and the annual NO_2, 24-hour PM-2.5, annual PM-2.5, 24-hour PM-10, and annual PM-10 Class II PSD increments.

The impacts of the Beech Hollow Energy facility's emissions were conservatively calculated by AERMOD to be less than the following:

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[18] Ibid.
[19] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2).
[20] Guidance Concerning the Implementation of the 1-hour NO_2 NAAQS for the Prevention of Significant Deterioration Program. EPA memorandum from Stephen D. Page, Office of Air Quality Planning and Standards (OAQPS) to Regional Air Division Directors. June 29, 2010. Pages 11-13.
[21] Interim 1-Hour Significant Impact Levels for Nitrogen Dioxide and Sulfur Dioxide. DEP memorandum from Andrew W. Fleck, Air Quality Modeling Section to Regional Air Program Managers. December 1, 2010.
[22] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2).
[23] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 15-16.
[24] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2).
[25] *Code of Federal Regulations*. 40 CFR § 51.165(b)(2). Based on long-standing EPA policy and guidance, these SILs have also been applied to Class II PSD increments.
[26] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 16-17.

- The EPA's annual NO_2, 24-hour PM-10, and annual PM-10 proposed Class I PSD increment SILs;[27] and
- The EPA's 24-hour PM-2.5 and annual PM-2.5 Class I PSD increment SILs.[28]

Cumulative impact analyses were therefore not necessary for the annual NO_2, 24-hour PM-2.5, annual PM-2.5, 24-hour PM-10, and annual PM-10 Class I PSD increments.

PSD Increment

In accordance with 25 *Pa. Code* § 127.45(b)(4), the DEP's notice of proposed plan approval issuance in the *Pennsylvania Bulletin* must include, for sources subject to the PSD regulations, "the degree of increment consumption expected to result from the operation of the source or facility." To this end, the degree of Class II and Class I PSD increment consumption expected to result from the operation of Robinson Power's Beech Hollow Energy facility is provided in the following tables:

Degree of Class II PSD Increment Consumption from Operation of Robinson Power's Beech Hollow Energy Facility

Pollutant	Averaging Period	Degree of Class II PSD Increment Consumption		Class II PSD Increment
		micrograms per cubic meter	Percent of Class II PSD Increment	micrograms per cubic meter
NO_2	Annual	< 0.14405	< 0.58 %	25
PM-2.5	24-hour	< 1.13916	< 12.66 %	9
	Annual	< 0.06115	< 1.53 %	4
PM-10	24-hour	< 1.13916	< 3.80 %	30
	Annual	< 0.06115	< 0.36 %	17

Degree of Class I PSD Increment Consumption from Operation of Robinson Power's Beech Hollow Energy Facility

Pollutant	Averaging Period	Degree of Class I PSD Increment Consumption		Class I PSD Increment
		micrograms per cubic meter	Percent of Class I PSD Increment	micrograms per cubic meter
NO_2	Annual	< 0.00606	< 0.25 %	2.5
PM-2.5	24-hour	< 0.05802	< 2.91 %	2
	Annual	< 0.00380	< 0.39 %	1
PM-10	24-hour	< 0.05802	< 0.73 %	8
	Annual	< 0.00380	< 0.10 %	4

[27] *Federal Register*. 61 FR 38249. Prevention of Significant Deterioration and Nonattainment New Source Review; Proposed Rule. July 23, 1996.

[28] Guidance on Significant Impact Levels for Ozone and Fine Particles in the Prevention of Significant Deterioration Permitting Program. EPA memorandum from Peter Tsirigotis, OAQPS to Regional Air Division Directors. April 17, 2018. Pages 16-17.

Confirmation of Air Dispersion Modeling Results

The DEP confirmed the overall results of Robinson Power's air dispersion modeling by executing AERMOD upon reviewing the appropriateness of all model input, i.e., model options, emission data, downwash data, terrain data, and meteorological data. The DEP executed the most recent version of AERMOD, v19191, with terrain data that were processed with the most recent version of AERMAP, v18081, and a meteorological dataset that was processed with the most recent version of AERMET, v19191.

In the Class I PSD increment SIL analyses, Robinson Power did not enter the correct receptor elevations in AERMOD to represent the minimum elevation in the Otter Creek Wilderness Area. In its review, the DEP corrected this error in AERMOD and confirmed that the results of Robinson Power's Class I PSD increment SIL analyses did not change.

Additional Impact Analyses

No impairment to visibility is expected from the Beech Hollow Energy facility's emissions based on a Level-2 plume visual impact screening analysis for Hillman State Park using VISCREEN v13190 in accordance with the EPA's guidance.[29] The Iowa Department of Natural Resources Level-2 Visibility Screening Tool[30] was used to determine the meteorological conditions to be entered in VISCREEN for the Level-2 analysis.

No adverse impacts to soils and vegetation are expected from the Beech Hollow Energy facility's emissions.

General commercial, residential, industrial, and other growth associated with the Beech Hollow Energy facility is expected to be negligible.

The DEP notes that the secondary NAAQS were established to protect visibility and vegetation, among other things, and the impacts of the Beech Hollow Energy facility's emissions were estimated by AERMOD to be less than the secondary NAAQS for the criteria pollutants subject to PSD review.

Class I Area Analyses for AQRVs and Visibility

The DEP's SWRO provided written notice[31] of the revisions to the proposed Beech Hollow Energy facility to the Federal Land Managers (FLM) of the following nearby federal Class I areas: Dolly Sods Wilderness and Otter Creek Wilderness in West Virginia and Shenandoah

[29] Workbook for Plume Visual Impact Screening and Analysis (Revised). October 1992. Publication No. EPA-454/R-92-023. Office of Air Quality Planning and Standards, Research Triangle Park, NC.
[30] Iowa Department of Natural Resources Level-2 Visibility Screening Tool (viscreen_tool.zip) was downloaded from https://www.iowadnr.gov/Environmental-Protection/Air-Quality/Modeling/Dispersion-Modeling#249516-psd-modeling-guidance.
[31] E-mail with attachment from Alexander Sandy, DEP SWRO to U.S. Forest Service and National Park Service representatives. March 8, 2019.

National Park in Virginia. The notice included initial screening calculations[32] to demonstrate that the Beech Hollow Energy facility's emissions would not adversely impact AQRVs and visibility in these nearby federal Class I areas. The FLM of each nearby federal Class I area stated that no analyses for AQRVs and visibility would be necessary.[33,34]

Conclusions

The DEP's technical review concludes that Robinson Power's air quality analyses satisfy the requirements of the PSD regulations. Additionally, Robinson Power provided adequate responses[35,36] to the DEP's comments[37] on the air quality analyses.

In accordance with 40 CFR § 52.21(k), Robinson Power's source impact analyses demonstrate that the Beech Hollow Energy facility's emissions would not cause or contribute to air pollution in violation of the NAAQS for CO, NO_2, PM-2.5, or PM-10. Additionally, Robinson Power's source impact analyses demonstrate that the Beech Hollow Energy facility's emissions would not cause or contribute to air pollution in violation of the Class II or Class I PSD increments for NO_2, PM-2.5, or PM-10.

In accordance with 40 CFR § 52.21(l), Robinson Power's estimates of ambient concentrations are based on applicable air quality models, data bases, and other requirements specified in the EPA's *Guideline on Air Quality Models*[38] as well as the EPA's relevant air quality modeling policy and guidance.

In accordance with 40 CFR § 52.21(m), Robinson Power provided an analysis of existing ambient air quality for PM-2.5 in the area that the Beech Hollow Energy facility would affect which included existing representative ambient monitoring data for PM-2.5. Robinson Power was exempted from the requirements of 40 CFR § 52.21(m) for CO, NO_2, PM-10, and H_2SO_4.

In accordance with 40 CFR § 52.21(n), Robinson Power provided all information necessary to perform the air quality analyses required by the PSD regulations, including all dispersion modeling data necessary to estimate the air quality impacts of the Beech Hollow Energy facility's emissions.

In accordance with 40 CFR § 52.21(o), Robinson Power provided additional impact analyses of the impairment to visibility, soils, and vegetation that would occur as a result of the Beech

[32] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, 2010. Federal Land Managers' Air Quality Related Values Work Group (FLAG): Phase I Report – Revised (2010). Natural Resource Report NPS/NRPC/NRR – 2010/232. National Park Service, Denver, CO. Subsection 3.2.
[33] E-mail from Holly Salazer, National Park Service to Alexander Sandy, DEP SWRO. April 2, 2019.
[34] E-mail from Jeremy Ash, U.S. Forest Service to Alexander Sandy, DEP SWRO. July 16, 2019.
[35] E-mail with attachment from Mary Hauner-Davis, Burns & McDonnell to John M. La Rosa, DEP Air Quality Modeling Section. August 26, 2019.
[36] Letter with enclosure (disk containing modeling data) from Emily Robbins, Burns & McDonnell to Andrew Fleck, DEP Air Quality Modeling Section. October 24, 2019.
[37] E-mail with attachment from John M. La Rosa, DEP Air Quality Modeling Section to Mary Hauner-Davis, Burns & McDonnell. July 11, 2019.
[38] *Code of Federal Regulations*. 40 CFR Part 51, Appendix W.

Hollow Energy facility and general commercial, residential, industrial, and other growth associated with the Beech Hollow Energy facility.

In accordance with 40 CFR § 52.21(p), written notice of the revisions to the proposed Beech Hollow Energy facility has been provided to the FLMs of nearby federal Class I areas as well as initial screening calculations to demonstrate that the Beech Hollow Energy facility's emissions would not adversely impact AQRVs and visibility in nearby federal Class I areas.

The technical review of Robinson Power's air quality analyses for PSD was conducted by John La Rosa, who is no longer employed with the DEP. If you have any questions regarding Robinson Power's air quality analyses for PSD, you may therefore contact me by e-mail at afleck@pa.gov or by telephone at 717.783.9243.

cc: Viren Trivedi, BAQ Acting Director
Sean Wenrich, BAQ New Source Review
Mark Gorog, SWRO Air Quality
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