ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

November 7, 2012

Subject: Revision of Review Memo for BART Application
Gen*On* Power Midwest LP
Cheswick Plant

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1. Background:

The Regional Haze regulation in 40 CFR 51.308(e) requires state implementation plans (SIPs) to contain emission limits representing Best Available Retrofit Technology (BART) for certain facilities that may reasonably be anticipated to cause or contribute to visibility impairment at a Class I area. The BART requirements apply to units that were in existence on August 7, 1977 but were not in operation before August 7, 1962 that collectively, at a facility, have the potential to emit more than 250 tons per year of a visibility impairing pollutant. Visibility impairing pollutants include: NOx, SO_2, PM10, and PM2.5. VOC and NH_3 may be visibility-impairing pollutants; however the PA Department of Environmental Protection (DEP) has determined that modeling tools to assess the visibility impacts from VOC and NH_3 adequately are not available at this time. The BART requirements only apply to facilities in 26 specific categories listed in the Clean Air Act.

States and local agencies are required to determine BART for each unit subject to BART based on an analysis of the best system of continuous emission control technology available and associated emission reductions achievable. The analysis must take into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts, any pollution control equipment in use at the units, the remaining useful life of the units, and the degree of improvement in visibility which may reasonably be anticipated to result from use of the technology.

The Allegheny County Health Department (ACHD) requested that Allegheny County facilities subject to BART conduct the BART analysis required by the Regional Haze rule and submit a BART proposal. The PA DEP and ACHD have determined that an engineering analysis of VOC control options is not needed, as visibility impairment contributions of VOCs from BART-eligible sources have been found to

have a combined negligible impact of less than 0.05 dv on Class I areas in other studies (see VISTAS 2007). EPA has determined that BART requirements for EGUs (Electric Generating Units) covered by CAIR are satisfied by the CAIR requirements for NO_x and SO_2 so an engineering analysis is not required for these pollutants. For Allegheny County EGUs the only pollutant requiring an engineering analysis is PM10.

A BART review memo was previously submitted on May 4, 2009. Since that time, the facility was issued an Installation Permit (IP No. 0054-I004a) and a Title V Operating Permit (TVOP No. 0054). During the permitting process, the PM10 emission limits in the previous BART review memo of 361.0 tons/year were found to be incorrect. The current BART review memo requirements reflect the current control devices, emission limits and regulations that the facility is bound to by their Installation and Title V Operating Permits.

2. Process Description:

GenOn Cheswick is a fossil fuel fired steam electric generating plant of more than 250 million BTU's per hour heat input. The plant is composed of one main boiler (Boiler #1) exhausting to one stack, which fires coal or synfuel as an alternate fuel. Natural gas is combusted as an auxiliary fuel for startup, shutdown, and at the operator's discretion. Pollution control equipment for the main boiler includes low NO_x burners, electrostatic precipitation with flue gas conditioning, selective catalytic reduction and flue gas desulfurization (FGD). The boiler is rated at 5,500 MMBtu/hr when combusting coal or synfuel.

Boiler #1 was originally constructed between 1962 and 1977, and the total emissions of three of the eligible pollutants (SO_2, NO_x and PM10) are over 250 tons, making it subject to the Best Available Retrofit Technology (BART) requirements that are a part of the Regional Haze rules specified in 40 CFR Part 51, Subpart P Protection of Visibility.

The following information relates to Boiler #1, the lone BART affected unit:

Point	Emission Source	Install Date	SO_2 Potential To Emit (TPY)(2)	NO_x Potential to Emit (TPY)(1)	PM_{10} Potential To Emit (TPY)(3)	VOC Potential To Emit (TPY)(1)
S-001a	Coal/ Gas Boiler 1	1970	33726.0	10840.0	788.0	82.0

(1) Potential-to-Emit Emissions per Title V Operating Permit No. 0054 (issued 12-30-2010)
(2) Potential-to-Emit Emissions per Installation Permit No. 0054-I004a (issued 4-20-2010)
(3) PM10 Potential-to-Emit Emissions per Installation Permit No. 0054-I004a (issued 4-20-2010) and excludes H_2SO_4 (sulfuric acid mist).

For comparison, the baseline year (2002), 2009 and 2010 emissions (tpy) for Boiler #1 are as follows:

Year	SO_2	NO_x	PM10	VOC
2002	42,017.9	5,761.2	205.7	10.7
2009	32,746.4	2,999.1	649.8(4)	10.2
2010	11,806.3	2,521.9	439.5(4)	6.8

(4) Includes condensable PM and H_2SO_4

Calendar year 2009 is the last complete calendar year in which Boiler #1 was operated without the FGD system in service.

3. NESCAUM CALPUFF Modeling:

Based upon the NESCAUM modeling (results shown in table below) the maximum impact of this source on a Class 1 area due to PM10 was 0.0336 deciviews (dv). This impact is on the Otter Creek Wilderness Area. The impacts from SO_2 and NO_x are not considered in this memo, since the source will be participating in CAIR.

			Change in visibility (delta-deciview)		
Nat_bgr	Maxclsi	Total	SO4	NO3	PM_{10}
Best	otcr	3.4898	3.1606	0.8134	0.0336
Average	otcr	2.5034	2.2569	0.5611	0.0229
Worst	otcr	1.7710	1.5910	0.3856	0.0156

The NESCAUM modeling effort was conducted in accordance with 40 CFR 51, Appendix Y – Guidelines for BART Determinations Under the Regional Haze Rule. Section III of Appendix Y provides guidance for determining if a particular BART-eligible source (or group of sources) causes or contributes to visibility impairment in nearby Class I areas. The EPA guidance notes that the threshold "for determining whether a source "contributes" to visibility impairment should not be higher than 0.5 deciviews."

4. BART Analysis

GenOn performed its own BART modeling in January 2007, and provided the ACHD with a report containing the results. The modeling report was also performed prior to the facility installing a FGD pollution control device and constructing a new stack for the main boiler emissions. The input to the model of 176.1 lb/hr non-sulfate PM10 emissions produced a highest 98th percentile (8th highest) impact of 0.03 delta deciviews, which is consistent with the NESCAUM modeling results. This visibility impact (filterable and organic condensable PM10)[1] is well below the EPA guidance threshold of 0.5 delta-deciviews. The recommended PM10 (excluding H_2SO_4) limit of 180.0 lb/hr (788.0 tons/yr) below is consistent with the emissions input that was modeled by the facility (see Appendix).

The NESCAUM modeling was performed prior to the facility installing a FGD pollution control device and constructing a new stack for the main boiler emissions. Additionally, the pre-FGD BART modeling that was performed by GenOn speciated the PM10 into component parts and used a new post-processing algorithm for estimating light extinction from particulate matter component concentrations. This algorithm was developed and approved by the IMPROVE Steering Committee. The GenOn BART model followed the VISTAS BART Protocol and produced results similar to those of the NESCAUM model. The new stack height is 552.5 ft, which is 198.5 feet shorter than the NESCAUM & GenOn modeled stack height of 751 ft (see Appendix). The FGD unit reduces sulfur oxides & PM10 emissions so it is assumed that those reductions, along with a significantly shorter stack, will create even less of a change in visibility at the maximum impacted Class I area (Otter Creek Wilderness Area) when compared to the GenOn BART modeling results. Since the GenOn BART modeling results demonstrated a slightly lower change in visibility than the NESCAUM model results, it can be concluded that the current PM10 emission limits will yield a change in visibility that is comparable to the results of the NESCAUM model.

Although the aforementioned modeling analyses showed that the PM10 emissions from GenOn

[1] The NPS spreadsheet specifies that, since only the filterable PM10 emissions were available at the time, the H_2SO_4 and organic condensable PM10 emissions were assumed to be 208% and 51% of the filterable PM10 emissions, respectively. The "organic portion" was modeled as secondary organic aerosols. See Appendix.

Cheswick are not "reasonably anticipated to cause or contribute to any visibility impairment in a Class I area," the ACHD performed a BART analysis in accordance with the Guidelines for BART Determinations Under the Regional Haze Rule issued by the EPA and available at http://www.epa.gov/air/visibility/actions.html#bart1 (40 CFR 51 Appendix Y). The guidelines provide a process for making BART determinations that States and local agencies can use in implementing the regional haze BART requirements on a source-by-source basis, as provided in 40 CFR 51.308(e)(1). ACHD decided not to exempt a BART-eligible source based on a "cause or contribute" deciview threshold, and made BART determinations for all BART-eligible sources. This approach was consistent with that performed by the PA DEP for other BART-eligible EGUs located in the Commonwealth.

The ACHD's BART analysis took into account each of the five statutory factors required by the Clean Air Act (CAA). These factors are: the costs of compliance; the energy and non-air quality environmental impacts of compliance; any existing pollution control technology in use at the source; the remaining useful life of the source; and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology. These statutory factors for BART were codified at 40 CFR 51.308(e)(1)(ii).

In addition, for the source subject to BART identified in this review memo, ACHD used the BART determination process under the guidelines to do the following: conduct an analysis of emissions control alternatives, which includes the identification of available, technically feasible retrofit technologies (which, in turn, is based on the existing emissions control equipment in use at the source), and for each technology identified, an analysis of the cost of compliance, the energy and non-air quality environmental impacts, and the degree of visibility improvement in affected Class I areas resulting from the use of the control technology. As part of the BART analysis, ACHD took into account the remaining useful life of the source and any existing control technology present at the source. For this source, ACHD determined a "best system of continuous emission reduction" based upon its evaluation of these factors. Below is the five-factor analysis, in detail, for the BART-eligible emissions unit at this facility that had the greatest impact.

BART Five-Factor Analysis:

STEP – 1: Identify All Available Retrofit Control Technologies

	Boiler #1
Existing controls:	Low NO_x burners, electrostatic precipitator (ESP) with flue gas conditioning, selective catalytic reduction (SCR), flue gas desulfurization (FGD)
Retrofit controls:	Fabric Filter Baghouse; wet ESP

A baghouse or a wet ESP installed downstream of the existing FGD are the available retrofit control options with the practical potential for application to Boiler #1 for the control of PM10. Installation of a baghouse (i) between the existing dry ESP and FGD or (ii) as a replacement for the existing dry ESP is of questionable value because the plant currently utilizes an SO_3 emissions control system (hydrated lime injection) in series with a wet FGD scrubber. Consequently, PM10 emission levels following these controls would be primarily dependent on the operation of the wet scrubber regardless of any reductions provided by a fabric filter baghouse. Importantly, although the aforementioned retrofit controls are potentially available for the purposes of completing a BART analysis, U.S. EPA does not consider these among the list of feasible retrofit emission control technologies for coal-fired EGUs subject to the Clean

Air Interstate Rule (CAIR) and the Mercury and Air Toxics Rule (MATS). EPA has recognized that the feasible retrofit emission control technologies for coal-fired EGUs subject to CAIR and MATS, as listed in the support documents for EPA's Integrated Planning Model (IPM), provide co-beneficial PM10 control – details are available on the EPA website per the following link:http://www.epa.gov/airmarkets/progsregs/epa-ipm/BaseCasev410.html#documentation.

STEP – 2: Eliminate Technically Infeasible Options Identified under Step 1

A baghouse is a technically infeasible option for an emissions source operated with an FGD system. A wet ESP is a technically feasible option for additional PM10 control for an emissions source operated with an FGD system. Information concerning the application of a wet ESP technology is attached to this memo – information pertinent to this BART analysis is presented below:

> "Wet ESPs can be configured either as tubular precipitators with vertical gas flow or as plate precipitators with horizontal gas flow. For a utility application, tubular wet ESPs would be appropriate as a mist eliminator above a FGD scrubber, while the plate type could be employed at the back end of a dry ESP train for final polishing of the gas in a hybrid ESP. In general, tubular precipitators are more efficient than the plate type and take up less space due to simple geometry."

STEP – 3: Evaluate Control Effectiveness of Remaining Control Technologies

For the purposes of this BART analysis, the ACHD has assumed that a wet tubular ESP can reduce PM10 emissions by 95%[2].

STEP – 4: Evaluate Impacts and Document the Results

Cost of Compliance:
According to the EPA-CICA Fact Sheet (http://www.epa.gov/ttncatc1/cica/atech_e.html#111), a typical wet tubular ESP could have annualized cost of $12 to $46 per scfm (West Electrostatic Precipitator (ESP), Wire-Pipe Type). Here, the depicted minimum annualized cost is $12 per scfm in 1998 dollars. Based on the installation of a new wet tubular ESP for Boiler #1, sized for similar operating parameters listed in the operating permit (1.56E+06 SCFM @ 68^0F), and not correcting for inflation, the annualized cost is $18,720,000. The potential PM10 (excluding H_2SO_4) emissions for Boiler #1 are 180 lb/hr (788.0 tons per year), resulting in a cost of $25,000 per ton PM10 removed (=$18,720,000 / (788 tons * 0.95)), and a minimum cost of $557,000,000 per deciview change (=$18,720,000 / 0.0336 dv). Importantly, because the modeled impact to the nearby Class I areas attributable to Cheswick's PM10 emissions did not consider the additional emissions control provided by the existing wet FGD, the calculated cost per deciview change would be significantly higher because the modeled impacts for the existing emissions control configuration would be lower (i.e., < 0.0336 dv).

STEP – 5: Evaluate Visibility Impacts

Using the CALPUFF NWS platform computer modeling the visibility impact of this facility due to PM10 on the Otter Creek Wilderness Area was found to be 0.0336 dv and is well below the 0.5 delta-

[2] EPRI tests for wet tubular ESP showed a 95% reduction of particulate matter. See Appendix.

deciview regional haze perceptibility threshold. The costs of possible new controls in terms of dollars per deciview for this facility were calculated to be at least $557,000,000 /dv for a wet tubular ESP for Boiler #1. In the event that BART was required due to source-specific impacts, this analysis indicates that it would not be cost effective to require this control option.

The results from this analysis are consistent with the aforementioned 40 CFR 51, Appendix Y – Guidelines for BART Determinations Under the Regional Haze Rule. Section IV.D.9 to Appendix Y lists the following with respect to Step 1:

> If you find that a BART source has controls already in place which are the most stringent controls available (note that this means that all possible improvements to any control devices have been made), then it is not necessary to comprehensively complete each following step of the BART analysis in this section. As long these most stringent controls available are made federally enforceable for the purpose of implementing BART for that source, you may skip the remaining analyses in this section, including the visibility analysis in step 5. Likewise, if a source commits to a BART determination that consists of the most stringent controls available, then there is no need to complete the remaining analyses in this section.

With respect to PM10 emissions, because the Boiler #1 flue gas stream cannot bypass the ESP and FGD systems, which are the most stringent controls available for a coal-fired boiler, and because the PM10 emission limits and other FGD operating conditions (e.g., operate with a minimum of 3 spray levels when firing coal) established in the aforementioned Installation Permit are federally-enforceable, and because the results from two independent modeling studies showed that the visibility impacts from PM10 emissions (without consideration of the FGD system in-service) to nearby Class I areas are imperceptible, no additional analyses are required for this facility.

5. Conclusion:

Per EPA guidance, the impact of this facility does not warrant additional control due to the small contribution (0.0336 dv) to regional haze and the high cost per deciview improvement for additional controls. Consequently, the ACHD recommends that the BART requirements for the GenOn Cheswick facility are satisfied by the following:

1. The control equipment described in this analysis is required by Title V Operating Permit No. 0054 (issued 12-30-2010) and Installation Permit No. 0054-I004a (issued 4-20-2010);

2. The conditions of Title V Permit No. 0054 (issued 12-30-2010) and Installation Permit No. 0054-I004a (issued 4-20-2010) along with the implementation of EGU CAIR requirements satisfy BART requirements for this facility; and

3. PM10 emissions shall be limited by Installation Permit No. 0054-I004a (issued 4-20-2010) emission limitations in the table below.

Pollutant	Emission Limit
PM10*	180.0 lbs/hr

* Includes condensable PM and excludes sulfuric acid mist (H_2SO_4). Emissions to be calculated from EPA test method 5B/202, as per EGU MACT.

References:

VISTAS. BART in the VISTAS Region: Sensitivity to VOC, NH_3 and Primary PM Emissions; April 29, 2007. Appendix H.5 – BART Analysis Sensitivity Modeling.