West Virginia Supplement to the State Implementation Plan Revision for Clean Air Act §110(a)(2)(A) - (M) Requirements for 2015 8-Hour Ozone NAAQS with the Demonstration of Compliance with the Good Neighbor Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I)

PROPOSED
September 2018

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

Promoting a healthy environment.

[This page intentionally left blank.]

Table of Contents

Tables and Charts

TABLES

CHARTS

FIGURES

List of Appendices

Acronyms and Abbreviations

AMPD	Air Markets Program Data
ARP	Acid Rain Program
BACT	Best Available Control Technology
BEIS	Biogenic Emission Inventory System
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAIR	Clean Air Interstate Rule
CAMD	Clean Air Market Division
CAMx	Comprehensive Air Quality Model with Extensions
CFB	Circulating Fluidized Bed
CFR	Code of Federal Regulations
CISWI	Commercial and Industrial Solid Waste Incinerators
CO	Carbon Monoxide
CoST	Control Strategy Tool
CPP	Clean Power Plan
CSAPR	Cross State Air Pollution Rule
CSR	Code of State Rules
CT	Connecticut
DC or D.C.	District of Columbia
DAQ	Division of Air Quality
DEP	Department of Environmental Protection
DV	Design Value
DV_b	Design Value (base year)
DV_f	Design Value (future year)
EG	Emission Guidelines
EGU	Electric(ity) Generating Unit
EIS	Emissions Inventory System
EPA	Environmental Protection Agency
ERTAC	Eastern Regional Technical Advisory Committee
FGR	Flue Gas Recirculation
FIP	Federal Implementation Plan
FR	Federal Register
g/bhp-hr	Grams per Brake Horsepower-Hour
HAP	Hazardous Air Pollutant
HMIWI	Hospital, Medical, Infectious Waste Incinerator
ICI	Industrial/Commercial/Institutional
IPM	Integrated Planning Model
km	Kilometers
KY	Kentucky
LADCO	Lake Michigan Air Directors Consortium
LAER	Lowest Available Control Technology
lb/MMBtu	Pounds Per Million British Thermal Units
LEV	Low Emission Vehicle
LNB	Low NO_x Burner
MACT	Maximum Available Control Technology
MI	Michigan
MD	Maryland

Acronyms and Abbreviations (Continued)

MOG	Midwest Ozone Group
MW	Megawatts
NAAQS	National Ambient Air Quality Standard
NBP	NO_x Budget Trading Program
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutant
NJ	New Jersey
NMHC	Non-Methane Hydrocarbons
NO_x	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
NODA	Notice of Data Availability
NSPS	New Source Performance Standard
NSR	New Source Review
NY	New York
O_3	Ozone
OSAT/APCA	Ozone Source Apportionment Technique/Anthropogenic Precursor Culpability Assessment
PA	Pennsylvania
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Microns in Diameter
ppb	Parts per Billion
ppm	Parts per Million
PSD	Prevention of Significant Deterioration
RACM	Reasonably Available Control Measure
RACT	Reasonably Available Control Technology
SCC	Source Classification Code
SCR	Selective Catalytic Reduction
SIL	Significant Impact Level
SIP	State Implementation Plan
SLT	State, Local, and Tribal
SMOKE	Sparse Matrix Operator Kernel Emissions
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulfur Dioxide
tpy	Tons per Year
TSD	Technical Support Document
TX	Texas
U.S.	United States
VOCs	Volatile Organic Compounds
WI	Wisconsin
WRF	Weather Research and Forecasting Model
WV or W. Va.	West Virginia
>	Greater Than

[This page intentionally left blank.]

West Virginia Supplement to the State Implementation Plan Revision for Clean Air Act §110(a)(2)(A) - (M) Requirements for the 2015 Ozone NAAQS with the Demonstration of Compliance with the Good Neighbor Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I)

1.0. Introduction

On October 1, 2015, the United States Environmental Protection Agency (EPA) revised the primary and secondary National Ambient Air Quality Standard (NAAQS) for ozone to an 8-hour standard of 0.070 part per million (ppm) or 70 parts per billion (ppb).[1] Section 110(a)(1) of the Clean Air Act (CAA) requires states to submit to the EPA, within three years of the promulgation of any new or revised NAAQS, State Implementation Plans (SIPs) meeting the applicable requirements of Section 110(a)(2) providing for the implementation, maintenance, and enforcement of the new or revised NAAQS. Such revisions are commonly referred to as "infrastructure SIPs or iSIPs." One of these applicable requirements is found in Section 110(a)(2)(D)(i) which generally requires SIPs to contain adequate provisions to prohibit in-state emissions activities from having certain adverse air quality effects on other states due to interstate transport of pollution. There are four prongs within CAA Section 110(a)(2)(D)(i): Section 110(a)(2)(D)(i)(I) contains prongs 1 and 2, while Section 110(a)(2)(D)(i)(II) includes prongs 3 and 4. This action addresses the first two prongs under Section 110(a)(2)(D)(i)(I), otherwise known as the good neighbor provision. Under prongs 1 and 2 of the good neighbor provision, a state's SIP for a new or revised NAAQS must contain adequate provisions prohibiting any source or other type of emissions activity within the state from emitting air pollutants in amounts that will contribute significantly to nonattainment of the NAAQS in another state (prong 1) or from interfering with maintenance of the NAAQS in another state (prong 2). Under Section 110(a)(2)(D)(i)(I) of the CAA, the EPA gives independent significance to evaluating prong 1 and prong 2.

The West Virginia Department of Environmental Protection (DEP) addressed the infrastructure requirements of CAA §110(a)(2)(A) through (M), including prongs 3 and 4 of §110(a)(2)(D)(i)(II), in a separate SIP revision, *State Implementation Plan Revision for Clean Air Act § 110(a)(2)(A)-*

[1] 80 FR 65292, 26 OCT 2015.

(M) Requirements for 2015 8-Hour Ozone NAAQS (2015 Ozone iSIP), for which a public comment period commenced on July 27, 2018, and ended with a public hearing on August 28, 2018. Upon finalization, the 2015 Ozone iSIP will be submitted to EPA for approval.

2.0. Request

The State of West Virginia is requesting that the EPA conditionally approve the *West Virginia Supplement to the State Implementation Plan Revision for Clean Air Act §110(a)(2)(A)-(M) Requirements for the 2015 8-Hour Ozone NAAQS with the Demonstration of Compliance with the Good Neighbor Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I)* as a SIP revision, to address the state's obligations under the CAA Section 110(a)(2)(D)(i)(I) (i.e., "good neighbor") requirements. This revision supplements DEP's 2015 Ozone iSIP submittal by addressing the "good neighbor" requirements and demonstrates that all reasonable measures, which have been identified as economically and technically feasible, have been implemented by West Virginia to address pollutant transport that may significantly contribute to downwind states' ozone maintenance and nonattainment problems.

DEP has proposed legislative rule, 45CSR43 - *Cross-State Air Pollution Rule to Control Annual Nitrogen Oxide Emissions, Annual Sulfur Dioxide Emissions and Ozone Season Nitrogen Oxide Emissions* - for the 2019 legislative session. The proposed rule incorporates by reference the federal Cross-State Air Pollution Rule (CSAPR) and CSAPR Update Rule, limiting emissions of nitrogen oxides (NO_x) and sulfur dioxide (SO_2) through three emission trading programs under 40 CFR 97 subparts AAAAA (CSAPR NO_x Annual Trading Program), subpart CCCCC (CSAPR SO_2 Group 1 Trading Program), and subpart EEEEE (CSAPR NO_x Ozone Season Group 2 Trading Program). Upon authorization and promulgation, the rule will be submitted to EPA as a revision to the West Virginia SIP. That action, in concert with this SIP revision, will fully address the State's obligations under CAA §110(a)(2)(D)(i)(I).

3.0. Ozone

3.1. Ozone Formation and Precursors

Ground-level ozone, (O_3), is a gas that is not emitted directly into the air, but is a secondary pollutant formed by the reaction of oxides of nitrogen (NO_x) and volatile organic compounds

(VOCs) in the presence of sunlight. Many types of sources emit these precursor pollutants, including power plants and industrial facilities, on-road and off-road motor vehicles and engines, and smaller sources, collectively referred to as non-point (area) sources. Ozone is predominately a summertime pollutant; however, high ozone concentrations have been observed in cold months in a few high elevation areas. Ozone and ozone precursors (NO_x and VOCs) can be transported hundreds of miles.

3.2. EPA's Designation Process

On October 26, 2015, the EPA revised both the primary and secondary NAAQS for ozone to a level of 0.070 ppm; annual fourth-highest daily maximum 8-hour average concentration, averaged over three years.[2] EPA based the designations on the most recent three years of certified ozone air quality monitoring data (2014-2016) and on an evaluation of factors to assess contributions to nonattainment in nearby areas.[3] EPA designated most areas of the country, including 52 counties in West Virginia,[4] "attainment/unclassifiable" with respect to the 2015 primary and secondary ozone NAAQS on November 16, 2017, in accordance with the requirements of CAA Section 107(d). With the exception of eight counties in the San Antonio, Texas (TX) metropolitan area, EPA completed the designation process for all areas, including the three remaining counties in West Virginia,[5] on June 4, 2018. All counties in West Virginia were designated "attainment/unclassifiable" for the 2015 8-hour ozone NAAQS.[6] EPA completed the designation process for the remaining eight counties in the San Antonio, TX metropolitan area on July 25, 2018.[7]

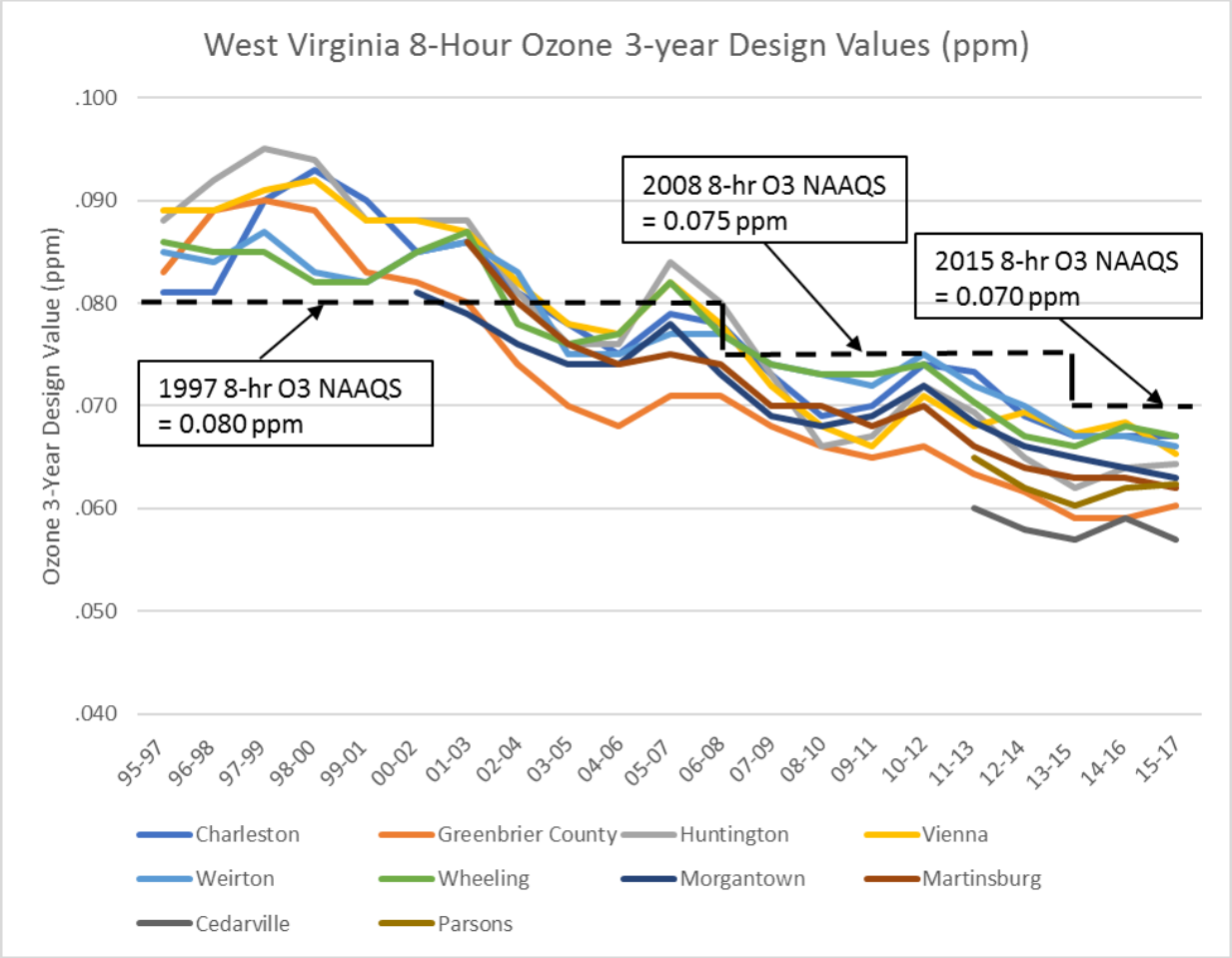
3.3. Ozone Design Value Trends in West Virginia

A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS.[8] For 8-hour ozone, a design value is the three-year average of the fourth-

[2] 80 FR 65292, 26 OCT 2015.
[3] 83 FR 25779, 4 JUN 2018.
[4] 82 FR 54232.
[5] 83 FR 25776.
[6] 83 FR 25843-25845, 4 JUN 2018.
[7] 83 FR 35136.
[8] https://www.epa.gov/air-trends/air-quality-design-values#definition

highest daily-maximum 8-hour averaged ozone. Design values are calculated at each ozone monitor and the monitor with the highest design value sets the design value for an area. Although the 8-hour ozone NAAQS is reported in ppm, design values can also be stated in ppb, 0.001 ppm is equivalent to 1 ppb.

Chart 1
West Virginia 8-hour ozone 3-year design values



As shown in Chart 1, ozone concentration levels have generally been decreasing in West Virginia over the past 25 years. All areas of West Virginia were designated attainment for both the 2008[9] and 2015[10] ozone standards.

3.4. Transport Modeling

EPA has undertaken multiple air quality modeling efforts using a 2011-base platform, to help states address the requirements of CAA Section 110(a)(2)(D)(i)(I) for the 2015 ozone NAAQS.

- *Air Quality Modeling for the 2015 Ozone NAAQS Transport Assessment (December 2016)*
- *Updated 2023 Transport Modeling for the 2008 Ozone NAAQS (October 2017)*
- *Updated 2023 Transport Modeling for the 2015 Ozone NAAQS (March 2018)*

Alpine Geophysics, LLC (Alpine), conducted modeling in December 2017[11] and June 2018[12], in accordance with a Modeling Protocol, which underwent EPA review, to help states address the requirements of CAA Section 110(a)(2)(D)(i)(I) for both the 2008 and 2015 ozone NAAQS. This modeling effort was undertaken working closely with states, local agencies, and stakeholder groups, including the Midwest Ozone Group (MOG), which provided funding for the project.

In addition to EPA and Alpine, the Lake Michigan Air Directors Consortium (LADCO) also conducted modeling in August 2018[13] to support the development of the LADCO states' iSIPs pursuant to the 2015 ozone NAAQS.

The analytic year 2023 was selected since it aligns with the anticipated attainment year for Moderate ozone nonattainment areas with respect to the 2015 ozone NAAQS. Each modeling

[9] 77 FR 30088, 21 MAY 2012.
[10] 82 FR 54232, 16 NOV 2017, and 83 FR 25843-25845, 4 JUN 2018.
[11] *"Good Neighbor" Modeling for the 2008 8-Hour Ozone State Implementation Plans*, Final Modeling Report, by Alpine Geophysics, LLC, December 2017, p.1. (http://midwestozonegroup.com/files/Ozone_Modeling_Results_Supporting_GN_SIP_Obligations_Final_Dec_2017_.pdf)
[12] *"Good Neighbor" Modeling Technical Support Document for 8-Hour Ozone State Implementation Plans*, by Alpine Geophysics, LLC, June 2018, p.5. (http://www.midwestozonegroup.com/files/FinalTSD-OzoneModelingSupportingGNSIPObligationsJune2018.pdf)
[13] *Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard*, by LADCO, August 2018, p.1. (http://epa.ohio.gov/portals/27/SIP/App3A_2015O3Inf_LADCO_TSD_8-13-18.pdf)

exercise used a screening threshold of one percent (1%) of the NAAQS to identify contributing upwind states warranting further review and analysis.

EPA developed a 4-step framework for addressing the requirements of the "Good Neighbor" provision in the CSAPR for the 1997 ozone NAAQS and the 1997 and 2006 $PM_{2.5}$ (particulate matter less than 2.5 microns in diameter) NAAQS:

(1) identify downwind receptors that are expected to have problems attaining or maintaining the NAAQS;
(2) determine which upwind states significantly contribute (or are "linked") to the downwind air quality problems;
(3) for states that are "linked", quantify the level of upwind emissions that need to be addressed to satisfy the "Good Neighbor" provision; and,
(4) adoption of permanent and enforceable emission reductions, in "linked" upwind states.

EPA has continued to apply this framework in regional transport modeling efforts for purposes of assisting states in development of SIPs to address CAA Section 110(a)(2)(D)(i)(I).

3.4.a. 2015 Ozone NAAQS Transport Assessment Modeling (December 2016)

In EPA's *Notice of Availability of the Environmental Protection Agency's Preliminary Interstate Ozone Transport Modeling Data for the 2015 Ozone National Ambient Air Quality Standard (NAAQS)*[14](NODA) (see Appendix A), preliminary interstate ozone transport modeling data and associated methods relative to the 2015 ozone NAAQS (i.e., 0.070 ppm) was available for public review and comment. Modeling projected ozone concentrations at individual receptors and estimated state-by-state contributions to the 2023 concentrations. A screening threshold at a significant impact level (SIL) of 1% of the 2015 ozone NAAQS (i.e., 0.70 ppb) was applied to those 2023 concentrations to determine which states are possibly "linked" to downwind receptors. The photochemical model simulations performed for this assessment used the Comprehensive Air Quality Model with Extensions (CAMx) version 6.30.[15] The updated electric generating unit (EGU) projections in the model included the implementation of the Clean Power Plan (CPP). Air

[14] 82 FR 1733, 6 Jan 2017.
[15] EPA, *Technical Support Document (TSD) Updates to Emissions Inventories for the Version 6.3, 2011 Emissions Modeling Platform for the Year 2023*, December 2016.

quality modeling (in the NODA) was based on Integrated Planning Model (IPM) v5.16 projections[16].

The NODA modeling identified West Virginia's largest contribution to downwind 8-hour ozone nonattainment and maintenance receptors of 2.59 ppb and 0.92 ppb, respectively[17]. The NODA modeling suggested West Virginia to be "linked" to three downwind 2023 nonattainment receptor and three maintenance receptors.[18] The future of the CPP is uncertain. The CPP was stayed by the Supreme Court in February 2016; followed by President Trump signing an Executive Order *Promoting Energy Independence and Economic Growth* on March 28, 2017 and the proposed repeal of said rule[19]. Based on the delays, the proposed timeline in the CPP will change; making the modeling including the CPP moot. Therefore, the December 2016 modeling cannot be relied upon to help states develop Good Neighbor SIPs for the 2015 ozone standard.

3.4.b. Updated 2023 Transport Modeling (October 2017)

The EPA released an October 27, 2017 memorandum from Stephen D. Page entitled *Supplemental Information on the Interstate Transport State Implementation Plan Submissions for the 2008 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I)*[20] (see Appendix B), (2017 memorandum) which supplemented EPA's analysis in the October 26, 2016, CSAPR Update rule. EPA used CAMx v.6.40[21] for modeling the updated emissions in 2011 and 2023.[22] The EPA used outputs from the 2011 and 2023 model simulations to project base period 2009-2013 average and maximum ozone design values to 2023 at receptor sites nationwide.

---

[16] 82 FR 1736, 6 Jan 2017
[17] 82 FR 1739 and 82 FR 1740
[18] https://www.epa.gov/airmarkets/notice-data-availability-preliminary-interstate-ozone-transport-modeling-data-2015-ozone, 2015 Ozone NAAQS Preliminary Transport Assessment Design Values and Contributions
[19] 82 FR 48035, 16 Oct 2017
[20] https://www.epa.gov/airmarkets/memo-supplemental-information-interstate-transport-sips-2008-ozone-naaqs
[21] CAMx v6.40 was the most recent public release version of CAMx at the time the EPA updated its modeling in fall 2017. ("Comprehensive Air Quality Model with Extensions version 6.40 User's Guide" Ramboll Environ, December 2016. http://www.camx.com/.)
[22] For the updated modeling, the EPA used the construct of the modeling platform (i.e., modeling domain and non-emissions inputs) that we used for the NODA modeling, except that the photolysis rates files were updated to be consistent with CAMx v6.40. The NODA Air Quality Modeling Technical Support Document describing the modeling platform is available at https://www.epa.gov/airmarkets/notice-data-availability-preliminary-interstateozone-transport-modeling-data-2015-ozone.

EPA provided future year ozone design values[23] for receptors in the U.S. based on updated air quality modeling (for 2023) and monitoring data. As noted in the memorandum, EPA's updated modeling indicates there are no monitoring sites, outside of California, that are projected to have nonattainment or maintenance problems in 2023 with respect to the 2008 ozone NAAQS.

3.4.c. Updated 2023 Transport Modeling (March 2018)

The EPA released a March 27, 2018 memorandum from Peter Tsirigotis entitled *Information on the Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I)*[24] (see Appendix C), (2018 memorandum) which supplements EPA's analysis in the January 2017 NODA for the 2015 ozone NAAQS[25] and builds upon information provided in the 2017 memorandum[26]. EPA again used CAMx v.6.40 for modeling the updated emissions in 2011 and 2023. The EPA used outputs from the 2011 and 2023 model simulations to project base period 2009-2013 average and maximum ozone design values to 2023 at receptors nationwide. EPA provided 2023 ozone design values for receptors in the U.S. based on the "3 x 3" approach and a modified "3 x 3" approach in which model predictions in grid cells that are predominately water and that do not contain receptors are excluded from the projection calculations. As noted in the 2018 memorandum, EPA's updated modeling indicates there are, outside of California, 11 monitoring sites projected to have nonattainment issues and 14 monitoring sites are projected to have maintenance problems in 2023 with respect to the 2015 ozone NAAQS. West Virginia's largest identified contribution to downwind 8-hour ozone nonattainment and maintenance receptors was 1.14 ppb and 2.78 ppb, respectively. West Virginia was projected to be "linked" to three downwind 2023 nonattainment receptors and two maintenance receptors.

[23] https://www.epa.gov/airmarkets/october-2017-memo-and-supplemental-information-interstate-transport-sips-2008-ozone-naaqs

[24] https://www.epa.gov/sites/production/files/2018-03/documents/transport_memo_03_27_18_1.pdf

[25] 82 FR 1733, 6 Jan 2017.

[26] EPA, memorandum from Stephen D. Page, *Supplemental Information on the Interstate Transport State Implementation Plan Submissions for the 2008 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I), October 27, 2017*
https://www.epa.gov/airmarkets/memo-supplemental-information-interstate-transport-sips-2008-ozone-naaqs

3.4.d. "Good Neighbor" Modeling by Alpine (December 2017)

In December 2017, Alpine released its report *"Good Neighbor" Modeling for the 2008 8-hour Ozone State Implementation Plans*[27] (see Appendix D) (Alpine 2017 report) which was undertaken working closely with states, other local agencies, and stakeholder groups, including the MOG, which provided funding for the effort.

The ozone simulation study, using the 12-km grid based on EPA's 2023en modeling platform and preliminary source contribution assessment, was created by incorporating the Weather Research and Forecasting Model (WRF), Sparse Matrix Operator Kernel Emissions (SMOKE), MOVES2014 – EPA's latest on-road mobile source emissions model, Biogenic Emission Inventory System (BEIS) version 3.61, CAMx, and the Ozone Source Apportionment Technique/Anthropogenic Precursor Culpability Assessment (OSAT/APCA) tool to project ozone concentrations at downwind receptors. The "Good Neighbor" Modeling Report concluded: "Through this modeling analysis, all upwind state identified in the final CSAPR Update demonstrated compliance with CAA Section 110(a)(2)(D)(i)(I) for the 2008 Ozone National Ambient Air Quality Standard."

Alpine also used results of this modeling effort to address the 2015 ozone NAAQS. (See below)

3.4.e. "Good Neighbor" Modeling by Alpine (June 2018)

In June 2018, Alpine released its report *"Good Neighbor" Modeling Technical Support Document for 8-Hour Ozone State Implementation Plans* (Alpine 2018 TSD) (See Appendix E),[28] which was undertaken working closely with states, other local agencies, and stakeholder groups, including the MOG, which provided funding for the effort. This modeling effort includes the ozone simulation study using a 12-km grid based on EPA's 2023en modeling platform and preliminary source contribution assessment from the December 2017 "Good Neighbor" Modeling Report,

[27] "Good Neighbor" Modeling for the 2008 8-Hour Ozone State Implementation Plans, Final Modeling Report, by Alpine Geophysics, LLC, December 2017. (http://midwestozonegroup.com/files/Ozone_Modeling_Results_Supporting_GN_SIP_Obligations_Final_Dec_2017_.pdf)

[28] "Good Neighbor" Modeling Technical Support Document for 8-Hour Ozone State Implementation Plans, Final Technical Support Document, by Alpine Geophysics, LLC, June 2018. (http://www.midwestozonegroup.com/files/FinalTSD-OzoneModelingSupportingGNSIPObligationsJune2018.pdf)

supplemented with two (2) additional nested 4-km modeling domains over the Mid-Atlantic region and Lake Michigan.

OSAT modeling was conducted for the Mid-Atlantic 4-km region, but not the Lake Michigan 4-km domain. Modeling for the Mid-Atlantic 4-km region indicates there is one receptor projected to have nonattainment issues and nine receptors projected to have maintenance problems in 2023 with respect to the 2015 ozone NAAQS. West Virginia's largest identified contribution to downwind 8-hour ozone nonattainment and maintenance receptors was 2.52 ppb and 1.63 ppb, respectively. West Virginia was projected to be "linked" to the only downwind 2023 nonattainment receptor and three (3) maintenance receptors in the Mid-Atlantic 4-km region.

This modeling demonstrates:

- many of the eastern state receptors demonstrate modeled attainment using a finer grid 4-km modeling domain (compared to 12-km results),
- the significance of international transport,
- emissions activities within some states will not significantly contribute to nonattainment or interfere with maintenance of the 2008 or 2015 ozone NAAQS in a neighboring state, and
- there may be options available to states that demonstrate significant contribution at air quality monitoring sites that qualify as nonattainment or maintenance.[29]

3.4.f. LADCO Transport Modeling (August 2018)

In August 2018, LADCO released its report *Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard*[30] (See Appendix F) to support the development of the LADCO states' iSIPs pursuant to the 2015 ozone NAAQS. EPA identified in the 2018 memorandum the "use of alternative power sector modeling consistent with EPA's emissions inventory guidance" as a flexibility to consider in preparing a Good Neighbor SIP. The 2023

[29] "Good Neighbor" Modeling Technical Support Document for 8-Hour Ozone State Implementation Plans, Final Technical Support Document, by Alpine Geophysics, LLC, June 2018. p, 8.
(http://www.midwestozonegroup.com/files/FinalTSD-OzoneModelingSupportingGNSIPObligationsJune2018.pdf)
[30] *Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard*, by LADCO, August 2018.
(http://epa.ohio.gov/portals/27/SIP/App3A_2015O3Inf_LADCO_TSD_8-13-18.pdf)

emissions data for this study were based on EPA's 2011v6.3en emissions modeling platform. The LADCO 2023 CAMx simulation is an example of an alternative power sector modeling flexibility. The only configuration difference between these simulations is in the EGU emissions used with CAMx to project future year air quality.[31] LADCO replaced the EGU emissions in EPA "en" platform with 2023 EGU forecasts estimated from the Eastern Regional Technical Advisory Committee (ERTAC) EGU Tool version 2.7. (ERTAC EGU 2.7 integrated state-reported information on EGU operations and forecasts as of May 2017.)

The LADCO simulation that used ERTAC EGU emissions projections forecasted lower 2023 DVs than the EPA 2023en simulation. Where six monitors were projected nonattainment monitors in the EPA simulation, the LADCO simulation predicted only three to be in nonattainment.[32] The three nonattainment monitors are in Babylon, NY, Westport, CT, and Edgewood, MD.[33]

3.5. Selection of Appropriate Modeling

West Virginia considered the 2023 modeling conducted by EPA, Alpine, and LADCO, which were based on the 2023en platform, and the guidance provided in the 2018 memorandum.

- In reference to EPA's updated 2023 modeling, EPA concluded in their 2018 memorandum that "States may consider using this national modeling to develop SIPs that address requirements of the good neighbor provision for the 2015 ozone NAAQS."[34]
- EPA further recommended that "states include in any such submission state-specific information to support their reliance on the 2023 modeling data."[35]
- EPA went on to conclude that "States may also choose to use other information to identify nonattainment and maintenance receptors relevant to development of their good neighbor SIPs."[36]

[31] *Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard*, by LADCO, August 2018, p. 67.
[32] Id., p. 68.
[33] Id. p. 74.
[34] Tsirigotis, Peter (EPA), *Information on the Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I)*, March 27, 2018. p. 6.
[35] Ibid.
[36] Ibid.

West Virginia reviewed the 2011en and 2023en emissions inventory data and noted EPA had included projections in the 2023en inventory for some major facilities which have shut down since 2011; as well as, the omission of some new major facilities that have been constructed since 2011. These are identified in Appendix G. West Virginia concluded that the 2023en inventory was a conservative projection of future emissions and was an appropriate inventory to use for modeling.

Alpine conducted an operational model performance evaluation and found the 4-km modeling domains performed similarly to EPA's 12-km model performance evaluation for the 2011en platform. The model performance results, therefore, demonstrate the scientific credibility of the 4-km domains used for the analysis, and provide confidence that the results provide a reasonable projection of expected future year ozone concentrations and contributions over the 4-km grids.[37]

West Virginia considered the various modeling studies and concluded the "Good Neighbor" Modeling by Alpine (June 2018), using the nested 4-km grid is the most appropriate, robust modeling available to identify the nonattainment and maintenance receptors to which West Virginia significantly contributes.

3.6. West Virginia's Contributions to Nonattainment and Maintenance Receptors

As noted in Alpine's June 2018 "Good Neighbor" Modeling, West Virginia is projected to be "linked" to the only downwind 2023 nonattainment receptor (Harford, MD) and three maintenance receptors (Gloucester, NJ; Richmond, NY; and Philadelphia, PA) in the Mid-Atlantic 4-km region. The Harford County, Maryland monitor is located in the Baltimore, MD Nonattainment Area; the Gloucester, NJ and Philadelphia, PA monitors are located in the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE Nonattainment Area; and the Richmond, NY monitor is located in the New York-Northern New Jersey-Long Island, NY-NJ-CT Nonattainment Area. Table 1 shows Alpine's Mid-Atlantic 4-km "Good Neighbor" Modeling results, with respect to West Virginia's contribution to the nonattainment and maintenance receptors and the in-state contribution (contribution of the state to its own nonattainment and maintenance monitors). As shown in Table 1, Maryland's contribution to the Harford, MD receptor is 23.97 ppb, 33.7% of the projected 2023 average design value.

[37] Id., p. 27.

Table 1
West Virginia Contribution to Nonattainment and Maintenance Receptors identified in Alpine's Mid-Atlantic 4-km Region based on the "Good Neighbor" Modeling Results[38]

Monitor ID	State	County	2011 DVb	2023 DVf (Avg)	2023 DVf (Max)	In-State Contribution (ppb)	WV Contribution (ppb)
Nonattainment Receptor							
240251001	Maryland	Harford	90.0	71.1	73.5	23.97	2.52
Maintenance Receptors							
90010017	Connecticut	Fairfield	80.3	69.2	71.5	6.36	0.52
90013007	Connecticut	Fairfield	84.3	69.7	73.6	5.19	0.44
90019003	Connecticut	Fairfield	83.6	69.9	72.7	4.97	0.53
90099002	Connecticut	New Haven	85.7	70.3	73.0	9.60	0.35
90110124	Connecticut	New London	80.3	68.2	71.3	9.89	0.32
340150002	New Jersey	Gloucester	84.3	68.8	71.0	4.51	1.63
360850067	New York	Richmond	81.3	69.6	71.0	3.19	0.71
361030002	New York	Suffolk	83.3	70.7	72.1	10.10	0.65
421020024	Pennsylvania	Philadelphia	83.3	68.0	71.0	14.70	1.21

Note: a value of 70.9 ppb (or less) is considered to be in attainment of the 2015 ozone NAAQS, and a value of 71.0 ppb (or higher) is considered to be in violation of the 2015 ozone NAAQS.
Contributions shown in RED identify monitors to which WV is "linked."

4.0. Flexibilities

Attachment A of the 2018 memorandum EPA provided a *Preliminary List of Potential Flexibilities Related to Analytical Approaches for Developing a Good Neighbor State Implementation Plan*[39] (Potential Flexibilities). In considering the modeled contribution to nonattainment and maintenance monitors, West Virginia identified several potential flexibilities for consideration.

4.1. HYSPLIT Back-Trajectories

In the Potential Flexibilities EPA identified several guiding principles for states to consider including: "The potential value of considering different modeling tools or analyses in addition to

[38] Alpine Geophysics, LLC, "Good Neighbor" Modeling Technical Support Document for 8-Hour Ozone State Implementation Plans, Final Technical Support Document, June 2018, p. 35. (http://www.midwestozonegroup.com/files/FinalTSD-OzoneModelingSupportingGNSIPObligationsJune2018.pdf)
[39] Tsirigotis, Peter (EPA), *Information on the Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I)*, March 27, 2018, p. A-1.

EPA's, provided that any alternative modeling is performed using a credible modeling system which includes "state-of-the-science" and "fit-for-purpose" models, inputs, and techniques that are relevant to the nature of the ozone problem. The use of results from each alternative technique should be weighed in accordance with the scientific foundation, construct and limitations of the individual techniques."[40]

West Virginia analyzed the 2015 - 2017 air monitoring data[41] for the one nonattainment receptor and three maintenance receptors to which West Virginia was linked based on Alpine's 4-km modeling. The monitoring data was obtained from EPA's Outdoor Air Quality Data website.

Table 2
Nonattainment Receptors – Exceedance Days 2015 - 17

Date	Concentration (ppm)	Date	Concentration (ppm)	Date	Concentration (ppm)
Harford, Maryland – Monitor 240251001					
6/11/15	0.074	5/25/16	0.079	5/17/17	0.076
8/31/15	0.072	5/26/16	0.080	5/18/17	0.073
9/2/15	0.088	6/20/16	0.079	6/12/17	0.077
9/3/15	0.074	7/21/16	0.072	6/13/17	0.088
9/4/15	0.074	7/22/16	0.082	7/19/17	0.072
		7/25/16	0.076	7/20/17	0.086
		7/27/16	0.079		
		9/14/16	0.077		
		9/23/16	0.080		

[40] Id.
[41] www.epa.gov/outdoor-air-quality-data/download-daily-data

Table 3
Maintenance Receptors – Exceedance Days 2015 - 17

Date	Concentration (ppm)	Date	Concentration (ppm)	Date	Concentration (ppm)
Gloucester, New Jersey – Monitor 340150002					
6/11/15	0.080	5/25/16	0.083	5/17/17	0.071
7/28/15	0.079	6/11/16	0.074	5/18/17	0.076
8/23/15	0.075	6/20/16	0.077	6/12/17	0.073
9/1/15	0.076	7/8/16	0.076	6/13/17	0.078
9/2/15	0.077	7/22/16	0.074	7/19/17	0.076
		7/27/16	0.071	7/20/17	0.071
		9/23/16	0.079		
Richmond, New York – Monitor 360850067					
5/5/15	0.075	5/25/16	0.086	5/17/17	0.081
5/15/15	0.073	5/26/16	0.078	5/18/17	0.074
6/11/15	0.080	5/28/16	0.074	6/10/17	0.071
7/19/15	0.073	6/11/16	0.071	6/12/17	0.079
7/28/15	0.079	7/6/16	0.075	6/13/17	0.072
8/15/15	0.075	7/15/16	0.071	7/22/17	0.072
8/16/15	0.072	7/21/16	0.077	8/1/17	0.072
8/17/15	0.074	7/22/16	0.081		
9/3/15	0.081	7/28/16	0.071		
9/17/15	0.085	7/29/16	0.073		
Philadelphia, Pennsylvania – Monitor 421010024					
5/8/15	0.073	5/25/16	0.084	4/11/17	0.073
6/11/15	0.089	5/26/16	0.079	5/17/17	0.086
7/19/15	0.074	6/11/16	0.074	5/18/17	0.092
7/28/15	0.075	6/20/16	0.073	6/10/17	0.073
7/29/15	0.074	7/21/16	0.076	6/12/17	0.075
8/15/15	0.080	7/22/16	0.081	6/13/17	0.076
8/30/15	0.071	8/31/16	0.080	6/22/17	0.080
9/2/15	0.079	9/23/16	0.078	7/18/17	0.074
9/16/15	0.076			7/19/17	0.073
9/17/15	0.086			7/27/17	0.072
9/18/15	0.078			8/1/17	0.074
				9/25/17	0.071

West Virginia used the National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory's HYSPLIT[42] model to analyze all exceedance days in the 2015 – 17 period for the nonattainment and maintenance receptors to which West Virginia was linked. The HYSPLIT model is a complete system for computing simple air parcel trajectories, as well as complex transport, dispersion, chemical transformation, and deposition simulations. A common application is a back-trajectory analysis to determine the origin of air masses and establish source-receptor relationships.

The HYSPLIT back trajectory analyses demonstrate that on the majority of the days on which ozone exceedances occurred at the subject receptors the origin of the air masses impacting the receptors did not originate within, or pass through, West Virginia's borders in the 48 hours preceding the exceedance. Of the 97 HYSPLIT model runs, each representing three vertical heights for each exceedance, for a total of 291 separate vertical wind heights, only 77 heights (26%) crossed West Virginia's borders. Although these heights may have crossed West Virginia's borders, only 50 (17%) crossed an industrialized area of the state where air emissions are more predominate.

The HYSPLIT results are contained in Appendix H.

4.2. Downwind Air Quality Context

The Alpine 2018 nested 4-km modeling projects nonattainment with the 2015 ozone NAAQS for the Baltimore, MD area due to a projected 2023 average design value of 71.1 ppb for the Harford, Maryland (MD) receptor. The Alpine nested 4-km modeling projects attainment of the 2015 ozone NAAQS for the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE area with projected 2023 average design values of 68.8 and 68.0 ppb for the Philadelphia, PA and Gloucester, NJ monitors, respectively. The area is projected to be a maintenance area due to a projected maximum 2023 design value of 71.0 ppb for both the Philadelphia, PA and Gloucester, NJ monitors. The Alpine modeling also projects attainment for the New York-Northern New Jersey-Long Island, NY-NJ-CT area with a projected 2023 average design value of 69.6 ppb at the Richmond, NY monitor.

[42] https://www.arl.noaa.gov/hysplit/hysplit/

The area is projected to be a maintenance area due to a projected maximum 2023 design value of 71.0 ppb at the Richmond, NY monitor.

West Virginia analyzed various factors, including air quality, emissions data, population, traffic, vehicle miles traveled (VMT), and meteorology for the projected nonattainment area, Baltimore, MD; and the two projected maintenance areas, Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE, and New York-Northern New Jersey-Long Island, NY-NJ-CT, to which West Virginia is projected to contribute greater than 0.70 ppb in 2023.

Figure 1 shows an interstate map of the northeast, with the ozone monitors color coded by 2014-2016 design values, and the 2015 8-hour ozone nonattainment areas shaded in green. The map clearly shows the monitors which exceed the 2015 ozone NAAQS follow the I-95 corridor.

Figure 1. 2015 Ozone Nonattainment Areas in the Northeast Overlaid with Interstate Map[43]

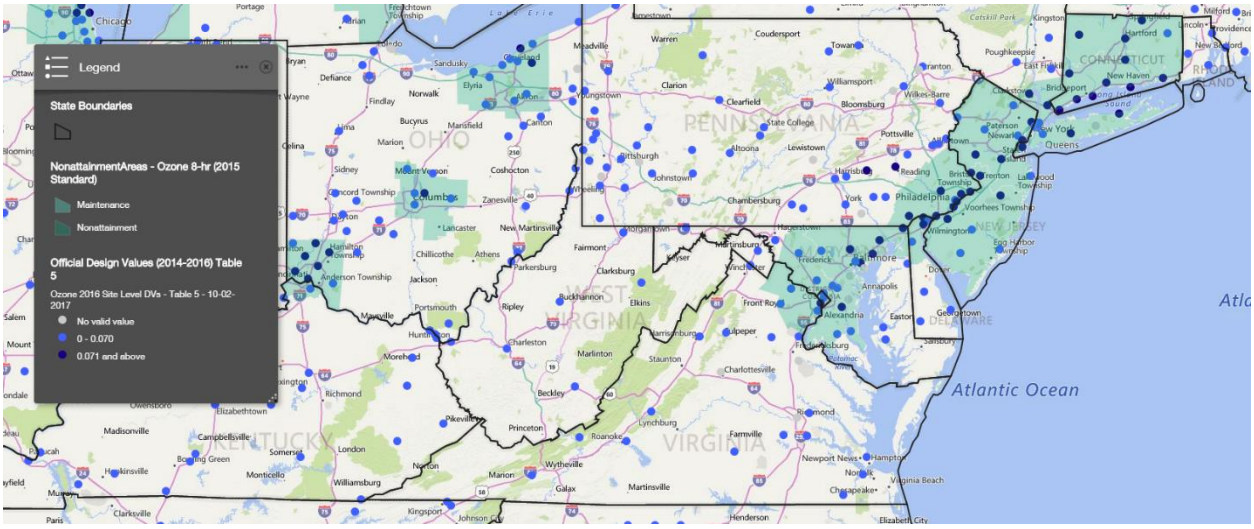


Figure 2 shows the population density by county for the northeast. A comparison of Figures 1 and 2 show that the high population areas closely correspond to the nonattainment areas. The population in 2015 for the Baltimore nonattainment area was 2,748,503, the population of the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE nonattainment area was 8,143,598, and

[43] EPA Ozone Designations Mapping Tool
https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=6a89e7170dd147b1852ec11ccb3880e8

the population of the New York-Northern New Jersey-Long Island, NY-NY-CT area was 23,887,759. In contrast, the population for the entire state of West Virginia was 1.84 million.

Figure 2. Population Density in the Northeast

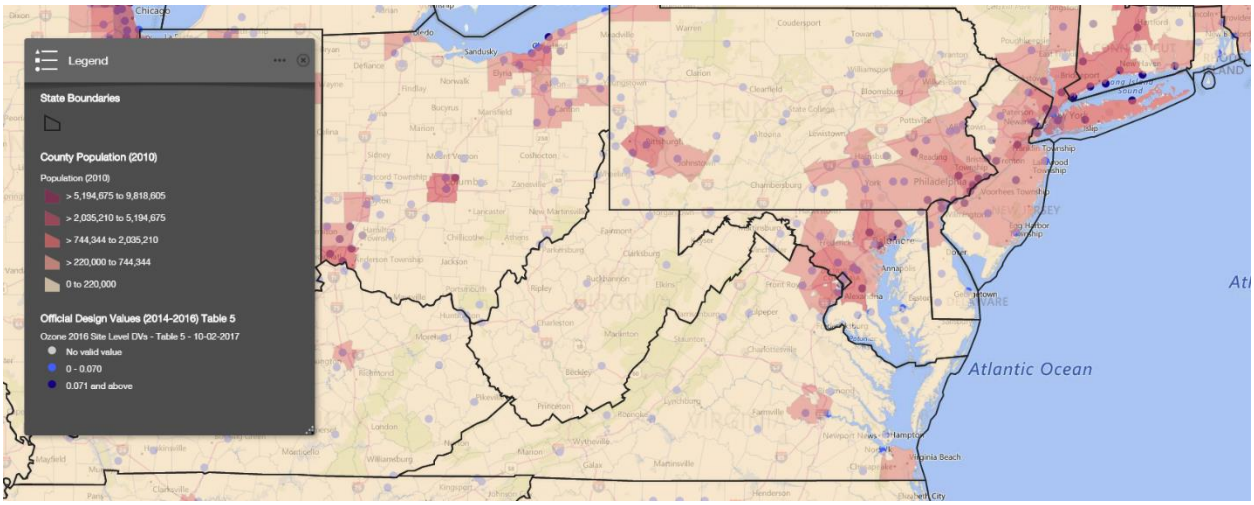
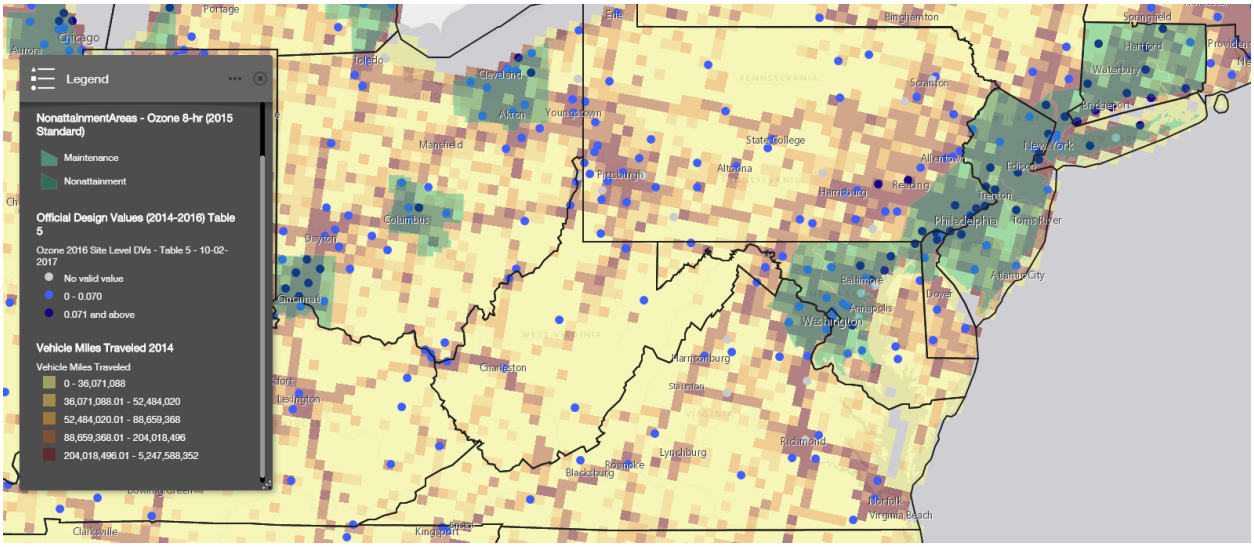


Figure 3 shows the ozone monitors, the 2014 VMT and the 2015 ozone nonattainment areas. A comparison of Figures 1, 2 and 3 clearly show that the high population density, and high VMT closely correlate to high ozone concentrations.

Figure 3. 2015 Ozone Nonattainment Areas overlaid with 2014 Vehicle Miles Traveled



Emissions in the areas were also considered. NO_x emissions from mobile sources, both onroad and nonroad, accounted for 62 percent of total NO_x emissions in the Baltimore area. In the Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE area, mobile source emissions accounted for 59 percent of total NO_x emissions. In the New York-Northern New Jersey-Long Island, NY-NJ-CT area, mobile source emissions accounted for 62 percent of total NO_x emissions.

The detailed analysis is contained in Appendix I.

4.3. International Emissions

CAA Section 179B (b) states:

> Notwithstanding any other provision of law, any State that establishes to the satisfaction of the Administrator that, with respect to an ozone nonattainment area in such State, such State would have attained the national ambient air quality standard for ozone by the applicable attainment date, but for emissions emanating from outside of the United States, shall not be subject to the provisions of section 7511(a)(2) or (5) of this title or section 7511d of this title.

Section 179B allows the EPA to approve prospective attainment plans if the demonstration shows the area would attain "but for emissions emanating from outside the U.S.", and not reclassify an area upon a determination that an area would have attained by its attainment date "but for emissions emanating from outside the U.S."

In the 2018 Memorandum, EPA recognized "that a number of non-U.S. and non-anthropogenic sources contribute to downwind nonattainment and maintenance receptors."[44] The modeling results reported in the 2018 memorandum indicate that six of the 11 receptors projected to be nonattainment in 2023 would be attainment but for the international emissions from Canada and Mexico.

As noted in the Alpine 2018 TSD, for the Harford, MD receptor "by accounting for the anthropogenic contribution of emissions from Canada and Mexico (tracked as a single tag), both

[44] Tsirigotis, Peter, March 27, 2018, p. A-1.

scenarios [EPA's 12-km and Alpine's 4-km modeling] demonstrate attainment with the 2015 ozone NAAQS (<71 ppb). This step allows a state to stop at Step 1 of the four-factor process."[45]

5.0. Contributions to "Link" Upwind State to Downwind Nonattainment and Maintenance Receptors

The EPA applied a four-step framework in the original CSAPR[46] to address the good neighbor provision for the 1997 ozone NAAQS, the 1997 and 2006 $PM_{2.5}$ NAAQS, and the CSAPR Update for the 2008 ozone NAAQS.[47] EPA in the 2018 memorandum summarizes the four-step framework as follows:

> EPA, working in partnership with states, established the following four-step framework to address the requirements of the good neighbor provision for ozone and fine particulate matter ($PM_{2.5}$) NAAQS: (1) identify downwind air quality problems; (2) identify upwind states that contribute enough to those downwind air quality problems to warrant further review and analysis; (3) identify the emissions reductions necessary (if any), considering cost and air quality factors, to prevent an identified upwind state from contributing significantly to those downwind air quality problems; and (4) adopt permanent and enforceable measures needed to achieve those emission reductions.[48]

5.1. Step 1

Alpine's 4-km "Good Neighbor" modeling projected two nonattainment receptors and 10 maintenance receptors under Step 1. Two nonattainment receptors were identified – Harford, MD, and Sheboygan, Wisconsin (WI) – West Virginia is linked to the Harford, MD receptor. Ten maintenance receptors were identified under Step 1 – three in Fairfield, Connecticut (CT), one each in New Haven and New London, CT, and one each in Allegan, Michigan (MI), Gloucester, New Jersey (NJ), Richmond, New York (NY), Suffolk, NY and Philadelphia, Pennsylvania (PA) – West Virginia is linked to the NY, NJ, and PA maintenance receptors. The tables below show

[45] Alpine Geophysics, June 2018, p. 38.
[46] 76 FR 48208, 08 AUG 2011.
[47] 81FR74504, 26 OCT 2016.
[48] Tsirigotis, March 27, 2018, p. 2-3.

EPA's modeling results and Alpine's 4-km modeling results for Alpine's projected nonattainment and maintenance receptors.

Table 4. Alpine 4-km Modeling-identified nonattainment monitors in the 4-km domain.[49]

Monitor	State	County	Ozone Design Values (ppb)					
				EPA "No Water" 12-km modeling		Alpine 4-km Modeling		2014-2016 DV
			DVb (2011)	DVf (2023) Ave	DVf (2023) Max	DVf (2023) Ave	DVf (2023) Max	
240251001	MD	Harford	90.0	70.9	73.3	71.1	73.5	73
551170006	WI	Sheboygan	84.3	72.8	75.1	71.7	74.0	79

Table 5. Alpine 4 -km Modeling-identified maintenance monitors in the 4-km domains.[50]

Monitor	State	County	Ozone Design Values (ppb)					
				EPA "No Water" 12-km modeling		Alpine 4-km Modeling		2014-2016 DV
			DVb (2011)	DVf (2023) Ave	DVf 2023 Max	DVf (2023) Ave	DVf 2023 Max	
90010017	CT	Fairfield	80.3	68.9	71.2	69.2	71.5	80
90013007	CT	Fairfield	84.3	71.0	75.0	69.7	73.6	81
90019003	CT	Fairfield	83.7	73.0	75.9	69.9	72.7	83
90099002	CT	New Haven	85.7	69.9	72.6	70.3	73.0	76
90110124	CT	New London	80.3	67.3	70.4	68.2	71.3	72
260050003	MI	Allegan	82.7	69.0	71.7	70.3	73.1	75
340150002	NJ	Gloucester	84.3	68.2	70.4	68.8	71.0	74
360850067	NY	Richmond	81.3	67.1	68.5	69.6	71.0	76
361030002	NY	Suffolk	83.3	74.0	75.5	70.7	72.1	72
421010024	PA	Philadelphia	83.3	67.3	70.3	68.0	71.0	77

5.2. Step 2

Step 2 involves determining which upwind states contribute to the identified problem areas in amounts sufficient to "link" them to the downwind air quality problems. In the CSAPR Update, the EPA identifies such states as those contributing one percent of the NAAQS, (i.e., > 0.70 ppb). Based on the Alpine 4-km modeling, West Virginia is "linked" to the downwind 8-hour ozone

[49] Alpine Geophysics, June 2018, p. 30.
[50] Id.

nonattainment receptor at Harford, MD, with a 2.52 ppb contribution. West Virginia was also "linked" to three maintenance receptors – Gloucester, NJ, Richmond, NY, and Philadelphia, PA, with contributions of 1.63, 0.71, and 1.21 ppb, respectively. Therefore, further review and analysis is warranted.

5.3. Step 3

In Step 3, for states that are "linked" to downwind air quality problems, it is necessary to identify the emissions reductions necessary (if any), considering cost and air quality factors, to prevent the identified upwind state from contributing significantly to downwind air quality problems.

5.3.a. West Virginia NO_x Emissions

The National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants from air emissions sources. The NEI is released every three (3) years (i.e., 2008, 2011, 2014 . . .) based primarily upon data provided by State, Local, and Tribal (SLT) air agencies for point, non-point, and mobile sources in their jurisdictions and supplemented by data developed by the EPA. The NEI is built using the Emissions Inventory System (EIS) first by collecting the data from SLT air agencies and then blending that data with other air emission data sources.

The EPA also maintains a database of current emissions trends data, which includes annual data estimates for Tier 1 Categories from 1990 through 2017. Off year trends data, such as 2015 and 2016, are estimated by the EPA and are not based on actual SLT submitted data for those years.

The 2008, 2011, 2014, and 2017 NO_x emissions provided below in Table 6 were last updated on August 2, 2018 from the NEI Air Pollutant Emissions Trends Data website.[51] The methodology for estimating emissions is continually changing with the advancement of knowledge regarding emissions from sources and revisions to the EPA's emission estimating tools. West Virginia reviewed this data for potential errors, facility and process shutdowns, new facilities and processes,

[51] EPA, Air Pollutant Emissions Trends Data, https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data

and updated emission calculations. West Virginia updated the data for 2017 in Table 6, as described below and in Appendix J.

The Tier 1 Category emissions were revised to reflect known 2017 emissions. Facility point source emissions for 2017 were submitted to the EPA's EIS on June 25, 2018. The Tier 1 emissions were also revised with actual 2017 West Virginia natural gas production and exploration data, using the EPA's Oil and Gas Tool, and default factors using the EPA's MOVES2014a for non-road emissions. NO_x emissions per source classification code (SCC) are shown in Appendix K.

Table 6
West Virginia
Tier 1 Criteria Pollutant: NO_x

TIER 1 CATEGORY	NO_x Emissions (x 1,000 tons)				% of 2017 NOx
	2008	2011	2014	2017	
Fuel Comb. Elec. Util.	99.373	54.289	70.695	40.843	29.5%
Fuel Comb. Industrial	19.261	16.592	17.735	12.675	9.1%
Fuel Comb. Other	8.706	8.661	7.642	6.630	4.8%
Chemical & Allied Product Mfg.	0.836	0.402	0.313	0.268	0.2%
Metals Processing	1.432	1.806	1.560	1.380	1.0%
Petroleum & Related Industries	0.690	22.041	25.885	31.578*	22.8%
Other Industrial Processes	7.739	2.464	2.398	2.018	1.5%
Solvent Utilization	0	0	0	0	0.0%
Storage & Transport	0.002	0.004	0.001	0.001	0.0%
Waste Disposal & Recycling	1.162	1.152	0.850	0.860	0.6%
Highway Vehicles	51.846	41.879	40.880	29.812	21.5%
Off-Highway	22.442	22.397	16.774	10.508**	7.6%
Miscellaneous	0.008	0.027	0.013	0.013	0.0%
Wildfires	0.188	0.516	1.146	1.146	0.8%
Prescribed Fired	1.537	0.752	0.819	0.819	0.6%
Totals	**215.222**	**172.982**	**186.710**	**138.551**	**100.0%**

*NO_x emissions (x 1,000 tons) from DAQ based on EPA's Oil & Gas tool using actual production, active well counts, and exploration. Note that the emissions are not necessarily comparable across years due to changes in EPA's Oil & Gas Tool.
**NO_x emissions (x 1,000 tons) from a DAQ MOVES2014a EPA default run.

An analysis of the Tier 1 categories shows that the six (6) categories, highlighted in yellow in the table above, (Fuel Comb. Elec. Util.; Fuel Comb. Industrial; Fuel Comb. Other; Petroleum & Related Industries; Highway Vehicles; and Off-Highway) accounted for approximately 95 percent of the state's NO_x emissions in 2017, while the remaining nine Tier 1 categories account for less

than 5 percent. Mobile sources – Highway Vehicles and Off-Highway – are regulated at the federal level not the state level, therefore, these were not considered for potential additional reductions beyond those required at the federal level.

The Petroleum and Related Industries Category has been a growing source category in West Virginia in past years and has been leveling off in the last couple of years. West Virginia's SIP approved permitting program ensures that new or modified sources will not cause or contribute to a violation of the NAAQS. West Virginia's permitting programs are discussed below in Section 6.1, New Source Review Permitting Programs.

The construction or modification of a major source requires a permit under state rules 45CSR14 Prevention of Significant Deterioration (PSD) or 45CSR19 (Nonattainment New Source Review (NNSR)). 45CSR14 requires the application of BACT (best available control technology) and 45CSR19 requires the application of LAER (lowest achievable emission rate), which are both more stringent than RACT/RACM (reasonably available control technology/reasonably available control measures).

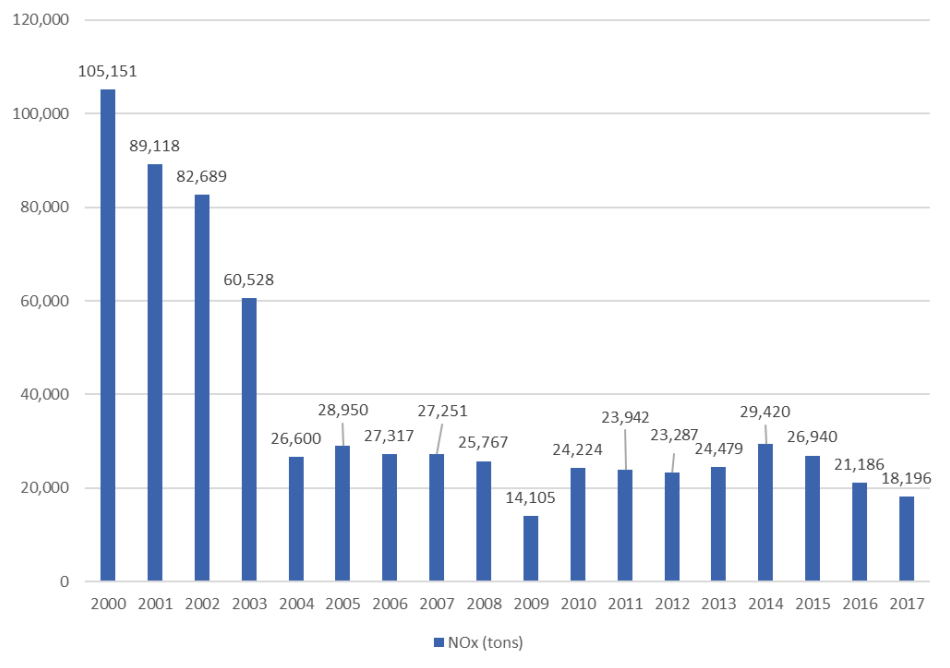
The remaining three 95 percent source categories are related to fuel combustion – electric utility, industrial and other. To assess the available control options, West Virginia reviewed EPA's preliminary analysis, the purpose of which was to characterize whether there are non-EGU source groups with a substantial amount of available cost-effective NO_x emissions reductions achievable. The results of EPA's preliminary analysis are provided in the *Assessment of Non-EGU NO_x Emission Controls, Cost of Controls, and Time for Compliance Final TSD*[52] for the CSAPR Update Rule. The results of the review are discussed below and in greater detail in Appendix L.

NO_x emissions declined dramatically under the Acid Rain Program (ARP), NO_x Budget Trading Program (NBP), Clean Air Interstate Rule (CAIR), and CSAPR program; with the majority of reductions coming from coal-fired units. These reductions have occurred while electricity demand (measured as heat input) remained relatively stable, indicating that the emission reductions were not driven by decreased electric generation. These emission reductions are a result of an overall

[52] EPA, *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance Final TSD*, August 2016. (Docket ID No. EPA-HQ-OAR-2015-0500-0508)
https://www.regulations.gov/searchResults?rpp=25&po=0&s=EPA-HQ-OAR-2015-0500-0508&dct=SR

increase in the efficiency at affected sources as power generators installed controls, ran their controls year-round, switched to lower emitting fuels, or otherwise reduced their NO_x emissions while meeting relatively steady electric demand.[53] Since 1997, power plants affected by these programs, along with other regional and state NO_x emission control programs, have cut ozone season NO_x emissions by over 75 percent, a reduction of almost 2 million tons. During the 2000 – 2015 time-period, average ozone concentrations across the U.S. have fallen by approximately 17 percent.[54] West Virginia ozone season EGU NO_x emissions have decreased 83 percent from 2000 – 2017, while emissions from Non-EGU sources subject to the NO_x SIP Call have decreased by 97 percent over the same period.[55]

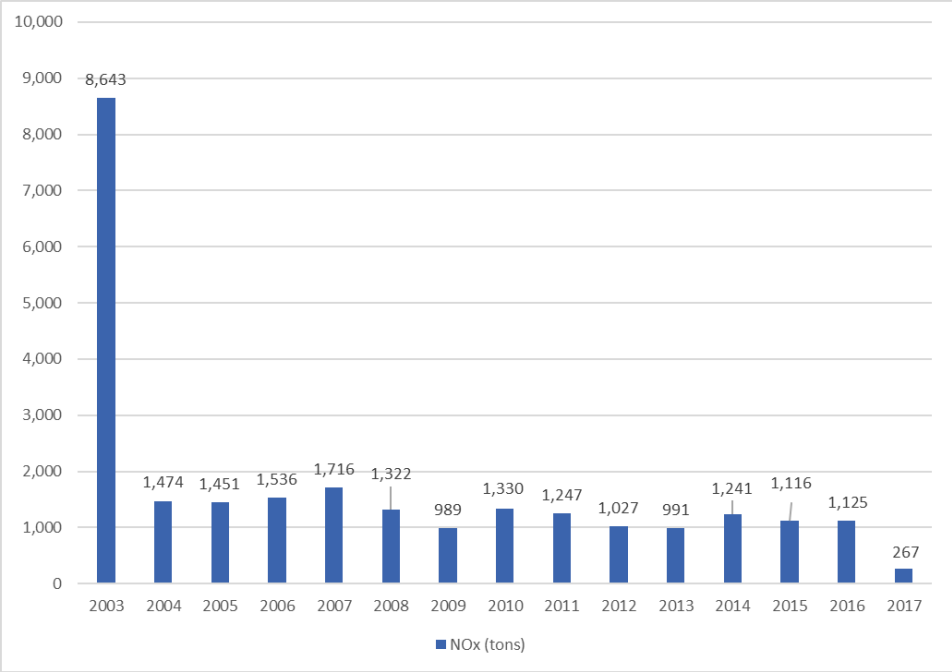
Chart 2
West Virginia Ozone Season EGU NO_x Emissions
2000-2017



Data source: https://ampd.epa.gov/ampd/

[53] https://www3.epa.gov/airmarkets/progress/reports/pdfs/index.html, EPA, 2015 Program Progress – Cross-State Air Pollution Rule and Acid Rain Program, p. 23.
[54] Fact Sheet Final Cross-State Air Pollution Rule Update for the 2008 NAAQS, p.2. https://www3.epa.gov/airmarkets/CSAPRU/FINAL_FinalCSAPRUR_Factsheet.pdf
[55] https://ampd.epa.gov/ampd/. EPA Air Markets Program Data

Chart 3
West Virginia Ozone Season non-EGU NO_x Emissions
(as reported to CAMD)
2003-2017



Data source: https://ampd.epa.gov/ampd/

5.3.b. EGU Controls

The Tier 1 category Fuel Combustion – Electric Utility accounted for 30.2 percent of the state's NO_x emissions in 2017. Therefore, potential controls for EGUs were evaluated.

Six coal-fired power plants in West Virginia have retired since the 2011 base year. Three plants, consisting of seven units with a total generating capacity of 655 MW, retired in September 2012. An additional three plants, consisting of 10 units with a total generating capacity of 2,080 MW, retired in June 2015. Documentation regarding EGUs, as of June 1, 2015, is provided in Appendix M.

As noted earlier, 2023 was selected as the future analytic year since it aligns with the anticipated attainment year for Moderate ozone nonattainment areas with respect to the 2015 ozone NAAQS. EPA stated, with respect to applying the 4-step framework, in the proposed *Determination*

Regarding Good Neighbor Obligations for the 2008 Ozone National Ambient Air Quality Standard (Determination for 2008 Ozone NAAQS):

> In step 3, the EPA quantified the upwind emissions that significantly contribute to nonattainment or interfere with maintenance. The EPA quantified significantly contributing emissions from upwind states by evaluating levels of uniform NO_x control stringency, represented by an estimated marginal cost per ton of NO_x reduced. The EPA applied a multi-factor test to evaluate cost, available emissions reductions, and downwind air quality impacts to determine the appropriate level of uniform NO_x control stringency that addressed the impacts of interstate transport on downwind nonattainment or maintenance receptors. The EPA used this multi-factor assessment to gauge the extent to which emissions reductions should be implemented beginning in 2017 and to ensure those reductions do not represent over-control. . . .
>
> The multi-factor test generated a "knee in the curve," i.e., a point at which the cost-effectiveness of the emissions reductions is maximized, so named for the discernable turning point observable in a cost curve. See 81 FR 74550. In the CSAPR Update this was at the point where emissions budgets reflected a control stringency with an estimated marginal cost of $1,400 per ton of NO_x reduced. This level of stringency in emissions budgets represented the level at which incremental EGU NO_x reduction potential and corresponding downwind ozone air quality improvements were maximized—relative to other cost levels evaluated—with respect to marginal cost. That is, the ratio of emissions reductions to marginal cost and the ratio of ozone improvements to marginal cost were maximized relative to the other emissions budget levels evaluated. . . .[56]

In evaluating EGU controls for the CSAPR Update, EPA considered the optimization of existing controls. West Virginia's EGUs, their NO_x controls, and 2017 ozone season NO_x emission rates are identified in the table below.

[56] 83 FR 31921-31922, 10 JUL 2018.

Table 7

West Virginia EGUs, Controls and 2017 NO_x Emission Rates

Plant	Unit	MW	Fuel	NO_x Control	2017 Ozone Season NO_x Emission Rate* (lb/MMBtu)
Ft. Martin	1	550	Pulverized Coal	SNCR Trim	0.3016
	2	550	Pulverized Coal	SNCR Trim	0.3118
Grant Town	1A	84	Coal Refuse	SNCR	0.3141
	1B		Coal Refuse	SNCR	0.3141
MEA	CFB1	60	Coal Refuse	SNCR	0.3334
	CFB2		Coal Refuse	SNCR	0.3332
Harrison	1	640	Pulverized Coal	SCR	0.1062
	2	640	Pulverized Coal	SCR	0.0885
	3	640	Pulverized Coal	SCR	0.0761
John Amos	1	800	Pulverized Coal	SCR	0.0838
	2	800	Pulverized Coal	SCR	0.0760
	3	1,300	Pulverized Coal	SCR	0.1135
Mitchell	1	80	Pulverized Coal	SCR	0.0834
	2	800	Pulverized Coal	SCR	0.0909
Mountaineer		1,300	Pulverized Coal	SCR	0.0991
Mt. Storm	1	530	Pulverized Coal	SCR	0.0684
	2	530	Pulverized Coal	SCR	0.0913
	3	520	Pulverized Coal	SCR	0.0810
Pleasants	1	650	Pulverized Coal	SCR	0.0887
	2	650	Pulverized Coal	SCR	0.1328
Longview		700	Pulverized Coal	SCR	0.0581
Big Sandy Peaker Plant	GS01		Natural Gas	Water Injection	0.1241
	GS02		Natural Gas	Water Injection	0.1111
	GS03		Natural Gas	Water Injection	0.1280
	GS04		Natural Gas	Water Injection	0.1027
	GS05		Natural Gas	Water Injection	0.1278
	GS06		Natural Gas	Water Injection	0.0911
	GS07		Natural Gas	Water Injection	0.1287
	GS08		Natural Gas	Water Injection	0.1069
	GS09		Natural Gas	Water Injection	0.1098
	GS10		Natural Gas	Water Injection	0.0931
	GS11		Natural Gas	Water Injection	0.1131
	GS12		Natural Gas	Water Injection	0.1138
Ceredo Generating Station	1		Natural Gas	Fuel Reburning	0.1200
	2		Natural Gas	Fuel Reburning	0.1147
	3		Natural Gas	Fuel Reburning	0.1141
	4		Natural Gas	Fuel Reburning	0.1202
	5		Natural Gas	Fuel Reburning	0.1223
	6		Natural Gas	Fuel Reburning	0.1096
Pleasants Energy	1		Natural Gas	Water Injection	0.0374
	2		Natural Gas	Water Injection	0.0463

*2017 NO_x emission rate data from EPA's AMPD website[57]

[57] https://ampd.epa.gov/ampd/

For the CSAPR Update, considering the optimization of existing controls on EGUs, EPA determined West Virginia's final 2017 EGU NO_x ozone season emission budget to be 17,815 tons, with a variability limit of 3,741 tons, and an assurance level of 21,566 tons.[58] As stated in the proposed *Determination for the 2008 Ozone NAAQS*, "the EPA considers the turning on and optimizing of existing SCR controls and the installation of combustion controls to be NO_x control strategies that have already been appropriately evaluated and implemented in the final CSAPR Update."[59]

Therefore, because all identified highly cost-effective emission reductions have already been implemented with respect to EGUs, WV finds that no additional highly cost-effective reductions are available for EGUs for the 2015 ozone NAAQS.

5.3.c. Non-EGU Controls

The EPA performed a preliminary analysis to characterize whether there are non-EGU source groups with a substantial amount of available cost-effective NO_x emissions reductions achievable, the results of that preliminary analysis are provided in the *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance Final TSD* (TSD)[60] for the CSAPR Update Rule. As EPA noted:

> For the purpose of identifying a list of non-EGU NO_x source groups with controls available, the EPA ran CoST for non-EGU point sources for the 37 eastern U.S. with NO_x emissions of greater than 25 tons/year in 2017. The analysis using CoST was a basis for the review of NO_x control measures for non-EGUs undertaken by two different contractors for EPA. Through a contractual agreement with EPA, SRA International and RTI International provided reports within which CoST examined a number of source categories of non-EGUs with annualized control costs up to $10,000 per ton (in 2011 dollars). These reports are included in the Appendices of this TSD. CoST selected particular control technologies based on application of a least-cost criterion for control measures applied as part of the control strategy. Other

[58] 81 FR 74567, 26 Oct 2016.
[59] 83 FR 31927, 8 JUN 2018.
[60] EPA, *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance Final TSD*, August 2016. (Docket ID No. EPA-HQ-OAR-2015-0500-0508)
https://www.regulations.gov/searchResults?rpp=25&po=0&s=EPA-HQ-OAR-2015-0500-0508&dct=SR

> NO_x control measures are available for some of these categories, but on average, annualized costs for these measures were at higher cost.[61]

SRA International (SRA) was provided with the outputs from EPA's Control Strategy Tool (CoST) scenario identifying sources for which NO_x controls were available at a cost-effectiveness level of less than $10,000 per ton. Source identifiers, control technology, baseline emissions and estimates of NO_x emission reductions were included in the CoST outputs. The CoST results were divided into two groups – greater than (>) 100 tons per year (tpy), and 25 to 100 tpy. There were 547 sources in the > 100 tpy group, and 1,280 sources in the 25 to 100 tpy group. EPA included two spreadsheets in the docket for the CSAPR Update Rule, which identify the sources in the >100 tpy[62] and the 25 to100 tpy[63] groups.

The TSD identified nine sources[64] (emission units) in West Virginia in the > 100 tpy group, and 21 sources[65] (emission units) in the 25 to 100 tpy group. The West Virginia sources identified in the >100 tpy group and the 25 to 100 tpy group are listed in Tables 8 and 9 below. Based on the preliminary review in the TSD EPA recommended reductions of 793 tons/O_3 season for sources in the > 100 tpy reduction group and 334 tons/O_3 season for sources in the 25 to 100 tpy reduction group.

Of the nine sources identified in the >100 tpy group, four have permanently shutdown, two sources are subject to a Consent Order which requires them to be shut down by December 31, 2021, and one source is subject to a Consent Order which establishes a 0.2 lb/MMBtu NO_x limit during the ozone season. For the remaining two sources, EPA determined that one source was controlled, and one did not have any technically and economically available controls. Therefore, all nine sources in the group have been addressed. Emissions of NO_x from these nine sources decreased from 4,451 tons in 2011 to 1,933 tons in 2017, a 56.6 percent reduction. Of the 2,518 tons of reduction, 1,628 tons (36.6%) were due to the shutdown of the four sources, and an additional

[61] Ibid., p. 9.
[62] Docket ID No. EPA-HQ-OAR-2015-0500-0090
[63] Docket ID No. EPA-HQ-OAR-2015-0500-0089
[64] Ibid, Appendix B, p. 15.
[65] Ibid, Appendix B, p. 30.

reduction of 780 tons (17.5% from 2011 levels) are expected by December 31, 2021 due to the required shutdown of two additional sources.

Of the 21 sources identified in the 25 to 100 tpy group, six sources have permanently shutdown, and three are subject to a Consent Order which requires them to be shut down by December 31, 2021. These 21 sources emitted 1,391 tons of NO_x in 2011. The six sources that have shutdown accounted for 214 tons (15.4%). An additional three sources are required to shutdown by December 31, 2021 and account for 232 tons (16.7%) of the 2011 emissions. In 2017 the 21 sources emitted 977 tons of NO_x emissions, with the three sources required to shutdown by December 31, 2021 accounting for 171 tons (17.5%).

A discussion of these 30 sources, their controls, copies of permits, Consent Orders and documentation of shutdowns are contained in Appendix N.

The shutdown of the identified 10 sources; the required shutdown of the additional five sources; and the current level of control on the remaining 20 sources, in conjunction with the implementation of the Control Measures programs listed in Section 6, represent the implementation of reasonable control measures in West Virginia.

Table 8
West Virginia Sources in the >100 tpy Group

Facility ID	Facility Name	Unit	Source Category	SRA/RTI Recommended Control Technology	2011 NO_x Emissions (tons)	2017 NO_x Emissions (tons)	WV Comments
54-003-00006	Argos USA, formerly Essroc, Capitol Cement	Kiln	Cement Kiln	Already controlled	1,495	1,005	Preheater/Precalciner kiln with LNB
54-009-00002	Mountain State Carbon	Battery #8	By-Product Coke Manufacturing	Control technically or economically infeasible	425	216	Battery uses under firing, no additional control feasible
54-029-00001	Arcelor Mittal	Boiler 5	ICI Boilers - Natural Gas	LNB and FGR	140	0	Shutdown
54-039-00007	Bayer Crop Science	Boiler 10	ICI Boilers - Coal	LNB and SCR	494	13	Shutdown
54-039-00007	Bayer Crop Science	Boiler 11	ICI Boilers - Coal	LNB and SCR	492	0	Shutdown
54-039-00007	Bayer Crop Science	Boiler 12	ICI Boilers - Coal	LNB and SCR	502	0	Shutdown
54-039-00001	Chemours – Belle	Boiler 10	ICI Boilers - Natural Gas	LNB and FGR	124	80	CO-R40-C-2016-30, 0.20 lb/MMBtu NO_x limit
54-107-00001	Chemours – Washington Works	#5 Boiler	ICI Boilers – Coal/Stoker	SNCR	318	269	Consent Order to shutdown by 12/31/21
54-107-00001	Chemours – Washington Works	#6 Boiler	ICI Boilers – Coal/Stoker	SNCR	462	350	Consent Order to shutdown by 12/31/21

Table 9
West Virginia Sources in the 25 to 100 tpy Group

Facility ID	Facility Name	Unit	Source Category	Revised Control Technology Recommendation	2011 NO_x Emissions (tons)	2017 NO_x Emissions (tons)	WV Comments
54-007-00100	Columbia Frametown	04501	Gas Turbine – Natural Gas	Low NO_x Burners (LNB)	52	0	Emergency Standby Unit
54-011-00009	SWVA	Reheat Furnace #1	Mills - Reheating	LNB and FGR	29	27	No control
54-011-00009	SWVA	Reheat Furnace #2	Mills - Reheating	LNB and FGR	42	44	No control
54-029-00001	Arcelor Mittal	Boiler 4	ICI Boilers – Natural Gas	LNB and FGR	61	0	Permanently Shutdown
54-037-00007	Ox Paperboard	001	ICI Boilers – Coal/Stoker	SNCR	53	67	Current Max 40% capacity factor, dry sorbent injection, a baghouse; Scheduled shutdown by 2019
54-039-00001	Chemours Belle	Boiler 6	ICI Boilers – Natural Gas	LNB and FGR	91	3	No NOx control, ICI Boiler MACT
54-039-00001	Chemours Belle	Boiler 14	ICI Boilers – Natural Gas	LNB and FGR	26	98	No NOx control, ICI Boiler MACT
54-039-00001	Chemours Belle	Boiler 15	ICI Boilers – Natural Gas	LNB and FGR	73	31	No NOx control, ICI Boiler MACT
54-039-00007	Bayer Crop Science	040	ICI Boilers – Natural Gas	LNB and FGR	32	0	Permanently Shutdown
54-049-00019	Marion County Mine	008	Thermal Dryer – Fluidized Bed	LNB	134	147	Cyclone, Scrubber
54-049-00043	Fibrek	001	ICI Boilers – Natural Gas	LNB and FGR	25	0	Existing controls: LNB and FGR

Facility ID	Facility Name	Unit	Source Category	Revised Control Technology Recommendation	2011 NO_x Emissions (tons)	2017 NO_x Emissions (tons)	WV Comments
54-051-00009	COVESTRO	22A	ICI Boilers – Natural Gas	LNB and FGR	53	38	No NOx control, ICI Boiler MACT
54-057-00011	Naval Sea Systems	034	ICI Boilers – Coal/Stoker	SNCR	2	0	Permanently Shutdown
54-061-00016	Monongalia County Mine	008	Thermal Dryer – Fluidized Bed	LNB	95	75	Cyclone, Scrubber
54-099-00013	Columbia Ceredo	0509	Gas Turbines – Natural Gas	LNB	116	75	Permanently Shutdown
54-107-00010	SABIC	BH4	ICI Boilers – Natural Gas	LNB and FGR	42	0	Permanently Shutdown
54-107-00001	Chemours, Washington Works	#2 Boiler	ICI Boilers – Coal/Stoker	SNCR	44	11	Consent Order to shutdown by 12/31/21
54-107-00001	Chemours, Washington Works	#3 Boiler	ICI Boilers – Coal/Stoker	SNCR	103	98	Consent Order to shutdown by 12/31/21
54-107-00001	Chemours, Washington Works	#4 Boiler	ICI Boilers – Coal/Stoker	SNCR	85	61	Consent Order to shutdown by 12/31/21
54-109-00013	Kepler Processing Plant	006	Thermal Dryer – Fluidized Bed	LNB	97	67	Venturi and wet scrubber, 15% NO_x control
54-109-00006	Pinnacle Mining	001	Thermal Dryer – Fluidized Bed	LNB	135	134	Venturi and wet scrubber, 15% NO_x control

5.4. Step 4

In Step 4, for States that are found to have emissions that significantly contribute to nonattainment or interfere with maintenance of the NAAQS downwind, must implement reasonable control measures, which may include regional emission allowance trading programs, to reduce the identified upwind emissions. Section 6 identifies the reasonable control measures which have been implemented in West Virginia.

6.0. Control Measures

This section addresses programs that are established to control air pollution emissions, including ozone precursors, for existing and potential new sources located in West Virginia, without regard to the contribution analysis. The programs discussed below are organized by permitting programs, stationary source control measures, and mobile source control measures. This section also discusses the mechanism by which West Virginia has primacy of the stationary source control program, or will have, primacy of the program with respect to CSAPR and CSAPR Update.

6.1. New Source Review (NSR) Permitting Programs

West Virginia's permit program includes review of applications, determination of permit applicability and issuance of permits for both minor and major sources. Minor sources are primarily permitted under the minor source rule found at 45CSR13 – *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation*. Major sources are primarily permitted under the new source review rules found at 45CSR14 – *Permits for the Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration* and 45CSR19 – *Permits for Construction and Major Modification of Major Stationary Sources Which Cause or Contribute to Nonattainment Areas*. Major sources are also issued operating permits under the authority of 45CSR30 – *Requirements for Operating Permits*, which is the implementing rule of Title V of the 1990 Federal Clean Air Act Amendments.

6.1.a. 45CSR13 – Minor Source NSR

West Virginia's permitting program requires the construction or modification of a source with the potential to emit six or more pounds per hour and 10 tons per year, or greater than 144 pounds per calendar day, of a regulated pollutant, including the ozone precursors NO_x and VOCs, to obtain a permit under state rule 45CSR13 – *Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, Permission to Commence Construction, and Procedures for Evaluation* (minor source NSR). 45CSR13 §5.7 requires the Secretary to consider whether the "proposed construction, modification, registration or relocation will violate applicable emission standards, will interfere with attainment or maintenance of an applicable ambient air quality standard, cause or contribute to a violation of an applicable air quality increment, or be inconsistent with the intent and purpose of this rule or W. Va. Code § 22-5-1, et seq., in which case the Secretary shall issue an order denying such construction, modification, relocation and operation." 45CSR13 is the mechanism under which NSPS, are applied to a given minor source. Reductions from sources subject to NSPS are assumed to be equivalent to RACT/RACM (reasonably available control technology/reasonably available control measures).

West Virginia has had a minor source NSR program as part of its SIP since 1972. 45CSR13 sets forth the procedures for stationary source reporting, and the criteria for obtaining a permit to construct and operate a new stationary source which is not a major stationary source, to modify a non-major stationary source, to make modifications which are not major modifications to an existing major stationary source, to relocate non-major stationary sources within the state of West Virginia, and to set forth procedures to allow facilities to commence construction in advance of permit issuance. Such construction, modification, relocation, and operation without a required permit is a violation of this rule. This rule also establishes the requirements for obtaining an administrative update to an existing permit, a temporary permit, or a general permit registration, and for filing notifications and maintaining records of changes not otherwise subject to the permit requirements of this rule. This rule does not apply to non-road engines, non-road vehicles, motor vehicles, or other emission sources regulated under Subchapter II of the CAA; however, the Secretary may regulate such sources pursuant to another rule promulgated for that purpose. The

EPA last approved 45CSR13 as a SIP revision effective August 20, 2014[66]. West Virginia submitted the current version of 45CSR13, effective June 1, 2017, to the EPA as a SIP revision on June 7, 2017. The EPA has not yet acted on this revision.

6.1.b. 45CSR14 - PSD

Legislative rule 45CSR14 – *Permits for the Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration*, satisfies the prevention of significant deterioration permit program requirements under Part C of Title I of the CAA.

New major sources and major modifications are subject to a comprehensive PSD permit program as set forth in SIP approved rule 45CSR14[67]. The PSD program governs the preconstruction review and permitting of any new major stationary sources or major modification with respect to all regulated NSR pollutants, including greenhouse gases, under the CAA, as well as any precursors to the formation of such pollutants when identified for regulation by EPA.

45CSR14 regulates future growth and provides for continued maintenance of the 2015 8-hour ozone NAAQS. This rule includes specific federal requirements which ensure that new or modified sources do not interfere with measures to prevent significant deterioration of air quality by providing a mechanism to prevent the development of any new nonattainment problems. 45CSR14 requires the evaluation of sources of air pollutants to preclude the construction or relocation of any major stationary source or major modification in any area classified as attainment/unclassifiable with the NAAQS to prevent the significant deterioration of air quality.

Pursuant to CAA §165(a)(3), the DAQ is authorized to implement the existing PSD permit program to ensure the construction and modification of major stationary sources will not cause or contribute to a violation of the 2015 8-hour ozone NAAQS (or any NAAQS or increment) in West Virginia or another state, as set forth in the source impact analysis requirements of 45CSR§ 14-9.1 and 40 CFR §51.166(k).

[66] 79 FR 42212
[67] 81 FR 53008, August 11, 2016

As set forth in 45CSR14-4, ambient air quality increments and ceilings are not confined to a state boundary. Pursuant to the public review procedures set forth in 45CSR §14-17.5, West Virginia must provide notice to any state affected by a proposed source or modification. The DAQ must send a copy of the advertisement to the applicant, to the Administrator, and to officials and agencies having cognizance over the location where the proposed construction would occur as follows: any other State or local air pollution control agencies, the chief executives of the city and county where the source would be located; any comprehensive regional land use planning agency, any State, and any Federal Land Manager, whose lands may be affected by emissions from the source or modification.

The EPA last approved 45CSR14, effective June 1, 2016, as a SIP revision effective September 12, 2016[68]. On June 7, 2017, West Virginia submitted to the EPA a SIP revision which included updates to 45CSR14, effective June 1, 2017. The EPA has not yet acted on this revision.

6.1.c. 45CSR19 – Nonattainment NSR

Legislative rule 45CSR19 – *Permits for Construction and Major Modification of Major Stationary Sources Which Cause or Contribute to Nonattainment Areas*, satisfies the nonattainment area nonattainment new source review (NNSR) permit program requirements under Part D of the CAA.

West Virginia's SIP approved[69] NNSR program under 45CSR19, has a state effective date of June 1, 2014. West Virginia has had a SIP approved NNSR program under 45CSR19 since EPA first approved the program[70].

In-state sources not subject to PSD for one or more regulated pollutants because they are located in a nonattainment area for a NAAQS related to the nonattainment pollutant(s) may also have the potential to interfere with PSD in an attainment/unclassifiable area of another state. New or major sources and major modifications in nonattainment areas are subject to the NNSR program under 45CSR19. 45CSR19 contains a significance level for ozone of 40 tpy of VOC or NO_x. The significant impact level (µg/m3) for NO_2 for annual averaging time (hours) of ambient air

[68] 81 FR 53008
[69] 80 FR 29972, effective June 25, 2015
[70] 50 FR 27247, effective August 1, 1985

concentration increase is 1.0. A NNSR permit may be granted if the source meets LAER, emission offset requirements, and additional requirements. West Virginia does not have any nonattainment areas for ozone.

6.2. Stationary Source Control Measures

6.2.a. New Source Performance Standards (40 CFR Part 60)

Section 111 of the CAA authorizes the EPA to develop technology-based standards which apply to specific categories of stationary sources. These standards are referred to as new source performance standards (NSPS) and are found in 40 CFR Part 60. The NSPS apply to new, modified, and reconstructed affected facilities in specific source categories such as EGUs, industrial-commercial-institutional steam generating units (boilers), manufacturers of glass, cement, rubber tires and wool fiberglass.

Section 111(c) of the CAA directs EPA to delegate to each State, when appropriate, the authority to implement and enforce standards of performance for new stationary sources located in such State. West Virginia first received delegation for the NSPS program on December 14, 1984[71] and has automatic delegation of authority to enforce the NSPS program in accordance with EPA's delegation of authority letters dated March 19, 2001 and January 8, 2002. All emission limitations and standards of performance for NO_x and VOCs promulgated under 40 CFR Part 60 are incorporated by reference under legislative rule 45CSR16 – *Standards of Performance for New Stationary Sources,* with limited exception. Under the terms of the delegation agreement, the DEP must legally adopt each standard. The DEP revises 45CSR16 on an annual basis to incorporate by reference the NSPS promulgated by EPA in the preceding year. The DEP is also required to provide notification to the EPA that it has adopted by reference the standards and that it intends to enforce the standards in conformance with the terms of the delegation. The DEP provides this notification to EPA on an annual basis following the annual incorporation by reference of the NSPS under 45CSR16. The last notification to EPA was sent June 5, 2018 regarding the latest revision to 45CSR16, effective June 1, 2018.

[71] 49 FR 48692

6.2.b. Acid Rain Program

The Acid Rain Program (ARP), which began in 1995, covers fossil fuel fired power plants across the contiguous U.S. and is designed to reduce sulfur dioxide (SO_2) and NO_x emissions, the primary precursors of acid rain. The ARP's market-based SO_2 cap and trade program sets an annual cap on the total amount of SO_2 that may be emitted by EGUs. The final annual SO_2 emissions cap was set at 8.95 million tons in 2010, a level of about one-half of the emissions from the power sector in 1980. NO_x reductions under the ARP are achieved through a rate-based approach that applied to a subset of coal-fired EGUs.[72]

West Virginia implements the ARP through 45CSR33 – *Acid Rain Provisions and Permits*, which incorporates by reference the CAA Title IV Acid Rain Program as part of the state's Title V requirements, which were approved on December 15, 1995 with the interim approval of the state's Title V program.

6.2.c. NO_x SIP Call

In October 1998, EPA finalized the *Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone* — commonly called the NO_x SIP Call. In response to the NO_x SIP Call the NO_x Budget Program (NBP) was designed to mitigate significant transport of NO_x. The NBP was a cap and trade program created to reduce the regional transport of NO_x emissions from power plants and other large combustion sources in the eastern U.S. The NBP began in 2003 and was designed to reduce NO_x emissions during the warm summer months (i.e., ozone season), when ground-level ozone concentrations are highest. The NBP was a central component of the NO_x SIP Call, which was implemented from 2003 to 2008.[73]

West Virginia implemented the NO_x SIP Call through the adoption of 45CSR1 – *NO_x Budget Trading Program as a Means of Control and Reduction of Nitrogen Oxides from Non-Electric Generating Units (Rule 1)* and 45CSR26 – *NO_x Budget Trading Program as a Means of Control*

[72] https://www3.epa.gov/airmarkets/progress/reports/pdfs/2015_full_report.pdf. EPA, 2015 Program Progress – Cross-State Air Pollution Rule and Acid Rain Program, p. 7.
[73] https://www.epa.gov/airmarkets/nox-budget-trading-program

and Reduction of Nitrogen Oxides from Electric Generating Units (Rule 26). Both rules were approved as a revision to the SIP in 2002[74] and were subsequently repealed in 2009 when replaced with the Clean Air Interstate Rule (CAIR). EPA approved the repeal of 45CSR1 and 45CSR26 [75 FR 6305] effective February 9, 2010, as a revision to the SIP.

6.2.d. Clean Air Interstate Rule

Beginning in 2009, the NBP was effectively replaced by the ozone season NO_x program under the CAIR, which required further summertime NO_x reductions from the power sector. EPA's CAIR addressed regional interstate transport of soot (fine particulate matter) and smog (ozone). CAIR required 28 eastern states to make reductions in SO_2 and NO_x emissions that contribute to unhealthy levels of fine particle and ozone pollution in downwind states. CAIR was replaced by CSAPR as of January 1, 2015.[75]

West Virginia implemented the CAIR through the adoption of three state rules, which were approved as revisions to the SIP[76]:

- 45CSR39 – *Control of Annual Nitrogen Oxide Emissions to Mitigate Interstate Transport of Fine Particulate Matter and Nitrogen Oxides*;
- 45CSR40 – *Control of Ozone Season Nitrogen Oxide Emissions to Mitigate Interstate Transport of Fine Particulate Matter and Nitrogen Oxides*; and
- 45CSR41 – *Control of Annual Sulfur Dioxide Emissions to Mitigate Interstate Transport of Fine Particulate Matter and Sulfur Dioxide*.

CAIR was replaced by the Cross-State Air Pollution Rule (CSAPR) as of January 1, 2015;[77] therefore, 45CSR39 and 45CSR41 were repealed, effective July 1, 2016. EPA approved the repeal of 45CSR39 and 45CSR41[78] as a revision to the SIP.

[74] 67 FR 31733
[75] https://archive.epa.gov/airmarkets/programs/cair/web/html/index.html
[76] 74 FR 38536, effective August 4, 2009
[77] https://archive.epa.gov/airmarkets/programs/cair/web/html/index.html
[78] 83 FR 5540, effective March 12, 2018

Also due to the replacement of the CAIR program with the federal CSAPR, 45CSR40 was revised, effective July 1, 2016, removing the EGU CAIR requirements and retaining the non-EGU requirements from the NO_x SIP call. The DEP submitted 45CSR40 as a SIP revision on July 13, 2016 and subsequently submitted additional information including a non-EGU NO_x SIP Call Demonstration. To date, no action has been taken by EPA.

The CSAPR became effective January 1, 2015, as set forth in an October 23, 2014 decision by the U.S. Court of Appeals for the D.C. Circuit.

6.2.e. Cross-State Air Pollution Rule

On July 6, 2011, the EPA finalized the Cross-State Air Pollution Rule (CSAPR) as a federal implementation plan (FIP), limiting the interstate transport of emissions of NO_x and SO_2 that contribute to harmful levels of $PM_{2.5}$ and ozone in downwind states. The CSAPR requires 28 states in the eastern U.S. to reduce SO_2, annual NO_x and ozone season NO_x emissions from fossil fuel-fired power plants that affect the ability of downwind states to attain and maintain compliance with the 1997 and 2006 $PM_{2.5}$ NAAQS and the 1997 ozone NAAQS.

The CSAPR achieved these reductions through emissions trading programs, Phase 1 began in January 2015 for the annual programs and May 2015 for the ozone season program. Phase 2 began in January 2017 for the annual programs and May 2017 for the ozone season program.

The total emissions allowed in each compliance period under CSAPR equals the sum of the affected state emission budgets in the program. The budget for each program in 2015 was:

- SO_2 Group 1 – 2.55 million tons
- SO_2 Group 2 – 917,787 tons
- Annual NO_x – 1.27 million tons
- Ozone Season NO_x – 628,392 tons[79]

[79] https://www3.epa.gov/airmarkets/progress/reports/pdfs/2015_full_report.pdf. EPA, 2015 Program Progress – Cross-State Air Pollution Rule and Acid Rain Program, p. 8.

As noted earlier, DEP has proposed legislative rule 45CSR43 – *Cross-State Air Pollution Rule to Control Annual Nitrogen Oxide Emissions, Annual Sulfur Dioxide Emissions and Ozone Season Nitrogen Oxide Emissions* for West Virginia legislative approval during the 2019 Legislative Session. Upon legislative approval and signature by the Governor, 45CSR43 will be submitted to EPA as a SIP revision. 45CSR43 incorporates by reference the 40 CFR Part 97, Subparts AAAAA and CCCCC, the CSAPR NO_x Annual and SO_2 Group 1 trading programs, respectively.

6.2.f. CSAPR Update

On September 7, 2016, the EPA revised the CSAPR ozone season NO_x emission program by finalizing the CSAPR Update for the 2008 ozone NAAQS.[80] Starting in May 2017, the CSAPR Update began reducing summertime (May - September) NO_x emissions from power plants in 22 states in the eastern U.S., including West Virginia. The CSAPR Update reduces air quality impacts of ozone pollution that crosses state lines and helps downwind areas meet and maintain the 2008 ozone air quality standard.[81] The combined state emission budgets in the CSAPR Update equals 316,464 tons of ozone season NO_x emissions in 2017 and 313,626 tons of emissions for 2018 and later years.[82] The Final 2017 EGU NO_x ozone season emission budget for West Virginia is 17,815 tons, with a variability limit of 3,741 tons, for an assurance level of 21,556 tons[83]. West Virginia's CSAPR Update Budget of 17,815 is a reduction of 7,468 tons (29.5%) and 5,476 tons (23.5%), respectively, of the budgeted amounts, in CSAPR, of 25,283 tons for 2012-2013 and 23,291 tons for 2014 and beyond[84].

EPA's Clean Air Markets Division's (CAMD) AMPD shows that actual ozone season NO_x emissions in the 22 states subject to the CSAPR Update dropped by 26.5% from 2015 to 2017, from 401,403 tons to 295,208 tons, a reduction of 106,195tons.[85] EPA's AMPD shows West Virginia's 2017 ozone season emissions were 18,187 tons, which is below the CSAPR assurance level of 21,556 tons for West Virginia.

---

[80] https://www.epa.gov/csapr/cross-state-air-pollution-rule-csapr-regulatory-actions-and-litigation
[81] https://www.epa.gov/airmarkets/final-cross-state-air-pollution-rule-update
[82] https://www3.epa.gov/airmarkets/progress/reports/pdfs/2015_full_report.pdf. EPA, 2015 Program Progress – Cross-State Air Pollution Rule and Acid Rain Program, p. 8.
[83] 81 FR 74508, 26 Oct 2016
[84] 76 FR 48263, 08 Aug 2011
[85] https://ampd.epa.gov/ampd/

As noted earlier, DEP has proposed legislative rule 45CSR43 – *Cross-State Air Pollution Rule to Control Annual Nitrogen Oxide Emissions, Annual Sulfur Dioxide Emissions and Ozone Season Nitrogen Oxide Emissions* for West Virginia legislative approval during the 2019 Legislative Session. Upon legislative approval and signature by the Governor, 45CSR43 will be submitted to EPA as a SIP revision. 45CSR43 incorporates by reference the 40 CFR Part 97, Subpart EEEEE, the CSAPR ozone season NO_x trading program.

6.2.g. Solid Waste Combustion Rules (40 CFR Part 60)

Section 129 of the CAA directs the Administrator to develop regulations under Section 111 of the Act limiting emissions of nine air pollutants, including NO_x, from four categories of solid waste incineration units: municipal solid waste; hospital, medical and infectious solid waste; commercial and industrial solid waste; and other solid waste.

Section 111 of the CAA authorizes the EPA to develop technology-based standards which apply to specific categories of stationary sources. New Source Performance Standards (NSPS) are found in 40 CFR Part 60 and apply to new, modified, and reconstructed affected facilities in specific source categories. Emission Guidelines (EG) are found in 40 CFR Part 60 and apply to existing affected facilities in specific source categories.

West Virginia legislative rule 45CSR18 – *Control of Air Pollution from Combustion of Solid Waste* adopts standards of performance, and establishes emission guidelines and compliance times pursuant to §§ 111(d) and 129 of the CAA for the control of certain designated pollutants from the following categories of solid waste combustors, combustion units, incinerators and incineration units in West Virginia:

(a) Large municipal waste combustors subject to the standards of performance under Subpart Eb;

(b) Small municipal waste combustion units subject to the standards of performance under Subpart AAAA;

(c) Hospital/ medical/ infectious waste (HMIWI) incinerators subject to the standards of performance under Subpart Ec and the emission guidelines and compliance times under Subpart Ce;

(d) Commercial and industrial solid waste incineration (CISWI) units subject to the standards of performance under Subpart CCCC and the emission guidelines and compliance times under Subpart DDDD;

(e) Other solid waste incineration units subject to the standards of performance under Subpart EEEE, and

(f) Sewage sludge incineration units subject to the standards of performance under Subpart LLLL.

The effective date of the latest revision to 45CSR18 is June 1, 2018. As previously described, West Virginia has automatic delegation of the NSPS program. The most recent communication to EPA regarding the incorporation of the NSPS under 45CSR18 was August 15, 2018. The CISWI and HMIWI State Plans for existing facilities were approved by EPA[86]. DEP submitted revisions to the CISWI State Plans on November 21, 2016 and August 15, 2018. There has been no action taken by EPA regarding the latest CISWI State Plan revision submittals.

6.2.h. Maximum Achievable Control Technology (MACT) Program (40 CFR Part 63)

The first NESHAPs were originally required by the 1970 CAA. These standards were developed for sources and source categories that were determined to pose adverse risk to human health by the emission of hazardous air pollutants (HAPs). The EPA Administrator was directed to set the standard "at the level which in his judgment provides an ample margin of safety to protect the public health from such hazardous air pollutants". These risk-based NESHAPs are in 40 CFR 61 and incorporated by reference in 45CSR34. The NESHAPs applies to all existing and new/modified sources.

Congress directed EPA to develop a program to further the regulation of HAPs in section 112 of the 1990 Clean Air Act Amendments (CAAA). While the standards for major sources of HAPs developed per this section are also designated as NESHAPs, they are established in accordance with MACT requirements. MACT is a technology-based standard, as opposed to the original conception of NESHAPs as a risk-based standard. These technology-based NESHAPs are located

[86] 68 FR 17738, effective June 10, 2003 and 77 FR 3389, effective March 26, 2012, respectively

at 40 CFR 63 and incorporated by reference in 45CSR34. The last effective date of 45CSR34 is June 1, 2018.

West Virginia implements the MACT rules through the adoption of 45CSR34 – *Emission Standards for Hazardous Air Pollutants*, which incorporates by reference federal NESHAPs for source categories as set forth in 40 CFR Parts 61 and 63. This is a delegated program for which the state received partial delegation effective March 19, 2001 and full delegation effective June 3, 2002. While the purpose of 45CSR34 is the control of HAPs, there may also be a co-beneficial reduction in the emissions of NO_x and/or VOCs.

6.3. Mobile Source Control Measures

6.3.a. 2007 Heavy-Duty Highway Rule (40 CFR Part 86, Subpart P)

In this regulation, EPA set a particulate matter (PM) emission standard for new heavy-duty engines of 0.01 grams per brake horsepower-hour (g/bhp-hr), which took effect for diesel engines in the 2007 model year. This rule also included standards for NO_x and non-methane hydrocarbons (NMHC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. The diesel engine NO_x and NMHC standards were successfully phased in together between 2007 and 2010. The rule also required that sulfur in diesel fuel be reduced to facilitate the use of modern pollution control technology on these trucks and buses. The EPA required a 97 percent reduction in the sulfur content of highway diesel fuel – from levels of 500 ppm (low sulfur diesel) to 15 ppm (ultra-low sulfur diesel). These requirements were successfully implemented on the timeline in the regulation.

6.3.b. Tier 2 Vehicle and Gasoline Sulfur Program (40 CFR Part 80, Subpart H; 40 CFR Part 85, 40 CFR Part 86)

The EPA's Tier 2 fleet averaging program for on-road vehicles, modeled after the California low emission vehicle (LEV) II standards became effective in the 2005 model year. The Tier 2 program allows manufacturers to produce vehicles with emissions ranging from relatively dirty to very clean, but the mix of vehicles a manufacturer sells each year must have average NO_x emissions below a specified value. Mobile emissions continue to benefit from this program as motorists replace older, more polluting vehicles with cleaner vehicles.

6.3.c. Tier 3 Motor Vehicle Emission and Fuel Standards (40 CFR Parts 79, 80, 85, 86, 600, 1036, 1037, 1039, 1042, 1048, 1054, 1065, and 1066)

The Tier 3 program is part of a comprehensive approach to reducing the impacts of motor vehicles on air quality and public health by considering the vehicle and its fuel as an integrated system, setting new vehicle emissions standards and a new gasoline sulfur standard beginning in 2017. The vehicle emissions standards will reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. The gasoline sulfur standard will enable more stringent vehicle emissions standards and will make emissions control systems more effective.

The Tier 3 standards include new light- and heavy-duty vehicle emission standards for exhaust emissions of VOC (specifically, non-methane organic gases, or NMOG), NO_x, and PM, as well as new evaporative emissions standards. The fully phased-in standards for light-duty vehicle, light-duty truck, and medium-duty passenger vehicle tailpipe emissions are an 80 percent reduction in fleet average NMOG+NO_x compared to current standards, and a 70 percent reduction in per-vehicle PM standards. The fully phased-in Tier 3 heavy-duty vehicle tailpipe emissions standards for NMOG+NO_x and PM are about 60 percent lower than current standards. Finally, the fully phased-in evaporative emissions standards represent a 50 percent reduction from the earlier standards.[87]

6.3.d. Tier 4 Vehicle Standards

On May 11, 2004, EPA signed the final rule introducing Tier 4 emission standards, which were phased-in from 2008-2015. Engine manufacturers were required to produce new engines with advanced emission control technologies. Exhaust emissions from these engines were predicted to decrease by more than 90%. When the full inventory of older non-road engines are replaced by Tier 4 engines, annual emission reductions are estimated at 738,000 tons of NO_x and 129,000 tons of PM.

[87] 79FR23417, 28APR2014.

6.3.e. Nonroad Diesel Emissions Program (40 CFR Part 89)

The EPA adopted standards for emissions of NO_x, hydrocarbons, and carbon monoxide (CO) from several groups of non-road engines, including industrial spark-ignition engines and recreational non-road vehicles. Industrial spark-ignition engines power commercial and industrial applications and include forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications. Non-road recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain vehicles. These rules were initially effective in 2004 and were fully phased in by 2012.

The non-road diesel rule sets standards that reduced emissions by more than 90 percent from non-road diesel equipment.

7.0. Conclusion

The Final TSD[88] for the CSAPR Update Rule focused on emissions and control measures for sources of NO_x other than EGUs. The TSD evaluated whether non-EGU emissions could be reduced in a cost-effective manner for specific categories, assessed available NO_x emission reductions from such categories, and presented the category-by-category emissions reduction potential. Based on contractor review of the CoST results, EPA identified 30 sources in West Virginia with potential cost-effective controls. Based on their preliminary analysis EPA determined there were potential cost-effective reductions of 793 tons/O_3 season for sources in the > 100 tons per year reduction group and 334 tons/O_3 season for sources in the 25 to 100 tons per year reduction group.

In the review of EPA's preliminary analysis of the 30 sources identified by EPA in the CSAPR Update TSD, West Virginia identified permanent non-EGU NO_x emissions reductions from 2011 emissions of 1,842 tons resulting from 10 source shutdowns and expected reductions of 1,012 tons due to the required shutdown of five sources by December 31, 2021.

[88] EPA, *Assessment of Non-EGU NOx Emission Controls, Cost of Controls, and Time for Compliance Final TSD*, August 2016.

West Virginia's SIP approved permitting program ensures that new or modified sources will not cause or contribute to a violation of the NAAQS. West Virginia's permitting program requires the construction or modification of a source with the potential to emit more than six pounds per hour and 10 tons per year, or greater than 144 pounds per calendar day, of a regulated pollutant which includes NO_x, to obtain a permit under state rule 45CSR13 (minor source NSR). 45CSR13 §5.7 requires the Secretary to consider whether the "proposed construction, modification, registration or relocation will violate applicable emission standards, will interfere with attainment or maintenance of an applicable ambient air quality standard, cause or contribute to a violation of an applicable air quality increment, or be inconsistent with the intent and purpose of this rule or W. Va. Code § 22-5-1, et seq., in which case the Secretary shall issue an order denying such construction, modification, relocation and operation". 45CSR13 is the mechanism under which NSPS, NESHAPs, including MACT standards, are applied to a given minor source. Reductions from existing sources subject to NSPS and NESHAP are assumed to be equivalent to RACT/RACM.

The construction or modification of a major source requires a permit under state rules 45CSR14 (PSD) and/or 45CSR19 (nonattainment NSR). 45CSR14 requires the application of BACT and 45CSR19 requires the application of LAER, which are both more stringent than RACT/RACM.

Based on this analysis, West Virginia concludes that, upon incorporation of 45CSR43 into the SIP, no additional highly cost-effective reductions are available for the 2015 ozone NAAQS. The State of West Virginia is requesting that the EPA conditionally approve the *West Virginia Supplement to the State Implementation Plan Revision for Clean Air Act §110(a)(2)(A)-(M) Requirements for the 2015 8-Hour Ozone NAAQS with the Demonstration of Compliance with the Good Neighbor Requirements of Clean Air Act Section 110(a)(2)(D)(i)(I)* as a SIP revision, to address the state's obligations under the CAA Section 110(a)(2)(D)(i)(I) (i.e., "Good Neighbor") requirements, contingent upon the State's adoption of the emission reduction requirement pursuant to 40 CFR 97 subpart EEEEE, the CSAPR NO_x Ozone Season Group 2 Trading Program as described above (Section 2.0).