west virginia department of environmental protection

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2a. Response Letter from FirstEnergy (Harrison Plant)

G-2b. Response Letter from AEP (Mitchell Plant)

G-2c. Response Letter from FirstEnergy (Fort Martin Plant)

G-2d. Response Letter from Energy Harbor (Pleasants Station)

G-2e. Response Letter from AEP (John Amos Plant)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment.

west virginia department of environmental protection

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2a. Response Letter from FirstEnergy (Harrison Plant)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

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MonPower™
A FirstEnergy Company

800 Cabin Hill Dr.
Greensburg, PA 15601

James A. Meade
Corporate Counsel

724-838-6965
Fax: 234-678-2370

February 1, 2021

VIA EMAIL AND U.S. MAIL

Todd H. Shrewsbury
Engineer, Planning Section
West Virginia Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

**RE: Monongahela Power
Harrison Power Station
Regional Haze Rule Compliance**

Mr. Shrewsbury:

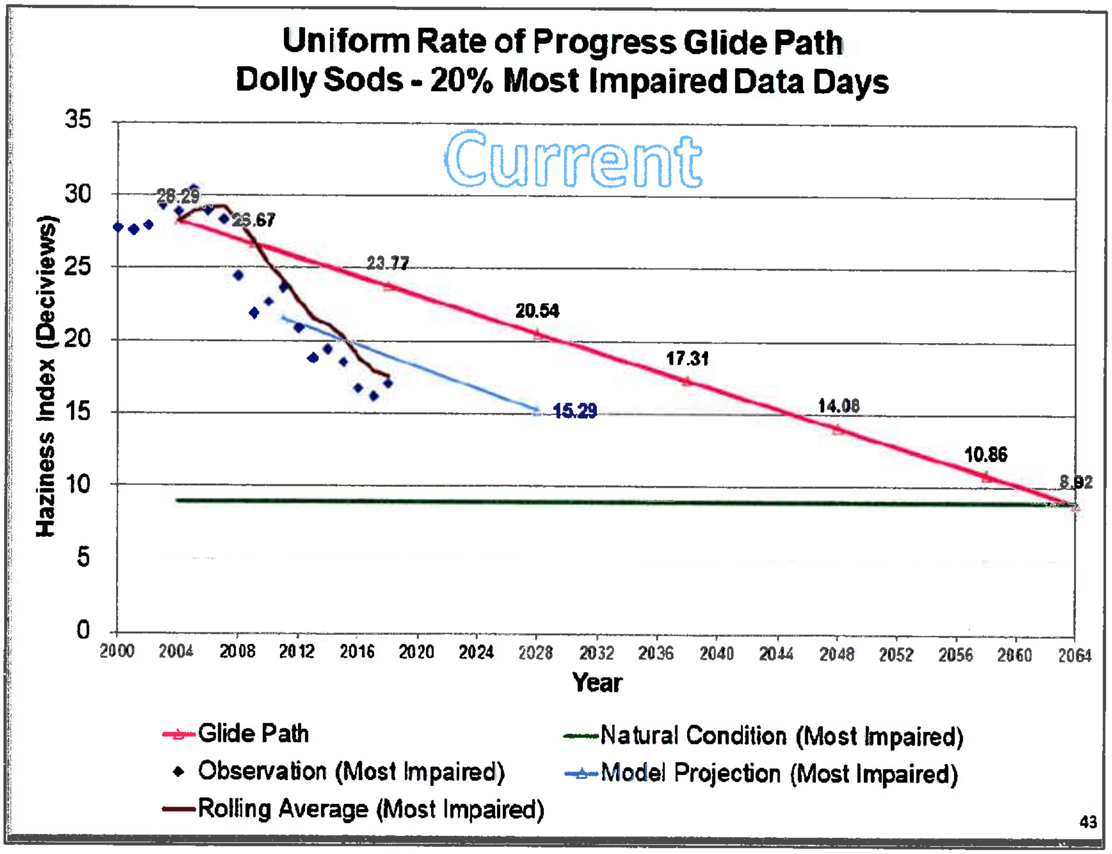
This letter is in response to a November 4, 2020 letter (enclosed) from David R. Fewell, Deputy Director of the Division of Air Quality for the West Virginia Department of Environmental Protection ("WVDEP"). As you are aware, the letter was a request to FirstEnergy to perform a four-factor analysis or submit a permit application to limit SO2 emissions going forward on certain emission units at the Mon Power-owned Harrison Power Station ("Harrison"). After reviewing the criteria set forth in EPA's "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period" EPA-457/B-19-003 August 2019 (EPA Guidance), and for the reasons detailed below, we do not believe a formal four-factor analysis (or a permit application to limit SO2 tons) is required or appropriate for the EGUs at Harrison. However, we do believe that the information provided below is an appropriate assessment of Harrison relative to the regional haze program and will not only support our position, but will provide you with the necessary equipment and operations information to allow you to prepare the SIPs that are due to be submitted to the EPA by July 31, 2021, for the Regional Haze second implementation period ending in 2028.

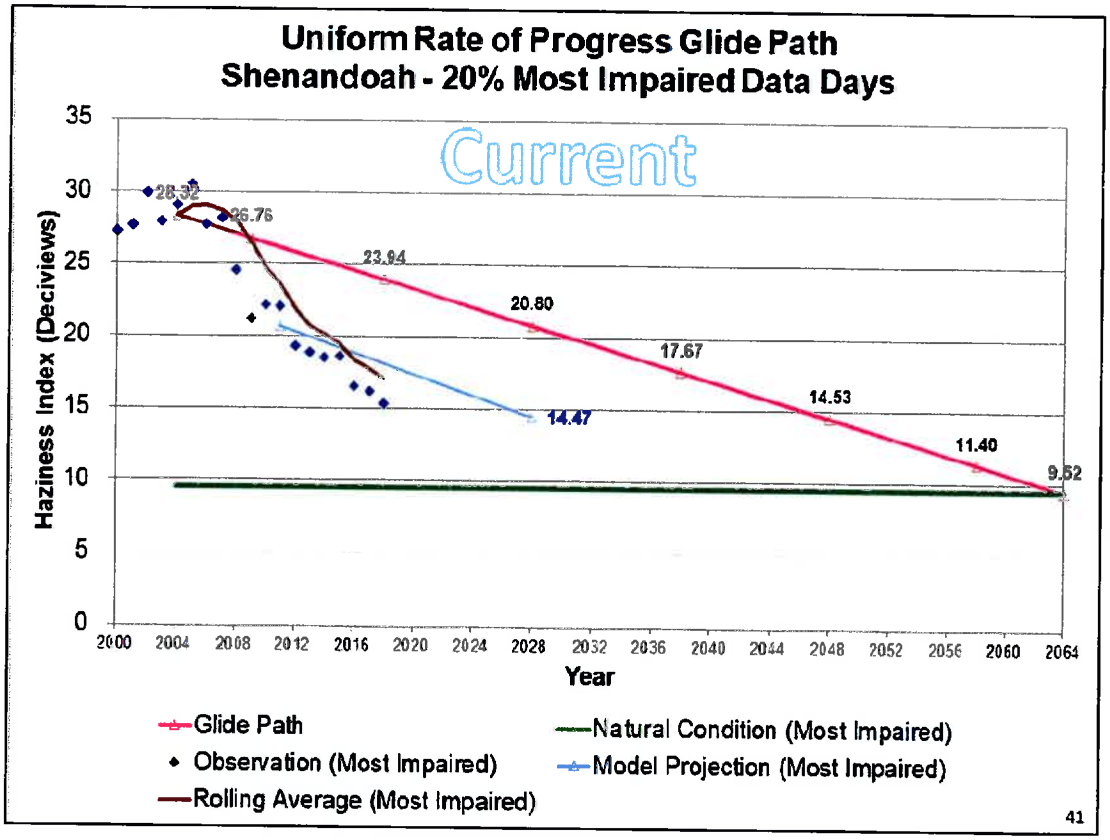
Uniform Rate of Progress Glide Path

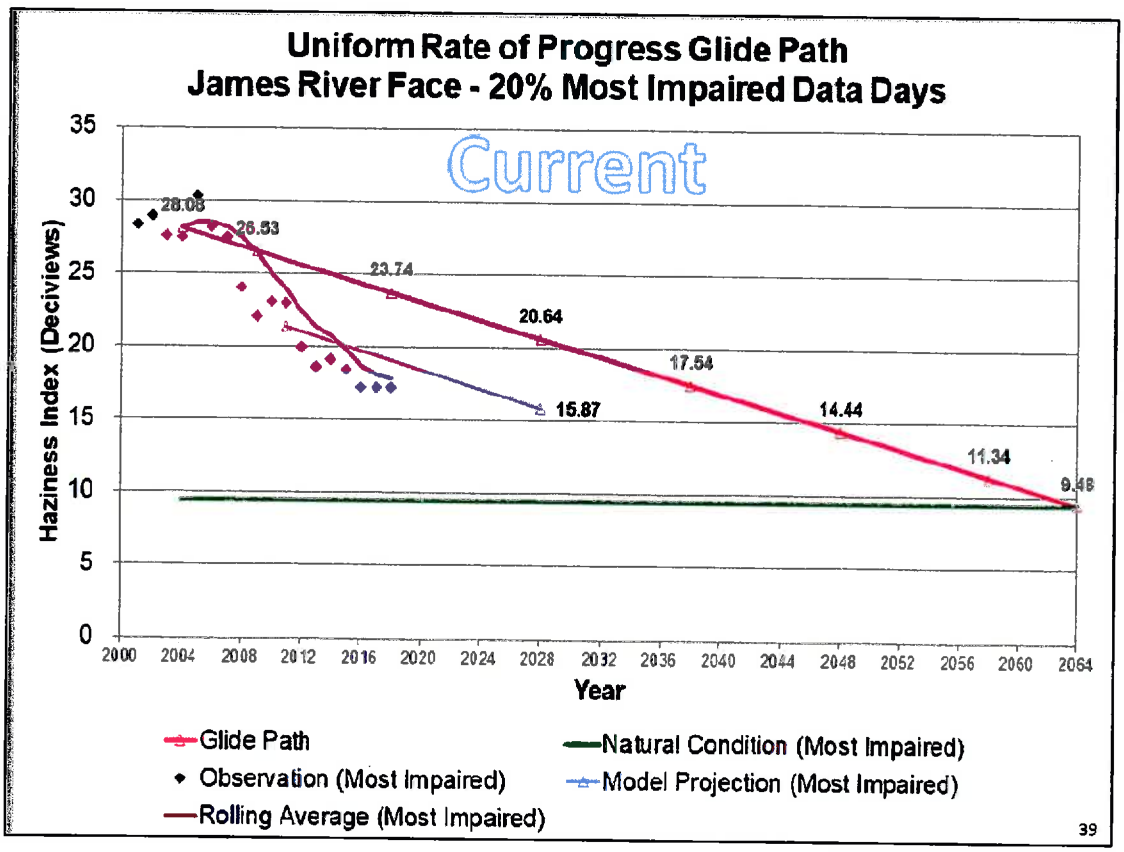
As an initial matter, and most importantly, all of the Class I areas listed, Dolly Sods, Otter Creek[1], Shenandoah, James River Face, Swanquarter, Moosehorn, Roosevelt Campobello, and Acadia in the Harrison VISTAS/ MANE-VU observations & projections are well below the Uniform Rate of Progress (URP) Glide Path to Natural Condition in 2064 with regards to the most impaired days as shown on the VISTAS/MANE-VU graphs. In addition, the current observations are well below the projected URP Glide Path values for 2028. The graphs (set forth below) also demonstrate a downward trend of the observed & modelled visibility impairment, the slope of

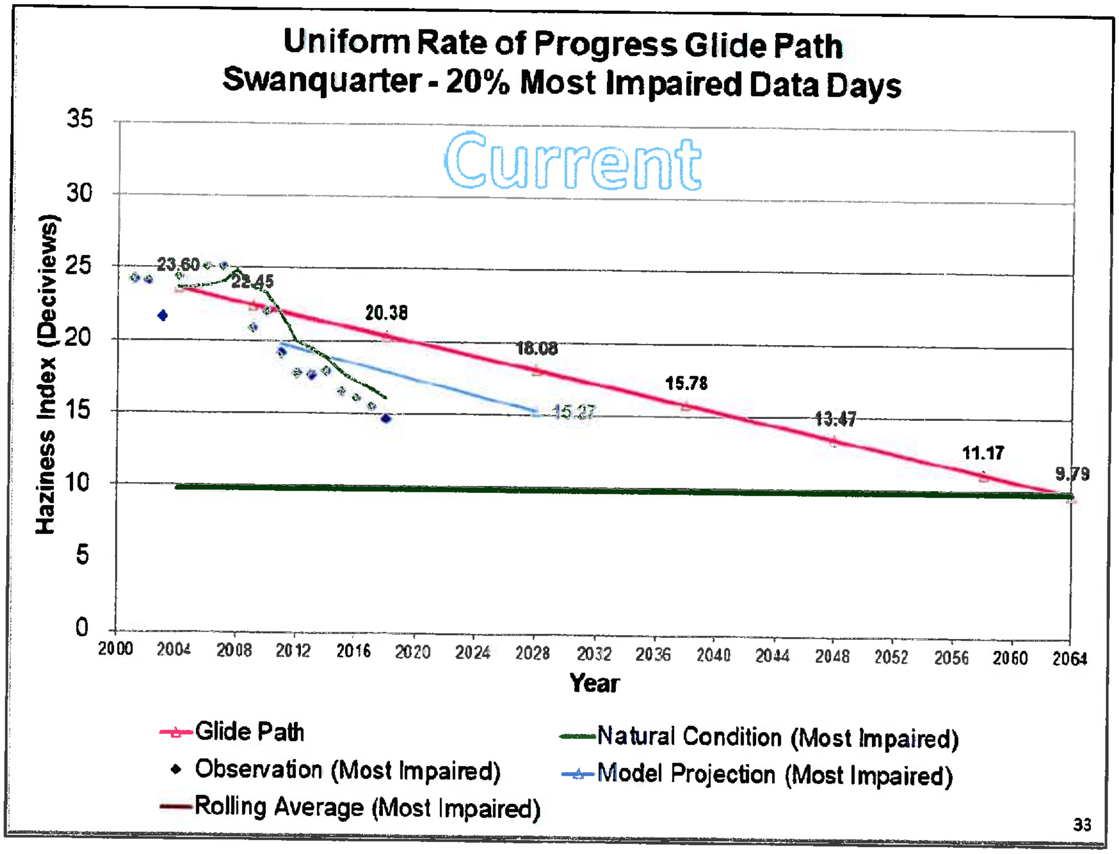
[1] Because Otter Creek does not have an IMPROVE monitor, we understand that it was not made the subject of a separate chart and is to be represented by data from nearby areas. See VISTAS Stakeholder Briefing May 20, 2020, slide 6.

which is greater than the URP Glide Path, *i.e.* visibility is improving much more quickly than required by the Regional Haze rules. The data as displayed on the charts below demonstrate that "reasonable further progress" ("RFP") is being attained at a rate such that Natural Conditions are expected to be obtained well before the required 2064. The EPA Guidance states that "the state may consider this information when selecting sources." As the URP Glide Path graphs show, visibility improvement is well ahead of schedule and RFP is demonstrated, therefore no further controls are needed.




Uniform Rate of Progress Glide Path
Shenandoah - 20% Most Impaired Data Days
Current
Haziness Index (Deciviews)
35
30
25
20
15
10
5
0
28.32
26.76
23.94
20.80
17.67
14.53
11.40
9.52
14.47
2000
2004
2008
2012
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
2060
2064
Year
Glide Path
Observation (Most Impaired)
Rolling Average (Most Impaired)
Natural Condition (Most Impaired)
Model Projection (Most Impaired)
41


Uniform Rate of Progress Glide Path
James River Face - 20% Most Impaired Data Days
Current
Haziness Index (Deciviews)
35
30
25
20
15
10
5
0
28.08
26.53
23.74
20.64
17.54
14.44
11.34
9.48
15.87
2000
2004
2008
2012
2016
2020
2024
2028
2032
2036
2040
2044
2048
2052
2056
2060
2064
Year
Glide Path
Observation (Most Impaired)
Rolling Average (Most Impaired)
Natural Condition (Most Impaired)
Model Projection (Most Impaired)
39


Uniform Rate of Progress Glide Path
Swanquarter - 20% Most Impaired Data Days
Current
Haziness Index (Deciviews)
Year
23.60
22.45
20.38
18.08
15.78
15.27
13.47
11.17
9.79
Glide Path
Observation (Most Impaired)
Rolling Average (Most Impaired)
Natural Condition (Most Impaired)
Model Projection (Most Impaired)
33

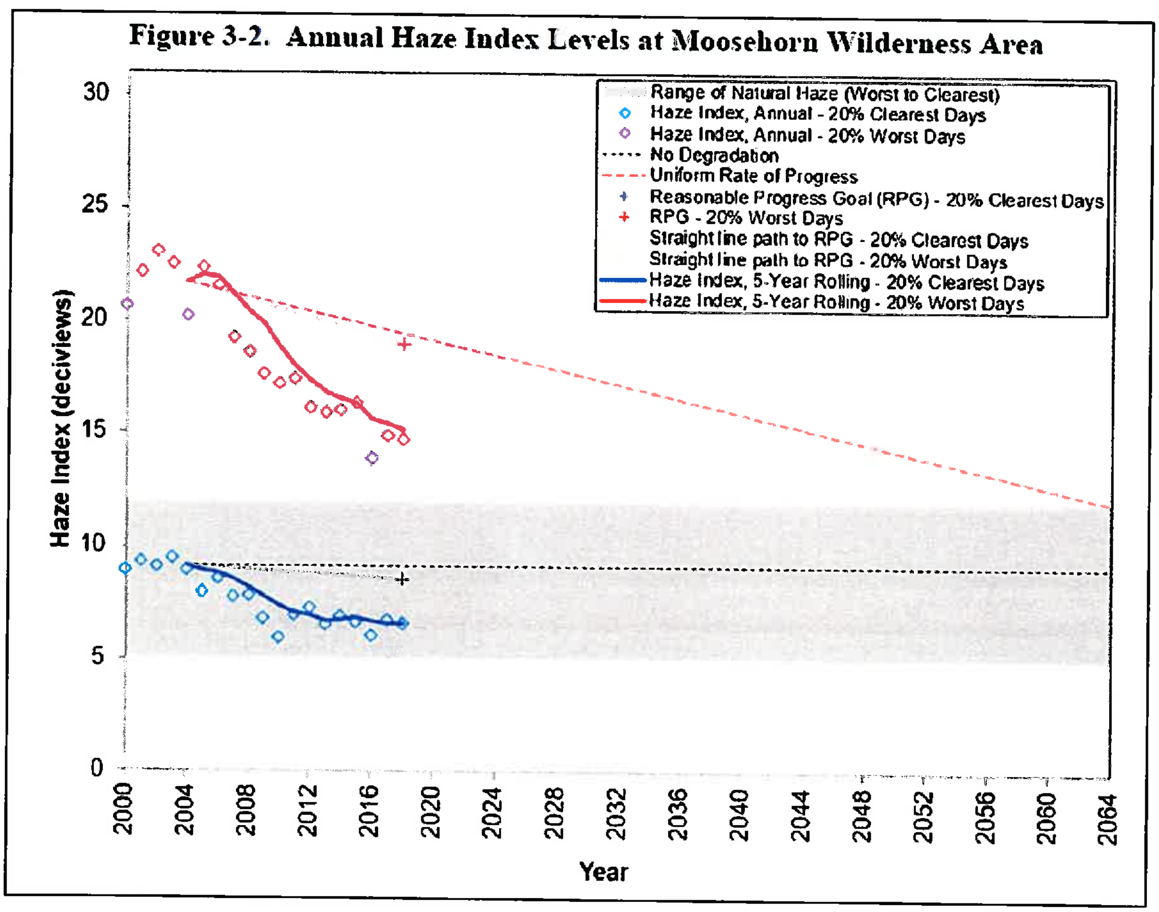
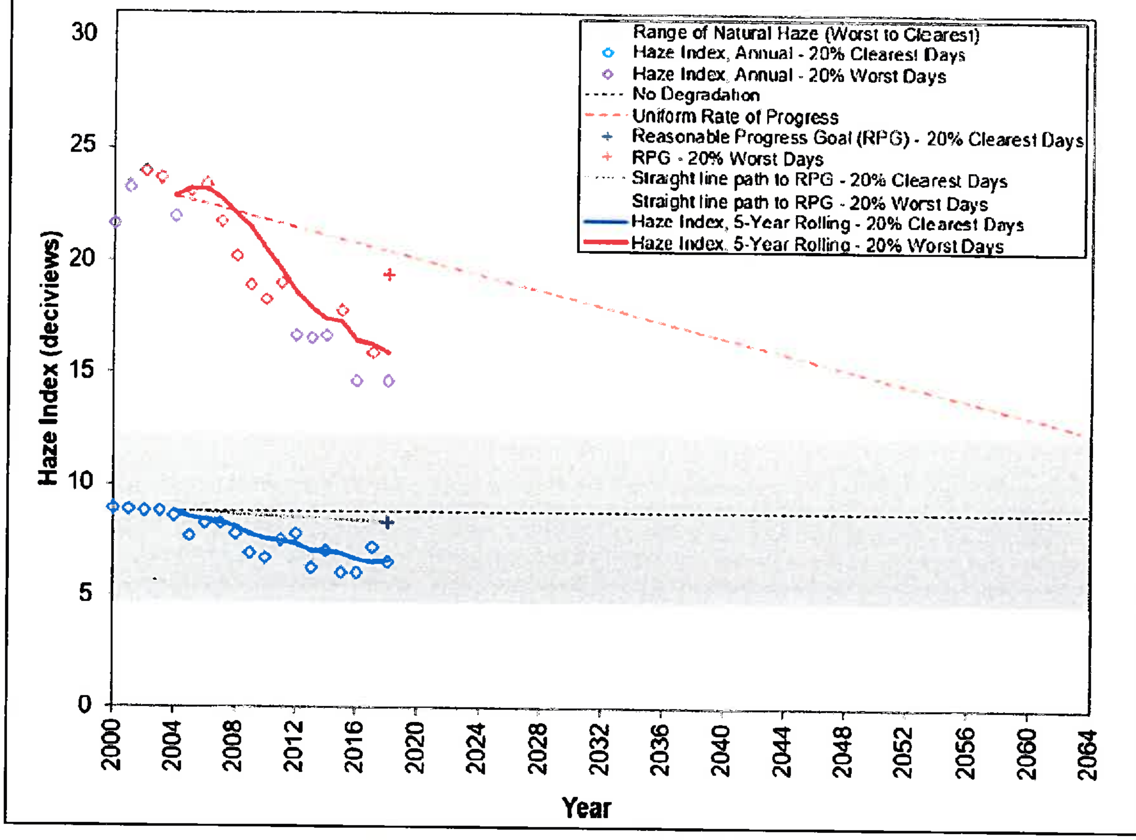


Figure 3-2. Annual Haze Index Levels at Moosehorn Wilderness Area
Range of Natural Haze (Worst to Clearest)
Haze Index, Annual - 20% Clearest Days
Haze Index, Annual - 20% Worst Days
No Degradation
Uniform Rate of Progress
Reasonable Progress Goal (RPG) - 20% Clearest Days
RPG - 20% Worst Days
Straight line path to RPG - 20% Clearest Days
Straight line path to RPG - 20% Worst Days
Haze Index, 5-Year Rolling - 20% Clearest Days
Haze Index, 5-Year Rolling - 20% Worst Days
Haze Index (deciviews)
Year

Figure 3-1. Annual Haze Index Levels at Acadia National Park



As clearly demonstrated on the URP Glide Path graphs above, the ERTAC Model predictions which are used to estimate the 2028 Most Impaired Haziness Index appear to have a high bias when compared to the rolling average/slope of the actual observations. The charts show the year-to-year variability in the actual observations and the general downward trend of visibility impairment, yet the model predictions do not accurately depict this downward trend. This leads to the conclusion that the projected effect of Harrison on the subject Class I Areas is significantly overstated by the ERTAC 2028 projections.

WVDEP, in its letter, bases its request on the EPA Guidance and states "Portions of this document provide guidance to states on the selection of sources for analysis, characterization of factors for emission control measures, and decisions on what control measures are necessary to make reasonable progress." It is indisputable that progress toward the 2064 compliance level is well ahead of schedule.

<u>Source Selection – Effectively Controlled Source</u>

The above-mentioned EPA Guidance Section II.B.3. Step 3: Selection of sources for analysis: (f) Sources that already have effective emission control technology in place states:

> "It may be reasonable for a state not to select an effectively controlled source. A source may already have effective controls in place as a result of a previous regional haze SIP or to meet another

CAA requirement. In general, if post-combustion controls were selected and installed fairly recently … to meet a CAA requirement, there will be only a low likelihood of a significant technological advancement that could provide further reasonable emission reductions having been made in the intervening period. If a source owner has recently made a significant expenditure that has resulted in significant reductions of visibility impairing pollutants at an emissions unit, it may be reasonable for the state to assume that additional controls for that unit are unlikely to be reasonable for the upcoming implementation period."

This portion of the EPA Guidance is directly applicable to Harrison as that facility is and has been an effectively controlled source. Therefore, it is neither required nor appropriate for WVDEP to select Harrison for the four-factor analysis. Harrison scrubbers were installed in 1994 at a cost of approximately $555 million. More recently, an additional expenditure of approximately $13.9 million was made for 2016 MATS and continued compliance. The Harrison scrubbers have an average removal efficiency of 97.1% (2017-2019). Simply stated, the Harrison units are being effectively controlled with substantial expenditures made to meet CAA requirements. As such it is unreasonable to include Harrison in the request.

EPA further states that scenarios in which EPA believes it may be reasonable for a state <u>not to select</u> a particular source for further analysis includes Section (f) "[F]or the purpose of SO2 control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO2 emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule for power plants. The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil-derived solid fuel) are low enough that <u>it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO2 is necessary to make reasonable progress.</u>" (underline added)

This is also applicable to Harrison as its SO2 emission rate has averaged 0.16 #/mmBtu for the 2015-2020* which is well below the 0.2#/mmbtu MATS limit. Therefore, neither a four-factor analysis or a permit restriction on SO2 tons are required or appropriate. Harrison should be excluded from the sources selected per EPA Guidance.

SO2 Rate (lb/mmBtu)						
	2015	2016	2017	2018	2019	2020*
Harrison	0.15	0.13	0.12	0.19	0.18	0.18

*Jan-Sep 2020 data

Another example of when it is reasonable for a state to <u>not select</u> an effectively controlled source is, as stated in the EPA Guidance, "For the purposes of SO2 and NOX control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), on a pollutant-specific basis."

As you know, Harrison has FGD installed with an effectiveness greater than 90% that is operated year-round. Clearly Harrison should not be selected.

<u>CSAPR Better Than BART</u>

WVDEP has evaluated CAIR and has accepted that EPA's overall finding that the requirements in CAIR are equal to or better than those found in the Best Available Retrofit Technology ("BART") for NOx and SO2 as stated on page 108 of the 2008 Regional Haze SIP that was approved by the EPA:

> "The EPA has determined that, as a whole, the CAIR cap-and-trade program improves visibility more than implementing BART for individual sources in states affected by CAIR. A state that opts to participate in the CAIR program under 40 CFR Part 96 AAA-EEE need not require affected BART-eligible EGUs to install, operate and maintain BART controls for SO2 or NOx emissions. Given that all BART-eligible units have already installed or are installing scrubbers and NOx controls, and since West Virginia is participating in CAIR , and accepts EPA's overall finding that CAIR "substitutes" for BART for NOx and SO2"

EPA Guidance APPENDIX A - Clean Air Act Provisions, and EPA Rulemakings, and EPA Guidance Documents Related to SIPs Addressing Visibility Protection states that "The 2016 and 2017 Revisions to CSAPR and Affirmation that CSAPR as Updated is Better-than-BART. ... In the same action, EPA re-affirmed that CSAPR as updated remained a better-than-BART alternative for states participating in the CSAPR trading programs, on a pollutant-specific basis."

WVDEP has stated that it has accepted EPA's determination that the CAIR cap & trade program improves visibility more than implementing BART. The EPA has also affirmed that the CSAPR rules as updated (which replaced CAIR) is also more effective than BART. Harrison is subject to and in compliance with CSAPR and the CSAPR Update and therefore a four-factor analysis is not required nor is it appropriate.

Based on the foregoing, it is clear that a formal four-factor analysis (or a permit application to limit future SO2 emissions) is neither required or appropriate for the EGUs at Harrison. We believe that the information set forth in this letter provides the WVDEP with an appropriate assessment of Harrison and the necessary relevant information to allow you to prepare the Regional Haze SIPs due to EPA later this year. If you have any questions or would like to discuss this matter in further detail, please contact me at jmeade@firstenergycorp.com or by phone at (724) 244-4473, or Don Hromulak at dchromulak@firstenergycorp.com or (330) 436-2781.

Sincerely,

James A. Meade

James A. Meade
FirstEnergy Service Company
o/b/o Monongahela Power Company

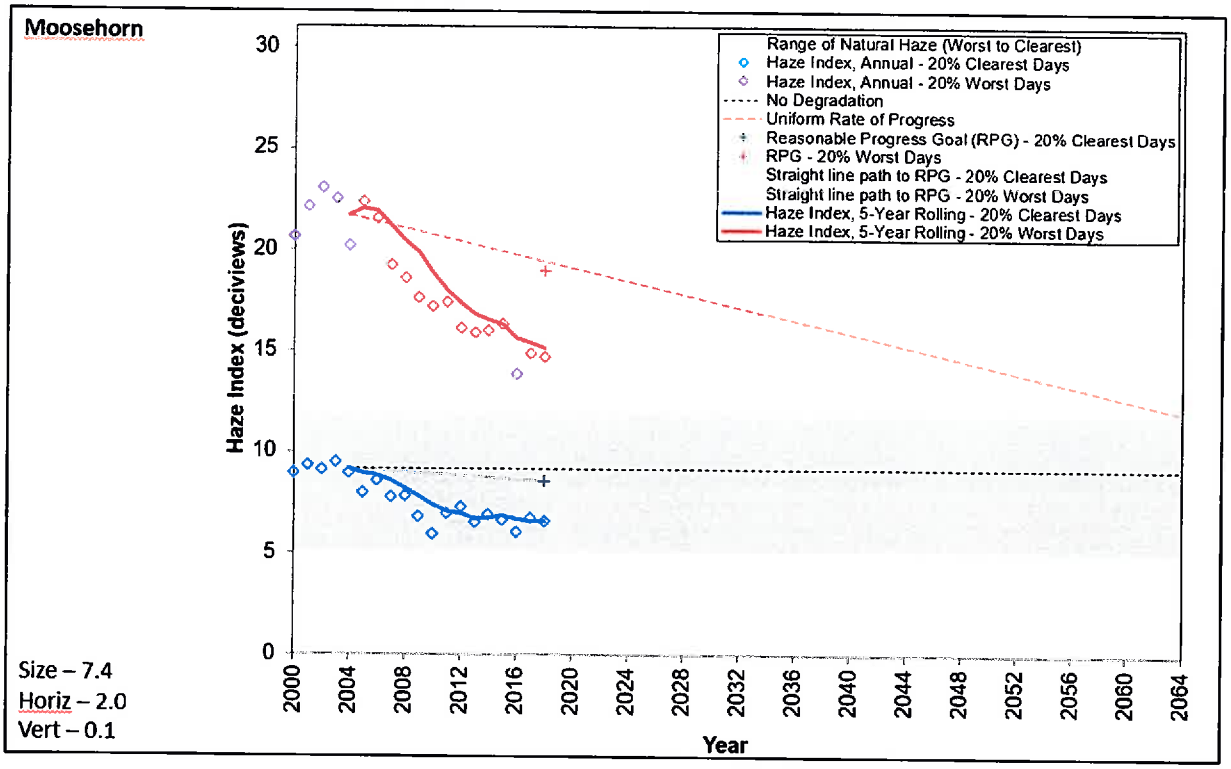
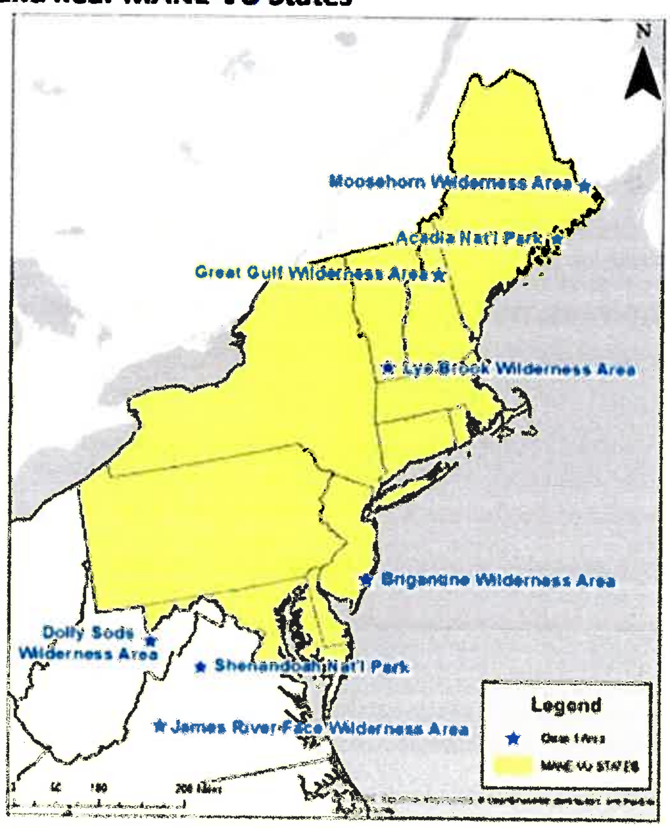


Figure 1: Class I Areas with IMPROVE Monitors in and near MANE-VU States



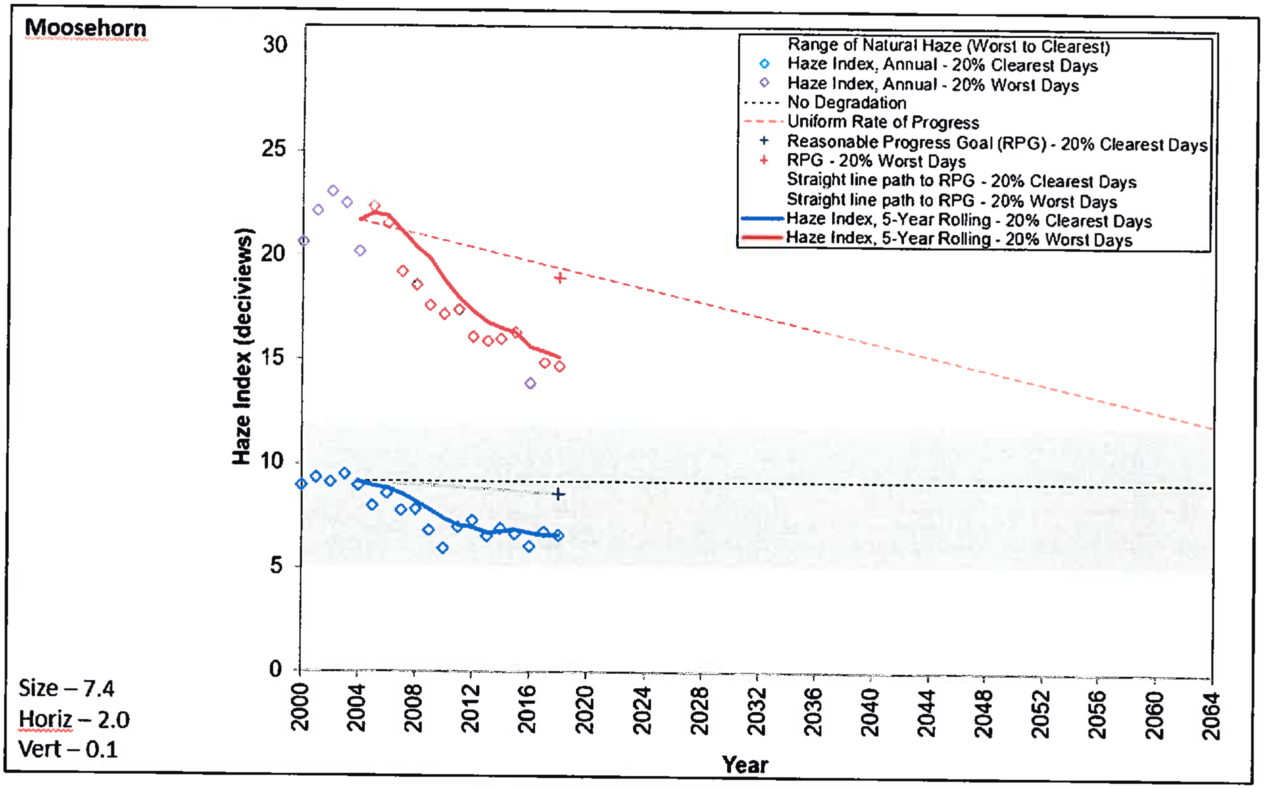


Table 2: Harrison Power Station Total PSAT Visibility Impacts at Class I Federal Areas

Class I Federal Area	Total PSAT Visibility Impact
Dolly Sods Wilderness Area (WV)	7.65%
Otter Creek Wilderness Area (WV)	6.93%
Shenandoah National Park (VA)	4.42%
James River Face Wilderness Area (VA)	3.88%
Swanquarter Wilderness Area (NC)	1.81%
Moosehorn Wilderness Area (ME)	1.13%
Roosevelt Campobello International Park (ME)	1.13%
Acadia National Park (ME)	1.04%

Table 2: Fort Martin Power Station Total PSAT Visibility Impacts at Class I Federal Areas

Class I Federal Area	Total PSAT Visibility Impact
Dolly Sods Wilderness Area (WV)	1.20%
Otter Creek Wilderness Area (WV)	1.07%
Shenandoah National Park (VA)	1.04%

ALLEGHENY ENERGY SUPPLY CO, LLC-HARRISON	DOSO, JARI, MOOS, OTCR, SHEN, SWAN
APPALACHIAN POWER COMPANY - JOHN E AMOS PLANT	DOSO, JARI, OTCR
MITCHELL PLANT	DOSO, JARI, OTCR, SHEN
MONONGAHELA POWER CO.- FORT MARTIN POWER	DOSO, OTCR
MONONGAHELA POWER CO-PLEASANTS POWER STA	DOSO, JARI, OTCR, SHEN, SWAN

west virginia department of environmental protection

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2b. Response Letter from AEP (Mitchell Plant)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Scott A. Weaver
Director, Air Quality
Environmental Services Division
American Electric Power Service Corporation
1 Riverside Plaza
Columbus, OH 43215
614/716-3771 (P)
saweaver@aep.com

January 31, 2021

Mr. Todd Shrewsbury, Engineer
Planning Section
West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Re: Regional Haze Reasonable Progress Assessment
Response of Kentucky Power Company to WV DAQ
Request for an Analysis of SO_2 Controls at the Mitchell Plant

Dear Mr. Shrewsbury:

Attached is the response of Kentucky Power Company to the request, dated November 4, 2020, for information to support a four-factor analysis of sulfur dioxide (SO_2) controls for the units at the Mitchell Plant in Marshall County, West Virginia. The information is requested to support the Division of Air Quality's (DAQ's) development of a regional haze plan consistent with the requirements of 40 CFR §51.308(f) for the second planning period (2018-2028). For the reasons that follow, no additional controls are necessary at the Mitchell Plant, and a full four-factor evaluation is not required.

Mitchell Plant has been identified as a facility that contributes more than 1 percent of the visibility impacts in four Class 1 federal areas, two in West Virginia and two in Virginia, in modeling performed by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS). Each of these areas has a documented rate of progress that is better than the uniform rate of progress goals that would return these areas to natural visibility conditions by 2064. Based on continuing emission reductions at other sources throughout the eastern United States, and within the AEP system, more progress will be made in the remainder of this planning period without additional reductions at the Mitchell Plant.

The Mitchell Plant already employs the most effective type of SO_2 controls. The two electric generating units at the Mitchell Plant are each equipped with high efficiency wet limestone scrubbers (FGDs) that are designed to achieve at least 98% reductions in uncontrolled SO_2 emissions. Each unit regularly achieves an emission rate of less than 0.2 pounds of SO_2 per million Btu, the applicable alternative emission rate established in the Mercury and Air Toxics Standards (MATS). Based on the U.S. Environmental Protection Agency's (USEPA's) recent guidance, this rate represents highly efficient operation of wet FGDs, and states can treat such units as a source for which more stringent SO_2 controls are not necessary to make reasonable progress.

In addition, Mitchell Plant is also subject to the Cross State Air Pollution Rule (CSAPR) SO_2 Group 1 Trading Program and must, collectively with other electric generating units in West Virginia, emit no more than 75,668 tons of SO_2 each year. Collectively, SO_2 emissions from EGU sources in West Virginia are predicted to decline to less than 53,000 tons per year by 2028, based on the most recent VISTAS modeling. USEPA has already determined that participation in the CSAPR program is better than BART for purposes of regional haze planning responsibilities. In addition, USEPA recently proposed additional seasonal restrictions on emissions of nitrogen oxides (NOx) during the ozone season (May through September each year) that are likely to constrain generation for coal-fired electric utility units if finalized, beginning with the 2021 ozone season. These further restrictions on NOx will also lower SO_2 emissions from CSAPR sources like the Mitchell Plant, making investigation of additional SO_2 control measures unnecessary.

Finally, actual emission rates and additional Clean Air Act requirements that take effect in future years provide assurance that emissions at the Mitchell Plant will not significantly increase over the remainder of the second implementation period. The actual emission rates achieved during the baseline period and used in the VISTAS modeling for the Mitchell Plant are well below the MATS alternative limit, typically less than one-half that limit or less. Mitchell Plant is subject to an AEP Eastern System-wide SO_2 emissions limitation pursuant to a federal consent that was recently modified. The AEP Eastern System annual SO_2 emission limitations will decline from the current level of 52,000 tons per year in 2021, to 44,000 tons per year by the beginning of 2029. In addition, continued integration of renewable energy resources and persistently low natural gas prices have and are likely to continue to impact the utilization of coal fueled units. However, the current requirements within PJM Interconnection, LLC require that units like those at Mitchell Plant be prepared to respond to directions to supply up to the maximum capacity from each unit to ensure regional reliability of the electricity grid. Given that no further controls are readily available that would improve upon the performance of the current equipment, reductions in annual emissions can only be achieved through constraints on generation. Such restrictions would be incompatible with Kentucky Power's public utility service obligations.

For all of these reasons, explained in more details in the attached response, no further evaluation of additional controls is necessary at Mitchell Plant, nor should the plant be required to limit emissions so as to contribute less than 1 percent to the affected federal Class 1 areas. Should you have any questions concerning this response, please contact me at (614) 716-3771 or by email at saweaver@aep.com.

Sincerely,

Scott A Weaver

Scott Weaver
Director, Air Quality Services
American Electric Power Service Corporation

Attachment

Response of Kentucky Power Company
to the West Virginia Division of Air Quality
Request for Analysis of SO_2 Controls
at the Mitchell Plant

On November 4, 2020, the Deputy Director of the Division of Air Quality (DAQ) sent an information request to Kentucky Power Company (KPCo), a subsidiary of American Electric Power Company, Inc. (AEP), asking for information necessary to perform a four factor analysis of the two electric generating units (EGUs) at the Mitchell Power Plant (Mitchell Plant) in Winfield, West Virginia. The request also included background on the regional haze program, the process used to identify facilities for further analysis by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), the regional planning organization that includes West Virginia, and an explanation of how to proceed with performing a four-factor analysis.

In this response, KPCo provides some additional background on the regional planning program and its implementation in West Virginia, the steadily improving conditions at the affected federal Class 1 areas, the critical assumptions used by VISTAS in its modeling exercises, information concerning the existing controls at Mitchell Plant, the lack of any more effective control technologies, and the other factors that demonstrate that it is not reasonable to select Mitchell Plant as a candidate for an evaluation of further controls. Based on this information, it is reasonable to conclude that no additional controls are necessary during the second implementation period.

Background of the Regional Haze Planning Program

Pursuant to Section 169A of the Clean Air Act, states are required to include in their implementation plans a program to prevent any future and remedy any existing impacts on visibility in Class 1 federal areas that result from manmade air pollution. The United States Environmental Protection Agency (USEPA) was authorized by Section 169B of the 1990 Clean Air Act Amendments to issue rules governing this state planning process and establishing a comprehensive visibility impairment program for each Class 1 federal area. These programs are to be designed to achieve natural visibility conditions by 2064.

The state planning process is described in 40 CFR §51.308. Initial plans were required to be submitted no later than December 17, 2007, and covered the period from 2008 to 2018. The initial state plans included: (1) a long-term strategy addressing regional haze in each Class 1 area in the state; (2) reasonable progress goals based on calculations of baseline visibility and natural visibility conditions, and a determination of the rate of progress required to achieve natural visibility conditions by 2064; and (3) emission limitations based on the Best Available Retrofit Technology (BART) for certain classes of stationary sources, including certain EGUs, or alternative measures (including emissions trading programs) that would achieve greater emission reductions and greater reasonable progress than BART. The plans also included monitoring provisions to measure visibility improvements at each Class 1 area, and states were required to submit periodic progress reports.

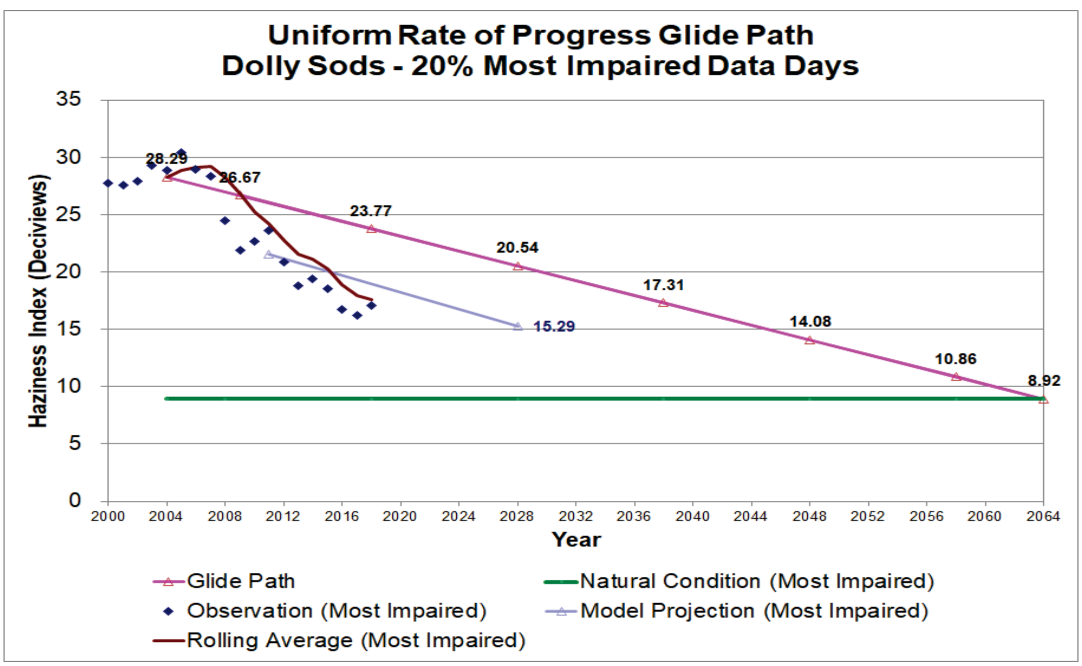
West Virginia's initial plan was submitted in 2008, and was not granted full approval by USEPA until September of 2018. There are two Class 1 areas within West Virginia, Dolly Sods Wilderness Area and Otter Creek Wilderness Area. Although these are distinct, large wilderness areas managed by the U. S. Forest Service, they have been treated as a single area for purposes of regional haze planning, and DAQ has relied upon data from a monitor located at Dolly Sods to assess visibility conditions in both regions.

Requirements for the Second Planning Period and Visibility Improvements

Subparagraph (f) of 40 CFR §51.308 describes the requirements for periodic updates of the state plans, and established July 31, 2021, as the date on which plans for the second planning period (2018-2028) are due. Again, each Class 1 area within the state must be assessed, and reasonable progress goals must be established. Plans are required to be established to achieve reasonable further progress at in-state Class 1 areas and any out-of-state Class 1 area that is affected by emission sources within the state. Those plans must be informed by the costs of compliance, the time necessary for compliance, the energy and non-air environmental impacts of compliance and the remaining useful life of any potentially affected anthropogenic sources of visibility impairment.

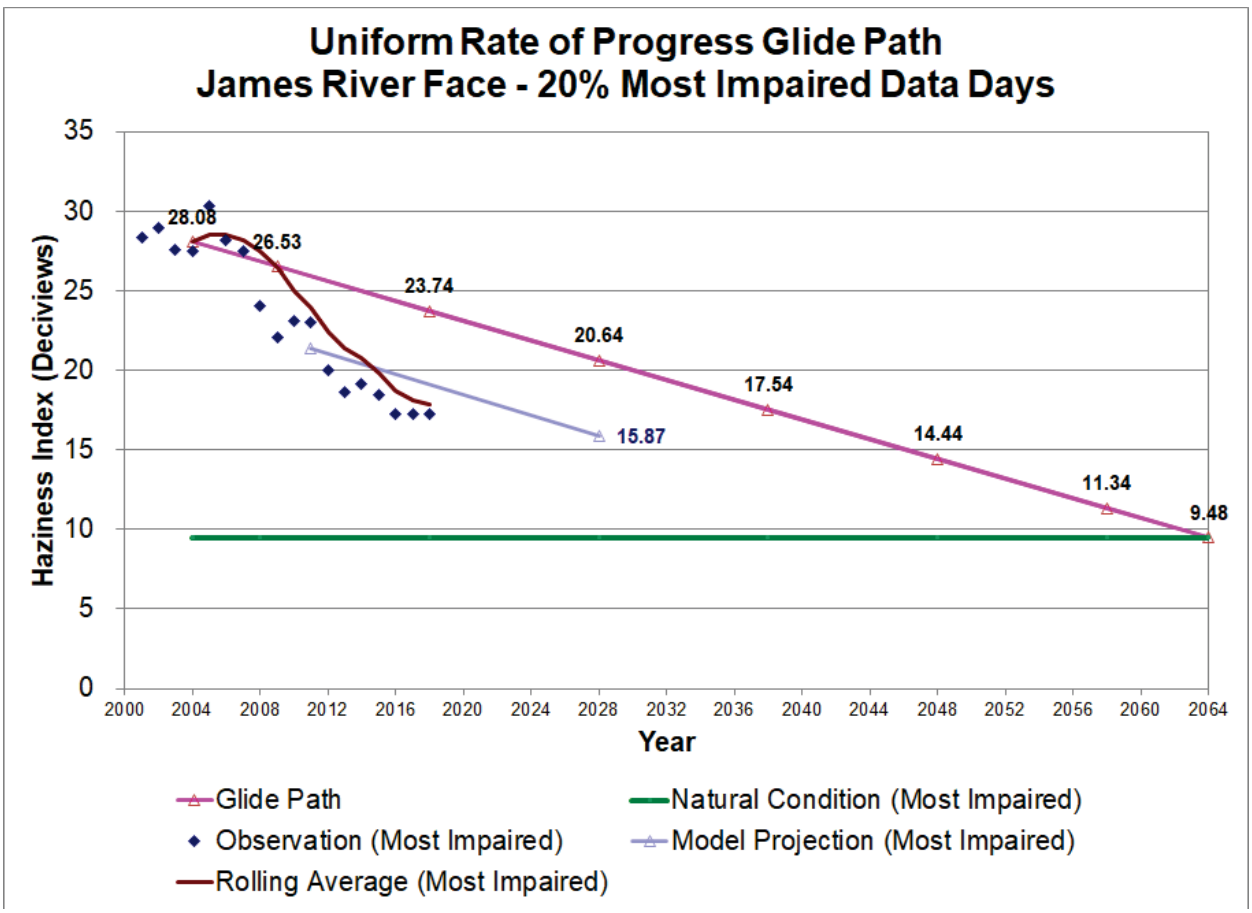
The visibility improvements already achieved in the West Virginia Class 1 areas are substantial, with a rate of improvement well beyond the uniform rate of progress established for these areas. Even if no further reductions were planned at West Virginia sources for the remainder of the second planning period and visibility levels remained stable, both of the in-state Class 1 areas would be almost 4 deciviews (dv) below the levels required by the uniform rate of progress. Figure 1 below shows the improvements from baseline achieved in these in-state Class 1 areas based on the most recent data collected.

Figure 1: Dolly Sods Wilderness Area Visibility Improvements



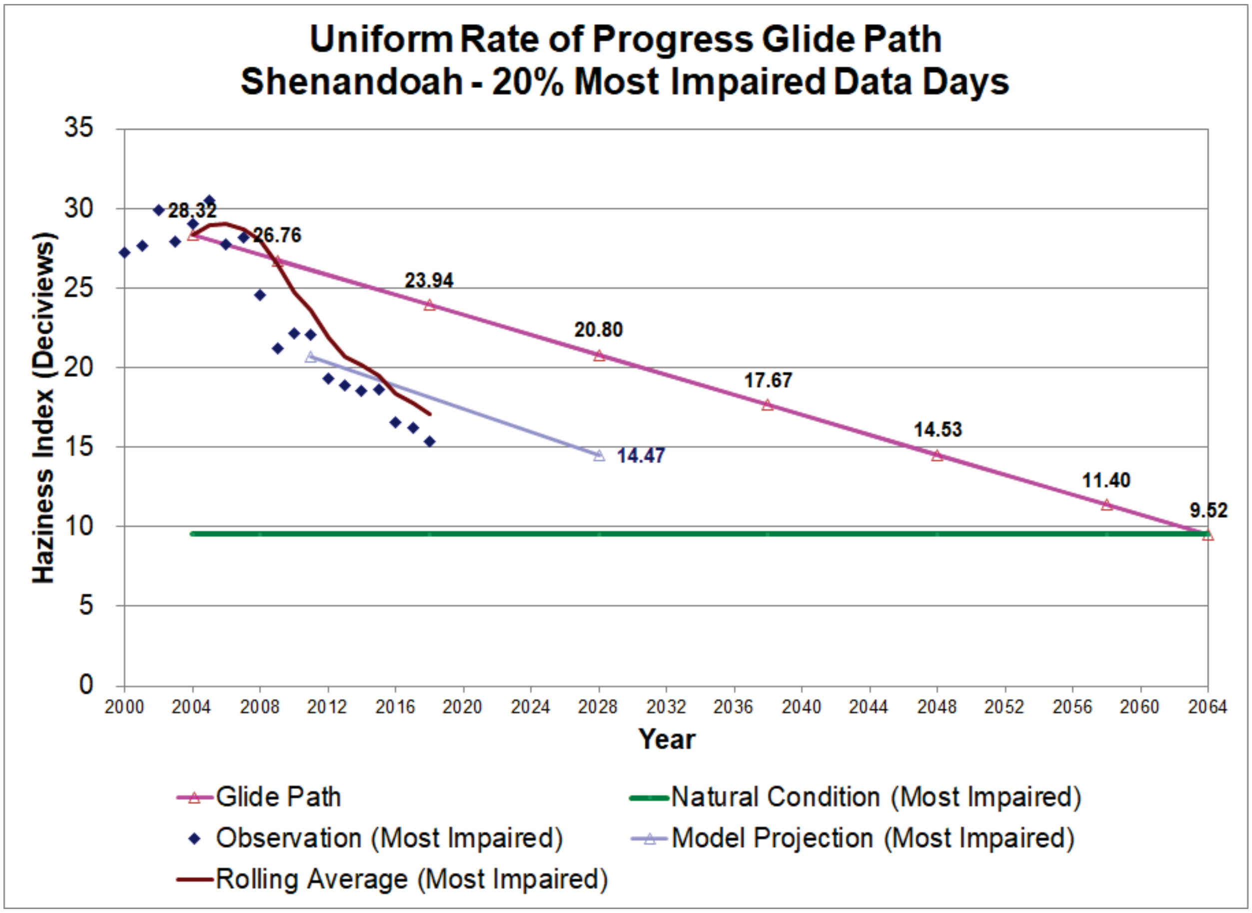
Based on the VISTAS analysis, Mitchell Plant contributes more than 1% of the impairment on the 20 most impaired days at the two in-state areas described above, and at the James River Face Wilderness Area and Shenandoah National Park in Virginia. Similar to the improvements seen in West Virginia, the James River Face Wilderness Area also has seen a substantial improvement in visibility on the 20% most impaired days, as shown below. And similarly, even if no further reductions were planned at West Virginia sources for the remainder of the second planning period and visibility levels remained stable, the James River Face Wilderness Area would be almost 3 deciviews (dv) below the levels required by the uniform rate of progress. Figure 2 below shows the latest assessment of visibility improvements compared to the uniform rate of progress for the James River Face Wilderness Area.

Figure 2: James River Face Wilderness Area Visibility Improvements



The Shenandoah National Park has also seen substantial improvements in visibility, and its 20 most impaired days have improved much more quickly than the uniform rate of progress would require. Figure 3 provides the latest information on visibility improvements in the area.

Figure 3: Shenandoah National Park Visibility Improvements



VISTAS reports that emissions of SO_2 within the region are expected to decline by over 73% from 2011 through the end of the second planning period in 2028. NOx emissions, which also contribute to visibility impairment, are expected to decline by 54%. Total SO_2 emissions from EGUs in West Virginia are expected to decline to 47,746 tons by 2028. Mitchell Plant facility-wide SO_2 emissions in 2017-2019 were 3,236 tons in 2017, 2,494 tons in 2018, and 2,061 tons in 2019. Annual tonnage varies widely due to unit availability, customer demands, weather, fuel quality, and other factors. For modeling purposes, VISTAS estimates that Mitchell Plant emissions will total 6,099 tons annually in 2028. Individual unit emission rates used in the modeling are 0.0913 pounds per million Btu (#/mmBtu) for Unit 1, and 0.0931 #/mmBtu for Unit 2 based on 2016 actual emission rates.

SO_2 Emission Controls and Other Obligations at Mitchell Plant

While visibility impairment and the relative contributions of individual facilities to such impairment are typically the criteria for selecting sources for further evaluation in planning for long-term progress toward natural visibility conditions, they are not the only factors that can or should be considered. USEPA's guidance makes clear that at the source selection stage, states may consider available information related to the four factors that inform the selection process for the actual control measures, and/or the five additional factors that must be considered under 40 CFR §51.308(f)(2)(iv). Two of these five factors in particular demonstrate that Mitchell Plant need not be evaluated during the second planning period, because of the prior evaluations undertaken, the ongoing implementation of other air pollution programs, and the anticipated net effect on visibility due to projected changes in emissions over the period addressed by the long-term strategy. *Guidance on Regional Haze State Implementation Plans for the Second Planning Period*, August 20, 2019 (hereinafter "*Guidance")*, p. 28.

Federal Consent Decree Requirements

Each of the EGUs at the Mitchell Plant is already equipped with the most effective type of SO_2 controls currently employed. The EGUs at the Mitchell Plant are each equipped with high efficiency wet limestone scrubbers (FGDs) that are designed to achieve as much as 98% reduction in uncontrolled SO_2 emissions. These controls were installed in 2007, to satisfy the obligations of a federal consent decree with USEPA and other parties, and are required to be continuously operated whenever the units are in service. The consent decree requirements have been incorporated into the Title V permit at Mitchell Plant.

The consent decree also contains a system-wide cap on SO_2 emissions from a group of units in the eastern United States. This annual cap has been reduced in modifications made to the consent decree over time. Most recently, the AEP Eastern System-Wide Annual Limitation on SO_2 was reduced to no more than 52,000 tons per year in 2021, declining to 44,000 tons in 2029. The group of units subject to the cap emitted 75,038 tons in 2017, 73,652 ton in 2018, and 62,844 tons in 2019. In addition to the Mitchell, Amos, and Mountaineer Plants in West Virginia, the cap includes the Rockport Plant in Indiana, the Gavin, Cardinal, and Conesville Plants in Ohio, the Big Sandy Plant in Kentucky and the Clinch River Plant in Virginia. The recent retirement of the Conesville Plant, and the addition of SCRs and enhancement of SO_2 controls at the Rockport Plant will make these further reductions achievable, but clearly indicate that sustained, highly effective operation of the SO_2 controls at Mitchell Plant must continue. All of these reductions will make ongoing contributions to visibility during the second planning period.

BART and Regional Interstate Transport Requirements

During the first regional haze planning period, states were required to evaluate BART on specific sources as a means of satisfying their visibility planning obligations. In its 2008 initial plan, West Virginia identified the units at Mitchell Plant as BART-eligible sources. While BART controls were not included in the initial West Virginia visibility plan for Mitchell Plant, their installation was already assured by the federal consent decree requirements discussed above.

Moreover, USEPA had previously adopted the Clean Air Interstate Rule (CAIR), which established a regional emissions trading program for EGUs designed to achieve substantial reductions in emissions of both SO_2 and NOx to mitigate interstate transport of emissions that contributed to downwind non-attainment with the 1997 National Ambient Air Quality Standards (NAAQS) for fine particulate matter and ozone. USEPA subsequently determined that compliance with CAIR provided greater visibility improvements than those that would be achieved through the unit-by-unit application of BART. CAIR was subsequently replaced by the Cross-State Air

Pollution Rule (CSAPR), and CSAPR was updated to address the 2008 ozone NAAQS with tighter emission budgets for EGUs in many states, including West Virginia. USEPA affirmed that CSAPR is better than BART for the first planning period and approved West Virginia's initial visibility plan based in part on implementation of the CSAPR program.

USEPA has recently proposed a Revised CSAPR Update rule that will further decrease the ozone season NOx budgets for 12 states in the Eastern United States, including West Virginia. West Virginia's current budget for ozone season NOx emissions would be reduced from the current 17,815 tons to 13,686 tons in 2021 for the ozone season from May through September. Additional reductions would occur in 2022 and 2023, until the state's ozone season budget reaches 11,810 tons. In 2019, actual ozone season emissions in West Virginia from covered units were 15,615 tons. While USEPA assumes that these reductions will occur largely as a result of optimizing highly effective selective catalytic reactor (SCR) NOx controls, the control efficiency assumptions were not accurately determined or applied, particularly to units burning bituminous coal, the majority of the fuels used in West Virginia. Accordingly, reduced generation from these units may be necessary if the rule is adopted without change, which would reduce emissions of both SO_2 and NOx, and lead to further visibility improvements.

Mercury and Air Toxics Standards

In 2013, USEPA adopted final standards under Section 112 of the Clean Air Act to regulate emissions of hazardous air pollutants from EGUs. The Mercury and Air Toxics Standards (MATS) rule established more stringent emissions limitations for mercury, non-mercury metals, certain acid gases, and organic pollutants. The limitations on non-mercury metals are implemented through limitations on fine particulates, a direct contributor to visibility impairment.

Because the same high efficiency controls that are used to reduce emissions of NOx and SO_2 at EGUs also effectively control certain of these hazardous air pollutants, USEPA developed monitoring protocols that allow source owners and operators to demonstrate compliance with the acid gas limitations using the data collected by continuous monitoring systems for SO_2. Since 2016, each unit at Mitchell Plant has regularly achieved an emission rate of less than 0.2 pounds of SO_2 per million Btu, the applicable alternative emission rate established in the MATS rule to demonstrate compliance with the acid gas limitations. As noted above, individual unit actual emission rates were 0.0913 pounds SO_2 per million Btu (#/mmBtu) for Unit 1, 0.0931 #/mmBtu for Unit 2 in 2016, well below the 0.2 pound threshold. USEPA recently completed its risk and technology review and maintained the current requirements of the MATS rule, finding there were no technological developments that would support a more stringent standard. This affirmation demonstrates that it is unlikely any additional control strategy is available for EGUs currently complying with the MATS rule, and they should be eliminated from selection for a full four-factor evaluation during the second planning period for the regional haze program.

EPA's Guidance to the States

In August 2019, USEPA issued guidance to assist the states in determining how best to effectively select and evaluate sources to determine whether further emission reductions were likely to satisfy the requirements to make further reasonable progress during the second planning period under the regional haze rule. As noted in the guidance, states are not required to evaluate every source in each planning period. Rather, states have broad discretion to examine the visibility impacts, types of sources, and pollutants that are most likely to provide further progress at a reasonable cost, and that can be implemented during the planning period without adverse non-air quality environmental or energy impacts.

In the case of the Mitchell Plant, several of the specific examples are particularly applicable. USEPA cites as an example of sources that could be excluded from further review BART-eligible sources selected for analysis during the first planning period that installed BART-level controls. Similarly, USEPA cites fuel combustion sources (like EGUs) that have installed and are operating year-round controls that achieve 90% or greater reductions in SO_2 and NOx emissions as sources that could be excluded from further consideration. In perhaps the clearest example of the level of control that could exclude a source from further evaluation, USEPA concludes that for the purpose of SO_2 control measures, an EGU that has add-on FGD and that meets the applicable alternative SO_2 emission limit of the 2012 MATS rule for power plants has emissions low enough that it is unlikely that an analysis would conclude that even more stringent control of SO_2 is necessary to make reasonable progress. *Guidance*, p. 30. USEPA's own recent technological assessment in support of retaining the MATS standards further reinforces that the state need not perform duplicative analyses for purposes of the regional haze program.

These factors, and the existence of the federal consent decree requirements and the potential revisions to the CSAPR state budgets, assure that Mitchell Plant and other EGUs in the AEP system will make additional contributions to improving visibility conditions in a number of Class 1 areas throughout the second planning period. Accordingly, no further evaluation of the Mitchell Plant is necessary.

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2c. Response Letter from FirstEnergy (Fort Martin Plant)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment.

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MonPower™
A FirstEnergy Company

800 Cabin Hill Dr.
Greensburg, PA 15601

James A. Meade
Corporate Counsel

724-838-6965
Fax: 234-678-2370

February 1, 2021

VIA EMAIL AND U.S. MAIL

Todd H. Shrewsbury
Engineer, Planning Section
West Virginia Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

RE: Monongahela Power
Fort Martin Power Station
Regional Haze Rule Compliance

Dear Mr. Shrewsbury:

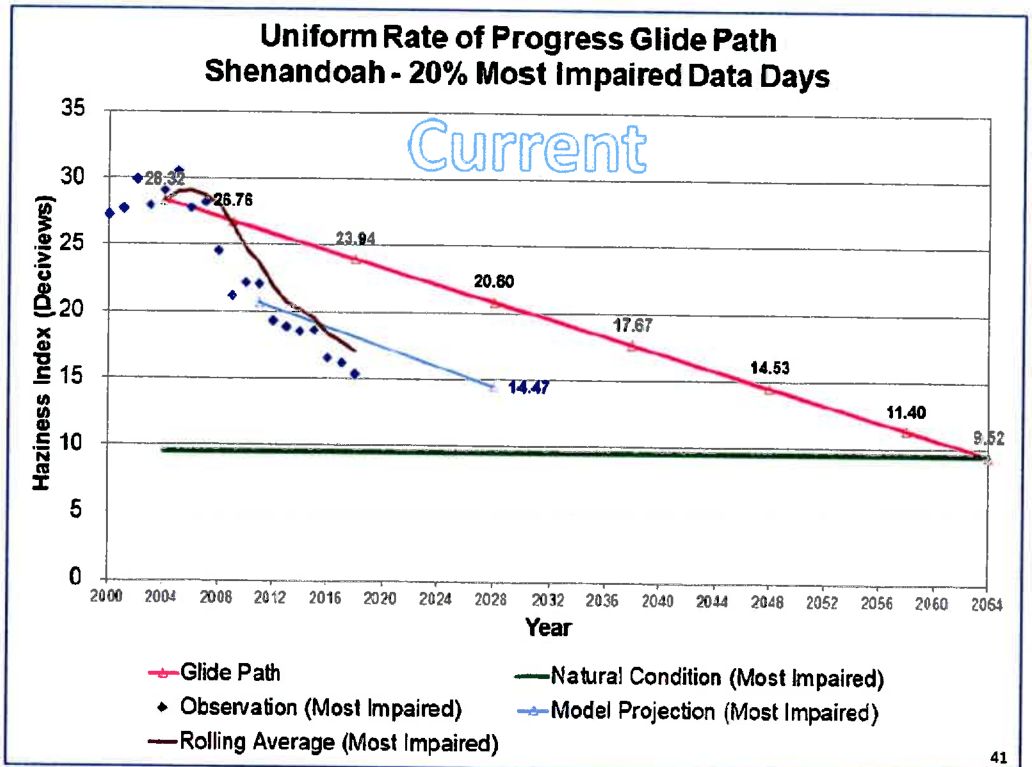
This letter is in response to the November 4, 2020 letter (enclosed) from David R. Fewell, Deputy Director of the Division of Air Quality for the West Virginia Department of Environmental Protection ("WVDEP"). As you are aware, the letter is a request to FirstEnergy to perform a four-factor analysis or submit an application to limit SO2 emissions on certain emission units at the Mon Power-owned Fort Martin Power Station ("Fort Martin"). After reviewing the criteria set forth in EPA's "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period" EPA-457/B-19-003 August 2019 ("EPA Guidance"), and for the reasons detailed below, we do not believe a formal four-factor analysis (or a permit application to limit SO2 tons) is required or appropriate for the EGUs at Fort Martin. However, we do believe that the information provided below is an appropriate assessment of Fort Martin relative to the regional haze program and will not only support our position, but will provide you with the necessary equipment and operations information to allow you to prepare the SIPs that are due to be submitted to the EPA by July 31, 2021, for the Regional Haze second implementation period ending in 2028.

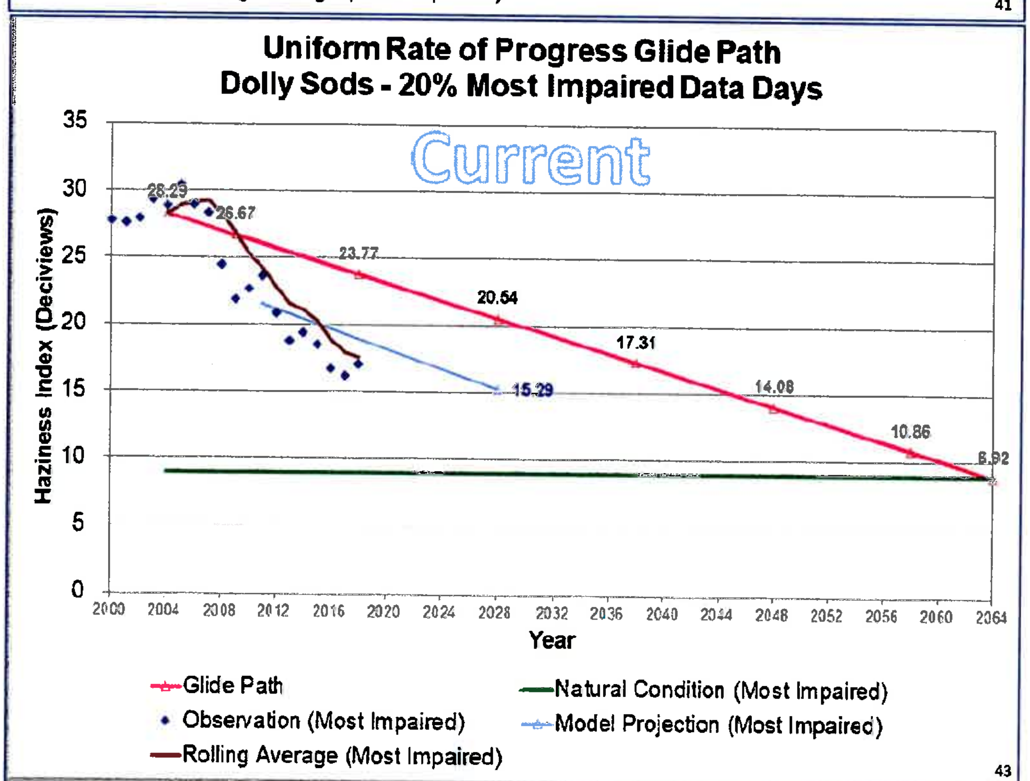
Uniform Rate of Progress Glide Path

As an initial matter, and most importantly, all of the Class I areas listed, including Shenandoah, Otter Creek[1], and Dolly Sods, in the Fort Martin VISTAS observations & projections are well below the Uniform Rate of Progress (URP) Glide Path to Natural Condition in 2064 with regards to the most impaired days as shown on the VISTAS graphs. In addition, the current observations are well below the projected URP Glide Path values for 2028. The graphs (set forth below) also demonstrate a downward trend of the observed & modelled visibility impairment, the slope of which is greater than the URP Glide Path, *i.e.* visibility is improving much more quickly

[1] Because Otter Creek does not have an IMPROVE monitor, we understand that it was not made the subject of a separate chart and is to be represented by data from nearby areas. See VISTAS Stakeholder Briefing May 20, 2020, slide 6.

than required by the Regional Haze rules. The data as displayed on the charts below demonstrate that "reasonable further progress" ("RFP") is being attained at a rate such that Natural Conditions are expected to be obtained well before the required 2064. The EPA Guidance states that "the state may consider this information when selecting sources." As the URP Glide Path graphs show, visibility improvement is well ahead of schedule and RFP is demonstrated, therefore no further controls are needed.





As clearly demonstrated on the UPR Glide Path graphs above, the ERTAC Model predictions which are used to estimate the 2028 Most Impaired Haziness Index appear to have a high bias when compared to the rolling average/slope of the actual observations. The charts show the year-to-year variability in the actual observations and the general downward trend of visibility impairment, yet the model predictions do not accurately depict this downward trend. This leads to the conclusion that the projected effect of Fort Martin on the subject Class I Areas is significantly overstated by the ERTAC 2028 projections.

Per the VISTAS information, Fort Martin's contribution to Haziness for Shenandoah, Otter Creek, and Dolly Sods is 1.04, 1.07% and 1.20% respectively. As discussed above, the ERTAC model projections are shown to be biased high. Correcting for the high bias, Fort Martin's contribution to the three Class I areas are under 1.00%.

WVDEP, in its letter, bases its request on the EPA Guidance and states "Portions of this document provide guidance to states on the selection of sources for analysis, characterization of factors for emission control measures, and decisions on what control measures are necessary to make reasonable progress." It is indisputable that progress toward the 2064 compliance level is well ahead of schedule.

Source Selection – Effectively Controlled Source

The above-mentioned EPA Guidance Section II.B.3. Step 3: Selection of sources for analysis: (f) Sources that already have effective emission control technology in place states:

> "It may be reasonable for a state not to select an effectively controlled source. A source may already have effective controls in place as a result of a previous regional haze SIP or to meet another CAA requirement. In general, if post-combustion controls were selected and installed fairly recently ... to meet a CAA requirement, there will be only a low likelihood of a significant technological advancement that could provide further reasonable emission reductions having been made in the intervening period. If a source owner has recently made a significant expenditure that has resulted in significant reductions of visibility impairing pollutants at an emissions unit, it may be reasonable for the state to assume that additional controls for that unit are unlikely to be reasonable for the upcoming implementation period."

This portion of the EPA Guidance is directly applicable to Fort Martin as that facility is and has been an effectively controlled source. Therefore, it is neither required nor appropriate for WVDEP to select Fort Martin for the four-factor analysis. Fort Martin scrubbers were installed in 2009 at a cost of approximately $500 million. More recently, an additional expenditure of approximately $4 million was made for 2016 MATS and continued compliance. The Fort Martin scrubbers have an average removal efficiency of 97.5% (2017-2019). Simply stated, the Fort Martin units are being effectively controlled with substantial expenditures made to meet CAA requirements. As such it is unreasonable to include Fort Martin in the request.

EPA further states that scenarios in which EPA believes it may be reasonable for a state not to select a particular source for further analysis includes Section (f) "[F]or the purpose of SO2

As clearly demonstrated on the UPR Glide Path graphs above, the ERTAC Model predictions which are used to estimate the 2028 Most Impaired Haziness Index appear to have a high bias when compared to the rolling average/slope of the actual observations. The charts show the year-to-year variability in the actual observations and the general downward trend of visibility impairment, yet the model predictions do not accurately depict this downward trend. This leads to the conclusion that the projected effect of Fort Martin on the subject Class I Areas is significantly overstated by the ERTAC 2028 projections.

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This portion of the EPA Guidance is directly applicable to Fort Martin as that facility is and has been an effectively controlled source. Therefore, it is neither required nor appropriate for WVDEP to select Fort Martin for the four-factor analysis. Fort Martin scrubbers were installed in 2009 at a cost of approximately $500 million. More recently, an additional expenditure of approximately $2 million was made for 2016 MATS and continued compliance. The Fort Martin scrubbers have an average removal efficiency of 97.5% (2017-2019). Simply stated, the Fort Martin units are being effectively controlled with substantial expenditures made to meet CAA requirements. As such it is unreasonable to include Fort Martin in the request.

EPA further states that scenarios in which EPA believes it may be reasonable for a state <u>not to select</u> a particular source for further analysis includes Section (f) "[F]or the purpose of SO2 control measures, an EGU that has add-on flue gas desulfurization (FGD) and that meets the applicable alternative SO2 emission limit of the 2012 Mercury Air Toxics Standards (MATS) rule for power plants." The two limits in the rule (0.2 lb/MMBtu for coal-fired EGUs or 0.3 lb/MMBtu for EGUs fired with oil-derived solid fuel) are low enough that it is unlikely that an analysis of control measures for a source already equipped with a scrubber and meeting one of these limits would conclude that even more stringent control of SO2 is necessary to make reasonable progress." (underline added)

This is also applicable to Fort Martin as its SO2 emission rate has averaged 0.11 #/mmBtu for the 2015-2020* (see chart below) which is well below the 0.2#/mmbtu MATS limit. Therefore, neither a four-factor analysis or a permit restriction on SO2 tons are required or appropriate. Fort Martin should be excluded from the sources selected per the EPA Guidance.

SO2 Rate (lb/mmBtu)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020*
Fort Martin	0.07	0.11	0.13	0.18	0.14	0.12	0.08	0.05	0.17	0.13	0.14

*Jan-Sep 2020 data

Another example of when it is reasonable for a state to not select an effectively controlled source is, as stated in the EPA Guidance, "For the purposes of SO2 and NOX control measures, a combustion source (e.g., an EGU or industrial boiler or process heater) that, during the first implementation period, installed a FGD system that operates year-round with an effectiveness of at least 90 percent or by the installation of a selective catalytic reduction system that operates year-round with an overall effectiveness of at least 90 percent (in both cases calculating the effectiveness as the total for the system, including any bypassed flue gas), on a pollutant-specific basis."

As you know, Fort Martin has FGD installed with an effectiveness greater than 90% that is operated year-round. Clearly Fort Martin should not be selected.

CSAPR Better Than BART

WVDEP has evaluated CAIR and has accepted that EPA's overall finding that the requirements in CAIR are equal to or better than those found in the Best Available Retrofit Technology ("BART") for NOx and SO2 as stated on page 108 of the 2008 Regional Haze SIP that was approved by the EPA:

> "The EPA has determined that, as a whole, the CAIR cap-and-trade program improves visibility more than implementing BART for individual sources in states affected by CAIR. A state that opts to participate in the CAIR program under 40 CFR Part 96 AAA-EEE need not require affected BART-eligible EGUs to install, operate and maintain BART controls for SO2 or NOx emissions. Given that all BART-eligible units have already installed or are installing scrubbers and NOx controls, and since West Virginia is participating in CAIR, and accepts EPA's overall finding that CAIR "substitutes" for BART for NOx and SO2."

EPA Guidance APPENDIX A - Clean Air Act Provisions, and EPA Rulemakings, and EPA Guidance Documents Related to SIPs Addressing Visibility Protection states that "The 2016 and 2017 Revisions to CSAPR and Affirmation that CSAPR as Updated is Better-than-BART. In the same action, EPA re-affirmed that CSAPR as updated remained a better-than-BART alternative for states participating in the CSAPR trading programs, on a pollutant-specific basis."

WVDEP has stated that it has accepted EPA's determination that the CAIR cap & trade program improves visibility more than implementing BART. The EPA has also affirmed that the CSAPR rules as updated (which replaced CAIR) is also more effective than BART. Fort Martin is subject to and in compliance with CSAPR and the CSAPR Update and therefore a four-factor analysis is not required nor is it appropriate.

Based on the foregoing, it is clear that a formal four-factor analysis (or a permit application to limit future SO2 emissions) is neither required or appropriate for the EGUs at Fort Martin. We believe that the information set forth in this letter provides the WVDEP with an appropriate assessment of Fort Martin and the necessary relevant information to allow you to prepare the Regional Haze SIPs due to EPA later this year. If you have any questions or would like to discuss this matter in further detail, please contact me at jmeade@firstenergycorp.com or by phone at (724) 244-4473, or Don Hromulak at dchromulak@firstenergycorp.com or (330) 436-2781.

Sincerely,

James A. Meade

James A. Meade
FirstEnergy Service Company
o/b/o Monongahela Power Company

Enclosure

west virginia department of environmental protection

Division of Air Quality
601 57th Street, SE
Charleston, WV 25304
(304) 926-0475

Austin Caperton, Cabinet Secretary
dep.wv.gov

November 4, 2020

Donald Hromulak
Senior Consulting Engineer
FirstEnergy Corporation
341 White Pond Drive
Akron, OH 44320

via email: dchromulak@firstenergycorp.com

Re: Regional Haze Reasonable Progress Assessment
Request for Four-Factor Analyses of Sulfur Dioxide Controls for Fort Martin Power Station

Dear Mr. Hromulak,

The West Virginia Department of Environmental Protection (DEP) is preparing the West Virginia Regional Haze State Implementation Plan (SIP) for the second planning period (2018-2028). The DEP has worked with the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), of which West Virginia is a member, to identify emission source sectors and facilities that significantly impact visibility impairment in Class I federal areas within and outside of our state. This work is consistent with and required by the regional haze statutory and regulatory requirements and federal guidance.

Based on analyses and modeling conducted by West Virginia and VISTAS, sulfur dioxide (SO_2) emissions from Fort Martin Power Station (Fort Martin) have been shown to contribute at least 1.00% to total anthropogenic visibility impairment in 2028 at three Class I federal areas. By this letter, DEP formally requests that FirstEnergy Corp (FirstEnergy) conduct a four-factor analysis on certain emissions units at the Fort Martin facility. The four-factor analyses must be submitted to DEP no later than January 31, 2021.

Part I to this request provides background on the regional haze program requirements. Part II explains the process that VISTAS followed to identify facilities such as Fort Martin for additional analyses. Part III explains how to proceed with a four-factor analysis of the major SO_2 sources at Fort Martin.

Please submit all items requested in this letter to Todd Shrewsbury, Engineer, Planning Section, West Virginia Division of Air Quality, by January 31, 2021. This information may be submitted electronically via email to Todd.H.Shrewsbury@wv.gov. Should you have any questions regarding this request, please contact Todd Shrewsbury via the email above or at (304) 414-1908.

Sincerely,

David R. Fewell Digitally signed by: David R. Fewell
DN: CN = David R. Fewell email = david.r.fewell@wv.gov C = US O = DAQ OU = DEP
Date: 2020.11.04 09:46:46 -05'00'

David Fewell
Deputy Director
Division of Air Quality

Part I: Overview of the Regional Haze Program

Section 169A of the 1977 Amendments to the federal Clean Air Act (CAA) sets forth a program for protecting visibility in Class I federal areas that calls for the "prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas which impairment results from manmade air pollution." Congress added Section169B to the 1990 Amendments to the CAA, which requires the United States Environmental Protection Agency (EPA) to issue rules regarding regional haze. The Regional Haze Rule (RHR) promulgated by EPA on July 1, 1999 (64 FR 35713) revised the existing visibility rule to integrate provisions addressing regional haze impairment and establish a comprehensive visibility protection program for each federal Class I area. These programs must provide for reasonable progress toward achieving natural visibility conditions by 2064.

The regional haze rules are codified at 40 Code of Federal Regulations (CFR) Subpart P - Protection of Visibility. Regional haze program requirements are located under 40 CFR 51.308(f) and mandate that each state must "address regional haze in each mandatory Class I federal area located within the state and in each mandatory Class I federal area located outside the state that may be affected by emissions from within the state." West Virginia submitted its regional haze plan for the first planning period (2008 – 2018) to EPA on June 18, 2008, and EPA subsequently granted full approval of this plan on September 24, 2018 (83 FR 48249). DEP is now preparing West Virginia's regional haze plan for the second planning period (2018 – 2028).

EPA finalized revisions to the RHR in January 2017 (82 FR 3078) to strengthen, streamline, and clarify certain aspects of the agency's regional haze program. 40 CFR 51.308(f) of the RHR requires that states must submit a regional haze plan for the second planning period by July 31, 2021. As part of the plan revision, West Virginia must establish a reasonable progress goal expressed in deciviews (dv) that provides for reasonable progress toward achieving natural visibility conditions by 2064 in the state's two Class I areas, Dolly Sods Wilderness Area and Otter Creek Wilderness Area. The goal "must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the clearest days over the same period." West Virginia must also work with other states with Class I areas which sources within our state have a visibility impact. These Class I areas are identified in Part II below.

West Virginia must also submit a long-term strategy that addresses regional haze visibility impairment for Dolly Sods Wilderness Area and Otter Creek Wilderness Area. The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals established for these Class I areas.

In establishing reasonable progress goals, West Virginia must consider the four factors specified in § 169A of the CAA and in 40 CFR 51.308(f)(2)(i):

- Statutory factor 1: the cost of compliance,
- Statutory factor 2: the time necessary for compliance,

- Statutory factor 3: the energy and non-air quality environmental impacts of compliance, and
- Statutory factor 4: the remaining useful life of any potentially affected sources.

On August 20, 2019, EPA issued "Guidance on Regional Haze State Implementation Plans for the Second Implementation Period.[1]" Portions of this document provide guidance to states on the selection of sources for analysis, characterization of factors for emission control measures, and decisions on what control measures are necessary to make reasonable progress.

Part II: Reasonable Progress Assessment

DEP has completed the reasonable progress assessment for its second regional haze SIP. The following steps describe DEP's process for conducting its reasonable progress assessment for the current planning period from 2018 through 2028.

Step 1: Determine pollutants of concern

Using 2013 through 2017 Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data for Class I federal areas in the VISTAS states, VISTAS evaluated the species contribution on the 20% most impaired visibility days and concluded that sulfate accounted for greater than 70% of the visibility impairing pollution associated with anthropogenic emission sources. Since sulfate is a large contributor to visibility impairment during this period, the VISTAS states concluded that SO_2 emission reductions should be the focus for reasonable progress assessments in this second round of planning.

Step 2: Determine which source sectors should be evaluated for reasonable progress

For the ten VISTAS states, point source SO_2 emissions in 2028 are projected to represent over 80% of the total SO_2 emissions inventory for all sectors. Therefore, the VISTAS states concluded that the sector evaluated for reasonable progress should be the point source sector, which is comprised of electric generating units (EGUs) such as Fort Martin as well as certain non-EGU industrial sources.

Step 3: Determine which facilities would be evaluated based on impact

VISTAS relied upon an area of influence (AoI) analysis to help identify the areas and sources most likely contributing to poor visibility in Class I federal areas. This AoI analysis included a backward trajectory model to determine the origin of the air parcels affecting visibility in each Class I area. This information was then spatially combined with emissions data to determine the pollutants, sectors, and individual sources that were most likely contributing to the visibility impairment at each Class I area. West Virginia first used this information to determine that the pollutant and emissions sector with the largest impact on visibility impairment was SO_2 from point sources. West Virginia then used the AoI results for each Class I area to identify sources to select for Particulate Matter Source Apportionment Technology (PSAT) modeling.

[1] https://www.epa.gov/sites/production/files/2019-08/documents/8-20-2019_-_regional_haze_guidance_final_guidance.pdf

An initial AoI screen of 0.2% for sulfate or nitrate was utilized to construct a potential list of point sources that could include facilities both inside and outside of West Virginia that might impact one of our Class I areas. From this list, point source facilities with an AoI contribution of at least 2% for sulfate or nitrate were selected for PSAT modeling. Since Fort Martin had calculated AoI impacts >2% at a Class I area, its emissions were tagged for PSAT modeling. Table 1 below illustrates the calculated AoI impacts from Fort Martin at Class I areas.

Table 1: Fort Martin Power Station Nitrate and Sulfate AoI Screens

Class I Federal Area	Nitrate AoI Screen	Sulfate AoI Screen
Dolly Sods Wilderness Area (WV)	1.07%	6.53%
Otter Creek Wilderness Area (WV)	0.92%	4.98%

PSAT modeling uses "reactive tracers" to apportion particulate matter among different sources, source categories, and regions. PSAT was implemented with the Comprehensive Air Quality Model with extensions (CAMx) photochemical grid model to determine visibility impairment from individual facilities. Use of PSAT modeling is a superior approach to the AoI analyses for determining individual facility contributions to visibility impairment in Class I federal areas and is considered "state of the science" technology. Using PSAT results, West Virginia identified facilities with an impact on one or more Class I federal areas of at least 1.00% calculated based on the total visibility impairment associated with SO_2 on the 20% most impaired days for each Class I federal area. These sources are being considered for additional reasonable progress analyses. The projected visibility impairment percentage from the PSAT modeling associated with Fort Martin's projected SO_2 emissions of 3,056.87 tons in 2028 is illustrated in Table 2 below. Note that some Class I areas are included in the PSAT modeling that were not selected in the 2% AoI screen.

Table 2: Fort Martin Power Station Total PSAT Visibility Impacts at Class I Federal Areas

Class I Federal Area	Total PSAT Visibility Impact
Dolly Sods Wilderness Area (WV)	1.20%
Otter Creek Wilderness Area (WV)	1.07%
Shenandoah National Park (VA)	1.04%

Fort Martin may choose to limit emissions to levels equating to less than 1.00% impact on the Class I areas listed above. Should Fort Martin select this option, the facility's annual, facility wide SO_2 emissions could not exceed 2,990 tons of SO_2 by 2028. Should Fort Martin choose to exercise this option and submit a permit application for this limitation by January 31, 2021, the facility needs not take further action to address reasonable progress requirements for this second round of regional haze planning.

Part III: Evaluate the Four Factors

To meet the requirements of 40 CFR 51.308(d)(1)(i)(A), DEP must consider each of the four statutory factors for emission sources at Fort Martin that are estimated to significantly contribute to visibility impairment in a Class I federal area:

- Statutory factor 1: the cost of compliance,

- Statutory factor 2: the time necessary for compliance,
- Statutory factor 3: the energy and non-air quality environmental impacts of compliance, and
- Statutory factor 4: the remaining useful life of any potentially affected sources.

DEP requests that Fort Martin conduct a four-factor analysis on all units contributing SO_2 emissions to the following emissions points in the facility's emissions inventory:

- Stack Point 001
- Stack Point 002

The requested four-factor analyses must be submitted to DEP no later than January 31, 2021.

EPA's August 20, 2019, regional haze guidance explains how the four statutory factors can be characterized. To identify control measures with the highest level of control effectiveness that are both technically feasible and cost effective, DEP requests that the analyses be conducted using a "top-down" approach for each emission unit as follows:

Step 1: Identify all control technologies.
Step 2: Eliminate technically infeasible options.
Step 3: Rank remaining control technologies by control effectiveness.
Step 4: Apply the four statutory factors (cost of compliance, time necessary for compliance, energy and non-air quality environmental impacts, remaining useful life of existing source) to control technologies identified in Step 3 and document the results.
Step 5: Select control technology and control effectiveness.

In accordance with EPA's 2019 guidance, Fort Martin should identify all SO_2 control technologies for each noted source at the facility. Fort Martin should then select the technically feasible technologies and provide a thorough justification for those screened out as infeasible. Technically feasible technologies, which may include but are not limited to reductions in sulfur content for fuels and raw materials, incremental improvements in the operation of existing air pollution control devices, and the installation of new air pollution control devices, should be ranked in order of highest to lowest control effectiveness. The facility's current emission limitations should be used as the baseline emission level for estimating control effective of each control measure.

Please estimate the cost of compliance, statutory factor 1, starting with the control measure with the highest level of control effectiveness. The cost of compliance should be in terms of cost per ton of SO_2 reduced. The cost used as the numerator in the cost per ton metric should be the annualized cost of implementing the control measure and should be determined using methods consist with EPA's Air Pollution Cost Control Manual.[2] Please provide all assumptions and data used in this analysis.

[2] https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution%23cost%20manual

Should the company rely on a methodology other than those included in EPA's Air Pollution Cost Control Manual, please include a description of that methodology in the submission, including all calculations and assumptions as well as a strong justification for why the methodology used is more appropriate than methods specified in the Air Pollution Cost Control Manual.

The emissions reduction used as the denominator of the cost per ton metric should be the annual tons of SO_2 reductions from implementation of the control measure. If the analysis indicates that the control measure should be included as part of West Virginia's long-term strategy for the second implementation period, further analysis of less effective control measures is not necessary. If the analysis indicates that the control measure is not cost effective, the company should estimate the cost of compliance for the control measure with the next highest level of control effectiveness. This process should be repeated until Fort Martin has identified a control measure to be included in West Virginia's long-term strategy or until all control measures have been fully analyzed and documented.

For statutory factor 2, time necessary for compliance, please provide a fully documented estimate of the time needed to comply with the control measures identified using statutory factor 1. This timeline should specify the source-specific factors used to estimate the time to install the control measures or to modify existing control strategies and provide a justification as to why the estimated time is reasonable.

For statutory factor 3, energy and non-air environmental impacts, please specify the cost of direct energy consumption of any control measure and which is included in the cost of compliance analysis. If any non-air environmental impacts associated with a certain control measure exist, such as impacts on nearby water bodies, those impacts should be thoroughly discussed.

Statutory factor 4, remaining useful life of the sources, is the number of years prior to the shutdown date during which the new emission control would be operating. If the remaining useful life of the source is less than the useful life of the control system being analyzed, please use the remaining useful life of the source in determining the annualized cost in the cost of compliance analysis. Otherwise, the company should use the useful life of the control measure in the cost of compliance analysis. If the remaining useful life of a source is relied upon in a four-factor analysis of a control measure instead of the useful life of the control system, and that control measure becomes part of West Virginia's long-term strategy, the shutdown date for the source will need to be included in West Virginia's SIP and shall become federally enforceable.

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2d. Response Letter from Energy Harbor (Pleasants Station)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Promoting a healthy environment.

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Regional Haze Four-Factor SO_2 Analysis

Pleasants Power Station

January 2021

Project No.: 0582962

The business of sustainability

ERM

Document details	A detailed Regional Haze Program four-factor SO_2 analysis for the Pleasants Power Station to satisfy the request of the WVDEP received on November 4th, 2020.
Document title	Regional Haze Four-Factor SO_2 Analysis
Document subtitle	Pleasants Power Station
Project No.	0582962
Date	29 January 2021
Version	1.0
Author	Christa Schumacher
Client Name	Energy Harbor

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1. EXECUTIVE SUMMARY

Pleasants LLC (a subsidiary of Energy Harbor Generation LLC) owns and operates a coal fired power plant located at 1 Power Station Boulevard Willow Island, WV (herein “Pleasants Power Station” or “Pleasants”). This report provides a four-factor control technology analysis along with a five step “top-down” approach for each of the two coal fired boilers at Pleasants. One boiler, Unit 1P, was built in 1978 and the second boiler, Unit 2P, was built in 1980, are both 657 MW opposed wall fired boilers. The primary fuel is coal with natural gas used for start-up and stabilization. The flue gas emissions are controlled with an ESP for particulate control, a wet lime scrubber for sulfur dioxide (SO_2) control, a SCR for NO_x control, and a SBS Injection System for SO_3/opacity control. Each Unit is permitted for a maximum heat input rate of 6,245 MMBtu/hr through the West Virginia Department of Environmental Protection (WVDEP), Division of Air Quality’s Title V permit, No. R30-07300005-2019.

This report is provided in response to the WVDEP request on November 4th, 2020 for Pleasants to perform a four-factor control analysis. Per WVDEP, only SO_2 needs to be considered as the visibility impairing pollutant for this analysis for the WVDEP’s Regional Haze Program. This analysis will support WVDEP’s submittal of the West Virginia Regional Haze State Implementation Plan (SIP). WVDEP’s letter to Pleasants on November 4th, 2020 outlines the assessment of potential impacts by Pleasants on Class I areas. Class I areas are specially designated National Parks and recreation areas where additional levels of air quality are granted to prevent the visual impairment of the view shed through the formation of haze. WVDEP identifies that Pleasants has a potential impact in excess of 1 percent on six Class I areas in WV, VA, NC, and VT.

The United States Environmental Protection Agency’s (EPA) guidelines in 40 CFR Part 51.308 are used to evaluate reduction measures for the two boilers at the Pleasants facility. In establishing a reasonable progress goal for any mandatory Class I Federal area within the State, the State must consider the following factors and demonstrate how these factors are considered. The program requires analysis of the Best Available Retrofit Technology (BART) to those eligible sources in order to meet the targets for visibility improvement at the designated Class I areas. The BART analysis will be utilized by WVDEP for development of the state’s Regional State Implementation Plan (SIP). 40 CFR 51.308(d)(1)(i)(A):

1. Cost of Compliance
2. Time Necessary for Compliance
3. The energy and non-air quality environmental impacts
4. Remaining useful life of source(s)

This report must also include a demonstration showing how these factors were taken into consideration in selecting the goal. In addition, per EPA regional haze guidance, the four statutory factors be characterized using a 5-step “top-down” approach for each emission unit as follows:

1. *Identify all control technologies.*
2. *Eliminate technically infeasible options.*
3. *Rank remaining control technologies by control effectiveness.*
4. *Apply the four statutory factors to control technologies identified in Step 3 and document the results.*
5. *Select, if feasible and appropriate, control technology and control effectiveness.*

This report provides information to WVDEP regarding potential SO_2 emission reduction measures for Pleasants. Based on the Regional Haze Rule and EPA guidance, Pleasants understands that it will only move forward with requiring emission reductions from the boilers if WVDEP determine that the emission reductions are needed to show reasonable progress and provide the most cost-effective controls among the options available. It is not expected that controls will be required based on this report.

The results of the four-factor analysis have indicated that additional controls are not necessary to make reasonable progress due to costs. Additionally, Pleasants already has in place robust SO_2 controls that would not be feasible or practical to replace. The four-factor analysis does not qualify for additional emission controls or limitation based on the four-factor analysis.

Table 1-1 – Summary of Findings, SO_2 Control Technology Options

Option Name:	Technically Feasible?	Timeframe	Energy and Non-Air Quality Environmental Impacts	Comments:
Lower Sulfur Coals	No	Due to major upgrades to properly utilize lower sulfur fuels, timeframe is not realistic	Lower sulfur coals would adversely affect the current SO_2 control technology; reducing the SO_2 control efficiency	Additional safety and fire hazards with lower sulfur coals, i.e. PRB. Coal handling of low sulfur fuel could result in coal pile fires and coal bunker fires. (Past experience from the decommissioned Willow Plant)
Wet Limestone Scrubber	No	Current scrubbers would need to be dismantled or majorly modified and new equipment installed to handle limestone.	The energy and non-air quality environmental impacts are similar to the current technology utilized.	The cost outweigh any benefit – making this option not feasible.
Spray Dryer Absorber / Dry Sorbent Injection / Circulating Dry Scrubber / Hydrated Ash Reinjection	No	Due to complete dismantling of existing FGD and installation of new control technology, timeframe is not realistic		The facility would have lost revenue from the elimination of the gypsum. Addition of a particulate removal system would be required to handle the increase in particulates. The byproducts are dry in nature and would pose disposal issues since beneficial use options are limited.

Pleasants concludes from this review, that the existing control technologies in place for SO_2 are the most suitable for the existing boilers. The reduction methods that were evaluated in this report are found to be either technically infeasible or pose insignificant reductions.

2. INTRODUCTION & BACKGROUND

Part of the 1977 amendments to the Federal Clean Air Act set forth a program to prevent any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal Areas which impairment results from manmade air pollution. This goal was eventually codified in the Code of Federal Regulations primarily in 40 CFR Subpart P – Protection of Visibility. These requirements mandate states to establish reasonable progress goals in order to attain natural visibility conditions by the year 2064. West Virginia submitted its regional haze plan for the first planning period (2008 – 2018) to EPA on June 18, 2008, and EPA subsequently granted full approval of this plan on September 24, 2018. WVDEP is now preparing West Virginia's regional haze plan for the second planning period (2018 – 2028).

The West Virginia Department of Environmental Protection (DEP) is preparing the West Virginia Regional Haze State Implementation Plan (SIP) for the second planning period (2018-2028). The WVDEP has worked with the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), of which West Virginia is a member, to identify emission source sectors and facilities that significantly impact visibility impairment in Class I federal areas within and outside of West Virginia. This work is consistent with and required by the regional haze statutory and regulatory requirements and federal guidance.

Based on analyses and modeling conducted by West Virginia and VISTAS, sulfur dioxide (SO_2) emissions from Pleasants Power Station (Pleasants) have been shown to contribute at least 1.00% to total anthropogenic visibility impairment in 2028 at six Class I federal areas. On November 4th, 2020, WVDEP formally requested that Pleasants conduct a four-factor analysis on the two boiler units at the Pleasants facility. This four-factor analyses must be submitted to WVDEP no later than January 31, 2021. The four factors are as follows:

Factor 1: Cost of Compliance
Factor 2: Time necessary for compliance
Factor 3: Energy and non-air quality environmental impacts of compliance
Factor 4: Remaining useful life of any existing source subject to such requirements

DEP has requested that Pleasants conduct a four-factor analysis on all units contributing SO_2 emissions to the following emission points in the facility's emissions inventory:

- Stack Point 001
- Stack Point 002

EPA's Regional Haze Guidance explains how the four statutory factors can be characterized. To identify control measures with the highest level of control effectiveness that are both technically feasible and cost effective, WVDEP has requested that the analyses be conducted utilizing a five-step top-down approach for each emission unit as follows:
Step 1: Identify all control technologies.
Step 2: Eliminate all technically infeasible options.
Step 3: Rank remaining control technologies by control effectiveness.
Step 4: Apply the four statutory factors.
Step 5: Select control technology and control effectiveness.

In accordance with the EPA guidance, Pleasants will identify all SO_2 control technologies for each source requested by WVDEP. Pleasants will then select any technically feasible technologies and provide a thorough justification for those screened out as infeasible. Technically feasible technologies, which may include but are not limited to reductions in sulfur content for fuels and raw materials, incremental improvements in the operation of existing air pollution control devices, and the installation of new air pollution control devices, should be ranked in order of highest to lowest control effectiveness. The facility's current emission limitations should be used as the baseline emission level for estimating control effective of each control measure.

Pleasants is an electric generating facility with two boilers designed to burn coal with a sulfur content up to 4.5%. One boiler, Unit 1P, was built in 1978 and the second boiler, Unit 2P, was built in 1980, are both 657 MW opposed wall fired boilers. The flue gas emissions are controlled with an ESP for particulate control, a wet lime scrubber for SO_2 control, a SCR for NO_x control, and a SBS Injection System for SO_3/opacity control. The Units have permitted design heat input rates of 6,245 MMBtu/hr each through the West Virginia Department of Environmental Protection (WVDEP), Division of Air Quality's Title V permit, No. R30-07300005-2019.

Pleasants is located on Willow Island, Pleasants County, in the western part of West Virginia. The facility is situated along the Ohio River and occupies approximately 160 acres. Parkersburg is the closest metropolitan area, located approximately 10 miles southeast of the facility.

A USGS topographic map is included as *Figure 1* with the sites location. *Figure 2* shows an aerial view of the facility and the closest Class I Federal Area, the Otter Creek Wildlife Area, which is approximately 90 miles southeast of the Pleasants.

Figure 1 - USGS Topographic Map of Pleasants Power Station

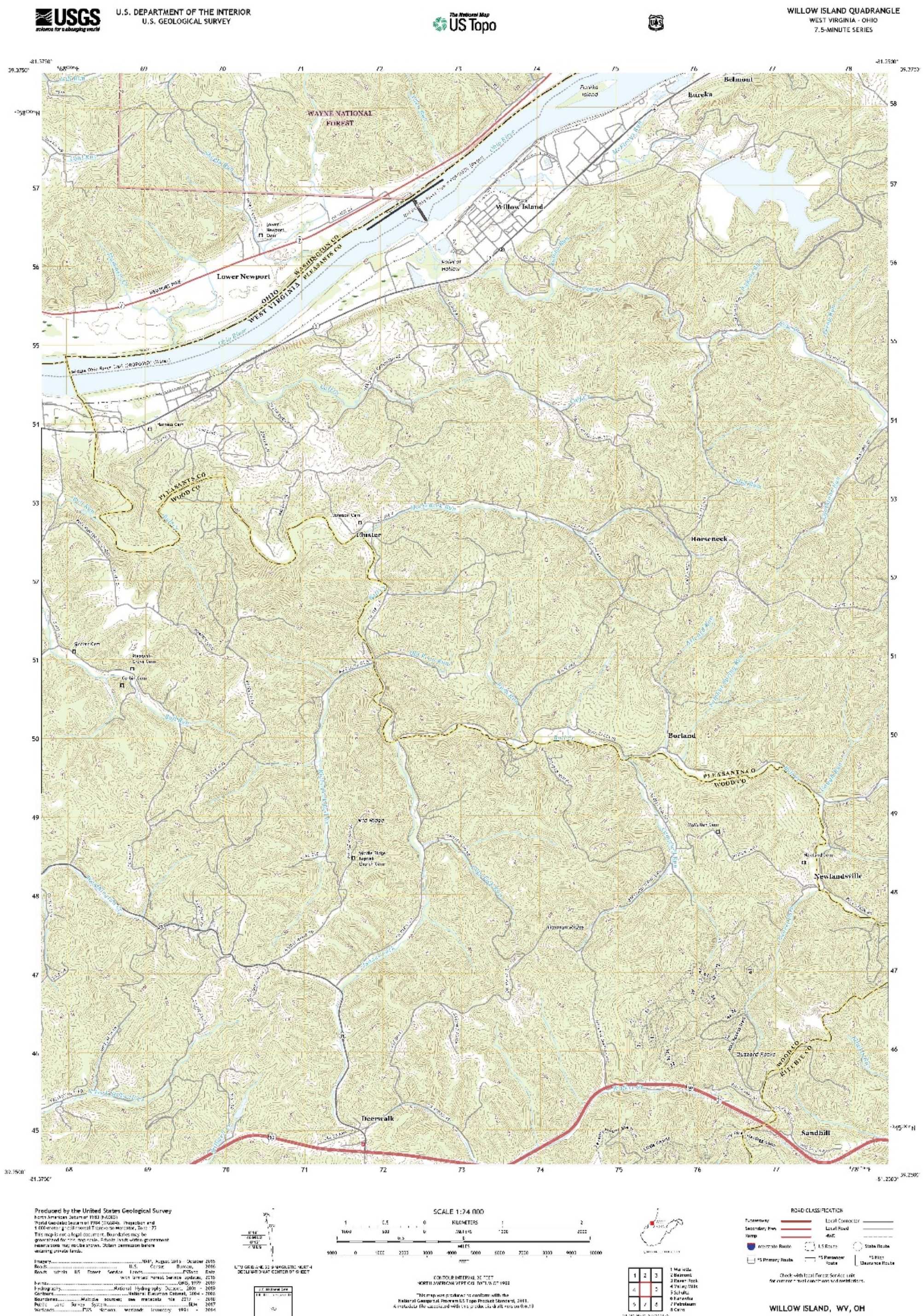
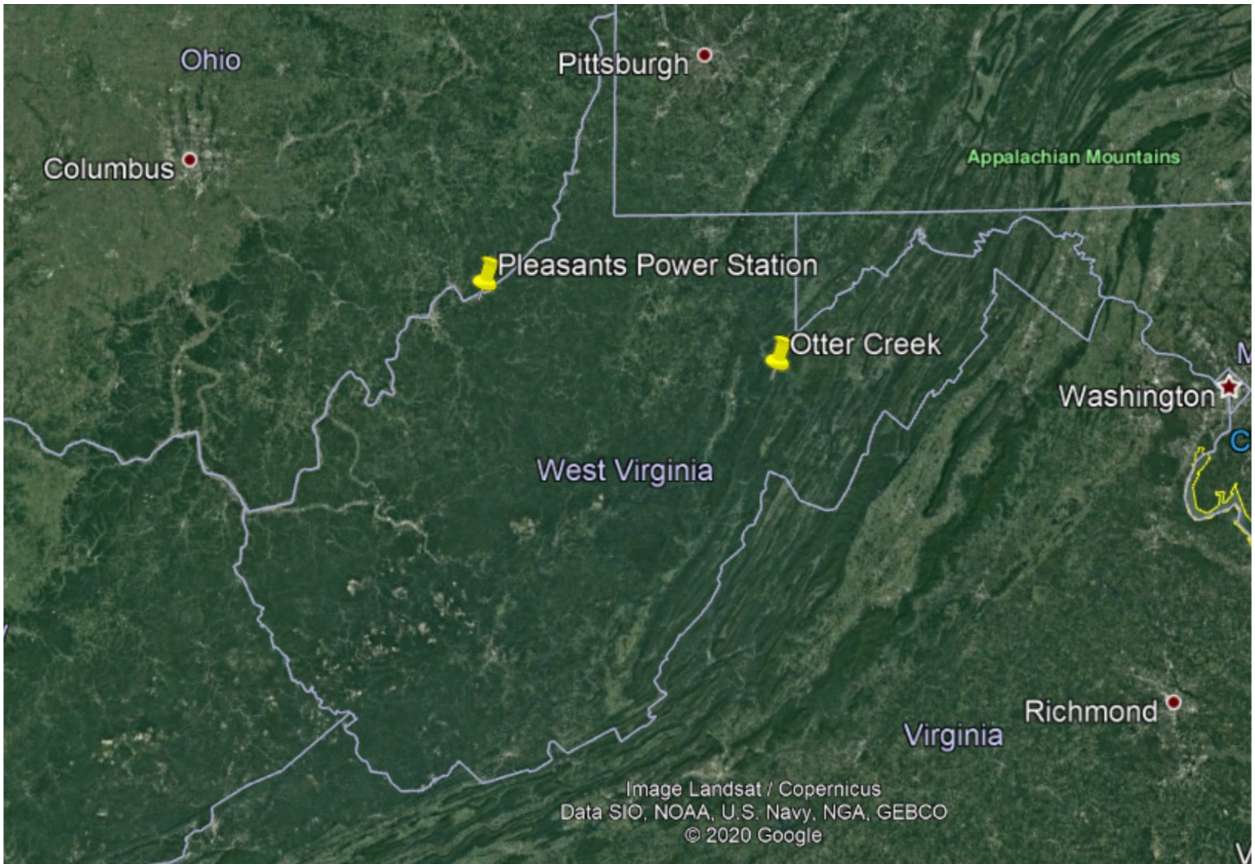


Figure 2 – Aerial Overview of Pleasants Power Station



3. EXISTING EMISSIONS AND VISIBILITY IMPACTS

3.1 Annual Baseline Emission Rates

Table 3-1 summarizes the emission rates from calendar year 2020 that are used as baseline rates in this report.

Table 3-1 Baseline SO_2 Emission Rates based on CY 2020 Emissions

Unit	Emissions, TPY
Unit 1P	3389.8
Unit 2P	4256.1
Total	**7645.9**

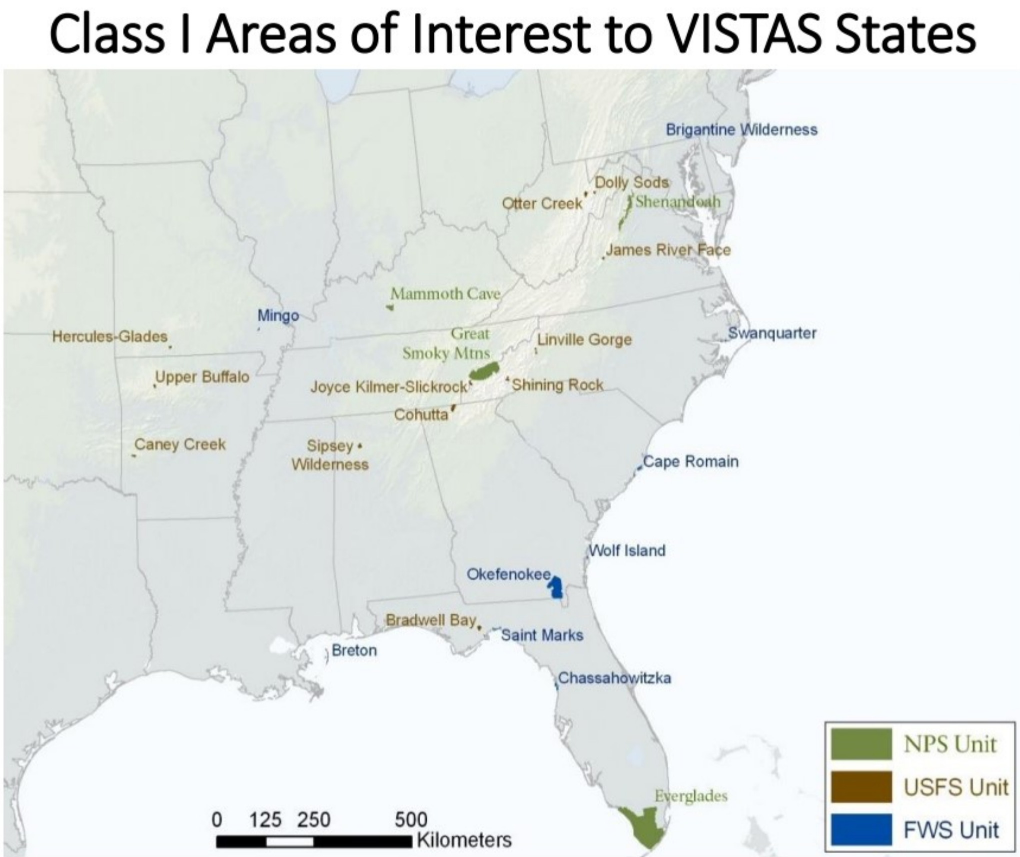
3.2 Visibility Impacts

WVDEP has completed a reasonable progress assessment for the second round of regional haze SIPs. WVDEP's following steps outline the process used to conduct their reasonable progress assessment for the current planning period from 2018 to 2028.

Step 1: Determine pollutants of concern

WVDEP utilized 2013 – 2017 Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring data for Class I Federal areas in the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) states, of which WV is a member. VISTAS evaluated the species contribution on the 20% most impaired visibility days and concluded that sulfate accounted for more than 70% of the visibility impairing pollution associated with anthropogenic emission sources. VISTAS concluded that SO_2 emission reductions should be the focus for the second round of regional haze planning.

Figure 3.2-1 – Class I Federal Areas in the VISTAS States



Step 2: Determine which source sectors should be evaluated for reasonable progress

In the VISTAS states, 80% of the total SO_2 emissions are projected to come from point sources from all sectors. Therefore, VISTAS states concluded that point sources, which is comprised of electric generating units (EGUs) such as Pleasants, as well as other non-EGU industrial sources should be evaluated for reasonable progress.

Step 3: Determine which facilities would be evaluated based on impact

VISTAS used an area of influence (AoI) analysis to identify areas and sources most likely to contribute to poor visibility in Class I Federal areas. This AoI analysis included a backward trajectory model to determine the origin of the air parcels affecting visibility in each Class I area. This was then used with emissions data to determine the pollutants, sectors, and individual sources that were most likely to contribute to the visibility impairment of these Class I areas. WVDEP used the AoI results for each Class I area to identify sources to select for Particulate Matter Source Apportionment (PSAT) modeling. WVDEP selected an initial AoI screen of 0.2% for sulfate or nitrate to construct a potential list of point sources that could impact Class I areas. From this list, point source facilities with an AoI contribution of 2% or greater for sulfate or nitrate were selected for PSAT modeling. Since Pleasants had AoI impacts of more than 2% at Class I areas, its emissions were tagged for PSAT modeling. The table below shows the calculated impacts from Pleasants at Class I areas:

Table 3.2-1 – Pleasants Power Station Sulfate and Nitrate AoI Screens

Class I Federal Area	Sulfate AoI Screen	Nitrate AoI Screen
Dolly Sods Wilderness Area (WV)	4.64%	0.16%
Otter Creek Wilderness Area (WV)	8.19%	0.30%
Shenandoah National Park (VA)	4.97%	0.24%
James River Face Wilderness Area (VA)	3.87%	0.15%
Swanquarter Wilderness Area (NC)	0.84%	0.07%

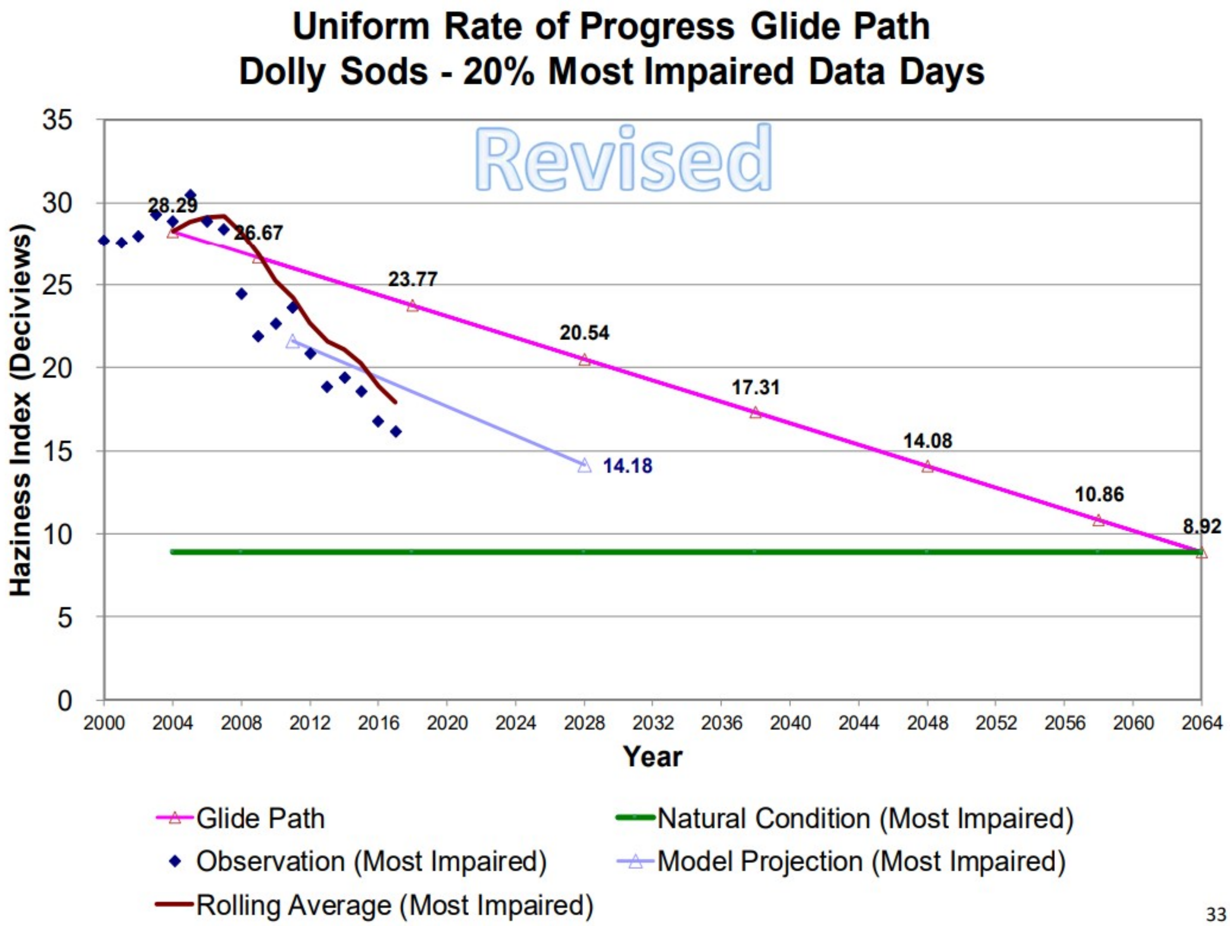
Using PSAT results, WVDEP identified facilities with an impact on one or more Class I Federal areas of at least 1.00% calculated based on the total visibility impairment associated with SO_2 on the 20% most impaired days for each Class I area. These sources are considered for additional reasonable progress analyses. Pleasants has projected visibility impairment percentages from the PSAT modeling using projected SO_2 emissions of 11,501.78 tons in 2028 as shown in Table 3.2-2. (Note: Some Class I areas were included in the PSAT modeling that were not selected in the 2% AoI screen.)

Table 3.2-2 – Pleasants Power Station Projected 2028 PSAT Visibility Impacts

Class I Federal Area	Total PSAT Visibility Impact
Otter Creek Wilderness Area (WV)	4.52%
Dolly Sods Wilderness Area (WV)	4.46%
James River Face Wilderness Area (VA)	2.40%
Shenandoah National Park (VA)	2.35%
Swanquarter Wilderness Area (NC)	1.24%
Lye Brooke Wilderness Area (VT)	1.01%

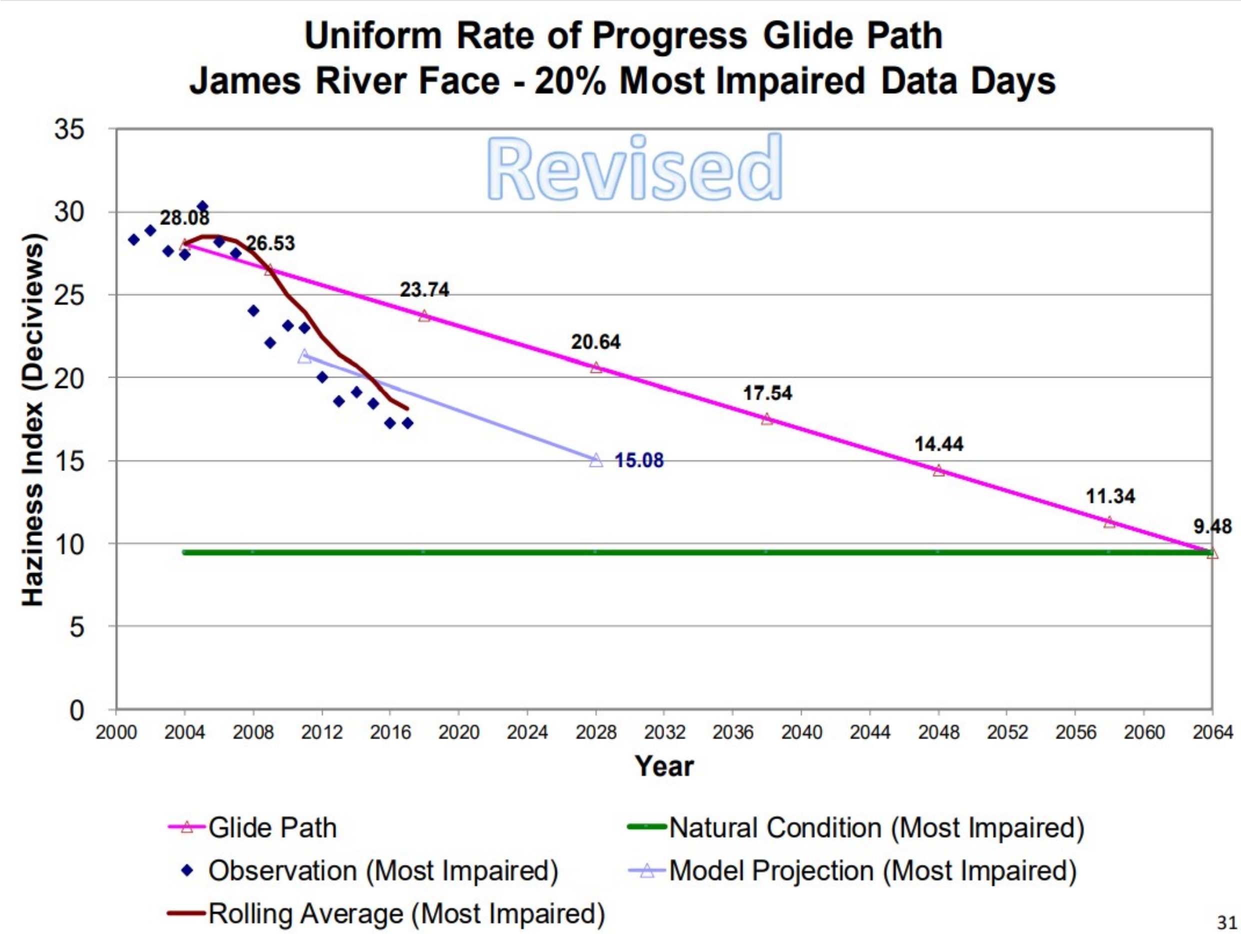
It is important to note thus far in the report that based on VISTAS modeling, overall reasonable progress has been projected and can conclude that enough reductions will be achieved by themselves to constitute progress in terms of the Regional Haze Rule. The figures below from VISTAS, ‘VISTAS Regional Haze Project Update’, on May 20, 2020, support this conclusion.

Figure 3.2-2 – SO_2 2028 Model Projections, Dolly Sods AoI[1]



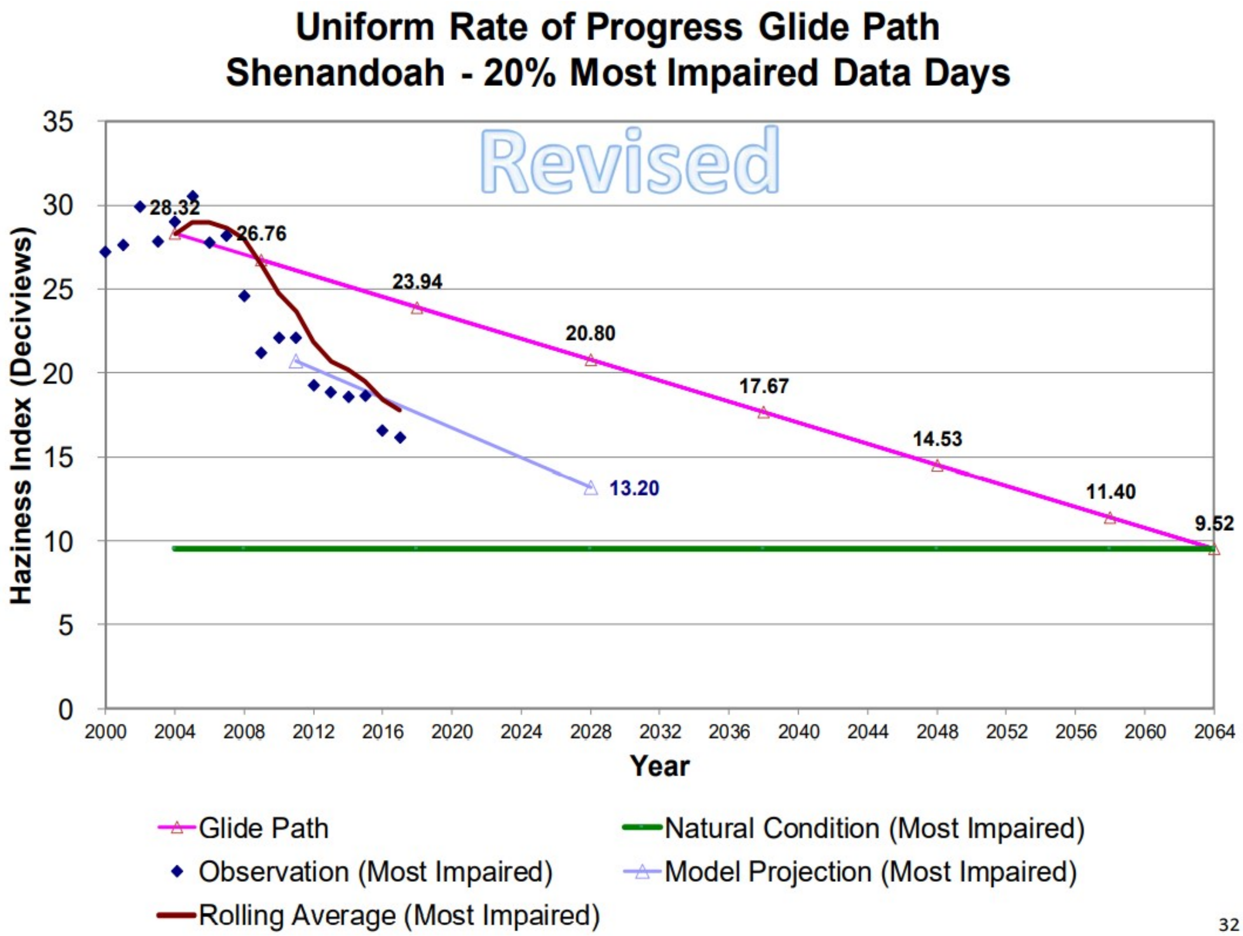
[1]From page 33 of the 'VISTAS Regional Haze Project Update', dated May 20, 2020.

Figure 3.2-3 – SO_2 2028 Model Projections, James River AoI[1]



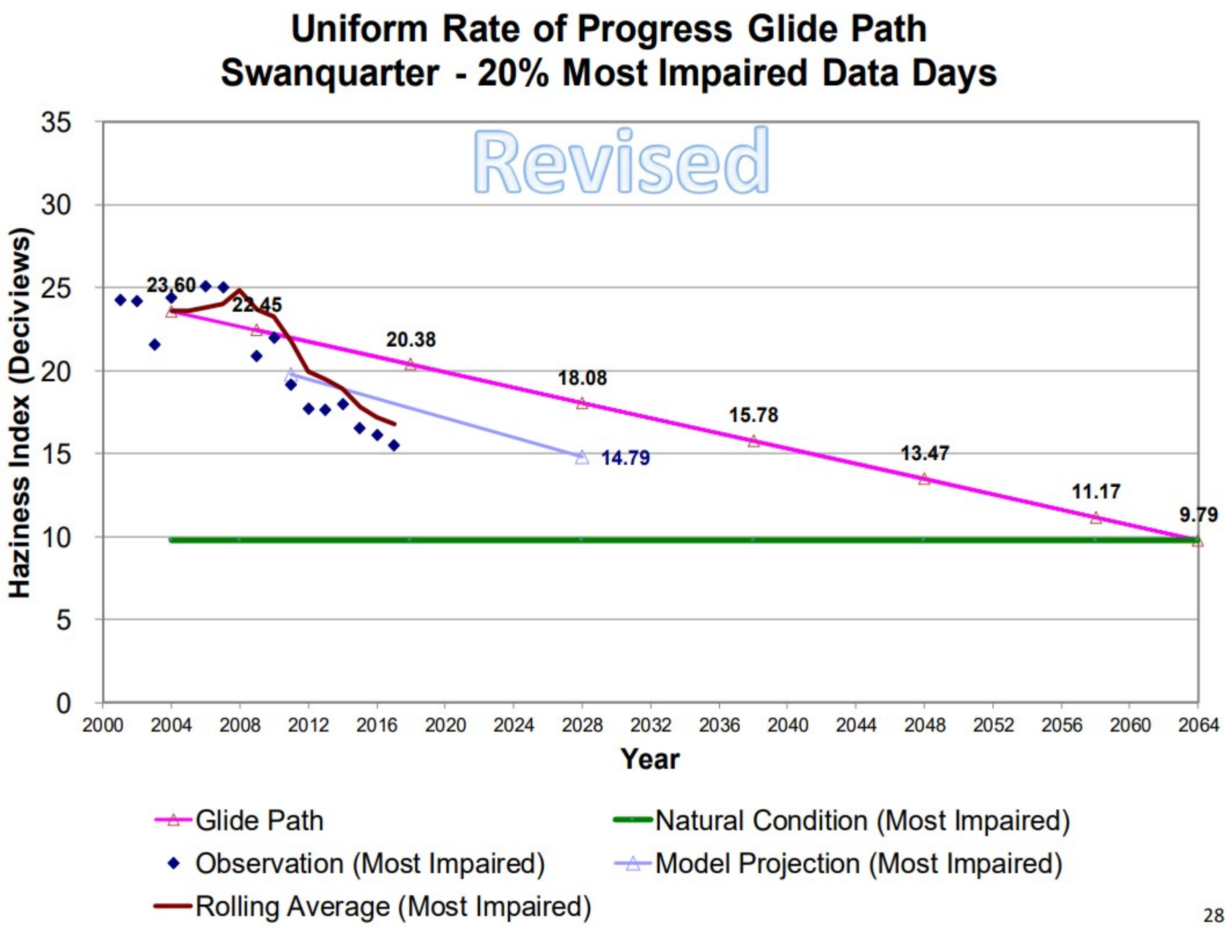
[1]From page 31 of the 'VISTAS Regional Haze Project Update', dated May 20, 2020.

Figure 3.2-4 – SO_2 2028 Model Projections, Shenandoah AoI[1]



[1]From page 32 of the ‘VISTAS Regional Haze Project Update’, dated May 20, 2020.

Figure 3.2-5 – SO_2 2028 Model Projections, Swanquarter AoI[1]



[1]From page 28 of the 'VISTAS Regional Haze Project Update', dated May 20, 2020.

From a national perspective, emissions of SO_2 are on a downward trend. Regardless of the decisions in the second round of planning, the impacts to regional haze are forecasted to decline, thus improving visibility in the Class I AoIs. (Assumptions made that the reductions in SO_2 emissions would have a direct benefit to visibility.)

4. SO_2 FOUR-FACTOR ANALYSIS

As requested by WVDEP, Pleasants has complete its four-factor analysis and documented the analysis for Pleasants' sources following direction of the EPA Draft Guidance. The initial step in the analysis was to identify all available SO_2 reduction technologies that could be available to similar type of sources. The options selected in this analysis are based on EPA guidelines, the EPA Cost Control Manual and BART analyses. Next, in step 2, the facility has eliminated technically infeasible SO_2 control technologies and an outline of the elimination criteria is document in Section 4.2. Any potentially feasible options remaining are ranked and discussed in Step 3 in Section 4.3. Following Step 3, the detailed four-factor analysis of the remaining options are evaluated in Section 4.4. Under section 4.4, the report will detail all four statutory factors. A summary of control technologies and effectiveness will be discussed in Section 4.5.

4.1 Step 1: Identification of Available SO_2 Reduction Technologies

Pleasants has taken a three strategy approach to SO_2 reduction technologies: pre-combustion controls, combustion controls, and post-combustion controls. Given the infeasibility of combustion controls (i.e. types of boilers), the complete disassembly, redesign, and construction, the facility will not detail these approaches in this report given other potentially feasible pre-combustion and post-combustion controls for existing permitted equipment.

Pleasants currently controls SO_2 emissions utilizing two Babcock & Wilcox packed tower scrubbers. Scrubber #1P was installed in 1978 and Scrubber #2P was installed in 1980. The scrubbers utilizes a lime slurry. The design is countercurrent tray system with a venture quencher. Each scrubber has four modules served by a common lime feed system. The monitoring of SO_2 emissions in the exhaust stream with the certified Continuous Emission Monitoring System (CEMs) is the primary method used to indicate the control device is operating properly. In addition the rate of lime slurry addition to replace the lime that has reacted with SO_2 is modulated to maintain the pH of the slurry returning from the absorber between 5.0 and 6.0. The SO_2 control reduction is listed in the facility's air permit at 92.5%.

The current scrubber system is operating at or near its maximum capacity and any increase to the system beyond current levels would result in plugged lines, increased bed ash which would reduce combustion efficiency. As all available upgrades have been completed, additional improvements or upgrades to the system are not considered further. This analysis will focus on available pre-combustion and post-combustion controls.

4.1.1 Pre-Combustion Controls

Three categories of pre-combustion control technologies were considered during this analysis:

- *Lower Sulfur Coals*
- *Fuel Blending*
- *Coal Cleaning*

Details on these control technologies are described in Table 4.1-1 – Pre-Combustion Control Technologies.

Table 4.1.1 – Pre-Combustion Control Technologies

Option Name	Description	Potential SO_2 Reduction (%)	Comments:
Lower Sulfur Coals	A switch from current coal types to lower sulfur content coals, like PRB (i.e. western coals).	Variable	Facility utilizes this control technology up to the limitation of the equipment. Lower sulfur coals would reduce the effectiveness of the SO_2 removal by the scrubber.
Fuel Blending	Material such as limestone is injected into the coal prior to the combustion.	Variable	Facility utilizes this control technology up to the limitation of the equipment. Further fuel blending is not practical for pulverized coal boilers
Coal Cleaning	Physical washing of the coal to remove sulfur and other impurities before it is used.	20-25%	Water-intensive process. Facility has confirmed that coal is cleaned by the supplier prior to arrival on-site.

Pleasants directly or non-directly applies the above pre-combustion control technologies. Thus, evaluation was conducted on improving or further utilizing these control technologies. Details on each control technologies improvement feasibility is discussed below:

Lower Sulfur Coals

Pleasants is currently permitted to use coals with a maximum sulfur content of up to 4.5%. Currently, given economic and operating factors, Pleasants has been utilizing Illinois Basin coal (ILB) blended with Ohio and Marshall County Ohio coal to obtain an average sulfur content of 3%. This is the lowest feasible sulfur content for the pulverized coal boilers at Pleasants to be efficient, dependable, and available as to not disrupt production. Additionally, the facility has noted that the switch to lower sulfur coals present challenges to the system that impact boiler performance. Given the trade off in utilizing lower sulfur coals, it is important to note that with the current facility equipment/operations, Pleasants is operating with the lowest sulfur content coal available to achieve SO_2 reductions to stay in compliance with their air permit. Any lower sulfur coals available would additionally present safety concerns at the facility. Due to the quality of lower sulfur coals, such as western coals, potentially fire hazards would be present and unacceptable at the facility.

In summary, any further reductions to lower sulfur fuels than is already being accomplished at the facility would present great challenges and costs to Pleasants. Significant investment and modification to the existing plant would be required. Any switch to lower sulfur coals would affect the coal handling system, boiler performance, PM control effectiveness and ash handling systems.

Fuel Blending

The process of fuel blending discussed in this section involves materials such as limestone and other chemicals to be used pre-combustion, during the coal preparation process, to assist in the reduction of

SO_2 when the fuel is combusted in the boilers. This option is not feasible due to the design of the current boilers. It should be noted that the facility does have a refined coal system at the coal handling process (prior to combustion) that does utilize MERSORB, limestone, and iron as fuel pretreatment additives. These additives are used on the conveyor belt as it is running into the plant. Any further fuel blending options are not feasible.

Coal Cleaning

The coal cleaning options is the physical washing of the coal to remove sulfur and other impurities before use. It is worthy to note that this is a very water-intensive process – both consuming a large quantity of water (~12,000 gal/ton) and loss of coal (from ~2-15%).

This option is currently utilized by the coal supplier prior to receipt at the facility. It would be technically infeasible to perform on-site as the facility is not equipped for a coal-washing operation. Considering that the coal is already washed prior to arrival on-site, there would be no added benefit to conducting the washing on-site. In addition, the washing would create water and waste issues for the facility.

Given the information presented above, the four-factor analysis will not be continued for any pre-combustion options.

4.1.2 Post-Combustion Controls

Several available control technologies can be utilized to reduce SO_2 from coal combustion sources post-combustion. Currently, Pleasants utilizes a wet lime scrubber system for each boiler. The packed tower scrubbers, Babcock & Wilcox scrubbers, utilize a lime slurry. The design is a countercurrent tray system with a venture quencher. The scrubbers have four modules served by a common lime feed system. The monitoring of SO_2 emission in the exhaust stream with the certified CEM is the primary method used to indicate the control devices are operating properly. In addition the rate of lime slurry addition to replace the lime that has reacted with SO_2 is modulated to maintain the pH of the slurry returning from the absorber between 5.0 and 6.0. This reduction technology used at the facility achieves an SO_2 control rate of 92.5% as listed in the facility air permit. These scrubbers are at maximum capacity. And the facility previously completed various upgrades that allow the technology to operate at maximum capacity. Any increases to the lime injection would cause detrimental system issues such as plugged lines and increased bed ash which would reduce combustion efficiency. It is currently not feasible to upgrade the system to accommodate increased lime injection as all upgrades that are technically feasible have been completed. It is also important to note that this current control technology relies on higher sulfur coals, which makes the current coal-sulfur limit allowed by the permit (4.5%) the most effective option for the system. Therefore, any upgrades to the current system are not considered further. This analysis will focus on add-on control systems to control SO_2.

Five post-combustion control technologies were considered during this analysis:

- *Wet Limestone Scrubber, otherwise known as Limestone Forced Oxidation (LSFO) Scrubber*
- *Spray Dry Absorber (SDA)*
- *Dry Sorbent Injection (DSI)*
- *Circulating Dry Scrubber (DS/FF)*
- *Hydrated Ash Reinjection (HAR)*

Details on these control technologies are described in Table 4.1-2 – Pre-Combustion Control Technologies.

Table 4.1.2 – Post-Combustion Control Technologies

Option Name	Description	Potential SO_2 Reduction (%)	Comments[1]:
Wet Limestone Scrubber or LSFO Scrubber	A wet flue gas desulfurization system utilizing a limestone slurry.	90-95%	For ~500 MW units: Heat Rate needed 9500 btu/kwh Capital Cost 354 $/kW Total Project Cost: 531 $/kW Fixed O&M cost 8.45 $/kw-yr Variable O&M cost: 3.07 $/MWh
Spray Dry Absorber (SDA)	The typical spray dry absorber (SDA) uses lime slurry and water injected into a tower to remove SO_2 from the combustion gases.	60-95%	For ~500 MW units using 2 lbs/mmbtu SO_2 content: Heat Rate needed ~9800 btu/kwh Capital Cost 313 $/kW Total Project Cost: 470 $/kW Fixed O&M cost 6.81 $/kw-yr Variable O&M cost: 3.64 $/MWh Limited to coals with a sulfur content <3 lbs SO_2/MMBtu
Dry Sorbent Injection (DSI)	Dry sorbent injection (DSI) involves the injection of powdered or hydrated sorbent (typically alkaline) directly into the flue gas exhaust stream.	50% for dry sorbent, potential for up to 80% or greater for hydrated lime	For ~500MW units* using 2 lbs/mmbtu SO_2 content: Heat Rate needed ~9500 btu/kwh Capital Cost: 37 $/kW Total project cost: ~44 $/kW Fixed O&M cost: ~0.89 $/kW yr Variable O&M cost: ~9.18 $/MWh *Cost estimation is based on sorbent feed rate and primarily independent of unit size. SO_2 control efficiencies less than existing technology.
Circulating Dry Scrubber (DS/FF)	The circulating dry scrubber (CDS) uses a circulating fluidized bed of dry hydrated lime reagent to remove SO_2.	80-90%	Costing comparable to Spray Dry Absorber (SDA) system. SO_2 control efficiencies less than existing technology.
Hydrated Ash Reinjection (HAR)	The hydrated ash reinjection (HAR) process is a modified dry FGD process developed to increase utilization of unreacted lime (CaO) in the ash and any free lime left from the furnace burning process.	50%	This technology is similar to other dry FGD systems. Pricing is vendor specific and was not analyzed for the purposes of this report due to low SO_2 control efficiencies.

[1]From EPA Best Case v5.13, in 2012 dollars

Wet Limestone Scrubber, otherwise known as Limestone Forced Oxidation (LSFO) Scrubber

Wet limestone scrubbers are similar to the wet lime scrubbers currently utilized at the facility. The use of limestone instead of lime is utilized. In this process, the limestone slurry solution is injected in a spray tower to absorb SO_2 and form a calcium sulfite/sulfate sludge. It is subject to the same scaling, plugging, and corrosion/erosion issues as a wet lime scrubber mainly due to the circulating alkali slurry.

It is important to note that the use of limestone at the facility would require new feed preparation equipment, higher liquid to gas ratios, larger absorption unit, and new crushing equipment to process the limestone feed. However, a limestone-based system can utilize cooling tower blowdown water which is typically less expensive than raw water required for lime systems.

Wet limestone scrubbers are capable of achieving SO_2 control efficiencies of ~90-95%, however, it is important to note that similar to lime, higher sulfur coals would achieve greater efficiencies and lower sulfur coals lower efficiencies. Additionally, similar to lime, the use of a limestone scrubber presents similar material handling and disposal issues, as well as significant downtime and lost revenue associated with an outage to install in a new scrubber as well as tear down the old scrubber.

Spray Dry Absorber (SDA)

This process is a semi-dry process that uses lime slurry and water injected into a tower to remove SO_2 from the flue gas. Towers must be designed so the exhaust gas and the slurry have adequate contact and residence time in order to produce a relatively dry by-product. This dry by-product is a result from the flue gas SO_2 and lime reacting to form a solid material, which is collected with the fly ash in a fabric filter immediately downstream.

The process equipment associated with an SDA typically includes an alkaline storage tank, mixing and feed tanks, atomizer, spray chamber, particulate control device, and recycle system. The recycle system collects solid reaction products and recycles them back to the spray dryer feed system to reduce alkaline sorbent use. This equipment would be new and have significant capital costs. Additionally, the reagent would need to be slaked onsite. SDAs are the commonly used dry scrubbing method in large industrial and utility boiler applications.

The byproduct created by this process is dry in nature and would have very limited beneficial use options.

Dry Sorbent Injection (DSI)

Dry sorbent injection (DSI) involves the injection of powdered or hydrated sorbent (typically alkaline) directly into the flue gas exhaust. DSIs generally require a sorbent storage tank, feeding equipment, transfer lines and blower as well as an injection device. The dry sorbent is injected countercurrent to the gas flow. An expansion chamber is often used downstream from the injection point to increase contact to improve collection efficiency. Particulates generated in the reaction would need to be controlled with a baghouse.

It is worth noting that the use of hydrated lime may be selected to avoid potential heavy metal leaching from the collected fly ash mixed the DSI by-product. So it is important to note that there are potential impacts for fly ash disposal.

Control efficiencies are higher with hydrated sorbent versus powered sorbent but are also dependent of the SO_2 concentrations in the scrubber.

It typically has lower capital and operating costs as well as lower energy and maintenance requirements compared to conventional lime/limestone scrubbing, and has less waste handling issues. It is important to note that downstream particulate control would be need to added to the facility and additional maintenance issues can arise, for example the filter bags can blind if the flue gas approaches saturation temperature, and scaling can be an issue in the spray dryer.

Circulating Dry Scrubber (DS/FF)

This technology removes SO_2 from boiler flue gas by using a circulating fluidized bed of dry hydrated lime reagent. The flue gas goes through a venturi system at the base of the tower and then humidified by a water mist. The humid flue gas then enters a bed of hydrated lime where the SO_2 is removed. Dry byproduct is produced and would need to be routed to a particulate removal system. This technology is capable of utilizing higher sulfur coals. The lime reagent would need additional equipment to be hydrated onsite, causing additional processing labor and cost. Additionally, a particulate control device would be needed after the scrubber. The byproduct would present limited beneficial use options for the facility.

Some of the items of note for this system:

A hydrated lime bin is needed as well as byproduct recirculation equipment.

The reagent supply would require the facility to have spare hydrators.

Hydrated Ash Reinjection (HAR)

This modified FGD process was developed to reutilize the unreacted lime in the ash and any free lime left from the boiler process. This will further reduce the SO_2 concentration in the flue gas stream. This is a custom system that details would be vendor oriented. The process collects the ash and lime, rehydrated, and put into a reaction vessel ahead of the fabric filter inlet. In a conventional system like at Pleasants, additional lime can be added to the ash to increase the alkalinity. Analysis would be required on the ash to determine if the CaO content would be high enough for the system or if additional lime would need to be added.

4.2 Step 2: Eliminate Technically Infeasible SO_2 Control Technologies

Because of the design of the Pleasants Power Station, options that eliminate gypsum production, Spray Dry Absorbers, Dry Sorbent Injection, Circulating Dry Scrubber, and Hydrated Ash Reinjection would be technically infeasible due to a number of reasons outlined below:

- Facility has a 3-year contract currently for the sale of gypsum. Facility would be unable to pursue these options until the contract has been completed.
- The facility would have lost revenue from the elimination of the gypsum.
- Addition of a particulate removal system would be required to handle the increase in particulates.
- The byproducts are dry in nature and would pose disposal issues since beneficial use options are limited.

4.3 Step 3: Rank of Technically Feasible SO_2 options by effectiveness

The remaining technically feasible SO_2 remaining is Wet Limestone Scrubber (aka Limestone Forced Oxidation (LSFO) Scrubber). Due to its similarities to existing technology but the benefit of lower reagent costs, this option has been determined by the facility to be technically feasible. As this is the only option considered as feasible, there is no ranking needed in this section of the report.

4.4 Step 4: Evaluation of Impacts for Technically Feasible SO_2 Controls (Four-Factor Analysis)

4.4.1 Factor 1 – Cost of Compliance

Several costing tools and documentation were utilized for this section of the report. The EPA Air Pollution Control Cost Manual was utilized to develop the wet limestone scrubber estimated capital costs. The estimated capital costs were inflated to December 2020 dollars utilizing the Consumer Price Index (CPI) Inflation calculator, and then annualized over a 20-year period utilizing the retrofit capital cost leveling factor, %/year, from the 'Wet Flue Gas Desulfurization Technology Evaluation' prepared for the National Lime Association (NLA).

As for operating and maintenance (O&M) cost estimates, considering the similarities in wet lime scrubber technology and wet limestone scrubber technology, it was decided to utilize the 2020 O&M actual costs from Pleasants and adjust to an estimated O&M cost for wet limestone scrubber technology. The 'Wet Flue Gas Desulfurization Technology Evaluation' prepared for the National Lime Association compared costs between lime and limestone scrubbers, documenting the comparative costs. This was utilized to adjust the actual O&M cost at the facility to potential cost from the installation of wet limestone scrubber technology. Estimates of reagent costs, power consumption, and other fixed and variable O&M costs were compared and it was determined that O&M costs would be approximately 8.33% lower utilizing a limestone system.

Lime scrubber total levelized O&M costs: 11.76 MM$/hr vs. 10.78 MM$/yr for limestone system O&M costs. (Retrofit unit costing from NLA.) Detailed costing calculations are provided in Appendix A.

It is important to note that the costing effectiveness shown in the last column of the table below is calculated by dividing the sum of the annualized capital cost plus the estimated annual operation costs by the estimated reduced SO_2 emissions amount.

Table 4.4.1 – Estimated Cost of Technically Feasible SO_2 Controls

Option Name	Potential SO_2 Reduction (%)	Estimated Capital Investment (USD $)	Estimated Annual Operation Cost (USD $)	2020 SO_2 Emissions (TPY)	Potential 2020 SO_2 Emissions with LSFO (TPY)	Estimated Cost-Effectiveness[1] ($/ton SO_2)
Wet Limestone Scrubber	~95%	Total Cost (assuming two scrubbers): $44,960,816.84 Levelized cost for 20-year retrofit life (15.43%/yr from NLA): $6,937,454.04	Current 2020 O&M cost from facility): $23,829,972 Adjusted O&M cost (-8.33% from NLA): $21,844,935.33	7,645.90 (assuming SO_2 control as 92.5%, from current permit)	5,097.27	$11,292.95 ($9,931.94 for one scrubber)

[1]Note, this estimate does not include lost revenue associated with outage to install new control technology.

4.4.2 Factor 2 – Time Necessary for Compliance

Pleasants believes that the current SO_2 controls in place meet the reasonable progress goals of the RHR. However, the technically feasible option is estimated for the purposes of this section.

The addition of the technically feasible SO_2 control would require replacement or major modifications to the existing facility. The time necessary to make the modifications to the facility would be approximately five years due to complex engineering design and installation needs. A boiler outage of approximately two to three years would be necessary to perform the installation of the control system.

4.4.3 Factor 3 – Energy and Non-Air Environmental Impacts

All flue gas desulfurization require electricity in some capacity. Electric demand would increase for limestone handling (as compared to lime handling). The power consumption for a wet limestone scrubber is more than a wet lime scrubber (per the National Lime Association's Wet Flue Gas Desulfurization Technology Evaluation).

Waste and wastewater considerations are similar when comparing wet limestone scrubbers to wet lime scrubbers.

4.4.4 Factor 4 – Remaining Useful Life of Source

Although Pleasants' boilers are not expected to operate for decades, they are not scheduled to be retired in the very short term. The plant's existing SO_2 control technology, with appropriate maintenance, has a remaining useful life that matches or exceeds the boilers' useful lives.

4.4.5 Step 5: Select Control Technology and Control Effectiveness

Due to the limited SO_2 reduction benefit received from switching from a wet lime scrubber to a wet limestone scrubber, it has been determined that it is not feasible to make the switch due to the factors discussed in Section 4 of this report.

5.0 Conclusion

When you consider existing SO_2 control technologies compared to available potentially-feasible control technologies, there is no benefit to replacing the existing system. The control technology identified by this analysis was found to cost in excess of $11,000/ton of SO_2 removed. The cost considerations alone, in the context of the four-factor analysis, shows that the replacement SO2 control technology identified, is not feasible or reasonable based on a cost to benefit evaluation. Additionally, the capital investment and negative energy impacts from the production, transportation, and storage of limestone outweigh the minor increase in SO_2 reduction beyond what the facility is currently achieving. The added SO_2 reductions that could be achieved, are insignificant at the facility level as well as at the state level. Considering WVDEP's regional haze program, the evaluated options will have little to no impact on West Virginia's compliance, thus resulting in minimal to no impact on visibility improvement at the Class 1 Federal Areas.

This technology has a high SO_2 reduction efficiency, however, considering the wet lime scrubbers in place at Pleasants, this option would not be cost effective nor have added SO_2 reduction value. There are several engineering issues related to switching the reagent from lime to limestone, making this option not feasible or practical.

In regards to reasonable progress under the Regional Haze Rule, it is important to note the basis of the goal. See excerpt from 40 CFR 51.308(d)(1):

Reasonable progress goals. For each mandatory Class I Federal area located within the State, the State must establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period.

Considering the rule language, the addition of costly pollution control equipment with minimal impact/benefit to overall AoIs does not meet the goals of visibility improvement.

We conclude, at this time, there are no known SO_2 reduction technologies that are cost effective or technically feasible to implement at the Pleasants Power Station.

6.0 References

VISTAS Glidepath data, https://www.metro4-sesarm.org/sites/default/files/VISTAS%20Pres%20Stakeholders%20Final%20200520.pdf

WVDEP Request for 4-Factor Analyses of Sulfur Dioxide Controls for Pleasants Power Station, 11/4/20

40 CFR 51.308, https://www.ecfr.gov/cgi-bin/text-idx?SID=426f781a1b5aaa9d05c1f066dd3eb16d&mc=true&node=sp40.2.51.p&rgn=div6#se40.2.51_1308

EPA Guidance on Regional Haze State Implementation Plans for the Second Implementation Period, 8/2019, 8-20-2019_-_regional_haze_guidance_final_guidance.pdf (epa.gov)

Draft Guidance on Progress Tracking Metrics, Long term strategies, reasonable progress goal and other requirements for regional haze state implementation plans for the second implementation period, EPA Draft Guidance on Progress Tracking Metrics

EPA Cost Control Manual, Cost Reports and Guidance for Air Pollution Regulations | Economic and Cost Analysis for Air Pollution Regulations | US EPA

EPA Best Case v5.13: Emission Control Technologies, https://www.epa.gov/airmarkets/documentation-base-case-v513-emission-control-technologies

Sargent and Lundy IPM Model – Updates to Cost and Performance for APC Technologies – Dry Sorbent Injection for SO_2/HCL Control Cost Development Methodology, https://www.epa.gov/sites/production/files/2018-05/documents/attachment_5-5_dsi_cost_development_methodology.pdf

Sargent and Lundy IPM Model – Updates to Cost and Performance for APC Technologies – Wet FDG Cost Development Methodology, https://www.epa.gov/sites/production/files/2015-08/documents/attachment_5-1_wet_fgd_cost_methodology.pdf

Reduction of Sulfur Dioxide Emissions by Burning Coal Blends, https://asmedigitalcollection.asme.org/energyresources/article/138/3/032204/373239/Reduction-of-Sulfur-Dioxide-Emissions-by-Burning

EPRI Estimating Total Sulfuric Acid Emissions from Stationary Power Plants, https://www.epri.com/research/products/1023790

Guidance for Setting Reasonable Progress Goals Under the RH program; https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/20070601_wehrum_reasonable_progress_goals_reghaze.pdf

Dry Sorbent Injection for SOx Emissions Controls, https://www.powerengineeringint.com/news/dry-sorbent-injection-for-sox-emissions-control/

National Lime Association’s Wet Flue Gas Desulfurization Technology Evaluation, January 2003, https://www.lime.org/documents/uses_of_lime/wet_fgdte2003.pdf

Babcock & Wilcox, https://cdn.ymaws.com/www.icac.com/resource/resmgr/AdvAirPollution/Chenevey_MARAMA_051811.pdf

Estimating Costs of Air Pollution Control by William M. Vatavuk

Appendix A – SO_2 Control Cost Calculations

Appendix A - SO2 Control Cost Calculations, Wet Limestone Scrubber Capital Costs [1]

ESTIMATED SYSTEM COST, EC			
Total Tower Cost, TTC			
TTC = 115 S	$	90,620.00	
FRP, fiberglass reinforced plastic (FRP)			
S, surface area of the absorber in ft2			
S =		788	ft, average
Packing Cost, unsupported depths of 20-25 ft.			
structured packings of SS	$	225.00	per ft3
Estimated packing amount		17730	ft3
total packing cost	$	3,989,250.00	
Auxiliary Equipment	$	5,500.00	per column
10% of EC			
ranges from $1,000 to $10,000 per column			
Estimated Cost, EC = TTC + Packing Cost + Auxiliary Equipment			
EC =	**$**	**4,085,370.00**	

TOTAL CAPITAL INVESTMENT COST, TCI						
Direct Cost	Factor:	1991 dollars				adjusted for inflation[2]
Cost for wet limestone scrubber system, EC	A =	$	4,085,370.00		$	7,760,160.32
Cost for auxiliary equipment						
Instrumentation	0.1	A			$	776,016.03
Sales Tax	0.03	A			$	232,804.81
Freight	0.05	A			$	388,008.02
Purchased equipment cost, PEC	1.18	A		= B	**$**	**9,156,989.17**
Installation cost						
foundation + supports	0.12	B			$	1,098,838.70
hanlding/erection	0.4	B			$	3,662,795.67
electrical	0.01	B			$	91,569.89
piping	0.3	B			$	2,747,096.75
insulation	0.01	B			$	91,569.89
painting	0.01	B			$	91,569.89
Direct Installation Cost, DIC	0.85	B			**$**	**7,783,440.80**
Retrofit Factor	*1.3*	*DEC*				
Total Installation Cost + Retrofit Factor, DIC +RF					**$**	**10,118,473.03**
Total Direct Cost, DC	**2.20 B (RF) + (Site Prep + Bldg Costs) =**				**$**	**19,275,462.21**
Indirect Costs - Installation						
Engineering	0.1	B			$	915,698.92
Consturction/Field	0.1	B			$	915,698.92
Contractor Fees	0.1	B			$	915,698.92
Start-up	0.01	B			$	91,569.89
Performance Test	0.01	B			$	91,569.89
Contingencies	0.03	B			$	274,709.68
Total Indirect Cost, IC	0.35	B			**$**	**3,204,946.21**
Total Capital Investment (TCI)[3] = DC + IC					**$**	**22,480,408.42**

NOTES:

[1]Calculations based on EPA Air Pollution Control Cost Manual

[2]Does not include site preparation, building, or baghouse costs

[3]For inflation adjustment, the CPI Inflation Calculator from the Bureau of Labor Statistics was utilized:

September 1991 =	*$*	*100.00*
December 2020 =	*$*	*189.95*
Ratio =		*1.8995*

west virginia department of environmental protection

Appendix G

Reasonable Progress Evaluation/Long-Term Strategy

G-2e. Response Letter from AEP (John Amos Plant)

West Virginia Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

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Scott A. Weaver
Director, Air Quality
Environmental Services Division
American Electric Power Service Corporation
1 Riverside Plaza
Columbus, OH 43215
614/716-3771 (P)
saweaver@aep.com

January 31, 2021

Mr. Todd Shrewsbury, Engineer
Planning Section
West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Re: Regional Haze Reasonable Progress Assessment
Response of Appalachian Power Company to WV DAQ
Request for an Analysis of SO_2 Controls at the John E. Amos Plant

Dear Mr. Shrewsbury:

Attached is the response of Appalachian Power Company to the request, dated November 4, 2020, for information to support a four-factor analysis of sulfur dioxide (SO_2) controls for the units at the John Amos Plant in Kanawha County, West Virginia. The information is requested to support the Division of Air Quality's (DAQ's development of a regional haze plan consistent with the requirements of 40 CFR §51.308(f) for the second planning period (2018-2028). For the reasons that follow, no additional controls are necessary at the Amos Plant, and a full four-factor evaluation is not required.

John E. Amos Plant (Amos Plant) has been identified as a facility that contributes more than 1 percent of the visibility impacts in three Class 1 federal areas, two in West Virginia and one in Virginia, in modeling performed by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS). Each of these three areas has a documented rate of progress that is better than the uniform rate of progress goals that would return these areas to natural visibility conditions by 2064. Based on continuing emission reductions at other sources throughout the eastern United States, and within the AEP system, more progress will be made in the remainder of this planning period without additional reductions at the Amos Plant.

The Amos Plant already employs the most effective type of SO_2 controls. The three electric generating units at the Amos Plant are each equipped with high efficiency wet limestone scrubbers (FGDs) that are designed to achieve at least 98% reductions in uncontrolled SO_2 emissions. Each unit regularly achieves an emission rate of less than 0.2 pounds of SO_2 per million Btu, the applicable alternative emission rate established in the Mercury and Air Toxics Standards (MATS). Based on the U.S. Environmental Protection Agency's (USEPA's) recent guidance, this rate represents highly efficient operation of wet FGDs, and states can treat such units as a source for which more stringent SO_2 controls are not necessary to make reasonable progress.

In addition, Amos Plant is also subject to the Cross State Air Pollution Rule (CSAPR) SO_2 Group 1 Trading Program and must, collectively with other electric generating units in West Virginia, emit no more than 75,668 tons of SO_2 each year. Collectively, SO_2 emissions from EGU sources in West Virginia are predicted to decline to less than 53,000 tons per year by 2028, based on the most recent VISTAS modeling. USEPA has already determined that participation in the CSAPR program is better than BART for purposes of regional haze planning responsibilities. In addition, USEPA recently proposed additional seasonal restrictions on emissions of nitrogen oxides (NOx) during the ozone season (May through September each year) that are likely to constrain generation for coal-fired electric utility units if finalized, beginning with the 2021 ozone season. These further restrictions on NOx will also lower SO_2 emissions from CSAPR sources like the Amos Plant, making investigation of additional SO_2 control measures unnecessary.

Finally, actual emission rates and additional Clean Air Act requirements that take effect in future years provide assurance that emissions at the Amos Plant will not significantly increase over the remainder of the second implementation period. The actual emission rates achieved during the baseline period and used in the VISTAS modeling for the Amos Plant are well below the MATS alternative limit, at times approaching one-fourth of that level. Amos Plant is subject to an AEP Eastern System-wide SO_2 emissions limitation pursuant to a federal consent decree that was recently modified. The AEP Eastern System annual SO_2 emission limitations will decline from the current level of 52,000 tons per year in 2021, to 44,000 tons per year by the beginning of 2029. In addition, continued integration of renewable energy resources and persistently low natural gas prices have and are likely to continue to impact the utilization of coal fueled units. However, the current requirements within PJM Interconnection, LLC require that units like those at Amos Plant be prepared to respond to directions to supply up to the maximum capacity from each unit to ensure regional reliability of the electricity grid. Given that no further controls are readily available that would improve upon the performance of the current equipment, reductions in annual emissions can only be achieved through constraints of generation. Such restrictions would be incompatible with APCo's public utility service obligations.

For all of these reasons, explained in more details in the attached response, no further evaluation of additional controls is necessary at Amos Plant, nor should the plant be required to limit emissions so as to contribute less than 1 percent to the affected federal Class 1 areas. Should you have any questions concerning this response, please contact me at (614) 716-3771 or by email at saweaver@aep.com.

Sincerely,

Scott A Weaver

Scott Weaver
Director, Air Quality Services
American Electric Power Service Corporation

Attachment

Response of Appalachian Power Company
to the West Virginia Division of Air Quality
Request for Analysis of SO_2 Controls
at the John E. Amos Plant

On November 4, 2020, the Deputy Director of the Division of Air Quality (DAQ) sent an information request to Appalachian Power Company (APCo), a subsidiary of American Electric Power Company, Inc. (AEP), asking for information necessary to perform a four factor analysis of the three electric generating units (EGUs) at the John E. Amos Power Plant (Amos Plant) in Winfield, West Virginia. The request also included background on the regional haze program, the process used to identify facilities for further analysis by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS), the regional planning organization that includes West Virginia, and an explanation of how to proceed with performing a four-factor analysis.

In this response, APCO provides some additional background on the regional planning program and its implementation in West Virginia, the steadily improving conditions at the affected federal Class 1 areas, the critical assumptions used by VISTAS in its modeling exercises, information concerning the existing controls at Amos Plant, the lack of any more effective control technologies, and the other factors that demonstrate that it is not reasonable to select Amos Plant as a candidate for an evaluation of further controls. Based on this information, it is reasonable to conclude that no additional controls are necessary during the second implementation period.

Background of the Regional Haze Planning Program

Pursuant to Section 169A of the Clean Air Act, states are required to include in their implementation plans a program to prevent any future and remedy any existing impacts on visibility in Class 1 federal areas that result from manmade air pollution. The United States Environmental Protection Agency (USEPA) was authorized by Section 169B of the 1990 Clean Air Act Amendments to issue rules governing this state planning process and establishing a comprehensive visibility impairment program for each Class 1 federal area. These programs are to be designed to achieve natural visibility conditions by 2064.

The state planning process is described in 40 CFR §51.308. Initial plans were required to be submitted no later than December 17, 2007, and covered the period from 2008 to 2018. The initial state plans included: (1) a long-term strategy addressing regional haze in each Class 1 area in the state; (2) reasonable progress goals based on calculations of baseline visibility and natural visibility conditions, and a determination of the rate of progress required to achieve natural visibility conditions by 2064; and (3) emission limitations based on the Best Available Retrofit Technology (BART) for certain classes of stationary sources, including certain EGUs, or alternative measures (including emissions trading programs) that would achieve greater emission reductions and greater reasonable progress than BART. The plans also included monitoring provisions to measure visibility improvements at each Class 1 area, and states were required to submit periodic progress reports.

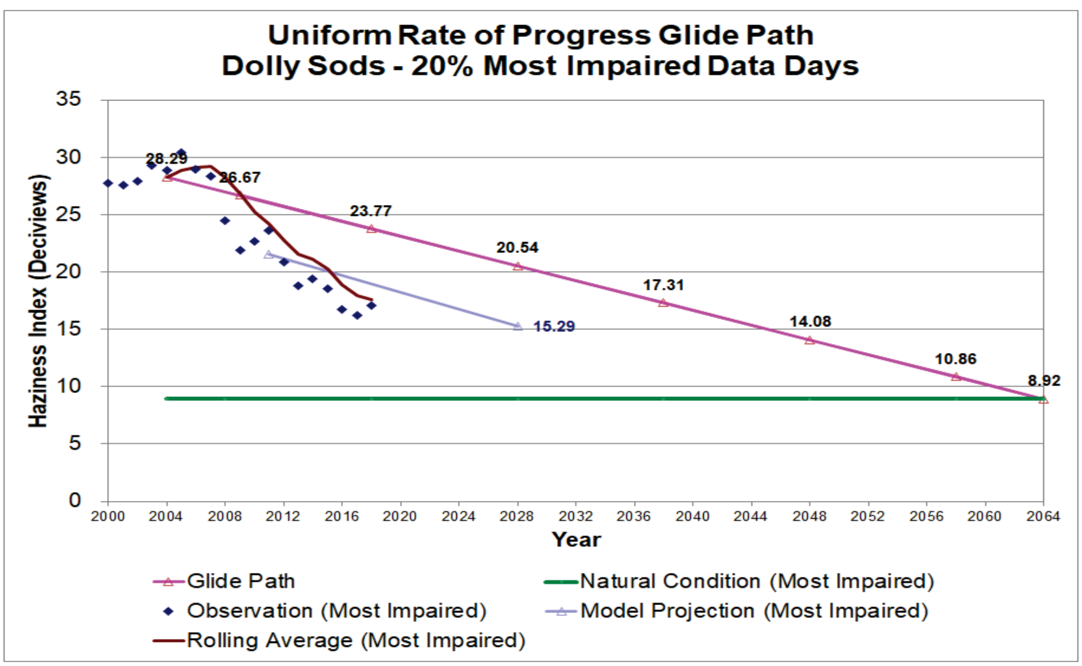
West Virginia's initial plan was submitted in 2008, and was not granted full approval by USEPA until September of 2018. There are two Class 1 areas within West Virginia, Dolly Sods Wilderness Area and Otter Creek Wilderness Area. Although these are distinct, large wilderness areas managed by the U. S. Forest Service, they have been treated as a single area for purposes of regional haze planning, and DAQ has relied upon data from a monitor located at Dolly Sods to assess visibility conditions in both regions.

Requirements for the Second Planning Period and Visibility Improvements

Subparagraph (f) of that 40 CFR §51.308 describes the requirements for periodic updates of the state plans, and established July 31, 2021, as the date on which plans for the second planning period (2018-2028) are due. Again, each Class 1 area within the state must be assessed, and reasonable progress goals must be established. Plans are required to be established to achieve reasonable further progress at in-state Class 1 areas and any out-of-state Class 1 area that is affected by emission sources within the state. Those plans must be informed by the costs of compliance, the time necessary for compliance, the energy and non-air environmental impacts of compliance and the remaining useful life of any potentially affected anthropogenic sources of visibility impairment.

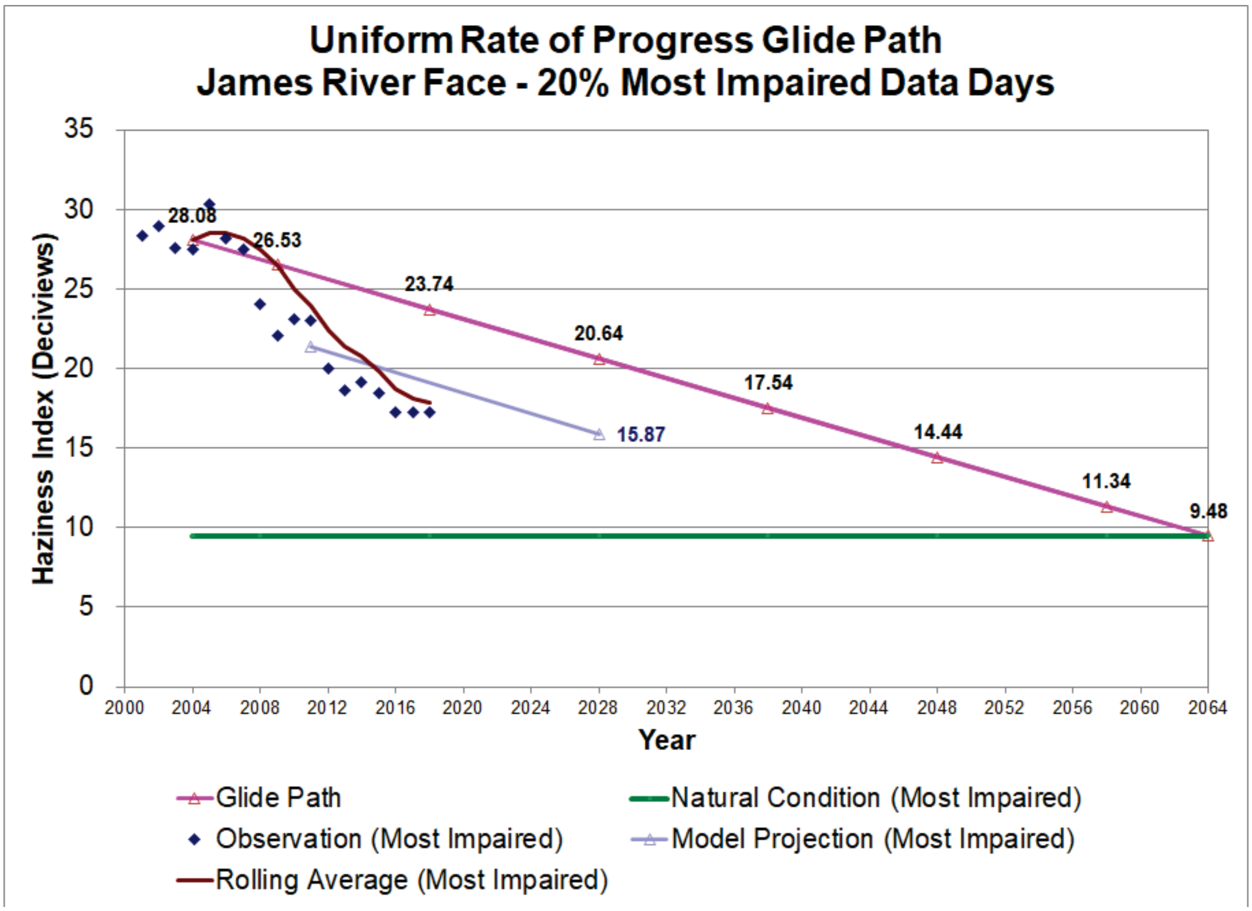
The visibility improvements already achieved in the West Virginia Class 1 areas are substantial, with a rate of improvement well beyond the uniform rate of progress established for these areas. Even if no further reductions were planned at West Virginia sources for the remainder of the second planning period and visibility levels remained stable, both of the in-state Class 1 areas would be almost 4 deciviews (dv) below the levels required by the uniform rate of progress. Figure 1 below shows the improvements from baseline achieved in these in-state Class 1 areas based on the most recent data collected.

Figure 1: Dolly Sods Wilderness Area Visibility Improvements



Based on the VISTAS analysis, Amos Plant contributes more than 1% of the impairment on the 20 most impaired days at the two in-state areas described above, and at the James River Face Wilderness Area in Virginia. Similar to the improvements seen in West Virginia, the James River Face Wilderness Area also has seen a substantial improvement in visibility on the 20% most impaired days, as shown below. And similarly, even if no further reductions were planned at West Virginia sources for the remainder of the second planning period and visibility levels remained stable, the James River Face Wilderness Area would be almost 3 deciviews (dv) below the levels required by the uniform rate of progress. Figure 2 below shows the latest assessment of visibility improvements compared to the uniform rate of progress for the James River Face Wilderness Area.

Figure 2: James River Face Wilderness Area Visibility Improvements



VISTAS reports that emissions of SO_2 within the region are expected to decline by over 73% from 2011 through the end of the second planning period in 2028. NOx emissions, which also contribute to visibility impairment, are expected to decline by 54%. Total SO_2 emissions from EGUs in West Virginia are expected to decline to 47,746 tons by 2028. Amos Plant facility-wide SO_2 emissions in 2017-2019 were 5,718 tons, 4,715 tons, and 3,517. Annual tonnage varies widely due to unit availability, customer demands, weather, fuel quality, and other factors. For modeling purposes, VISTAS estimates that Amos Plant emissions will total 6,099 tons annually in 2028. Individual unit emission rates used in the modeling are 0.0581 pounds per million Btu (#/mmBtu) for Unit 1, 0.0530 #/mmBtu for Unit 2, and 0.0960 #/mmBtu for Unit 3 based on 2016 actual emission rates.

SO_2 Emission Controls and Other Obligations at Amos Plant

While visibility impairment and the relative contributions of individual facilities to such impairment are typically the criteria for selecting sources for further evaluation in planning for long-term progress toward natural visibility conditions, they are not the only factors that can or should be considered. USEPA's guidance makes clear that at the source selection stage, states may consider available information related to the four factors that inform the selection process for the actual control measures, and/or the five additional factors that must be considered under 40 CFR §51.308(f)(2)(iv). Two of these five factors in particular demonstrate that Amos Plant need not be evaluated during the second planning period, because of the prior evaluations undertaken, the ongoing implementation of other air pollution programs, and the anticipated net effect on visibility due to projected changes in emissions over the period addressed by the long-term strategy. *Guidance on Regional Haze State Implementation Plans for the Second Planning Period*, August 20, 2019 (hereinafter "*Guidance")*, p. 28.

Federal Consent Decree Requirements

Each of the three EGUs at the Amos Plant is already equipped with the most effective type of SO_2 controls currently employed. The three EGUs at the Amos Plant are each equipped with high efficiency wet limestone scrubbers (FGDs) that are designed to achieve as much as 98% reduction in uncontrolled SO_2 emissions. These controls were installed in 2009 and 2010, to satisfy the obligations of a federal consent decree with USEPA and other parties, and are required to be continuously operated whenever the units are in service. The consent decree requirements have been incorporated into the Title V permit at Amos Plant.

The consent decree also contains a system-wide cap on SO_2 emissions from a group of units in the eastern United States. This annual cap has been reduced in modifications made to the consent decree over time. Most recently, the AEP Eastern System-Wide Annual Limitation on SO_2 was reduced to no more than 52,000 tons per year in 2021, declining to 44,000 tons in 2029. The group of units subject to the cap emitted 75,038 tons in 2017, 73,652 ton in 2018, and 62,844 tons in 2019. In addition to the Amos, Mitchell, and Mountaineer Plants in West Virginia, the cap includes the Rockport Plant in Indiana, the Gavin, Cardinal, and Conesville Plants in Ohio, the Big Sandy Plant in Kentucky and the Clinch River Plant in Virginia. The recent retirement of the Conesville Plant, and the addition of SCRs and enhancement of SO_2 controls at the Rockport Plant will make these further reductions achievable, but clearly indicate that sustained, highly effective operation of the SO_2 controls at Amos Plant must continue. All of these reductions will make ongoing contributions to visibility during the second planning period.

BART and Regional Interstate Transport Requirements

During the first regional haze planning period, states were required to evaluate Best Available Retrofit Technology (BART) on specific sources as a means of satisfying their visibility planning obligations. In its 2008 initial plan, West Virginia identified the three units at Amos Plant as BART-eligible sources. While BART controls were not included in the initial West Virginia visibility plan for Amos Plant, their installation was already assured by the federal consent decree requirements discussed above.

Moreover, USEPA had previously adopted the Clean Air Interstate Rule (CAIR), which established a regional emissions trading program for EGUs designed to achieve substantial reductions in emissions of both SO_2 and NOx to mitigate interstate transport of emissions that contributed to downwind non-attainment with the 1997 National Ambient Air Quality Standards (NAAQS) for fine particulate matter and ozone. USEPA subsequently determined that compliance with CAIR provided greater visibility improvements than those that would be achieved through the unit-by-unit application of BART. CAIR was subsequently replaced by the Cross-State Air Pollution Rule (CSAPR), and CSAPR was updated to address the 2008 ozone NAAQS with tighter emission budgets for EGUs in many states, including West Virginia. USEPA affirmed that CSAPR is better than BART for the first planning period and approved West Virginia's initial visibility plan based in part on implementation of the CSAPR program.

USEPA has recently proposed a Revised CSAPR Update rule that will further decrease the ozone season NOx budgets for 12 states in the Eastern United States, including West Virginia. West Virginia's current budget for ozone season NOx emissions would be reduced from the current 17,815 tons to 13,686 tons in 2021 for the ozone season from May through September. Additional reductions would occur in 2022 and 2023, until the state's ozone season budget reaches 11,810 tons. In 2019, actual ozone season emissions in West Virginia from covered units were 15,615 tons. While USEPA assumes that these reductions will occur largely as a result of optimizing highly effective selective catalytic reactor (SCR) NOx controls, the control efficiency assumptions were not accurately determined or applied, particularly to units burning bituminous coal, the majority of the fuels used in West Virginia. Accordingly, reduced generation from these units may be necessary if the rule is adopted without change, which would reduce emissions of both SO_2 and NOx, and lead to further visibility improvements.

Mercury and Air Toxics Standards

In 2013, USEPA adopted final standards under Section 112 of the Clean Air Act to regulate emissions of hazardous air pollutants from EGUs. The Mercury and Air Toxics Standards (MATS) rule established more stringent emissions limitations for mercury, non-mercury metals, certain acid gases, and organic pollutants. The limitations on non-mercury metals are implemented through limitations on fine particulates, a direct contributor to visibility impairment.

Because the same high efficiency controls that are used to reduce emissions of NOx and SO_2 at EGUs also effectively control certain of these hazardous air pollutants, USEPA developed monitoring protocols that allow source owners and operators to demonstrate compliance with the acid gas limitations using the data collected by continuous monitoring systems for SO_2. Since 2016, each unit at Amos Plant has regularly achieved an emission rate of less than 0.2 pounds of SO_2 per million Btu, the applicable alternative emission rate established in the MATS rule to demonstrate compliance with the acid gas limitations. As noted above, individual unit actual emission rates were 0.0581 pounds per million Btu (#/mmBtu) for Unit 1, 0.0530 #/mmBtu for Unit 2, and 0.0960 #/mmBtu for Unit 3 in 2016, well below the 0.2 pound threshold. USEPA recently completed it risk and technology review and maintained the current requirements of the MATS rule, finding there were no technological developments that would support a more stringent standard. This affirmation demonstrates that there is unlikely any additional control strategy available for EGUs currently complying with the AMTS rule, and they should be eliminated from selection for a full four-factor evaluation during the second planning period for the regional haze program.

EPA's Guidance to the States

In August 2019, USEPA's issued guidance to assist the states in determining how best to effectively select and evaluate sources to determine whether further emission reductions were likely to satisfy the requirements to make further reasonable progress during the second planning period under the regional haze rule. As noted in the guidance, states are not required to evaluate every source in each planning period. Rather, states have broad discretion to examine the visibility impacts, types of sources, and pollutants that are most likely to provide further progress at a reasonable cost, and that can be implemented during the planning period without adverse non-air quality environmental or energy impacts.

In the case of the Amos Plant, several of the specific examples are particularly applicable. USEPA cites as an example of sources that could be excluded from further review BART-eligible sources selected for analysis during the first planning period that installed BART-level controls. Similarly, USEPA cites fuel combustion sources (like EGUs) that have installed and are operating year-round controls that achieve 90% or greater reductions in SO_2 and NOx emissions as sources that could be excluded from further consideration. In perhaps the clearest example of the level of control that could exclude a source from further evaluation, USEPA concludes that for the purpose of SO_2 control measures, an EGU that has add-on FGD and that meets the applicable alternative SO_2 emission limit of the 2012 MATS rule for power plants has emissions low enough that it is unlikely that an analysis would conclude that even more stringent control of SO_2 is necessary to make reasonable progress. *Guidance*, p. 30. USEPA's own recent technological assessment in support of retaining the MATS standards further reinforces that states need not perform duplicative analyses for purposes of the regional haze program.

These factors, and the existence of the federal consent decree requirements and the potential revisions to the CSAPR state budgets, assure that Amos Plant and other EGUS in the AEP system will make additional contributions to improving visibility conditions in a number of Class 1 areas throughout the second planning period. Accordingly, no further evaluation of the Amos Plant is necessary.