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1600 ONE AMERICAN SQUARE, BOX 82065 INDIANAPOLIS, INDIANA 46282 317-632-4406 FAX 317-262-4940 www.indianaenergy.org

Ed Simcox, President Emeritus

Mark T. Maassel, President

Timothy J. Rushenberg, Vice President

Boonville Natural Gas Corp.

Citizens Energy Group

Community Natural Gas Co., Inc.

Duke Energy

Fountaintown Gas Co., Inc.

Indiana Michigan Power

Indiana Natural Gas Corp.

Indianapolis Power & Light Company

Midwest Natural Gas Corp.

Northern Indiana Public Service Co.

Ohio Valley Gas Corp.

South Eastern Indiana Natural Gas Co., Inc.

Sycamore Gas Co.

Vectren Energy Delivery of Indiana, Inc.

September 24, 2018

Ms. Amy Smith
Office of Air Quality, N1003
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46204

Re: Indiana's Infrastructure State Implementation Plan (SIP) Submittal under Clean Air Act (CAA) Sections 110(a)(1) and 110(a)(2) for the 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS)

Dear Ms. Smith:

In response to the Indiana Department of Environmental Management (IDEM) August 24, 2018, LEGAL NOTICE OF PUBLIC HEARING regarding Indiana's Infrastructure State Implementation Plan (SIP) Submittal under Clean Air Act Sections 110(a)(1) and 110(a)(2) for the 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS), the Indiana Energy Association (IEA) is pleased to offer the following comments.

Introduction

The IEA is an association of electric power companies and natural gas companies that provide Indiana consumers with affordable and reliable energy, benefiting families and businesses across the Hoosier state. Our mission is to advocate policies that promote the general welfare of the energy industry to enhance its role in improving the economy and quality of life in Indiana. Since 2000, emissions from the Indiana electric power industry are down approximately 43% percent for carbon dioxide (CO2), 89% percent for sulfur dioxide (SO2), and nearly 77% percent for nitrogen dioxide (NO2). We are investing heavily in new technologies to continue to reduce emissions, ranging from the operation of one of the world's cleanest coal-fired power plants to the largest airport-based solar farms in the country. IEA member companies deliver electricity and gas service to over 4,000,000 Hoosiers. Approximately 11,500 people are directly employed by the 14 IEA member companies in our state. The combined effects of the operating expenditures and capital investments of the IEA member companies generate nearly \$5.6 billion in Indiana each year.

THE VOICE FOR INDIANA ENERGY

Comments

1. The Proposed SIP Appropriately Addresses Interstate Transport

The proposed SIP notes that “Indiana has made amendments to existing rules in response to the replacement of the Clean Air Interstate Rule (CAIR) with the Cross State Air Pollution Rule (CSAPR) to address interstate air pollution transport, according to U.S. EPA rules for CSAPR’s implementation.”

Furthermore, referring to the process used by EPA to determine whether emissions in a state will contribute significantly to nonattainment in, or interfere with maintenance by, any other state,¹ the proposed Indiana SIP concludes that “[t]he state’s rule amendments under CSAPR for boilers, turbines and combined cycle units at large EGUs, as well as boilers and turbines at heavy non-EGUs such as aluminum smelters, petroleum refiners, iron and steel production facilities and institutional facility steam plants, ensure that Prong 1 and Prong 2 provisions will continue to be met. As such, Indiana’s emissions do not contribute significantly to issues with attainment or maintenance of the 2015 8-hour ozone NAAQS in downwind state. Therefore, Indiana believes that additional control measures are not necessary to address the state’s contribution to interstate transport.”

IDEM also notes that “large EGUs and non-EGUs operating in the state have achieved significant and permanent reductions in ozone precursors emissions (i.e., NO_x and VOCs), as well as emissions of SO₂ and fine particulate matter (PM_{2.5}).

The IEA agrees with the Weight of Evidence Analysis which accompanies the draft Infrastructure SIP.² That analysis includes factors such as the use of a 1 ppb significance test (as recommended by EPA in its April 17, 2018, guidance memo)³. Further, the IEA believes that the analysis is conservative based on the fact that (a) ozone concentrations in Indiana are continuing to decrease, (b) local mobile sources emissions in the northeast have not been addressed by the northeast states, (c) IDEM considered but chose not to eliminate, within the attainment test calculation, the use of model grid cells that contain over 50% water in the cell and did not contain an ozone monitor within the cell, which elimination would have reduced the estimated reduction obligations of Indiana to downwind states, and (d) emission reductions will continue because of additional on the books controls that are not yet implemented and their positive impact on ozone concentrations. These additional air quality benefits, not included in the proposed SIP demonstration, further support the conclusion of IDEM that the requirements of Prongs 1 and 2 will continue to be met.

¹ 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), prepared by Peter Tsirigotis, March 27, 2018. <https://www.epa.gov/airmarkets/march-2018-memo-and-supplemental-information-regarding-interstate-transport-sips-2015>

² See Attachment 1 to Draft Infrastructure State Implementation Plan (SIP) by the Indiana Department of Environmental Protection (IDEM) related to the 2015 ozone National Ambient Air Quality Standard (NAAQS) https://www.in.gov/idem/airquality/files/redesignation_state_pm_2015_submittal_attach_1.pdf

³ See https://www.epa.gov/sites/production/files/2018-04/documents/sils_guidance_2018.pdf

2. The Northeast is Responsible for Local Mobile Source Impacts

The SIP proposal on page 29 notes that mobile source emissions have a more significant impact on ozone concentrations and the problem monitors in the northeast than do Indiana sources, either EGU or non-EGU. IDEM states that “[t]he on road contributions are between 17% and 18% of the projected modeled ozone for the Northeast monitors while the nonroad sector contributions are approximately 13%. These impacts overshadow the overall EGU and non-EGU contribution which equate to approximately 12%...”

The CSAPR Update Rule already addresses EGU emissions, and the IEA believes, consistent with the prohibition against requiring upwind states to over control established in *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1604 n.18, 1608-09 (2014), that the CAA requires that mobile and local area sources that have the most significant impact on ozone concentrations at the problem monitors must be addressed before Indiana sources are required to reduce further emissions as part of an Indiana Good Neighbor SIP obligation.

3. Recent Integrated Resource Planning Results are Not Included, Which Infers that SIP Projections are Conservative

“Jurisdictional electric utilities are required to submit Integrated Resource Plans (IRPs) every three years. IRPs describe how the utility plans to deliver safe, reliable, and efficient electricity at just and reasonable rates. Further, these plans must be in the public interest and consistent with state energy and environmental policies. Each utility’s IRP explains how it will use existing and future resources to meet customer demand. When selecting these resources, the utility must consider a broad range of potential future conditions and variables and select a combination that would provide reliable service in an efficient and cost-effective manner.”⁴

For many years, the IRP process has resulted in declining coal-fired generation and emissions in Indiana. The proposed SIP does not incorporate all of the recently announced EGU retirements and emissions reductions in Indiana. Yet, even without these recent data, the proposed SIP will result in compliance with all requirements of CAA Section 110(a)(1) and 110(a)(2).

4. The Emission Inventory Should be Reviewed for Accuracy

The proposed SIP discusses inventories in Section 2, Indiana's Analytic Flexibilities, in which IDEM states:

Indiana has chosen or considered several flexibilities listed in U.S. EPA’s transport memo for its WOE analysis. With regards to analytics, Indiana chose to use alternative power sector emissions modeling and state-specific information on emission sources and optimization of nitrogen oxide (NOx) emission controls. Indiana is a member of the Lake Michigan Air Director's Consortium (LADCO), which consists of LADCO staff and staff from the air

⁴See <https://www.in.gov/iurc/2630.htm>

Minnesota, Ohio, and Wisconsin. Indiana, together with LADCO, has been heavily involved in the development of the Eastern Regional Technical Advisory Committee (ERTAC) Electricity Generating Unit (EGU) tool. This tool integrates state-reported information on EGU operations and emissions forecasts.

The IEA has reviewed the EGU emission inventory data used to support the proposed SIP and finds that it may not account for the retirements or projected retirements of several coal-fired EGUs. The IEA therefore suggests that IDEM review its EGU emissions inventory, including projected future years, and include the impacts as needed.

5. The Proposed SIP Addresses Good Neighbor SIP Obligations

IDEM states, "As documented above, Indiana's legal authority and SIP-approved regulations meet or exceed the requirements in CAA Sections 110(a)(1) and 110(a)(2) for the implementation of the NAAQS, and IDEM is fully able to fulfill each requirement for the 2015 8-hour ozone standards."

The IEA supports the conclusion of IDEM. The proposed SIP not only demonstrates compliance with CAA Sections 110(a)(1) and 110(a)(2), it does so conservatively. Numerous policy and analytical options were selected in the preparation of the proposed SIP and all options resulted in less demonstrated air quality benefits than will actually occur.

6. The IEA Supports the Comments of the Midwest Ozone Group

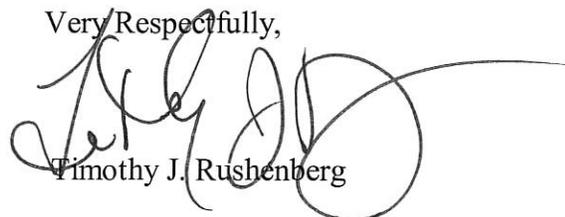
For many years, the IEA has been an active participant of the Midwest Ozone Group (MOG). The IEA participated in the development of the comments that MOG has offered on the Indiana Proposed Good Neighbor SIP and we support those comments.

Conclusion

For all of the aforementioned reasons, the IEA supports the IDEM proposal and believes that the proposed SIP fully satisfies the requirements of the CAA.

The IEA appreciates the opportunity to participate in the rulemaking process and looks forward to working with IDEM to continue to protect the environment, while promoting the general welfare of the energy industry to enhance its role in improving the economy and quality of life in Indiana.

Very Respectfully,



Timothy J. Rushenber

September 24, 2018

Bruno Pigott, Commissioner
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

RE: Proposed Infrastructure State Implementation Plan Related to the 2015
Ozone NAAQS.

Dear Commissioner Pigott:

The Midwest Ozone Group (MOG) is pleased to have the opportunity to comment in support of the Good Neighbor SIP portion of IDEM's proposed Infrastructure State Implementation Plan related to the 2015 ozone NAAQS.

MOG is an affiliation of companies, trade organizations, and associations that draws upon its collective resources to seek solutions to the development of legally and technically sound air quality programs.¹ MOG's primary efforts are to work with policy makers in evaluating air quality policies by encouraging the use of sound science. MOG has been actively engaged in a variety of issues and initiatives related to the development and implementation of air quality policy, including the development of transport rules, NAAQS standards, nonattainment designations, petitions under Sections 176A and 126 of the Clean Air Act, NAAQS implementation guidance, the development of Good Neighbor state implementation plans (SIPs) and related regional haze and climate change issues. MOG members and participants operate a variety of emission sources including more than 75,000 MW of coal-fired and coal-refuse fired electric power generation in more than ten states. MOG Members and Participants also own and operate several fossil-fired generating units in the State of Indiana. They are concerned about the development of technically or legally unsubstantiated interstate air

¹ The members of and participants in the Midwest Ozone Group include: American Coalition for Clean Coal Electricity, American Electric Power, American Forest & Paper Association, American Wood Council, Ameren, Alcoa, Appalachian Region Independent Power Producers Association (ARIPPA), ArcelorMittal, Associated Electric Cooperative, Citizens Energy Group, Council of Industrial Boiler Owners, Duke Energy, East Kentucky Power Cooperative, FirstEnergy, Indiana Energy Association, Indiana Utility Group, LGE / KU, National Lime Association, Ohio Utility Group, Olympus Power, and City Water, Light and Power (Springfield IL).

pollution actions and the impacts of those actions on their facilities, their employees, their contractors, and the consumers of their products.

While the attached comments will identify several factors that support IDEM's proposal, we will highlight only a few in this letter.

1. MOG supports the conclusion that no additional emissions reductions beyond existing and planned controls are necessary to comply with CAA Section 110(a)(2)(D)(i)(I).

Relying principally on modeling work performed by LADCO, IDEM has concluded that that no additional emission reductions are required to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I). IDEM's conclusion is indeed a conservative one. MOG not only supports IDEM's conclusion and its assessment of the factors that make that decision conservative, MOG offers in these comments additional data and comments that we believe will further support the conservative nature of the conclusion that no further emission requirements are necessary to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I).

2. Independent State-of-the-Art Modeling by Alpine Geophysics on behalf of MOG shows that all monitors in the Northeast are at or near attainment of the 2015 ozone NAAQS in 2023.

Beyond the modeling work performed by either LADCO or EPA, Alpine Geophysics has performed modeling on behalf of MOG which demonstrates that all monitors in the East attain the 2015 ozone NAAQS, except for a single monitor in Maryland. This modeling was undertaken to address the concerns about whether LADCO and EPA modeling with a 12 km grid is sufficiently refined to address the land/water interface issues, MOG undertook to run EPA's modeling platform at a finer 4km grid. When this state-of-the-art modeling is used to assess air quality downwind of Indiana at the appropriate attainment date, all monitors are in attainment, except for a single monitor at Harford Maryland with a MOG predicted average DV in 2023 of only 71.1 ppb (0.2 ppb above the 2015 ozone NAAQS). Remarkably, LADCO's predicted average design value for this monitor using its "water" data is 71.0 ppb (0.1 ppb above the 2015 ozone NAAQS), LADCO's "no water" data show this monitor to have an average design value of 70.5 ppb (attainment with the 2025 ozone NAAQS) and EPA's predicted average design value for the same monitor is 70.9 ppb (also attainment with the 2015 ozone NAAQS). Accordingly, all monitors in the Northeast are at or near attainment of the 2015 ozone NAAQS in 2023, making it unnecessary to further consider the potential for controls in upwind states.

3. Mobile sources have the most significant impact on ozone concentrations at the problem monitors identified in this proposal.

Given the dominant role of mobile sources impacting on ozone air quality, MOG agrees with IDEM that additional local mobile source controls in downwind states are necessary before

requiring additional emission reductions from upwind states such as Indiana. We urge that downwind states take full advantage of all of the authority provided to each of them under the CAA and to reduce mobile source emissions appropriately to assure continued attainment of the 2015 ozone NAAQS.

4. The 1% significant contribution test is inappropriate and should not be applied.

On August 31, 2018, EPA issued significant new guidance in which it analyzed 1 ppb and 2 ppb alternatives to the 1% significance level that it has historically used. In that memo, EPA offers the following statement:

Based on the data and analysis summarized here, the EPA believes that a threshold of 1 ppb may be appropriate for states to use to develop SIP revisions addressing the good neighbor provisions for the 2015 ozone NAAQS.

In the case of Indiana, applying the 2 ppb threshold to the LADCO significant contribution data, would eliminate any linkage to any non-attainment monitor and reduce to two (2), the linkage to maintenance monitors located in the Lake Michigan area.

We urge IDEM to carefully evaluate these additional flexibilities as further support for the conclusion that Indiana has already satisfied the requirements of CAA section 110(a)(2)(D)(i)(I).

Conclusion

As is stated in detail in the attached comments, the Midwest Ozone Group supports IDEM's draft Good Neighbor SIP as a conservative justification for the conclusion that no additional emissions reductions beyond existing and planned controls are necessary to mitigate any contribution Indiana may have to any downwind monitors to comply with CAA section 110(a)(2)(D)(i)(I).

Very truly yours,



David M. Flannery
Legal Counsel
Midwest Ozone Group

cc: Keith Baugues, Director, Office of Air Quality
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

Ms. Amy Smith, Office of Air Quality
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

**COMMENTS OF THE MIDWEST OZONE GROUP
REGARDING THE INDIANA'S INFRASTRUCTURE
STATE IMPLEMENTATION PLAN (SIP) SUBMITTAL
UNDER CLEAN AIR ACT SECTIONS 110(A)(1) AND
110(A)(2) FOR THE 2015 8-HOUR OZONE NATIONAL
AMBIENT AIR QUALITY STANDARDS (NAAQS)**

SEPTEMBER 24, 2018

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**COMMENTS OF THE MIDWEST OZONE GROUP REGARDING THE INDIANA'S
INFRASTRUCTURE STATE IMPLEMENTATION PLAN (SIP) SUBMITTAL UNDER
CLEAN AIR ACT SECTIONS 110(A)(1) AND 110(A)(2) FOR THE 2015 8-HOUR
OZONE NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)**

The Midwest Ozone Group (MOG) is pleased to have the opportunity to comment¹ on the draft Infrastructure State Implementation Plan (SIP) by the Indiana Department of Environmental Protection (IDEM) related to the 2015 ozone National Ambient Air Quality Standard (NAAQS). While the full proposal relates to the requirements of Section 110(a)(1) and (2) of the federal Clean Air Act (CAA), these comments will be limited to the interstate transport provisions. MOG strongly supports IDEM's proposed plan as fully satisfying the requirements CAA section 110(a)(2)(D)(i)(I) regarding the interstate transport for the 2015 ozone NAAQS.

MOG is an affiliation of companies, trade organizations, and associations that draws upon its collective resources to seek solutions to the development of legally and technically sound air quality programs.² MOG's primary efforts are to work with policy makers in evaluating air quality policies by encouraging the use of sound science. MOG has been actively engaged in a variety of issues and initiatives related to the development and implementation of air quality policy, including the development of transport rules, NAAQS standards, nonattainment designations, petitions under Sections 176A and 126 of the Clean Air Act, NAAQS implementation guidance, the development of Good Neighbor state implementation plans (SIPs) and related regional haze and climate change issues. MOG members and participants operate a variety of emission sources including more than 75,000 MW of coal-fired and coal-refuse fired electric power generation in more than ten states. MOG Members and Participants also own and operate several fossil-fired generating units in the State of Indiana. They are concerned about the development of technically or legally unsubstantiated interstate air pollution actions and the impacts of those actions on their facilities, their employees, their contractors, and the consumers of their products.

1. MOG supports the conclusion that no additional emissions reductions beyond existing and planned controls are necessary to comply with CAA Section 110(a)(2)(D)(i)(I).

¹ Comments or questions about this document should be directed to David M. Flannery, Kathy G. Beckett, or Edward L. Kropp, Legal Counsel, Midwest Ozone Group, Steptoe & Johnson PLLC, 707 Virginia Street East, Charleston West Virginia 25301; 304-353-8000; dave.flannery@steptoe-johnson.com and kathy.beckett@steptoe-johnson.com and skipp.kropp@steptoe-johnson.com respectively. These comments were prepared with the technical assistance of Alpine Geophysics, LLC

² The members of and participants in the Midwest Ozone Group include: American Coalition for Clean Coal Electricity, American Electric Power, American Forest & Paper Association, American Wood Council, Ameren, Alcoa, Appalachian Region Independent Power Producers Association (ARIPPA), ArcelorMittal, Associated Electric Cooperative, Citizens Energy Group, Council of Industrial Boiler Owners, Duke Energy, East Kentucky Power Cooperative, FirstEnergy, Indiana Energy Association, Indiana Utility Group, LGE / KU, National Lime Association, Ohio Utility Group, Olympus Power, and City Water, Light and Power (Springfield IL).

The issue being addressed in the proposed Good Neighbor SIP, is whether these existing measures also satisfy the Good Neighbor requirements of Section 110(a)(2)(D)(i)(I) which prohibits a state from significantly contributing to nonattainment or interfering with maintenance of any primary or secondary NAAQS in another state.

As was identified in the March 27, 2018, memorandum of EPA's Peter Tsirigotis³, a four step process is to be used by EPA to address Good Neighbor requirements. These four steps are:

- Step 1: identify downwind air quality problems;
- Step 2: identify upwind states that contribute enough to those downwind air quality problems to warrant further review and analysis;
- Step 3: identify the emissions reductions necessary to prevent an identified upwind state from contributing significantly to those downwind air quality problems; and
- Step 4: adopt permanent and enforceable measure needed to achieve those emission reductions.

Relying principally on modeling work performed by LADCO and its own assessment of other factors, IDEM concluded on page 6 of the draft Infrastructure SIP that:

The state's rule amendments under CSAPR for boilers, turbines and combined cycle units at large EGUs, as well as boilers and turbines at heavy non-EGUs such as aluminum smelters, petroleum refiners, iron and steel production facilities and institutional facility steam plants, ensure that Prong 1 and Prong 2 provisions will continue to be met. As such, Indiana's emissions do not contribute significantly to issues with attainment or maintenance of the 2015 8-hour ozone NAAQS in downwind states. Therefore, Indiana believes that additional control measures are not necessary to address the state's contribution to interstate transport.

In the Weight of Evidence Analysis⁴ which accompanies the draft Infrastructure SIP, IDEM identifies several additional factors that support this conclusion. Among the factors cited by IDEM in support of this conclusion are:

- Use of a 1 ppb significant contribution test;⁵

³ *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)*, prepared by Peter Tsirigotis, March 27, 2018. <https://www.epa.gov/airmarkets/march-2018-memo-and-supplemental-information-regarding-interstate-transport-sips-2015>.

⁴ DRAFT Interstate Transport "Good Neighbor" Provision Weight of Evidence Analysis for Indiana's Infrastructure State Implementation Plan (SIP) Submittal Under Clean Air Act Sections 110(a)(1) and 110(a)(2) for the 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS), August 2018, IDEM.

- Recognition of the downward trend in ozone concentrations in Indiana;⁶
- Need to account for local mobile sources emissions in the northeast;⁷
- Recognizing anticipated emission reductions and their positive impact on ozone concentrations;⁸ and
- Need to consider employment of “red lines” analysis to proportion responsibility for contribution to downwind problem areas.⁹

IDEM’s conclusion that no additional emission reductions are required to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I) is indeed a conservative one. MOG supports IDEM’s conclusion and in these comments will provide additional data and reasons that will further support the conservative nature of the conclusion that no further emission requirements are necessary to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I).

2. Independent State-of-the-Art Modeling by Alpine Geophysics on behalf of MOG shows that all monitors in the Northeast are at or near attainment of the 2015 ozone NAAQS in 2023.

Beyond the modeling work performed by either LADCO or EPA, Alpine Geophysics has performed modeling on behalf of MOG. To address the concerns about whether modeling with a 12 km grid is sufficiently refined to address the land/water interface issues, MOG undertook to run EPA’s modeling platform at a finer 4km grid. A copy of the Technical Support Document¹⁰ containing these results is attached and identified as Exhibit A.

As is shown in the following chart, when EPA’s air quality modeling platform is run with a 4 km grid (rather than a 12 km grid) the problem monitors identified by LADCO in New York and Connecticut are shown to attain the 2015 ozone NAAQS leaving them only as maintenance monitors.

LADCO Identified Nonattainment Monitor

LADCO Identified Nonattainment Monitor	State	County	2009-2013 Avg (ppb)	LADCO 12km 2023 "3x3" Avg (ppb)	MOG 4km 2023 "3x3" Avg (ppb)
90019003	CT	Fairfield	83.7	71.4	69.9
240251001	MD	Harford	90.0	71.0	71.1
361030002	NY	Suffolk	83.3	71.6	70.7

⁵ *Id.* at p. 4.

⁶ *Id.* at p. 11.

⁷ *Id.* at p. 14 and 29.

⁸ *Id.* at p. 20.

⁹ *Id.* at p. 34.

¹⁰ <http://www.midwestozonegroup.com/files/FinalTSD-OzoneModelingSupportingGNSIPObligationsJune2018.pdf>

LADCO Identified Maintenance Monitor

LADCO Identified Maintenance Monitor	State	County	2009-2013 Max (ppb)	LADCO 12km 2023 "3x3" Max (ppb)	MOG 4km 2023 "3x3" Max (ppb)
90010017	CT	Fairfield	83	71.2	71.5
90013007	CT	Fairfield	89	73.7	73.6
90099002	CT	New Haven	89	72.6	73.0
360810124	NY	Queens	80	71.0	69.8
360850067	NY	Richmond	83	72.4	71.0

Modeling of this type using a finer grid is specifically recommended under existing EPA guidance which states:

The use of grid resolution finer than 12 km would generally be more appropriate for areas with a combination of complex meteorology, strong gradients in emissions sources, and/or land-water interfaces in or near the nonattainment area(s).¹¹ Emphasis added.

Accordingly, when state-of-the-art modeling is used to assess air quality downwind of Indiana at the appropriate attainment date, all monitors are in attainment except for a single monitor at Harford Maryland with a MOG predicted average DV in 2023 of only 71.1 ppb (0.2 ppb above the 2015 ozone NAAQS). Remarkably, LADCO’s predicted average design value for this monitor using its “water” data is 71.0 ppb (0.1 ppb above the 2015 ozone NAAQS), LADCO’s “no water” data show this monitor to have an average design value of 70.5 ppb (attainment with the 2025 ozone NAAQS) and EPA’s predicted average design value for the same monitor is 70.9 ppb (also attainment with the 2015 ozone NAAQS).

These modeling platforms conclusively establish that the Harford Maryland monitor is at or near attainment of the 2015 ozone NAAQS.

3. Emission trends in the CSAPR Update region have been decreasing for many years and will continue to do so in the immediate future adding assurance that there will be no interference with any downwind maintenance areas.

NOx emissions have been dramatically reduced in recent years. These NOx emission reductions will continue as the result of “on-the-books” regulatory programs already required by states on their own sources, “on-the-way” regulatory programs that have already been identified by state regulatory agencies as efforts that they must undertake as well as from the effectiveness of a variety of EPA programs including the CSAPR Update Rule.

¹¹ http://www3.epa.gov/scram001/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf

Set forth below are tables developed from EPA modeling platform summaries¹² illustrating the estimated total anthropogenic emission reduction and EGU-only emission reduction in the several eastern states. As can be seen in the first table, total annual anthropogenic NOx emissions are predicted to decline by 29% between 2011 and 2017 over the CSAPR domain and by 43% (an additional 1.24 million tons) between 2011 and 2023.

Final CSAPR Update Modeling Platform Anthropogenic NOx Emissions (Annual Tons).

State	Annual Anthropogenic NOx Emissions (Tons)			Emissions Delta (2017-2011)		Emissions Delta (2023-2011)	
	2011	2017	2023	Tons	%	Tons	%
Alabama	359,797	220,260	184,429	139,537	-39%	175,368	-49%
Arkansas	232,185	168,909	132,148	63,276	-27%	100,037	-43%
Illinois	506,607	354,086	293,450	152,521	-30%	213,156	-42%
Indiana	444,421	317,558	243,954	126,863	-29%	200,467	-45%
Iowa	240,028	163,126	124,650	76,901	-32%	115,377	-48%
Kansas	341,575	270,171	172,954	71,404	-21%	168,621	-49%
Kentucky	327,403	224,098	171,194	103,305	-32%	156,209	-48%
Louisiana	535,339	410,036	373,849	125,303	-23%	161,490	-30%
Maryland	165,550	108,186	88,383	57,364	-35%	77,167	-47%
Michigan	443,936	296,009	228,242	147,927	-33%	215,694	-49%
Mississippi	205,800	128,510	105,941	77,290	-38%	99,859	-49%
Missouri	376,256	237,246	192,990	139,010	-37%	183,266	-49%
New Jersey	191,035	127,246	101,659	63,789	-33%	89,376	-47%
New York	388,350	264,653	230,001	123,696	-32%	158,349	-41%
Ohio	546,547	358,107	252,828	188,439	-34%	293,719	-54%
Oklahoma	427,278	308,622	255,341	118,656	-28%	171,937	-40%
Pennsylvania	562,366	405,312	293,048	157,054	-28%	269,318	-48%
Tennessee	322,578	209,873	160,166	112,705	-35%	162,411	-50%
Texas	1,277,432	1,042,256	869,949	235,176	-18%	407,482	-32%
Virginia	313,848	199,696	161,677	114,152	-36%	152,171	-48%
West Virginia	174,219	160,102	136,333	14,117	-8%	37,886	-22%
Wisconsin	268,715	178,927	140,827	89,788	-33%	127,888	-48%
CSAPR States	8,651,264	6,152,990	4,914,012	2,498,274	-29%	3,737,252	-43%

When looking exclusively at the estimated EGU emissions used in these modeling platforms, even greater percent decrease is noted between 2011 and 2017 (40% reduction CSAPR-domain wide) and between 2011 and 2023 (51% reduction). These reductions are particularly significant since the CSAPR Update Rule focus exclusively on EGU sources.

¹² 83 Fed. Reg. 7716 (February 22, 2018).

Final CSAPR Update Modeling Platform EGU NOx Emissions (Annual Tons).

State	Annual EGU NOx Emissions (Tons)			Emissions Delta (2017-2011)		Emissions Delta (2023-2011)	
	2011	2017	2023	Tons	%	Tons	%
Alabama	64,008	23,207	24,619	40,800	-64%	39,388	-62%
Arkansas	38,878	24,103	17,185	14,775	-38%	21,693	-56%
Illinois	73,689	31,132	30,764	42,557	-58%	42,926	-58%
Indiana	119,388	89,739	63,397	29,649	-25%	55,991	-47%
Iowa	39,712	26,041	20,122	13,671	-34%	19,590	-49%
Kansas	43,405	25,104	14,623	18,301	-42%	28,781	-66%
Kentucky	92,279	57,520	42,236	34,759	-38%	50,043	-54%
Louisiana	52,010	19,271	46,309	32,740	-63%	5,701	-11%
Maryland	19,774	6,001	9,720	13,773	-70%	10,054	-51%
Michigan	77,893	52,829	33,708	25,064	-32%	44,186	-57%
Mississippi	28,039	14,759	13,944	13,280	-47%	14,095	-50%
Missouri	66,170	38,064	44,905	28,106	-42%	21,265	-32%
New Jersey	7,241	2,918	5,222	4,323	-60%	2,019	-28%
New York	27,379	10,191	16,256	17,188	-63%	11,123	-41%
Ohio	104,203	68,477	37,573	35,727	-34%	66,630	-64%
Oklahoma	80,936	32,366	21,337	48,570	-60%	59,599	-74%
Pennsylvania	153,563	95,828	49,131	57,735	-38%	104,432	-68%
Tennessee	27,000	14,798	11,557	12,201	-45%	15,442	-57%
Texas	148,473	112,670	103,675	35,804	-24%	44,799	-30%
Virginia	40,141	7,589	20,150	32,553	-81%	19,992	-50%
West Virginia	56,620	63,485	46,324	(6,865)	12%	10,296	-18%
Wisconsin	31,881	15,374	15,419	16,507	-52%	16,462	-52%
CSAPR States	1,392,682	831,466	688,175	561,216	-40%	704,508	-51%

Importantly, these estimated 2017 emissions used in the EPA modeling are inflated as compared to the actual 2017 CEM-reported EGU emissions. As can be seen in the following table, when the CSAPR-modeled 2017 annual EGU emissions are compared to the actual CEM-reported 2017 annual EGU emissions, it becomes apparent that there is a significant domain-wide overestimation (129,000 annual tons NOx) of the predicted emissions for this category. The modeled values from state-to-state vary between over- and under-estimated, domain-wide, CEM-reported annual NOx ranging from 158% overestimation (2017 actual emissions are 61% of modeled emissions) for Pennsylvania to 54% underestimation (2017 actual emissions are 118% of modeled emissions) for Virginia with a domain-wide overestimation of 18% (129,553 tons) of annual NOx emissions from EGUs.

Final CSAPR Update Modeling Platform EGU NOx Emissions Compared to CEM-Reported EGU NOx Emissions (Annual Tons).

State	Annual EGU NOx Emissions (Tons)			Emissions Delta 2017 CEM-2017 EPA	
	2011 EPA	2017 EPA	2017 CEM	Tons	%
Alabama	64,008	23,207	24,085	878	4%
Arkansas	38,878	24,103	27,500	3,397	14%
Illinois	73,689	31,132	33,066	1,934	6%
Indiana	119,388	89,739	63,421	(26,318)	-29%
Iowa	39,712	26,041	22,564	(3,477)	-13%
Kansas	43,405	25,104	13,032	(12,072)	-48%
Kentucky	92,279	57,520	46,053	(11,467)	-20%
Louisiana	52,010	19,271	29,249	9,978	52%
Maryland	19,774	6,001	6,112	111	2%
Michigan	77,893	52,829	37,739	(15,090)	-29%
Mississippi	28,039	14,759	12,162	(2,597)	-18%
Missouri	66,170	38,064	49,692	11,628	31%
New Jersey	7,241	2,918	3,443	524	18%
New York	27,379	10,191	11,253	1,062	10%
Ohio	104,203	68,477	57,039	(11,438)	-17%
Oklahoma	80,936	32,366	21,761	(10,606)	-33%
Pennsylvania	153,563	95,828	37,148	(58,680)	-61%
Tennessee	27,000	14,798	18,201	3,402	23%
Texas	148,473	112,670	109,914	(2,756)	-2%
Virginia	40,141	7,589	16,545	8,957	118%
West Virginia	56,620	63,485	44,079	(19,406)	-31%
Wisconsin	31,881	15,374	17,856	2,482	16%
CSAPR States	1,392,682	831,466	701,913	(129,553)	-16%

These data conclusively demonstrate that annual anthropogenic NOx emissions in the CSAPR Update region are projected to be significantly reduced through 2017, with overall actual EGU 2017 emissions being even lower than these estimates. Emission trends for these states have been decreasing for many years and will continue to decrease through at least 2023 as the result of nothing more than on-the-books controls.

- Had current air modeling projections taken into account the significant emission reduction programs that are legally mandated to occur prior to 2023, even better air quality would have been demonstrated.**

There are several on-the-books NO_x emission reductions programs that have not yet been included in the current modeling efforts related to 2023 ozone predictions. These programs, both individually and collectively, will have a material effect on predicted air quality, particularly in the East.

The State of Maryland has identified¹³ nine such programs that have been recommended by the OTC for implementation by its member states to reduce both NO_x and VOC. These programs (set out below) have the potential to reduce a total of nearly 27,000 tons of ozone season NO_x and 22,000 tons of ozone season VOC emission reductions.

NO_x and VOC Reduction Programs

OTC Model Control Measures	Regional Reductions (tons per year)	Regional Reductions (tons per day)
Aftermarket Catalysts	14,983 (NO _x) 3,390 (VOC)	41 (NO _x) 9 (VOC)
On-Road Idling	19,716 (NO _x) 4,067 (VOC)	54 (NO _x) 11 (VOC)
Nonroad Idling	16,892 (NO _x) 2,460 (VOC)	46 (NO _x) 7 (VOC)
Heavy Duty I & M	9,326 (NO _x)	25 (NO _x)
Enhanced SMARTWAY	2.5%	
Ultra Low NOX Burners	3,669 (NO _x)	10 (NO _x)
Consumer Products	9,729 (VOC)	26 (VOC)
AIM	26,506 (VOC)	72 (VOC)
Auto Coatings	7,711 (VOC)	21 (VOC)

Most recently, Maryland's 75 ppb Ozone Transport SIP dated July 25, 2018¹⁴, confirms the additional emissions-reduction measures that Maryland has applied to such NO_x sources as mobile

¹³ http://midwestozonegroup.com/files/MOG_May_7_Final_050515.pptx

¹⁴ https://mde.maryland.gov/programs/Air/AirQualityPlanning/Documents/OzoneTransportSIP_2008/Proposed_MD0.075ppmOzoneTransportSIP%20.pdf

sources, and industrial sources as well as several sources of VOCs. In addition, Maryland lists a series of “Voluntary/Innovative Control Measures” that it identifies as assisting in “the overall clean air goals in Maryland” although these measures have not been quantified.

These programs as well other local control programs will almost certainly improve ozone predictions in 2023. Accounting for the programs and the related emission reductions at this time offers additional support for EPA’s conclusion that on-the-books control programs are all that is needed to address the 2015 ozone NAAQS.

5. Controls on local sources must be addressed first before any additional emission reductions can be imposed on sources in Indiana.

When an area is measuring nonattainment of a NAAQS, as is the case with the areas linked to Indiana, the Clean Air Act (CAA) requires that the effects and benefits of local controls on all source sectors be considered first, prior to pursuing controls of sources in upwind states. CAA §107(a) states that “[e]ach State shall have the primary responsibility for assuring air quality within the entire geographic area comprising such State.” In addition, CAA §110(a)(1) requires that a state SIP “provides for implementation, maintenance, and enforcement” of the NAAQS “in each air quality control region . . . within such State.” Moreover, by operation of law, additional planning and control requirements are applicable to areas that are designated to be in nonattainment.

This issue is important because upwind states must be confident this has occurred as they prepare to submit approvable Good Neighbor state implementation plans to address the 2015 ozone NAAQS. EPA’s current interstate transport modeling platforms fails to incorporate local emission reductions programs that are required to improve ambient ozone concentration by 2023. Only through a full assessment of these local emissions reductions can EPA determine whether there are any bases for the imposition of additional emissions controls in upwind states. This is because additional control requirements in upwind states can only be legally imposed if, after consideration of local controls, there is a continuing nonattainment issue in downwind areas.¹⁵

The CAA addresses the affirmative obligations of the states to meet the deadlines for submittal and implementation of state implementation plans designed to specifically address their degree of nonattainment designation. Review of Section 172(c)(1) of the CAA provides that State Implementation Plans (SIPs) for nonattainment areas shall include “reasonably available control measures”, including “reasonably available control technology” (RACT), for existing sources of emissions. Section 182(a)(2)(A) requires that for Marginal Ozone nonattainment areas, states shall revise their SIPs to include RACT. Section 182(b)(2)(A) of the CAA requires that for Moderate Ozone nonattainment areas, states must revise their SIPs to include RACT for each category of VOC sources covered by a CTG document issued between November 15, 1990, and the date of attainment.

¹⁵ *EME Homer et.al. v EPA*, 134 S. Ct. at 1608.

CAA section 182(c) through (e) applies this requirement to States with ozone nonattainment areas classified as Serious, Severe and Extreme.

The CAA also imposes the same requirement on States in ozone transport regions (OTR). Specifically, CAA Section 184(b) provides that a state in the Ozone Transport Region (OTR) must revise their SIPs to implement RACT with respect to all sources of VOCs in the state covered by a CTG issues before or after November 15, 1990. CAA Section 184(a) establishes a single OTR comprised of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and the Consolidated Metropolitan Statistical Area (CMSA) that includes the District of Columbia.

MOG's has previously documented that downwind states have many options to reduce their own NOx and VOC contributions.¹⁶

Maryland has already recognized the need to adopt and implement programs to control emissions from local sources in Maryland and the Northeast. For example, as recently as December 2017¹⁷, the Maryland Department of the Environment identified a series of local controls that it believed would further reduce ozone concentration in the Northeast, including:

- New rules by New York on small generators;
- New Ozone Transport Commission initiatives involving idle reduction;
- After market catalysts on mobile sources;
- Electric and other zero emission vehicles;
- Maryland rules on municipal waste combustors; and
- Maryland's Idle Free Initiative.

In addition, it is significant that the Connecticut Department of Energy and Environmental Protection, Bureau of Air Management has reached the conclusion¹⁸ that attainment in the Northeast cannot be achieved without local controls as is illustrated by the following statement:

To reach attainment in the NY-NJ-CT nonattainment area, HEDD emissions need to be addressed in all three state portions of the area.

¹⁶ Alpine Geophysics "Relative Impact of State and Source Category NOx Emissions on Downwind Monitors Identified Using the 2017 Cross State Air Pollution Rule Modeling Platform", Alpine Geophysics, LLC, January, 2016. <http://www.midwestozonegroup.com/files/RelativeImpactofStateandSourceCategoryNOxEmissionsonDownwindMonitorsIdentifiedUsingthe2017CrossStateAirPollutionRuleModelingPlatform.pdf> .

¹⁷ See: "A Path Forward for Reducing Ozone in Maryland and the Mid-Atlantic States, Driving With Science", Tad Aburn, Air Director, MDE, December 11, 2017 (slides 60 and 61). http://midwestozonegroup.com/files/Final_Path_Forward_2017_AQCAC_121117.pptx

¹⁸ "Reasonably Available Control Technology Analysis under the 2008 8-Hour Ozone National Ambient Air Quality Standard", dated July 17, 2014, http://www.ct.gov/deep/lib/deep/air/ozone/ozoneplanningefforts/ract_2008_naaqs/2014-07-17_-_ct_final_ract_sip_revision.pdf

...

In sum, to address Connecticut's ozone nonattainment, and Connecticut's good neighbor obligations to downwind states, peak day emissions must be reduced. Thus, "beyond RACT" measures may be warranted for HEDD units on HEDD to meet the state obligation of attainment of the ozone NAAQS as expeditiously as possible.

The New York State Department of Environmental Conservation has actually conducted an air quality assessment of the regulation of small generators in which it concluded¹⁹, that ozone concentrations could be reduced by as much as 4.8 ppb – an extremely significant improvement in ozone air quality (for perspective, 0.7 ppb represents a significant contribution relative to the 2015 ozone NAAQS) in a portion of the East that has historically had high ozone concentrations.

Given the significance of the need for local controls to address concern about any possible residual nonattainment area, MOG urges that this factor be considered as an additional factor supporting the conclusion that no further emission requirements are necessary from Indiana to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I).

6. Consideration of international emissions also adds support to the conclusion that there is no further obligation to reduce emissions.

As an integral part of the consideration of this proposal, MOG urges that the impact of natural and manmade international emissions be assessed in addressing the ultimate question of whether the downwind monitors can be properly considered either nonattainment or maintenance monitors.

The CAA addresses international emissions directly. Section 179(B)(a) states that -

(a) Implementation plans and revisions

Notwithstanding any other provision of law, an implementation plan or plan revision required under this chapter shall be approved by the Administrator if—

(1) such plan or revision meets all the requirements applicable to it under the ²⁰chapter other than a requirement that such plan or revision demonstrate attainment and maintenance of the relevant national ambient air quality standards by the attainment date specified under the applicable provision of this chapter, or in a regulation promulgated under such provision, and

(2) the submitting State establishes to the satisfaction of the Administrator that the implementation plan of such State would be adequate to attain and maintain the relevant national ambient air quality standards by the attainment date specified under the

¹⁹ "Background, High Electric Demand Day (HEDD) Initiative", New York Department of Environmental Conservation, undated but presumed to be in 2017. http://midwestozonegroup.com/files/New_York_Peakers.pptx

²⁰ So in original. Probably should be "this".

applicable provision of this chapter, or in a regulation promulgated under such provision, but for emissions emanating from outside of the United States.

In addition, addressing international emissions is particularly important to upwind states as they implement the requirements of CAA section 110(a)(2)(D)(i)(I).

The U.S. Supreme Court has ruled that it is essential that Good Neighbor states be required to eliminate only those amounts of pollutants that contribute to the nonattainment of NAAQS in downwind States. Specifically, the Supreme Court stated: “EPA cannot require a State to reduce its output of pollution by more than is necessary to achieve attainment in every downwind State. . .” EPA v. EME Homer City Generation, 134 S. Ct. 1584, 1608 (2014).

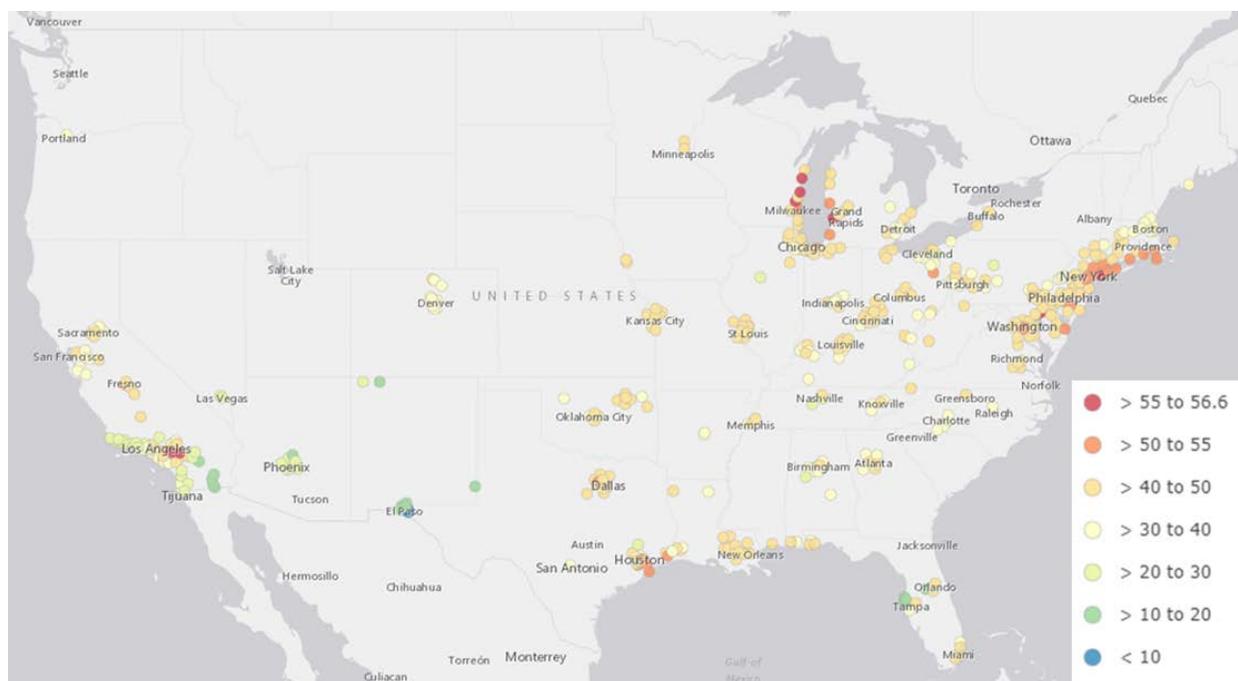
In addition, the D.C. Circuit has commented that “. . . the good neighbor provision requires upwind States to bear responsibility for their fair share of the mess in downwind States.”²¹ However, this “mess” seems to be related to international emissions for which upwind states and sources have no responsibility.

The D.C. Circuit has also stated “section 110(a)(2)(D)(i)(I) gives EPA no authority to force an upwind state to share the burden of reducing other upwind states’ emissions,” *North Carolina*, 531 F.3d at 921. Given this ruling by the Court it seems logical that the CAA would not require upwind states to offset downwind air-quality impacts attributable to other *countries*’ emissions. Simply put, EPA over-controls a state if the state must continue reducing emissions *after* its linked receptors would attain in the absent of international emissions.

The pProjected 2023 ozone design values (ppb) excluding the contribution from boundary condition, initial condition, Canadian and Mexican emission sources) shown below was prepared by Alpine Geophysics for MOG and depicts the projected 2023 8-hour ozone Design Values across the U.S. excluding the international emissions sector. The exclusion of international emissions was executed for all such emissions whether from international border areas or beyond. Note that this projection shows all monitors in the continental U.S. with a design value equal to or less than 56.6 ppb when international emissions are excluded. Modeling the U.S. emissions inventory projected to 2023 but without the impact of uncontrollable international emissions demonstrates that the CAA programs in the U.S. are performing as intended.

²¹ *EME Homer City Generation, L.P. v EPA*, 696 F.3d 7, 13 (D.C. Cir. 2012).

Projected 2023 ozone design values (ppb) excluding the contribution from boundary condition, initial condition, Canadian and Mexican emission sources



In addition to changing emissions resulting from growth and control in the continental U.S., EPA has identified updated projected emissions in both Canada and Mexico that have been integrated into the modeling platform used in this modeling.²² EPA's modeling boundary conditions, however, have been held constant at 2011 levels. This is inconsistent with recent publications that indicate emissions from outside of the U.S., specifically contributing to international transport, are on the rise.²³

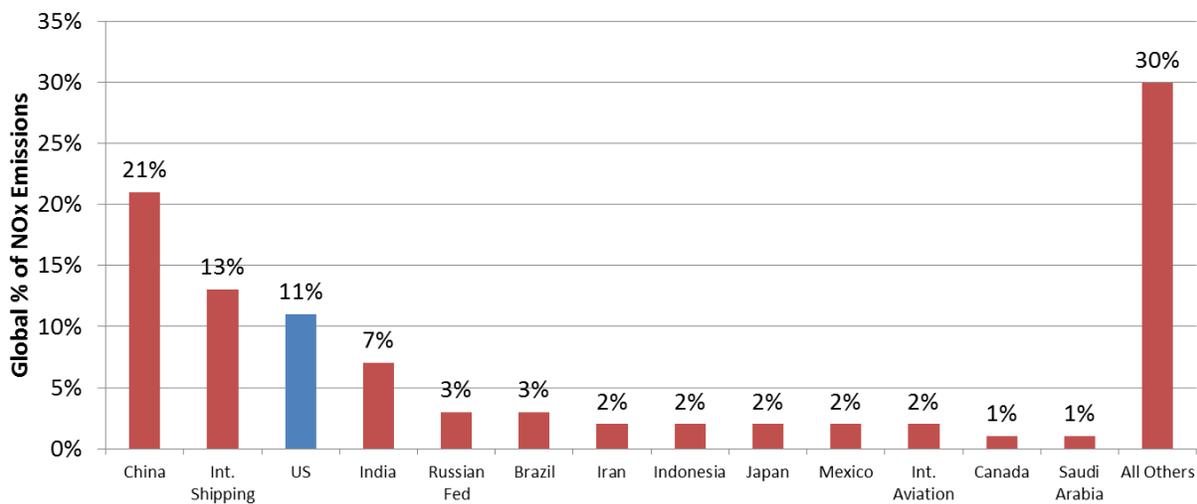
In support of conclusion that boundary conditions are significantly impacted by international emissions, the following chart illustrates that 89% of the emissions being modeled to establish boundary conditions are related to international sources.²⁴

²² EPA-HQ-OAR-2016-0751-0009.

²³ Atmos. Chem. Phys., 17, 2943–2970(2017).

²⁴ European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency. Emission Database for Global Atmospheric Research (EDGAR), <https://protect-us.mimecast.com/s/N-G6CERPwVI3vMWjhNVQlp?domain=edgar.jrc.ec.europa.eu>

**Relative International NOx Emissions (% of Total) Used to Inform Global Model
Boundary Concentrations of Ozone**



There can be no doubt that international emissions have a significant impact on ozone measurements at all monitors related to this proposal. MOG urges that the agency recognize the significance of this impact and to determine that but for international emissions there would be no downwind problems areas and therefore no need to for additional action to be undertaken to satisfy the requirements of CAA section 110(a)(2)(D)(i)(I).

7. Mobile sources have the most significant impact on ozone concentrations at the problem monitors identified in IDEM’s proposal.

As IDEM points out on page 29 of its proposal, it must be recognized that it is emissions from mobile, including both on-road and non-road, and local area sources that have the most significant impact on ozone concentrations and the problem monitors identified in this proposal. These sources must be addressed by EPA before requiring additional emission reductions from upwind states.

While the CSAPR Update Rule addressed only emissions from EGU sources, it must be recognized that it is emissions from mobile, including both on-road and non-road, and local area sources that have the most significant impact on ozone concentrations and the problem monitors identified in this proposal.

EPA recently recognized the significance of mobile source emissions in preamble to its full remedy proposal. There EPA stated:

Mobile sources also account for a large share of the NOx emissions inventory (i.e., about 7.3 million tons per year in the 2011 base year, which represented more than 50% of

continental U.S. NOx emissions), and the EPA recognizes that emissions reductions achieved from this sector as well can reduce transported ozone pollution. The EPA has national programs that serve to reduce emissions from all contributors to the mobile source inventory (i.e., projected NOx emissions reductions of about 4.7 million tons per year between the 2011 base year and the 2023 future analytical year). A detailed discussion of the EPA's mobile source emissions reduction programs can be found at www.epa.gov/otaq.

In light of the regional nature of ozone transport discussed herein, and given that NOx emissions from mobile sources are being addressed in separate national rules, in the CSAPR Update (as in previous regional ozone transport actions) the EPA relied on regional analysis and required regional ozone season NOx emissions reductions from EGUs to address interstate transport of ozone.

83 Federal Register 31918.

We strongly agree that mobile source emissions are the dominant contributor to predicted ozone concentrations across the nation. At the request of MOG, Alpine Geophysics has examined not only the relative contribution of mobile and local area sources to problem monitors but also how a small reduction in these emissions could bring about significant additional reductions in ozone concentrations.

The following table presents the annual mobile source NOx emission totals (onroad plus nonroad) for eastern states as presented in the final CSAPR update emission summary files²⁵. As can be seen in this table, consistent with EPA's national assessment of mobile source emissions, annual mobile source NOx emissions in this region comprise 51%, 41%, and 33% of the annual anthropogenic emission totals for 2011, 2017, and 2023, respectively.

²⁵ <ftp://ftp.epa.gov/EmisInventory/2011v6/v3platform/reports/>

Eastern State Mobile Source NOx Emissions (Annual Tons).

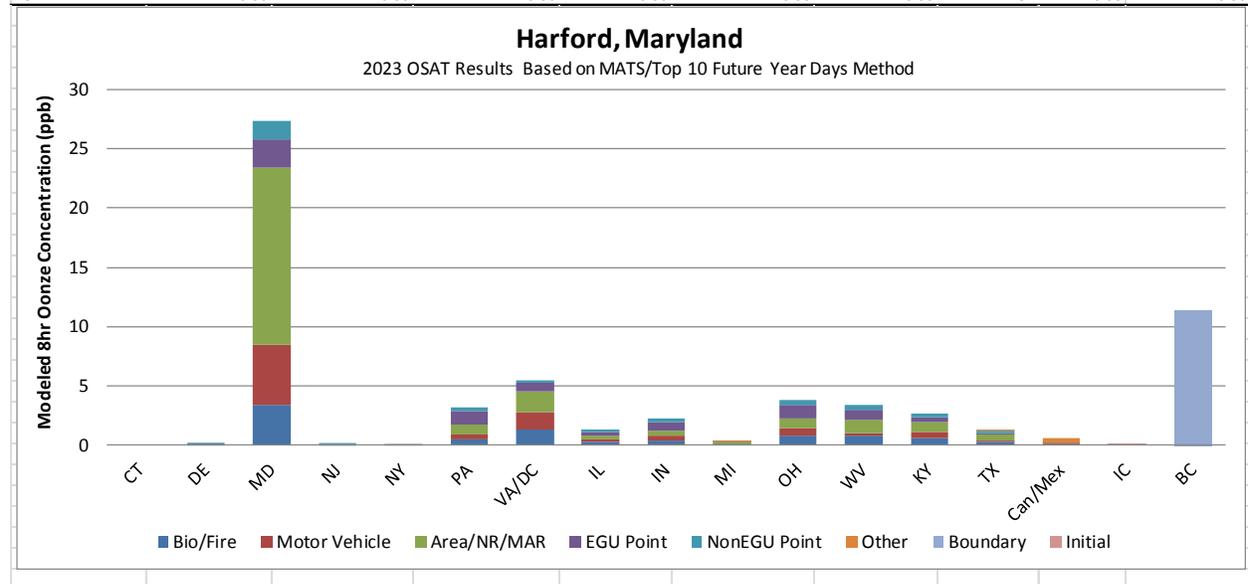
State	Annual Anthropogenic NOx Emissions (Tons)			Annual Mobile Source NOx Emissions (Tons)			Mobile Sources as % of All Annual Emissions (%)		
	2011	2017	2023	2011	2017	2023	2011	2017	2023
Alabama	359,797	220,260	184,429	175,473	88,094	54,104	49%	40%	29%
Arkansas	232,185	168,909	132,148	113,228	68,949	44,583	49%	41%	34%
Connecticut	72,906	46,787	37,758	49,662	26,954	18,718	68%	58%	50%
Delaware	29,513	18,301	14,511	17,788	10,387	6,819	60%	57%	47%
District of Columbia	9,404	6,052	4,569	7,073	3,947	2,500	75%	65%	55%
Florida	609,609	410,536	323,476	406,681	232,319	153,275	67%	57%	47%
Georgia	451,949	295,397	236,574	267,231	147,690	90,541	59%	50%	38%
Illinois	506,607	354,086	293,450	261,727	166,393	114,243	52%	47%	39%
Indiana	444,421	317,558	243,954	218,629	122,633	76,866	49%	39%	32%
Iowa	240,028	163,126	124,650	132,630	82,212	53,712	55%	50%	43%
Kansas	341,575	270,171	172,954	115,302	68,491	43,169	34%	25%	25%
Kentucky	327,403	224,098	171,194	139,866	80,244	50,633	43%	36%	30%
Louisiana	535,339	410,036	373,849	117,529	67,331	43,962	22%	16%	12%
Maine	59,838	42,918	32,186	34,933	18,380	12,240	58%	43%	38%
Maryland	165,550	108,186	88,383	103,227	60,164	38,922	62%	56%	44%
Massachusetts	136,998	90,998	73,082	83,398	45,031	30,508	61%	49%	42%
Michigan	443,936	296,009	228,242	250,483	135,434	88,828	56%	46%	39%
Minnesota	316,337	216,925	174,797	176,424	102,728	65,868	56%	47%	38%
Mississippi	205,800	128,510	105,941	108,198	57,751	34,561	53%	45%	33%
Missouri	376,256	237,246	192,990	219,505	122,137	75,380	58%	51%	39%
Nebraska	217,427	159,062	119,527	88,985	55,067	35,556	41%	35%	30%
New Hampshire	36,526	22,413	18,794	24,919	14,780	10,322	68%	66%	55%
New Jersey	191,035	127,246	101,659	133,073	75,538	51,231	70%	59%	50%
New York	388,350	264,653	230,001	224,454	130,023	92,171	58%	49%	40%
North Carolina	369,307	231,783	167,770	250,549	114,952	70,812	68%	50%	42%
North Dakota	163,867	135,009	128,864	57,289	37,071	23,956	35%	27%	19%
Ohio	546,547	358,107	252,828	311,896	168,799	100,058	57%	47%	40%
Oklahoma	427,278	308,622	255,341	139,550	79,830	50,525	33%	26%	20%
Pennsylvania	562,366	405,312	293,048	249,792	135,765	81,645	44%	33%	28%
Rhode Island	22,429	15,868	12,024	13,689	7,705	5,209	61%	49%	43%
South Carolina	210,489	134,436	104,777	132,361	73,359	44,886	63%	55%	43%
South Dakota	77,757	49,014	37,874	48,499	30,473	19,685	62%	62%	52%
Tennessee	322,578	209,873	160,166	213,748	122,738	77,135	66%	58%	48%
Texas	1,277,432	1,042,256	869,949	554,463	292,609	189,601	43%	28%	22%
Vermont	19,623	14,063	10,792	14,031	8,569	5,958	72%	61%	55%
Virginia	313,848	199,696	161,677	179,996	108,175	67,678	57%	54%	42%
West Virginia	174,219	160,102	136,333	48,294	27,487	17,494	28%	17%	13%
Wisconsin	268,715	178,927	140,827	167,753	100,814	67,201	62%	56%	48%
Eastern US Total	11,455,243	8,042,552	6,411,386	5,852,332	3,291,024	2,110,555	51%	41%	33%

Additionally, when source apportionment is applied to many of the problem monitors in the northeastern states, a distinct signal of mobile and local area source contribution to future year ozone concentrations is demonstrated.

Using the Harford, MD (240251001) monitor as an example and the 2023 4km modeling and source apportionment methods outlined elsewhere²⁶, it can be seen in the following table and figure that area, nonroad, marine/air/rail (MAR) and onroad mobile source emission from within Maryland itself dominate the relative contribution to projected nonattainment.

Relative Contribution of Source Regions and Categories to Harford, MD Monitor.

Monitor	240251001 Harford, Maryland		2023 OSAT Results (Modeled ppb) -- MATS/Top 10 Future Method							Final CSAPR DV	71.1
Region	Bio/Fire	Motor Vehicle	Area/NR/MAR	EGU Point	NonEGU Point	Other	Boundary	Initial	Total Anthro		
CT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
DE	0.02	0.01	0.02	0.01	0.01	0.01	0.00	0.00	0.05		
MD	3.41	5.09	14.93	2.39	1.55	0.00	0.00	0.00	23.96		
NJ	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.04		
NY	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.02		
PA	0.53	0.34	0.92	1.13	0.32	0.00	0.00	0.00	2.71		
VA/DC	1.37	1.40	1.79	0.67	0.27	0.00	0.00	0.00	4.13		
IL	0.32	0.17	0.33	0.34	0.22	0.00	0.00	0.00	1.06		
IN	0.41	0.40	0.44	0.68	0.32	0.00	0.00	0.00	1.84		
MI	0.06	0.07	0.11	0.05	0.05	0.01	0.00	0.00	0.27		
OH	0.77	0.66	0.86	1.12	0.40	0.00	0.00	0.00	3.03		
WV	0.81	0.24	1.15	0.74	0.41	0.00	0.00	0.00	2.55		
KY	0.62	0.53	0.84	0.38	0.34	0.00	0.00	0.00	2.09		
TX	0.29	0.14	0.44	0.16	0.15	0.03	0.00	0.00	0.89		
Can/Mex	0.14	0.01	0.01	0.01	0.01	0.40	0.00	0.00	0.04		
IC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00		
BC	0.00	0.00	0.00	0.00	0.00	0.00	11.34	0.00	0.00		

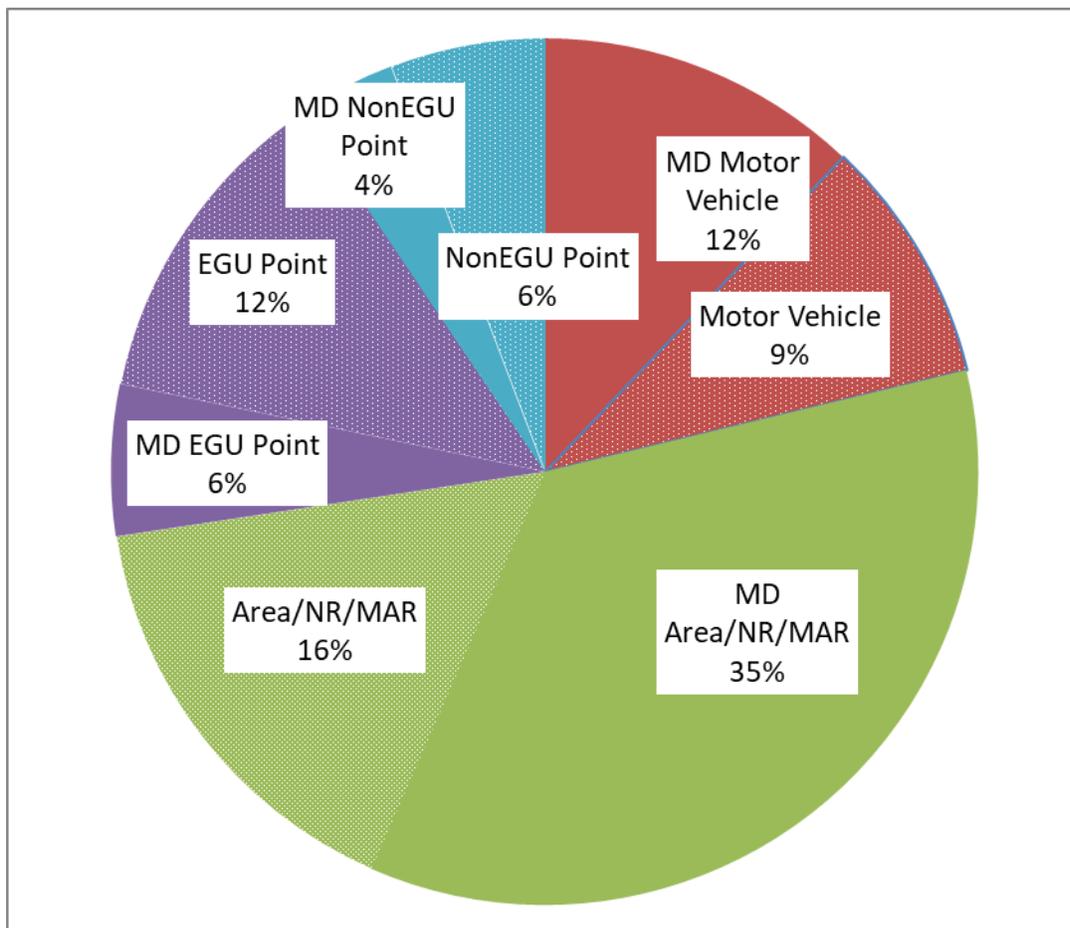


When focusing only on the anthropogenic contribution from the significant contributing states (1% of NAAQS or greater than or equal to 0.70 ppb), area/nonroad/MAR categories demonstrate more than half (51%; 35% from Maryland) of the total significant contribution from these states. As is shown in the following pie chart, an additional 21% of projected ozone from significant contributing state anthropogenic categories is estimated from onroad motor vehicle

²⁶ “Good Neighbor” Modeling for the 2008 8-Hour Ozone State Implementation Plans, Final Modeling Report, by Alpine Geophysics, LLC, December 2017 (http://www.midwestozonegroup.com/files/Ozone_Modeling_Results_Supporting_GN_SIP_Obligations_Final_Dec_2017_.pdf).

emissions. Of this 21%, 12% is estimated from onroad mobile source emissions originating in Maryland.

Relative Contribution of Anthropogenic Emission Categories from Significant Contributing States to Harford, MD Monitor.



To further the assessment of which regions and categories have the greatest impact on this monitor’s future year ozone concentration, a review of the modeling platform used in the 4km modeling develops relationships between the State-source category specific OSAT modeling and the seasonal NOx emissions used to develop the ozone concentrations. Using monthly, county and source category specific emissions published by EPA²⁷, relational “impact factors” were developed using these data.

This value represents the relative contribution of modeled emissions (tons) to resultant ozone concentrations (in ppb).

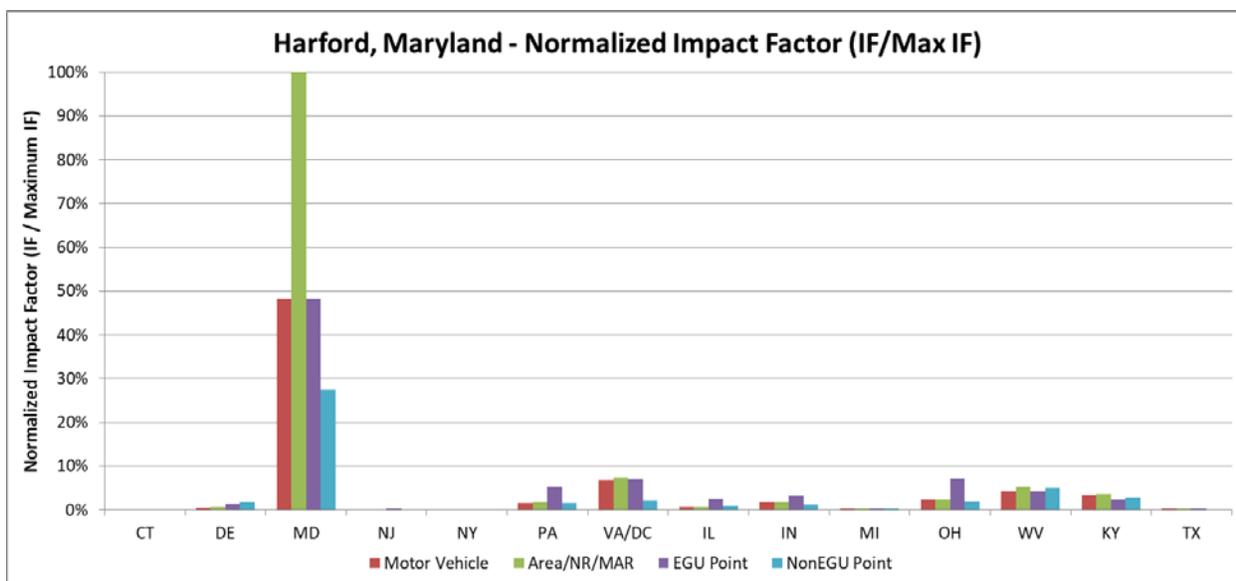
$$\text{Impact Factor (ppb/ton)} = \text{OSAT Contribution (ppb)} / \text{Emissions (tons)}$$

²⁷ ftp://ftp.epa.gov/EmisInventory/2011v6/v3platform/reports/2011en_and_2023en/

A primary purpose for this calculation is to determine, at each monitor, from where and what source category, on a ppb per ton basis, we see the greatest relative contribution. In other words, to determine which source category, and from what state, has the greatest per ton NOx contribution to the monitor’s modeled ozone concentrations.

After this calculation was conducted for each monitor, results to the maximum individual state/category contributor were normalized, so that in the comparisons, it could easily be identified the greatest ppb per ton state/source category and provide an easy way of determining which categories have greater relative impact compared to all others.

The chart below provides this normalized comparison of significant contributing state-category combinations to the Harford, MD monitor.



In addition to recognizing the usefulness of this impact factor in determining which states and categories are the largest ppb/ton contributors to each monitor, the results may be used to assist in the development of control strategies and their relative impact on ozone concentrations at various locations.

As a further example using these impact factor calculations, and similar to EPA methods²⁸ with the Air Quality Assessment Tool, assuming a linear relationship of NOx emissions to ozone concentrations at low emission changes, we estimate that a 1.5% NOx emission reduction in Maryland’s area, nonroad, and MAR category (226 NOx tons per ozone season) would have enough associated ozone concentration reduction (0.20 ppb) to bring the noted monitor into attainment at 70.9 ppb. Similarly, a reduction of 4% (or 426 tons NOx/ozone season) from onroad mobile source

²⁸ https://www.epa.gov/sites/production/files/2017-05/documents/ozone_transport_policy_analysis_final_rule_tsd.pdf

NOx emissions in Maryland alone would have the same ozone concentration impact (0.20 ppb). This compares to a 7% reduction from EGUs in all the other non-Maryland significant contributing states (PA, VA, DC, IL, IN, OH, WV, KY, and TX) and would be equivalent to an estimated 11,887 tons NOx per ozone season reduction from these sources.

The regulation of mobile sources is specifically addressed in the CAA section 209, which provides guidance on the management roles of mobile sources for the federal government, California and other states. Section 209(a) opens with the statement concerning on-road engines and vehicles, “No State or any political subdivision thereof shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part.” Relative to non-road engines or vehicles, CAA 209(e) provides similar language.

The exception to these prohibitions is set forth in CAA §177 for California and any other state that chooses to adopt an “EPA-approved California control on emissions of new motor vehicles or engines.” Regulation of new mobile-source emissions has been principally federally- driven, but states continue to have a role. *Engine Mfrs. Ass’n v. EPA*, 88 F.3d 1075, 1079 (D.C. Cir. 1996). The CAA §209(d) preserves the authority of the states to control, regulate, or restrict the use, operations, or movement of registered or licensed motor vehicles. The D.C. Circuit has interpreted this as maintaining state power to regulate pollution from motor vehicles once they are no longer new; for instance, through in-use regulations such as car pools and other incentive programs. *Id.* In response to the D.C. Circuit opinion, EPA clarified its position relative to state non-road regulatory authority in 40 CFR 89, Subpart A, Appendix A - State Regulation of Nonroad Internal Combustion Engines as follows:

EPA believes that states are not precluded under section 209 from regulating the use and operation of nonroad engines, such as regulations on hours of usage, daily mass emission limits, or sulfur limits on fuel; nor are permits regulating such operations precluded, once the engine is no longer new. EPA believes that states are precluded from requiring retrofitting of used nonroad engines except that states are permitted to adopt and enforce any such retrofitting requirements identical to California requirements which have been authorized by EPA under section 209 of the Clean Air Act. [62 FR 67736, Dec. 30, 1997]

Given the dominant role of mobile sources impacting on ozone air quality, MOG agrees with IDEM that additional local mobile source controls are necessary in downwind states before EPA requires additional emission reductions from upwind states such as Indiana. We urge that downwind states take full advantage of all of the authority provided to each of them under the CAA and to reduce mobile source emissions appropriately to assure continued attainment with 2015 ozone NAAQS.

8. 2023 is the appropriate year for assessing Good Neighbor SIP requirements related to the 2015 ozone NAAQS.

It is appropriate for the LADCO modeling results relied upon by IDEM to have been based on 2023 as the future analytic year. That year was selected by EPA as the basis for its modeling “because it aligns with the anticipated attainment year for the Moderate ozone nonattainment areas”.²⁹ Indeed, 2023 aligns with the last full ozone season before the attainment year for Moderate ozone nonattainment areas.

We note with interest the affidavit submitted by Assistant Administrator McCabe in the litigation involving the challenge to the Kentucky Good Neighbor SIP in which Assistant Administrator McCabe stated:

In order to establish the appropriate future analytic year for purposes of the EPA’s analysis, including the air quality modeling, the EPA considers several factors related to anticipated compliance timing of the rulemaking. It is essential to consider how best to align the future analytic year with compliance timing in order for the assessment of significant contribution to nonattainment and interference with maintenance to align with the identified air quality challenge. Compliance timing is informed by the D.C. Circuit’s decision in *North Carolina*, where the court held that the EPA should align implementation of its interstate transport rules with a date by which states are required to demonstrate attainment with the applicable NAAQS. 531 F.3d at 911-12. However, the determination as to how to align implementation with the attainment is not ready-made. Rather, the EPA considers several factors including the relevant attainment dates for the NAAQS, timelines necessary for installing appropriate control technologies, whether or not emission reductions preceding the relevant attainment dates (if possible) would further assist downwind areas in demonstrating attainment and maintenance of the NAAQS, or in the event that emission reductions are not feasible by the relevant attainment deadline, what date is as soon as practicable for EPA to require reductions following the relevant attainment deadline.³⁰

Equally significant is the following statement appearing in EPA’s brief in the same litigation:

²⁹ *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)*, prepared by Peter Tsirigotis, March 27, 2018, p. 3. <https://www.epa.gov/airmarkets/march-2018-memo-and-supplemental-information-regarding-interstate-transport-sips-2015>.

³⁰ Declaration of Janet D. McCabe, at ¶81.

Nonetheless, EPA is mindful of the need to align implementation of emission reductions in upwind states with the applicable attainment dates in downwind areas, as instructed by the court in *North Carolina v. EPA*, 531 F.3d 896, 911-12 (D.C. Cir. 2008).³¹

MOG strongly urges continued efforts to follow the court holding *North Carolina v. EPA*, 531 F.3d 896, 911-12 (D.C. Cir. 2008), and to assure alignment of the implementation of Good Neighbor SIPs with the date by which states are required to demonstrate attainment with the applicable NAAQS. There must be continued recognition that air quality will improve between the 2018 due date for Good Neighbor SIPs and the 2023 attainment deadline as a result of CAA programs including Federal Measures, federally mandated state RACT rules, nonattainment infrastructure SIPs, and Good Neighbor SIPs. While the Federal measures, state RACT rules, and nonattainment infrastructure SIPs will all significantly improve air quality in many nonattainment areas, those programs will all be implemented after the Good Neighbor SIPs are due, which means that states will need to carefully consider how best to address those air quality improvements as part of their Good Neighbor SIP submittals.

The failure to include the benefits of these programs in Good Neighbor SIPs will result in over-control of upwind states, which MOG asserts is illegal given the Supreme Court decision in *EPA v. EME Homer City Generation* in which stands for the proposition that EPA cannot require an upwind state to reduce its output of pollution by more than necessary to achieve attainment in every downwind state. The Good Neighbor SIP is a “down payment” on attainment and not a stand-alone attainment program. Numerous control programs will take effect now and between the 2018 Good Neighbor SIP due date and the 2023 attainment deadline. The Good Neighbor SIPs that are due in 2018 must take into account the impact of legally mandated controls on air quality by the attainment date to avoid violating the CAA prohibition against over-control.

9. IDEM is correct in calling for the application of an alternative significance threshold.

For many months, EPA has had under consideration the appropriateness of the use of its 1% significance test to determine whether an upwind state significantly contributes to downwind non-attainment or interference with downwind maintenance areas. While EPA’s March 27, 2018 memo related to interstate transport state implementation plan submission involving the 2015 ozone NAAQS provides a set of contributions by upwind states to downwind states, that data is not based on a particular significance threshold.³² Indeed, that memo identifies the significance threshold as one of the flexibilities that a state may wish to consider in the development of its Good Neighbor SIP. Specifically, EPA offers the following description of this flexibility:

²⁷ Defendant EPA’s Reply to Plaintiff’s Opposition to EPA’s Cross-Motion for Summary Judgment, *Sierra Club v. EPA*, Case No. 3:15-cv-JD, Sept. 22, 2015) ED No. 68, p. 7.

²⁸ *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)*, prepared by Peter Tsirigotis, March 27, 2018, p. A-2. <https://www.epa.gov/airmarkets/march-2018-memo-and-supplemental-information-regarding->

Consideration of different contribution thresholds for different regions based on regional differences in the nature and extent of the transport problem.

In commenting on this flexibility, states have made the point that the significant contribution threshold of 1% of the NAAQS (0.70 ppb for the 2015 ozone NAAQS) value is arbitrary and is not supported by scientific argument.³³

On August 31, 2018, EPA issued significant new guidance in which it analyzed 1 ppb and 2 ppb alternatives to the 1% significance level that it has historically used.³⁴ In that memo, EPA offers the following statement:

Based on the data and analysis summarized here, the EPA believes that a threshold of 1 ppb may be appropriate for states to use to develop SIP revisions addressing the good neighbor provisions for the 2015 ozone NAAQS.

In reaching its conclusion that a 2 ppb threshold was not recommended, EPA compared the 2 ppb alternative to the 1 ppb alternative using data which averaged all receptors outside California. In that circumstance, EPA determined that using a 1 ppb threshold captures 86 percent of the net contribution captured using a 1% threshold whereas a 2 ppb threshold captures only half of the net contribution using 1%. A different picture is presented, however, when the receptors east of the Mississippi River (involving the states of Connecticut, Maryland, Michigan, New York and Wisconsin) are considered separately from the states of Arizona, Colorado and Texas. In that case, use a 1 ppb threshold captures 92% of the net contribution captured using a 1% threshold compared with 78% for the 2 ppb threshold.

In the case of either a 1 ppb threshold or a 2 ppb threshold, a significant reduction in downwind linkages occurs.

The following chart compares all three alternatives when applied to EPA's modeling result:

[interstate-transport-sips-2015](#).

³³ Georgia EPD Comments on EPA's March 27, 2018 Interstate Transport Memo, J.W. Boylan, Air Protection Branch, Georgia EPD, May 4, 2018. https://www.epa.gov/sites/production/files/2018-08/documents/ga_epd_comments_on_epa_march_27_2018_ozone_transport_memo.pdf.

³⁴ *Analysis of Contribution Thresholds for Use in Clean Air Act Section 110(a)(2)(D)(i)(I) Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards*, Peter Tsirigotis, August 31, 2018. https://www.epa.gov/sites/production/files/2018-09/documents/contrib_thresholds_transport_sip_subm_2015_ozone_memo_08_31_18.pdf.

EPA Identified Nonattainment Site ID	State	County	Ozone Concentration (ppb)					% of 1ppb from 1%	% of 2ppb from 1%
			2009-2013 Avg DV	2023 Avg DV	Contrib from Upwind 1%	Contrib from Upwind 1ppb	Contrib from Upwind 2ppb		
90013007	Connecticut	Fairfield	84.3	71.0	36.91	33.63	27.38	91%	74%
90019003	Connecticut	Fairfield	83.7	73.0	38.55	36.93	32.28	96%	84%
361030002	New York	Suffolk	83.3	74.0	22.31	18.74	15.74	84%	71%
480391004	Texas	Brazoria	88.0	74.0	7.48	4.80	3.80	64%	51%
484392003	Texas	Tarrant	87.3	72.5	4.20	3.42	0.00	81%	0%
550790085	Wisconsin	Milwaukee	80.0	71.2	28.45	23.61	22.39	83%	79%
551170006	Wisconsin	Sheboygan	84.3	72.8	31.62	29.02	24.90	92%	79%

The results of the same comparison when applied to the LADCO modeling results are set forth in the following chart:

LADCO Identified Nonattainment Monitor	State	County	Ozone Concentration (ppb)					% of 1ppb from 1%	% of 2ppb from 1%
			2023 Avg DV	Contrib from Upwind 1%	Contrib from Upwind 1ppb	Contrib from Upwind 2ppb			
90019003	Connecticut	Fairfield	71.4	36.15	34.51	28.21	95%	78%	
240251001	Maryland	Harford	71.0	19.9	17.51	14.56	88%	73%	
361030002	New York	Suffolk	71.6	20.85	17.42	14.6	84%	70%	
480391004	Texas	Brazoria	74.1	7.45	4.65	3.62	62%	49%	
484392003	Texas	Tarrant	72.6	4.99	3.4	0	68%	0%	
482011039	Texas	Harris	71.7	8.14	5.64	4.5	69%	55%	

The results of the same comparison for the MOG modeling results are set forth in the following chart:

MOG Identified Nonattainment Site ID	State	County	Ozone Concentration (ppb)					% of 1ppb from 1%	% of 2ppb from 1%
			2009-2013 Avg DV	2023 Avg DV	Contrib from Upwind 1%	Contrib from Upwind 1ppb	Contrib from Upwind 2ppb		
90010017	Connecticut	Fairfield	80.3	69.2	26.85	25.98	21.68	97%	81%
90013007	Connecticut	Fairfield	84.3	69.7	23.91	23.04	18.57	96%	78%
90019003	Connecticut	Fairfield	83.6	69.9	27.78	26.12	21.49	94%	77%
90110124	Connecticut	New London	80.3	68.2	19.60	17.86	12.98	91%	66%
90099002	Connecticut	New Haven	85.7	70.3	21.08	17.92	15.04	85%	71%
240251001	Maryland	Harford	90.0	71.1	17.99	17.09	14.23	95%	79%
340150002	New Jersey	Gloucester	84.3	68.8	30.27	30.27	20.92	100%	69%
360850067	New York	Richmond	81.3	69.6	29.17	26.64	20.29	91%	70%
361030002	New York	Suffolk	83.3	70.7	22.52	19.85	14.50	88%	64%
421010024	Pennsylvania	Philadelphia	83.3	68.0	18.65	15.91	8.54	85%	46%

In the case of Indiana, applying the 2 ppb threshold to the LADCO significant contribution data, as shown in the table below, would eliminate any linkage to any non-attainment monitor and reduce to two (2), the linkage to maintenance monitors located in the Lake Michigan area.

Monitor	State	County	Ozone Contribution (ppb)																		
			2023 Avg	2023 Max	IL	WI	IN	OH	MI	MS	AR	TX	OK	NY	NJ	PA	MD	WV	VA	KY	
			DV (ppb)	DV (ppb)																	
240251001	Maryland	Harford	71.0	73.3	0.85	0.24	1.36	2.83	0.77	0.6	0.21	0.77	0.38	0.16	0.06	4.43	19.49	2.72	4.58	1.59	
360850067	New York	Richmond	70.9	72.4	0.86	0.31	1	2.24	1.03	0.51	0.16	0.77	0.41	6.99	10.57	9.83	1.69	1.61	1.66	0.95	
551170006	Wisconsin	Sheboygan	70.5	72.8	14.93	9.1	6.19	1.17	1.85	1.44	0.62	1.76	1.09	0.03	0	0.43	0.03	0.64	0.12	0.87	
260050003	Michigan	Allegan	68.8	71.5	19.25	1.84	6.91	0.19	3.35	2.59	1.92	2.4	1.42	0	0	0.05	0.01	0.11	0.04	0.6	

We urge IDEM to carefully evaluate these additional flexibilities as further support for the conclusion that Indiana has already satisfied the requirements of CAA section 110(a)(2)(D)(i)(I).

10. An important flexibility that should be considered is an alternative method for determining which monitors should be considered “maintenance” monitors.

Historically, the CSAPR Update methodology has been to address “interference with maintenance.” This approach is, however, not only inconsistent with the CAA, but also inconsistent with both the U.S. Supreme Court and D.C. Circuit decisions on CSAPR. Upon consideration of the reasonableness test, EPA’s emphasis upon the single maximum design value to determine a maintenance problem for which sources (or states) must be accountable creates a default assumption of contribution. A determination that the single highest modeled maximum design value is appropriate for the purpose to determining contribution to interference with maintenance is not reasonable either mathematically, in fact, or as prescribed by the Clean Air Act or the U.S. Supreme Court. The method chosen by EPA must be a “permissible construction of the Statute.”

The U.S. Supreme Court in *EPA v. EME Homer City* explains the maintenance concept set forth in the Good Neighbor Provision as follows:

*Just as EPA is constrained, under the first part of the Good Neighbor Provision, to eliminate only those amounts that “contribute...to nonattainment,” EPA is limited, by the second part of the provision, to reduce only by “amounts” that “interfere with maintenance,” i.e. by just enough to permit an already-attaining State to maintain satisfactory air quality.*³⁵

Relative to the reasonableness of EPA’s assessment of contribution, the U.S. Supreme Court also provides,

*The Good Neighbor Provision . . . prohibits only upwind emissions that contribute significantly to downwind nonattainment. EPA’s authority is therefore limited to eliminating . . . the overage caused by the collective contribution . . .*³⁶ (Emphasis added.)

EPA’s use of a modeled maximum design value, when the average design value is below the NAAQS, to define contribution, results in a conclusion that any modeled contribution is deemed to

³⁵ 134 S. Ct. at 1064, Ftn 18.

³⁶ Id. at 1604.

be a significant interference with maintenance. This concept is inconsistent with the Clean Air Act and the U.S. Supreme Court's assessment of its meaning.

As noted by the D.C. Circuit in the 2012 lower case of *EME Homer City v. EPA*, “The good neighbor provision is not a free-standing tool for EPA to seek to achieve air quality levels in downwind States that are *well below* the NAAQS.”³⁷ “EPA must avoid using the good neighbor provision in a manner that would result in unnecessary over-control in the downwind States. Otherwise, EPA would be exceeding its statutory authority, which is expressly tied to achieving attainment in the downwind States.”³⁸

The Texas Commission on Environmental Quality (TCEQ) introduced in its 2015 Ozone NAAQS Transport SIP Revision 39 an approach for identifying maintenance monitors that differs from the approach used by the EPA in CSAPR and the 2015 Transport NODA. The EPA used the maximum of the three consecutive regulatory design values containing the base year as the base year design value (DV_b) to identify maintenance monitors. Both the EPA's approach and the TCEQ's approach account for three years of meteorological variability in their choice of DV_b to identify maintenance monitors since a single design value is a three-year average of the annual fourth-highest MDA8 ozone concentration. The EPA's approach is to choose the maximum of the three consecutive regulatory design values containing the base year as the DV_b while the TCEQ's approach is to choose the latest of the three consecutive regulatory design values containing the base year as the DV_b. For the reasons described in TCEQ's SIP revision, the TCEQ determined that the selection of the most recent DV_b addresses all issues relevant for an independent assessment of maintenance; and therefore, provides a comprehensive assessment of the potential impacts of Texas emissions on potential maintenance monitors.

We urge IDEM to consider the recalculation of maintenance monitors using the Texas approach as presenting an excellent alternative to EPA's approach.

11. In the development of its Good Neighbor SIP, maintenance areas should not be given the same weight and status as nonattainment areas.

Maintenance areas should not be subject to the same “significance” test as is applied to nonattainment areas. Maintenance areas do not require the same emission reduction requirements as nonattainment areas, and therefore, require different management.

The U.S. Supreme Court opinion in *EPA v. EME Homer City* offered the following on “interference with maintenance,”

³⁷ *EME Homer City v. EPA*, 696 F.3d 7, 22 (D.C. Cir 2012).

³⁸ *Id.*

³⁹ <https://www.tceq.texas.gov/airquality/airmod/data/gn>

The statutory gap identified also exists in the Good Neighbor Provision’s second instruction. That instruction requires EPA to eliminate amounts of upwind pollution that “interfere with maintenance” of a NAAQS by a downwind State. §7410(a)(2)(D)(i). This mandate contains no qualifier analogous to “significantly,” and yet it entails a delegation of administrative authority of the same character as the one discussed above. Just as EPA is constrained, under the first part of the Good Neighbor Provision, to eliminate only those amounts that “contribute . . . to nonattainment,” EPA is limited, by the second part of the provision, to reduce only by “amounts” that “interfere with maintenance,” i.e., by just enough to permit an already-attaining State to maintain satisfactory air quality. (Emphasis added). With multiple upwind States contributing to the maintenance problem, however, EPA confronts the same challenge that the “contribute significantly” mandate creates: How should EPA allocate reductions among multiple upwind States, many of which contribute in amounts sufficient to impede downwind maintenance” Nothing in either clause of the Good Neighbor Provision provides the criteria by which EPA is meant to apportion responsibility.⁴⁰

The D.C. Circuit opinion in *EME Homer City v. EPA*, also informs the maintenance area issue:

The statute also requires upwind States to prohibit emissions that will “interfere with maintenance” of the NAAQS in a downwind State. “Amounts” of air pollution cannot be said to “interfere with maintenance” unless they leave the upwind State and reach a downwind State’s maintenance area. To require a State to reduce “amounts” of emission pursuant to the “interfere with maintenance” prong, EPA must show some basis in evidence for believing that those “amounts” from an upwind State, together with amounts from other upwind contributors, will reach a specific maintenance area in a downwind State and push that maintenance area back over the NAAQS in the near future. Put simply, the “interfere with maintenance” prong of the statute is not an open-ended invitation for EPA to impose reductions on upwind States. Rather, it is a carefully calibrated and commonsense supplement to the “contribute significantly” requirement.⁴¹

EPA’s January 17, 2018 brief in the CSAPR Update litigation (*Wisconsin et al. v EPA*, Case No. 16-1406) documents with the following statement on pages 77 and 78 that EPA is ready to concede that a lesser level of control is appropriate in situations not constrained by the time limits of the CSAPR Update:

Ultimately, Petitioners’ complaint that maintenance-linked states are unreasonably subject to the “same degree of emission reductions” as nonattainment linked states must fail. Indus. Br. 25. There is no legal or practical prohibition on the Rule’s use of a single level of control stringency for both kinds of receptors, provided that the level of control is demonstrated to result in meaningful air quality improvements without triggering either facet of the Supreme

⁴⁰ 134 S. Ct. at 1064, Ftn 18.

⁴¹ *EME Homer City v. EPA*, 96 F.3d 7, 27 Ftn. 25 (D.C. Cir 2012).

Court's test for over-control. So while concerns at maintenance receptors can potentially be eliminated at a lesser level of control in some cases given the smaller problem being addressed, this is a practical possibility, not a legal requirement. See 81 Fed. Reg. at 74,520. Here, EPA's use of the same level of control for both maintenance-linked states and nonattainment-linked states is attributable to the fact that the Rule considered only emission reduction measures available in time for the 2017 ozone season. Id. at 74,520. Under this constraint, both sets of states reduced significant emissions, without over-control, at the same level of control. Id. at 74,551-52. Accordingly, EPA's selection of a uniform level of control for both types of receptors was reasonable. Emphasis added.

As an alternative to maintenance monitors being accorded the same weight as nonattainment monitors, we urge that IDEM take the position that no additional control would be needed to address a maintenance monitor if it is apparent that emissions and air quality trends make it likely that the maintenance monitor will remain in attainment. Such an approach is consistent with Section 175A(a) of the Clean Air Act which provides:

Each State which submits a request under section 7407 (d) of this title for redesignation of a nonattainment area for any air pollutant as an area which has attained the national primary ambient air quality standard for that air pollutant shall also submit a revision of the applicable State implementation plan to provide for the maintenance of the national primary ambient air quality standard for such air pollutant in the area concerned for at least 10 years after the redesignation. The plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance.

It is also consistent with the John Calcagni memorandum of September 4, 1992, entitled "Procedures for Processing Requests to Redesignate Areas to Attainment", which contains the following statement on page 9:

A State may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that the future mix of source and emission rates will not cause a violation of the NAAQS. Under the Clean Air Act, many areas are required to submit modeled attainment demonstrations to show that proposed reductions in emissions will be sufficient to attain the applicable NAAQS. For these areas, the maintenance demonstration should be based upon the same level of modeling. In areas where no such modeling was required, the State should be able to rely on the attainment inventory approach. In both instances, the demonstration should be for a period of 10 years following the redesignation.

Accordingly, MOG urges that IDEM apply an alternate methodology to assess maintenance monitors than it does to assess nonattainment monitors. Any impacts which Indiana has on

maintenance areas will certainly be addressed by consideration of controls that are already on the books and by emissions reductions that have been and will continue to apply to Indiana sources as is well-demonstrated by these comments and the proposed GNS.

12. IDEM’s proportional calculation of responsibility for contribution to downwind monitors to which Indiana is linked is very conservative.

MOG was very pleased that EPA’s March 27, 2018 memorandum recognized two methods for apportioning responsibility among upwind states to downwind problem monitors. In its memorandum, EPA offers the following statement:

For states that are found to significantly contribute to nonattainment or interfere with maintenance of the NAAQS downwind, apportioning responsibility among states.

- *Consider control stringency levels derived through “uniform-cost” analysis of NOx reductions.*
- *Consider whether the relative impact (e.g., parts per billion/ton) between states is sufficiently different such that this factor warrants consideration in apportioning responsibility.*

Addressing these issues is particularly important in the situation in which a state’s contribution to a downwind problem monitor is greater than the level at which a monitor exceeds the NAAQS. To avoid unlawful over-control, a state must be allowed the option of prorating the reduction needed to achieve attainment over all states that contribute to that monitor. This process allows a state the option of addressing only their prorated portion of responsibility for the portion of the problem monitors ozone concentration that exceeds the NAAQS.

On page 34 of the IDEM draft, the agency calculates Indiana’s proportional responsibility for contribution to the Harford Maryland monitor – the worst nonattainment monitor linked to Indiana. IDEM calculates a responsibility of 0.0569 ppb attributed to Indiana. Because Indiana’s contribution to Harford Maryland is 1.36 ppb as determined by the LADCO data, Indiana’s proportionate responsibility for contribution that monitor by all upwind significantly contributing states (17.51 ppb) would be 7.8% which when applied to the 0.1 ppb needed to bring that monitor into attainment would make Indiana’s required reduction only 0.0078 ppb – an order of magnitude lower than is set forth in the draft GNS.

In addition, we strongly encourage IDEM not to apply this same red lines methodology to maintenance monitors as it has to nonattainment monitors. As noted earlier, we do not believe there to be either legal or technical support for attaching the same weight to maintenance monitors as might be attached to a nonattainment monitor. Any impacts which Indiana has on maintenance areas

will certainly be addressed by consideration of controls that are already on the books and by emissions reductions that have been and will continue to apply to Indiana sources as is well-demonstrated by these comments and the proposed GNS.

Conclusion.

Accordingly, the Midwest Ozone Group supports IDEM's draft Good Neighbor SIP as a conservative justification for the conclusion that no additional emissions reductions beyond existing and planned controls are necessary to mitigate any contribution Indiana may have to any downwind monitors to comply with CAA section 110(a)(2)(D)(i)(I).

“Good Neighbor” Modeling for the 2008 8-Hour Ozone State Implementation Plans

Final Modeling Report

Prepared by:
Alpine Geophysics, LLC
7341 Poppy Way
Arvada, CO 80007

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1.0 INTRODUCTION

1.1 OVERVIEW

Sections 110(a)(1) and (2) of the Clean Air Act (CAA) require all states to adopt and submit to the U. S. Environmental Protection Agency (EPA) any revisions to their infrastructure State Implementation Plans (SIP) which provide for the implementation, maintenance and enforcement of a new or revised national ambient air quality standard (NAAQS). The EPA revised the ozone NAAQS in March 2008 and completed the designation process to identify nonattainment areas in July 2012. Through final action and rulemaking of the Cross-State Air Pollution Rule (CSAPR) (81 FR 74504), EPA has indicated its intention to issue a Federal Implementation Plan (FIP) to multiple states in the absence of an approved revision to the SIP.

CAA section 110(a)(2)(D)(i)(I) requires each state to prohibit emissions that will significantly contribute to nonattainment of a NAAQS, or interfere with maintenance of a NAAQS, in a downwind state. According to EPA many states' infrastructure certification failed to demonstrate that emissions activities within those states will not significantly contribute to nonattainment or interfere with maintenance of the 2008 ozone NAAQS in a neighboring state.

This document serves to provide the air quality modeling results for 8-hour ozone modeling analysis in support of the revision of 2008 8-hour ozone Good Neighbor State Implementation Plan (GNS). The 2008 8-hour ozone NAAQS form is the three year average of the fourth highest daily maximum 8-hour ozone concentrations with a threshold not to be exceeded of 0.075 ppm (75 ppb). On October 26, 2015, the EPA promulgated a new 8-hour ozone NAAQS with a threshold not to be exceeded of 0.070 ppm (70 ppb). Attainment of this new (2015) ozone NAAQS will be addressed in future SIP actions and may use results of this effort to inform that determination.

This document describes the overall modeling activities performed in order to demonstrate that states do not significantly contribute to nonattainment or interfere with maintenance of the 2008 ozone NAAQS in a neighboring state. This effort was undertaken working closely with states, other local agencies, and stakeholder groups, including the Midwest Ozone Group which funded this modeling.

A comprehensive draft Modeling Protocol for an 8-hour ozone SIP revision study was prepared and provided to EPA for comment and review relative to Kentucky's Good Neighbor SIP requirements on which this modeling is established. Based on EPA comments, the draft document was revised to include many of the comments and recommendations submitted, most importantly, but not limited to, using EPA's 2023en modeling platform (EPA, 2017a). This 2023en modeling platform represents EPA's estimation of a projected "base case" that demonstrates compliance with final CSAPR update seasonal EGU NO_x budgets. A final Modeling Protocol (Alpine, 2017) was prepared and submitted to the Midwest Ozone Group and KYDAQ.

1.2 STUDY BACKGROUND

Section 110(a)(2)(D)(i)(I) of the CAA requires that states address the interstate transport of pollutants and ensure that emissions within the state do not contribute significantly to nonattainment in, or interfere with maintenance by, any other state. The following section is intended to address eastern state interstate transport, or “Good Neighbor,” responsibilities for the 2008 ozone NAAQS. Eastern states have many rules and limits currently in place that control ozone precursor pollutants and emissions of these pollutants are decreasing in the state. These facts strengthen the demonstration that no further controls or emission limits may be required to fulfil responsibilities under the Good Neighbor Provisions for the 2008 ozone NAAQS.

On October 26, 2016, EPA published in the Federal Register a final update to the Cross-State Air Pollution Rule (CSAPR) for the 2008 ozone NAAQS. In this final update, EPA outlines its four-tiered approach to addressing the interstate transport of pollution related to the ozone NAAQS, or states’ Good Neighbor responsibilities. EPA’s approach determines which states contribute significantly to nonattainment areas or significantly interfere with air quality in maintenance areas in downwind states. EPA has determined that if a state’s contribution to downwind air quality problems is below one percent of the applicable NAAQS, then it does not consider that state to be significantly contributing to the downwind area’s nonattainment or maintenance concerns. EPA’s approach to addressing interstate transport has been shaped by public notice and comment and refined in response to court decisions.

As part of the final CSAPR update, EPA released regional air quality modeling to support the 2008 ozone NAAQS attainment date of 2017, indicating which states significantly contribute to nonattainment or maintenance area air quality problems in other states. To make these determinations, the EPA projected future ozone nonattainment and maintenance receptors, then conducted state-level ozone source apportionment modeling to determine which states contributed pollution over a pre-identified “contribution threshold.”

Multiple upwind states’ contributions to projected downwind nonattainment area air quality was found to be over the one-percent threshold at numerous final CSAPR-identified nonattainment and maintenance (“problem”) monitors. The one percent threshold for the 2008 NAAQS is 0.75 parts per billion (ppb). These monitors and their final CSAPR update base period and modeled future year design values are shown in Table 1-1.

Table 1-1. Final CSAPR Update-identified problem monitor base period and modeled future year design values (ppb) .

Monitor ID	State	County	2009-2013 Base Period Average Design Value (ppb)	2009-2013 Base Period Maximum Design Value (ppb)	2017 Base Case Average Design Value (ppb)	2017 Base Case Maximum Design Value (ppb)
Nonattainment Monitors						
90019003	Connecticut	Fairfield	83.7	87	76.5	79.5
90099002	Connecticut	New Haven	85.7	89	76.2	79.2
480391004	Texas	Brazoria	88.0	89	79.9	80.8
484392003	Texas	Tarrant	87.3	90	77.3	79.7
484393009	Texas	Tarrant	86.0	86	76.4	76.4
551170006	Wisconsin	Sheboygan	84.3	87	76.2	78.7
Maintenance Monitors						
90010017	Connecticut	Fairfield	80.3	83	74.1	76.6
90013007	Connecticut	Fairfield	84.3	89	75.5	79.7
211110067	Kentucky	Jefferson	85.0	85	76.9	76.9
240251001	Maryland	Harford	90.0	93	78.8	81.4
260050003	Michigan	Allegan	82.7	86	74.7	77.7
360850067	New York	Richmond	81.3	83	75.8	77.4
361030002	New York	Suffolk	83.3	85	76.8	78.4
390610006	Ohio	Hamilton	82.0	85	74.6	77.4
421010024	Pennsylvania	Philadelphia	83.3	87	73.6	76.9
481210034	Texas	Denton	84.3	87	75.0	77.4
482010024	Texas	Harris	80.3	83	75.4	77.9
482011034	Texas	Harris	81.0	82	75.7	76.6
482011039	Texas	Harris	82.0	84	76.9	78.8

Because upwind state contribution to projected downwind maintenance problems is above the one percent threshold and thus significant, additional analyses are required to fulfil these state responsibilities under the Good Neighbor Provisions for the 2008 ozone NAAQS.

1.2.1 Current Ozone Air Quality at the Problem Monitors

Table 1-2 displays the maximum 8-hour ozone Design Values from 2008-2015 along with the highest fourth highest daily maximum 8-hour ozone concentration at the CSAPR-problem monitors. The fourth highest daily maximum 8-hour ozone concentration at these monitors exhibits high year-to-year variability that is primarily due to meteorological variations that can cause the values to change between successive years. Use of the three-year average of these fourth highest values in the ozone Design Value results in a suppression of this variability so that the differences in the maximum 8-hour ozone Design Value over this period is less pronounced.

Table 1-2. Final CSAPR Update-identified problem monitor design value observations (ppb).

Site ID	State	County	4th Highest (ppb)								3-yr Avg (ppb)					
			2008	2009	2010	2011	2012	2013	2014	2015	2008-10	2009-11	2010-12	2011-13	2012-14	2013-15
Nonattainment Monitors																
90019003	Connecticut	Fairfield	90	73	79	87	89	86	81	87	80	79	85	87	85	84
90099002	Connecticut	New Haven		73	79	92	90	85	69	81		81	87	89	81	78
480391004	Texas	Brazoria	75	91	88	90	87	84	71	86	84	89	88	87	80	80
484392003	Texas	Tarrant	85	90	85	97	79	80	74	76	86	90	87	85	77	76
484393009	Texas	Tarrant	77	86	83	91	86	83	73	79	82	86	86	86	80	78
551170006	Wisconsin	Sheboygan	75	74	85	84	93	78	72	81	78	81	87	85	81	77
Maintenance Monitors																
90010017	Connecticut	Fairfield	88	68	79	81	88	82	78	84	78	76	82	83	82	81
90013007	Connecticut	Fairfield	78	73	79	87	90	90	74	86	76	79	85	89	84	83
211110067	Kentucky	Jefferson			85	82	90	65	70	76			85	79	75	70
240251001	Maryland	Harford	89	83	96	98	86	72	67	74	89	92	93	85	75	71
260050003	Michigan	Allegan	73	76	73	85	95	78	77	72	74	78	84	86	83	75
360850067	New York	Richmond	64	78	85	87	78	71	72	79	75	83	83	78	73	74
361030002	New York	Suffolk	83	79	85	89	83	72	66	78	82	84	85	81	73	72
390610006	Ohio	Hamilton	86	72	80	88	87	69	70	72	79	80	85	81	75	70
421010024	Pennsylvania	Philadelphia	87	72	88	89	85	68	72	79	82	83	87	80	75	73
481210034	Texas	Denton	84	82	74	95	81	85	77	88	80	83	83	87	81	83
482010024	Texas	Harris	83	80	87	83	75	74	68	95	83	83	81	77	72	79
482011034	Texas	Harris	73	79	76	88	83	69	66	88	76	81	82	80	72	74
482011039	Texas	Harris	76	82	85	83	85	69	63	77	81	83	84	79	72	69

1.2.3 Purpose

This document serves to provide air quality modeling results for the 8-hour ozone modeling analysis in support of revisions of 2008 8-hour ozone Good Neighbor State Implementation Plans. This document demonstrates that emissions activities within eastern states will not significantly contribute to nonattainment or interfere with maintenance of the 2008 ozone NAAQS in a neighboring state with the four problem monitors identified in the final CSAPR update.

1.3 LEAD AGENCY AND PRINCIPAL PARTICIPANTS

Individual impacted states will be the lead agency in the development of 8-hour ozone SIP revisions. Relevant EPA Regional offices will be the local regional EPA office that will take the lead in the review and approval process for this SIP revision.

1.4 OVERVIEW OF MODELING APPROACH

The GNS 8-Hour ozone SIP modeling documented here includes an ozone simulation study using the 12 km grid based on EPA's 2023en modeling platform and preliminary source contribution assessment (EPA, 2016b).

1.4.1 Episode Selection

Episode selection is an important component of an 8-hour ozone attainment demonstration. EPA guidance recommends that 10 days be used to project 8-hour ozone Design Values at each critical monitor. The May 1 through August 31 2011 ozone season period was selected for the ozone SIP modeling primarily due to the following reasons:

- It is aligned with the 2011 NEI year, which is the latest currently available NEI.
- It is not an unusually low ozone year.
- Ambient meteorological and air quality data are available.
- A 2011 12 km CAMx modeling platform is available from the EPA that can be leveraged for the GNS ozone SIP modeling.

More details of the summer 2011 episode selection and justification using criteria in EPA's modeling guidance are contained in Section 3.

1.4.2 Model Selection

Details on the rationale for model selection are provided in Section 2. The Weather Research Forecast (WRF) prognostic meteorological model was selected for the GNS ozone modeling using a 12 km resolution grid. Additional emission modeling is not required as the 2023en platform was provided to Alpine in pre-merged CAMx ready format. Emissions processing was completed by EPA using the SMOKE emissions model for most source categories. The exceptions are that BEIS model was used for biogenic emissions and there are special processors for fires, windblown dust, lightning and sea salt emissions. The MOVES2014 on-road mobile source emissions model was used with SMOKE-MOVES to generate on-road mobile source emissions with EPA generated vehicle activity data provided in the NAAQS NODA. The CAMx photochemical grid model was also be used. The setup is based on the same WRF/SMOKE/BEIS/CAMx modeling system used in the EPA 2023en platform modeling.

1.4.3 Base and Future Year Emissions Data

The 2023 future year was selected for the attainment demonstration modeling based on OAQPS Director Steven Page's October 27, 2017 memo (Page, 2017, page 4) to Regional Air Directors. In this memo, Director Page identified the two primary reasons the EPA selected 2023 for their 2008 NAAQS modeling; (1) the D.C. Circuit Court's response to *North Carolina v. EPA* in considering downwind attainment dates for the 2008 NAAQS, and (2) EPA's consideration of the timeframes that may be required for implementing further emission reductions as expeditiously as possible. The 2011 base case and 2023 future year emissions will be based on EPA's "en" inventories with no adjustment. This platform has been identified by EPA as the base case for compliance with the final CSAPR update seasonal EGU NO_x emission budgets.

1.4.4 Input Preparation and QA/QC

Quality assurance (QA) and quality control (QC) of the emissions datasets are some of the most critical steps in performing air quality modeling studies. Because emissions processing is tedious, time consuming and involves complex manipulation of many different types of large databases, rigorous QA measures are a necessity to prevent errors in emissions processing from occurring. The GNS 8-Hour ozone modeling study utilized EPA's pre-QA/QC'd emissions platform that followed a multistep emissions QA/QC approach.

1.4.5 Meteorology Input Preparation and QA/QC

The CAMx 2011 12 km meteorological inputs are based on WRF meteorological modeling conducted by EPA. Details on the EPA 2011 WRF application and evaluation are provided by EPA (EPA 2014d).

1.4.6 Initial and Boundary Conditions Development

Initial concentrations (IC) and Boundary Conditions (BCs) are important inputs to the CAMx model. We ran 15 days of model spin-up before the first high ozone days occur in the modeling domain so the ICs are washed out of the modeling domain before the first high ozone day of the May-August 2011 modeling period. The lateral boundary and initial species concentrations are provided by a three dimensional global atmospheric chemistry model, GEOS-Chem (Yantosca, 2004) standard version 8-03-02 with 8-02-01 chemistry.

1.4.7 Air Quality Modeling Input Preparation and QA/QC

Each step of the air quality modeling was subjected to QA/QC procedures. These procedures included verification of model configurations, confirmation that the correct data were used and processed correctly, and other procedures.

1.4.8 Model Performance Evaluation

The Model Performance Evaluation (MPE) relied on the CAMx MPE from EPA's associated modeling platforms. EPA's MPE recommendations in their ozone modeling guidance (EPA, 2007; 2014e) were followed in this evaluation. Many of EPA's MPE procedures have already been performed by EPA in their CAMx 2011 modeling database being used in the GNS ozone SIP modeling.

1.4.9 Diagnostic Sensitivity Analyses

Since no issues were identified in confirming Alpine's CAMx runs compared to EPA's using the same modeling platform and configuration, additional diagnostic sensitivity analyses were not required.

2.0 MODEL SELECTION

This section documents the models used in the 8-hour ozone GNS SIP modeling study. The selection methodology presented in this chapter mirrors EPA's regulatory modeling in support of the 2008 Ozone NAAQS Preliminary Interstate Transport Assessment (Page, 2017; EPA, 2016b).

Unlike some previous ozone modeling guidance that specified a particular ozone model (e.g., EPA, 1991 that specified the Urban Airshed Model; Morris and Myers, 1990), the EPA now recommends that models be selected for ozone SIP studies on a "case-by-case" basis. The latest EPA ozone guidance (EPA, 2014) explicitly mentions the CMAQ and CAMx PGMs as the most commonly used PGMs that would satisfy EPA's selection criteria but notes that this is not an exhaustive list and does not imply that they are "preferred" over other PGMs that could also be considered and used with appropriate justification. EPA's current modeling guidelines lists the following criteria for model selection (EPA, 2014e):

- It should not be proprietary;
- It should have received a scientific peer review;
- It should be appropriate for the specific application on a theoretical basis;
- It should be used with data bases which are available and adequate to support its application;
- It should be shown to have performed well in past modeling applications;
- It should be applied consistently with an established protocol on methods and procedures;
- It should have a user's guide and technical description;
- The availability of advanced features (e.g., probing tools or science algorithms) is desirable; and
- When other criteria are satisfied, resource considerations may be important and are a legitimate concern.

For the GNS 8-hour ozone modeling, we used the WRF/SMOKE/MOVES2014/BEIS/CAMx-OSAT/APCA modeling system as the primary tool for demonstrating attainment of the ozone NAAQS at downwind monitors at downwind problem monitors. The utilized modeling system satisfies all of EPA's selection criteria. A description of the key models to be used in the GNS ozone SIP modeling follows.

WRF/ARW: The Weather Research and Forecasting (WRF)¹ Model is a mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs (Skamarock, 2004; 2006; Skamarock et al., 2005). The Advanced Research WRF (ARW) version of WRF was used in this ozone modeling study. It features multiple dynamical cores, a 3-dimensional variational (3DVAR) data assimilation system, and a software architecture allowing for computational parallelism and system extensibility. WRF is suitable for a broad spectrum of applications across scales ranging from meters to thousands of

¹ <http://www.wrf-model.org/index.php>

kilometers. The effort to develop WRF has been a collaborative partnership, principally among the National Center for Atmospheric Research (NCAR), the National Oceanic and Atmospheric Administration (NOAA), the National Centers for Environmental Prediction (NCEP) and the Forecast Systems Laboratory (FSL), the Air Force Weather Agency (AFWA), the Naval Research Laboratory, the University of Oklahoma, and the Federal Aviation Administration (FAA). WRF allows researchers the ability to conduct simulations reflecting either real data or idealized configurations. WRF provides operational forecasting a model that is flexible and efficient computationally, while offering the advances in physics, numerics, and data assimilation contributed by the research community.

SMOKE: The Sparse Matrix Operator Kernel Emissions (SMOKE)² modeling system is an emissions modeling system that generates hourly gridded speciated emission inputs of mobile, non-road, area, point, fire and biogenic emission sources for photochemical grid models (Coats, 1995; Houyoux and Vukovich, 1999). As with most ‘emissions models’, SMOKE is principally an emission processing system and not a true emissions modeling system in which emissions estimates are simulated from ‘first principles’. This means that, with the exception of mobile and biogenic sources, its purpose is to provide an efficient, modern tool for converting an existing base emissions inventory data into the hourly gridded speciated formatted emission files required by a photochemical grid model. SMOKE was used by EPA to prepare 2023en emission inputs for non-road mobile, area and point sources. These files were adopted and used as-is for this analysis.

SMOKE-MOVES: SMOKE-MOVES uses an Emissions Factor (EF) Look-Up Table from MOVES, gridded vehicle miles travelled (VMT) and other activity data and hourly gridded meteorological data (typically from WRF) and generates hourly gridded speciated on-road mobile source emissions inputs.

MOVES2014: MOVES2014³ is EPA’s latest on-road mobile source emissions model that was first released in July 2014 (EPA, 2014a,b,c). MOVES2014 includes the latest on-road mobile source emissions factor information. Emission factors developed by EPA were used in this analysis.

BEIS: Biogenic emissions were modeled by EPA using version 3.61 of the Biogenic Emission Inventory System (BEIS). First developed in 1988, BEIS estimates volatile organic compound (VOC) emissions from vegetation and nitric oxide (NO) emissions from soils. Because of resource limitations, recent BEIS development has been restricted to versions that are built within the Sparse Matrix Operational Kernel Emissions (SMOKE) system.

CAMx: The Comprehensive Air quality Model with Extensions (CAMx⁴) is a state-of-science “One-Atmosphere” photochemical grid model capable of addressing ozone, particulate matter (PM), visibility and acid deposition at regional scale for periods up to one year (ENVIRON, 2015⁵). CAMx is a publicly available open-source computer modeling system for the integrated assessment of gaseous and particulate air pollution. Built on today’s understanding that air

2 <http://www.smoke-model.org/index.cfm>

3 <http://www.epa.gov/otaq/models/moves/>

4 <http://www.camx.com>

5 http://www.camx.com/files/camxusersguide_v6-20.pdf

quality issues are complex, interrelated, and reach beyond the urban scale, CAMx is designed to (a) simulate air quality over many geographic scales, (b) treat a wide variety of inert and chemically active pollutants including ozone, inorganic and organic PM_{2.5} and PM₁₀ and mercury and toxics, (c) provide source-receptor, sensitivity, and process analyses and (d) be computationally efficient and easy to use. The U.S. EPA has approved the use of CAMx for numerous ozone and PM State Implementation Plans throughout the U.S., and has used this model to evaluate regional mitigation strategies including those for most recent regional rules (e.g., Transport Rule, CAIR, NO_x SIP Call, etc.). The current version of CAMx is Version 6.40 that was used in this study.

OSAT/APCA: Ozone Source Apportionment Technique/Anthropogenic Precursor Culpability Assessment (OSAT/APCA) tool of CAMx was selected to develop source contribution and significant contribution calculations and was not required for this analysis.

3.0 EPISODE SELECTION

EPA's most recent 8-hour ozone modeling guidance (EPA, 2014e) contains recommended procedures for selecting modeling episodes. The GNS ozone SIP revision modeling used the May through end of August 2011 modeling period because it satisfies the most criteria in EPA's modeling guidance episode selection discussion.

EPA guidance recommends that 10 days be used to project 8-hour ozone Design Values at each critical monitor. The May through August 2011 period has been selected for the ozone SIP modeling primarily due to being aligned with the 2011 NEI year, not being an unusually low ozone year, and availability of a 2011 12 km CAMx modeling platform from the EPA NAAQS NODA.

4.0 MODELING DOMAIN SELECTION

This section summarizes the modeling domain definitions for the GNS 8-hour ozone modeling, including the domain coverage, resolution, and map projection. It also discusses emissions, aerometric, and other data available for use in model input preparation and performance testing.

4.1 HORIZONTAL DOMAIN

The GNS ozone SIP modeling used a 12 km continental U.S. (12US2) domain. The 12 km nested grid modeling domain configuration is shown in Figure 4-1. The 12 km domain shown in Figure 4-1 represents the CAMx 12km air quality and SMOKE/BEIS emissions modeling domain. The WRF meteorological modeling was run on larger 12 km modeling domains than used for CAMx as demonstrated in EPA's meteorological model performance evaluation document (EPA, 2014d). The WRF meteorological modeling domains are defined larger than the air quality modeling domains because meteorological models can sometimes produce artifacts in the meteorological variables near the boundaries as the prescribed boundary conditions come into dynamic balance with the coupled equations and numerical methods in the meteorological model.



Figure 4-1. Map of 12km CAMx modeling domains. Source: EPA NAAQS NODA.

4.2 VERTICAL MODELING DOMAIN

The CAMx vertical structure is primarily defined by the vertical layers used in the WRF meteorological modeling. The WRF model employs a terrain following coordinate system defined by pressure, using multiple layer interfaces that extend from the surface to 50 mb (approximately 19 km above sea level). EPA ran WRF using 35 vertical layers. A layer averaging scheme is adopted for CAMx simulations whereby multiple WRF layers are combined into one CAMx layer to reduce the air quality model computational time. Table 4-1 displays the approach for collapsing the WRF 35 vertical layers to 25 vertical layers in CAMx.

Table 4-1. WRF and CAMx layers and their approximate height above ground level.

CAMx Layer	WRF Layers	Sigma P	Pressure (mb)	Approx. Height (m AGL)
25	35	0.00	50.00	17,556
	34	0.05	97.50	14,780
24	33	0.10	145.00	12,822
	32	0.15	192.50	11,282
23	31	0.20	240.00	10,002
	30	0.25	287.50	8,901
22	29	0.30	335.00	7,932
	28	0.35	382.50	7,064
21	27	0.40	430.00	6,275
	26	0.45	477.50	5,553
20	25	0.50	525.00	4,885
	24	0.55	572.50	4,264
19	23	0.60	620.00	3,683
18	22	0.65	667.50	3,136
17	21	0.70	715.00	2,619
16	20	0.74	753.00	2,226
15	19	0.77	781.50	1,941
14	18	0.80	810.00	1,665
13	17	0.82	829.00	1,485
12	16	0.84	848.00	1,308
11	15	0.86	867.00	1,134
10	14	0.88	886.00	964
9	13	0.90	905.00	797
	12	0.91	914.50	714
8	11	0.92	924.00	632
	10	0.93	933.50	551
7	9	0.94	943.00	470
	8	0.95	952.50	390
6	7	0.96	962.00	311
5	6	0.97	971.50	232
4	5	0.98	981.00	154
	4	0.99	985.75	115
3	3	0.99	990.50	77
2	2	1.00	995.25	38
1	1	1.00	997.63	19

4.3 DATA AVAILABILITY

The CAMx modeling systems requires emissions, meteorology, surface characteristics, initial and boundary conditions (IC/BC), and ozone column data for defining the inputs.

4.3.1 Emissions Data

Without exception, the 2011 base year and 2023 base case emissions inventories for ozone modeling for this analysis were based on emissions obtained from the EPA's "en" modeling platform. This platform was obtained from EPA, via LADCO, in late September of 2017 and represents EPA's best estimate of all promulgated national, regional, and local control strategies, including final implementation of the seasonal EGU NOx emission budgets outlined in CSAPR.

4.3.2 Air Quality

Data from ambient monitoring networks for gas species are used in the model performance evaluation. Table 4-2 summarizes routine ambient gaseous and PM monitoring networks available in the U.S.

4.3.4 Meteorological Data

Meteorological data were generated by EPA using the WRF prognostic meteorological model (EPA, 2014d). WRF was run on a continental U.S. 12 km grid for the NAAQS NODA platform.

4.3.5 Initial and Boundary Conditions Data

The lateral boundary and initial species concentrations are provided by a three dimensional global atmospheric chemistry model, GEOS-Chem (Yantosca, 2004) standard version 8-03-02 with 8-02-01 chemistry. The global GEOS-Chem model simulates atmospheric chemical and physical processes driven by assimilated meteorological observations from the NASA's Goddard Earth Observing System (GEOS-5; additional information available at: <http://gmao.gsfc.nasa.gov/GEOS/> and <http://wiki.seas.harvard.edu/geos-chem/index.php/GEOS-5>). This model was run for 2011 with a grid resolution of 2.0 degrees x 2.5 degrees (latitude-longitude). The predictions were used to provide one-way dynamic boundary concentrations at one-hour intervals and an initial concentration field for the CAMx simulations. The 2011 boundary concentrations from GEOS-Chem will be used for the 2011 and 2023 model simulations.

Table 4-2. Overview of routine ambient data monitoring networks.

Monitoring Network	Chemical Species Measured	Sampling Period	Data Availability/Source
The Interagency Monitoring of Protected Visual Environments (IMPROVE)	Speciated PM25 and PM10 (see species mappings)	1 in 3 days; 24 hr average	http://vista.cira.colostate.edu/improve/Data/IMPROVE/improve_data.htm
Clean Air Status and Trends Network (CASTNET)	Speciated PM25, Ozone (see species mappings)	Approximately 1-week average	http://www.epa.gov/castnet/data.html
National Atmospheric Deposition Program (NADP)	Wet deposition (hydrogen (acidity as pH), sulfate, nitrate, ammonium, chloride, and base cations (such as calcium, magnesium, potassium and sodium)), Mercury	1-week average	http://nadp.sws.uiuc.edu/
Air Quality System (AQS) or Aerometric Information Retrieval System (AIRS)	CO, NO2, O3, SO2, PM25, PM10, Pb	Typically hourly average	http://www.epa.gov/air/data/
Chemical Speciation Network (CSN)	Speciated PM	24-hour average	http://www.epa.gov/ttn/amtic/amticpm.html
Photochemical Assessment Monitoring Stations (PAMS)	Varies for each of 4 station types.		http://www.epa.gov/ttn/amtic/pamsmain.html
National Park Service Gaseous Pollutant Monitoring Network	Acid deposition (Dry; SO4, NO3, HNO3, NH4, SO2), O3, meteorological data	Hourly	http://www2.nature.nps.gov/ard/gas/netdata1.htm

5.0 MODEL INPUT PREPARATION PROCEDURES

This section summarizes the procedures used in developing the meteorological, emissions, and air quality inputs to the CAMx model for the GNS 8-hour ozone modeling on the 12 km grid for the May through August 2011 period. The 12 km CAMx modeling databases are based on the EPA “en” platform (EPA, 2017a; Page, 2017) databases. While some of the data prepared for this platform are new, many of the files are largely based on the NAAQS NODA platform. More details on the NAAQS NODA 2011 CAMx database development are provided in EPA documentation as follows:

- Technical Support Document (TSD) Preparation of Emissions Inventories for the Version 6.3, 2011 Emissions Modeling Platform (EPA, 2016a).
- Meteorological Model Performance for Annual 2011 WRF v3.4 Simulation (EPA, 2014d).
- Air Quality Modeling Technical Support Document for the 2015 Ozone NAAQS Preliminary Interstate Transport Assessment (EPA, 2016b).

The modeling procedures used in the modeling are consistent with over 20 years of EPA ozone modeling guidance documents (e.g., EPA, 1991; 1999; 2005a; 2007; 2014), other recent 8-hour ozone modeling studies conducted for various State and local agencies using these or other state-of-science modeling tools (see, for example, Morris et al., 2004a,b, 2005a,b; 2007; 2008a,b,c; Tesche et al., 2005a,b; Stoeckenius et al., 2009; ENVIRON, Alpine and UNC, 2013; Adelman, Shanker, Yang and Morris, 2014; 2015), as well as the methods used by EPA in support of the recent Transport analysis (EPA, 2010; 2015b, 2016b).

5.1 METEOROLOGICAL INPUTS

5.1.1 WRF Model Science Configuration

Version 3.4 of the WRF model, Advanced Research WRF (ARW) core (Skamarock, 2008) was used for generating the 2011 simulations. Selected physics options include Pleim-Xiu land surface model, Asymmetric Convective Model version 2 planetary boundary layer scheme, KainFritsch cumulus parameterization utilizing the moisture-advection trigger (Ma and Tan, 2009), Morrison double moment microphysics, and RRTMG longwave and shortwave radiation schemes (Gilliam and Pleim, 2010). The WRF model configuration was prepared by EPA (EPA, 2014d).

5.1.2 WRF Input Data Preparation Procedures

A summary of the WRF input data preparation procedures that were used are listed in EPA’s documentation (EPA, 2014d).

5.1.3 WRF Model Performance Evaluation

The WRF model evaluation approach was based on a combination of qualitative and quantitative analyses. The quantitative analysis was divided into monthly summaries of 2-m temperature, 2-m mixing ratio, and 10-m wind speed using the boreal seasons to help generalize the model bias and error relative to a set of standard model performance benchmarks. The qualitative approach was to compare spatial plots of model estimated

monthly total precipitation with the monthly PRISM precipitation. The WRF model performance evaluation for the 12km domain is provided in EPA's documentation (EPA, 2014d).

5.1.3 WRFCAMx/MCIP Reformatting Methodology

The WRF meteorological model output data was processed to provide inputs for the CAMx photochemical grid model. The WRFCAMx processor maps WRF meteorological fields to the format required by CAMx. It also calculates turbulent vertical exchange coefficients (Kz) that define the rate and depth of vertical mixing in CAMx. A summary of the methodology used by EPA to reform the meteorological data into CAMx format is provided in EPA's documentation (EPA, 2014d).

5.2 EMISSION INPUTS

5.2.1 Available Emissions Inventory Datasets

The base year and future year base case emission inventories used for the GNS 8-hour ozone modeling study were based on EPA's "en" modeling platform (EPA, 2017a) without exception.

5.2.2 Development of CAMx-Ready Emission Inventories

CAMx-ready emission inputs were generated by EPA mainly by the SMOKE and BEIS emissions models. CAMx requires two emission input files for each day: (1) low level gridded emissions that are emitted directly into the first layer of the model from sources at the surface with little or no plume rise; and (2) elevated point sources (stacks) with plume rise calculated from stack parameters and meteorological conditions. For this analysis, CAMx will be operated using version 6 revision 4 of the Carbon Bond chemical mechanism (CB6r4).

EPA's 2011 base year and 2023 future year inventories from the "en" platform were used for all categories.

5.2.2.1 Episodic Biogenic Source Emissions

Biogenic emissions were generated by EPA using the BEIS biogenic emissions model within SMOKE. BEIS uses high resolution GIS data on plant types and biomass loadings and the WRF surface temperature fields, and solar radiation (modeled or satellite-derived) to develop hourly emissions for biogenic species on the 12 km grids. BEIS generates gridded, speciated, temporally allocated emission files

5.2.2.2 Point Source Emissions

2011 point source emissions were from the 2011 "en" modeling platform. Point sources were developed in two categories: (1) major point sources with Continuous Emissions Monitoring (CEM) devices; and (2) point sources without CEMs. For point sources with continuous emissions monitoring (CEM) data, day-specific hourly NOx and SO₂ emissions were used for the 2011 base case emissions scenario. The VOC, CO and PM emissions for point sources with CEM data were based on the annual emissions temporally allocated to each hour of the year using the CEM hourly heat input. The locations of the point sources were converted to the LCP coordinate system used in the modeling. They were processed by EPA using SMOKE to generate the temporally varying (i.e., day-of-week and hour-of-day) speciated emissions needed by CAMx, using profiles by source category from the EPA "en" modeling platform.

5.2.2.3 Area and Non-Road Source Emissions

2011 area and non-road emissions were from the 2011 “en” modeling platform. The area and non-road sources were spatially allocated to the grid using an appropriate surrogate distribution (e.g., population for home heating, etc.). The area sources were temporally allocated by month and by hour of day using the EPA source-specific temporal allocation factors. The SMOKE source-specific CB6 speciation allocation profiles were also used.

5.2.2.4 Wildfires, Prescribed Burns, Agricultural Burns

Fire emissions in 2011NElv2 were developed based on Version 2 of the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation (SMARTFIRE) system (Sullivan, et al., 2008). SMARTFIRE2 was the first version of SMARTFIRE to assign all fires as either prescribed burning or wildfire categories. In past inventories, a significant number of fires were published as unclassified, which impacted the emissions values and diurnal emissions pattern. Recent updates to SMARTFIRE include improved emission factors for prescribed burning.

5.2.2.5 QA/QC and Emissions Merging

EPA processed the emissions by major source category in several different “streams”, including area sources, on-road mobile sources, non-road mobile sources, biogenic sources, non-CEM point sources, CEM point sources using day-specific hourly emissions, and emissions from fires. Separate Quality Assurance (QA) and Quality Control (QC) were performed for each stream of emissions processing and in each step following the procedures utilized by EPA. SMOKE includes advanced quality assurance features that include error logs when emissions are dropped or added. In addition, we generated visual displays that included spatial plots of the hourly emissions for each major species (e.g., NOX, VOC, some speciated VOC, SO₂, NH₃, PM and CO).

Scripts to perform the emissions merging of the appropriate biogenic, on-road, non-road, area, low-level, fire, and point emission files were written to generate the CAMx-ready two-dimensional day and domain-specific hourly speciated gridded emission inputs. The point source and, as available elevated fire, emissions were processed into the day-specific hourly speciated emissions in the CAMx-ready point source format.

The resultant CAMx model-ready emissions were subjected to a final QA using spatial maps to assure that: (1) the emissions were merged properly; (2) CAMx inputs contain the same total emissions; and (3) to provide additional QA/QC information.

5.2.3 Use of the Plume-in-Grid (PiG) Subgrid-Scale Plume Treatment

Consistent with the EPA 2011 modeling platform, no PiG subgrid-scale plume treatment will be used.

5.2.4 Future-Year Emissions Modeling

Future-year emission inputs were generated by processing the 2023 emissions data provided with EPA’s “en” modeling platform without exception.

5.3 PHOTOCHEMICAL MODELING INPUTS

5.3.1 CAMx Science Configuration and Input Configuration

This section describes the model configuration and science options used in the GNS 8-hour ozone modeling effort.

The latest version of CAMx (Version 6.40) was used in the GNS ozone modeling. The CAMx model setup used is defined by EPA in its air quality modeling technical support document (EPA, 2016b, 2017).

6.0 MODEL PERFORMANCE EVALUATION

The CAMx 2011 base case model estimates are compared against the observed ambient ozone and other concentrations to establish that the model is capable of reproducing the current year observed concentrations so it is likely a reliable tool for estimating future year ozone levels.

6.1 EPA MODEL PERFORMANCE EVALUATION

6.1.1 Overview of EPA Model Performance Evaluation Recommendations

EPA current (EPA, 2007) and draft (EPA, 2014e) ozone modeling guidance recommendations for model performance evaluation (MPE) describes a MPE framework that has four components:

- Operation evaluation that includes statistical and graphical analysis aimed at determining how well the model simulates observed concentrations (i.e., does the model get the right answer).
- Diagnostic evaluation that focuses on process-oriented evaluation and whether the model simulates the important processes for the air quality problem being studied (i.e., does the model get the right answer for the right reason).
- Dynamic evaluation that assess the ability of the model air quality predictions to correctly respond to changes in emissions and meteorology.
- Probabilistic evaluation that assess the level of confidence in the model predictions through techniques such as ensemble model simulations.

EPA's guidance recommends that *"At a minimum, a model used in an attainment demonstration should include a complete operational MPE using all available ambient monitoring data for the base case model simulations period"* (EPA, 2014, pg. 63). And goes on to say *"Where practical, the MPE should also include some level of diagnostic evaluation.* EPA notes that there is no single definite test for evaluation model performance, but instead there are a series of statistical and graphical MPE elements to examine model performance in as many ways as possible while building a *"weight of evidence"* (WOE) that the model is performing sufficiently well for the air quality problem being studied.

Because this 2011 ozone modeling is using a CAMx 2011 modeling database developed by EPA, we include by reference the air quality modeling performance evaluation as conducted by EPA (EPA, 2016b) on the national 12km domain and will include any additional documentation provided in the future on the use of the 2011en modeling configuration.

In summary, EPA conducted an operational model performance evaluation for ozone to examine the ability of the CAMx v6.32 and v.6.40 modeling systems to simulate 2011 measured concentrations. This evaluation focused on graphical analyses and statistical metrics of model predictions versus observations. Details on the evaluation methodology, the calculation of performance statistics, and results are provided in Appendix A of that report.

Overall, the ozone model performance statistics for the CAMx v6.32 2011 simulation are similar to those from the CAMx v6.20 2011 simulation performed by EPA for the final CSAPR Update. The 2011 CAMx model performance statistics are within or close to the ranges found in other

recent peer-reviewed applications (e.g., Simon et al, 2012). As described in Appendix A of the AQ TSD, the predictions from the 2011 modeling platform correspond closely to observed concentrations in terms of the magnitude, temporal fluctuations, and geographic differences for 8-hour daily maximum ozone. We fully anticipate that the MPE performed for the 2011en platform will demonstrate similar results and will document final evaluation metrics in the documentation associated with the final SIP revision. Thus, the current model performance results demonstrate the scientific credibility of the 2011 modeling platform chosen and used for this analysis. These results provide confidence in the ability of the modeling platform to provide a reasonable projection of expected future year ozone concentrations and contributions.

7.0 FUTURE YEAR MODELING

This chapter discusses the future year modeling used in the GNS 8-hour ozone modeling effort.

7.1 FUTURE YEAR TO BE SIMULATED

As discussed in Section 1, to support the 2008 ozone NAAQS preliminary interstate transport assessment, EPA conducted air quality modeling to project ozone concentrations at individual monitoring sites to 2023 and to estimate state-by-state contributions to those 2023 concentrations. The projected 2023 ozone concentrations were used to identify ozone monitoring sites that are projected to be nonattainment or have maintenance problems for the 2008 ozone NAAQS in 2023.

7.2 FUTURE YEAR GROWTH AND CONTROLS

In September 2017, EPA released the revised “en” modeling platform that was the source for the 2023 future year emissions in this analysis. This platform has been identified by EPA as the base case for compliance with the final CSAPR update seasonal EGU NO_x emission budgets. Additionally, there were several emission categories and model inputs/options that were held constant at 2011 levels as follows:

- Biogenic emissions.
- Wildfires, Prescribed Burns and Agricultural Burning (open land fires).
- Windblown dust emissions.
- Sea Salt.
- 36 km CONUS domain Boundary Conditions (BCs).
- 2011 12 km meteorological conditions.
- All model options and inputs other than emissions.

The effects of climate change on the future year meteorological conditions were not accounted. It has been argued that global warming could increase ozone due to higher temperatures producing more biogenic VOC and faster photochemical reactions (the so called climate penalty). However, the effects of inter-annual variability in meteorological conditions will be more important than climate change given the 12 year difference between the base (2011) and future (2023) years. It has also been noted that the level of ozone being transported into the U.S. from Asia has also increased.

7.3 FUTURE YEAR BASELINE AIR QUALITY SIMULATIONS

A 2023 future year base case CAMx simulation was conducted and 2023 ozone design value projection calculations were made based on EPA’s latest ozone modeling guidance (EPA, 2014).

7.4 CONCLUSIONS FROM 2023 CAMX MODELING

All sites identified in the final CSAPR update are predicted to be well below the 2008 ozone standard by 2023. Table 7-1 provides the GNS 2023 future year average and maximum design value modeling results from this analysis for the eastern state problem monitors identified in Section 1.

Based on these calculations, none of the problem monitors are predicted to be in nonattainment or have issues with maintenance in 2023 and therefore no states are required to estimate their contribution to these monitors.

Table 7-1. GNS Modeling results at Final CSAPR Update-identified problem monitors (ppb).

Monitor ID	State	County	2009-2013 Base Period Average Design Value (ppb)	2009-2013 Base Period Maximum Design Value (ppb)	2023 Base Case Average Design Value (ppb)	2023 Base Case Maximum Design Value (ppb)
Nonattainment Monitors						
90019003	Connecticut	Fairfield	83.7	87	72.7	75.6
90099002	Connecticut	New Haven	85.7	89	71.2	73.9
480391004	Texas	Brazoria	88.0	89	74.0	74.9
484392003	Texas	Tarrant	87.3	90	72.5	74.8
484393009	Texas	Tarrant	86.0	86	70.6	70.6
551170006	Wisconsin	Sheboygan	84.3	87	70.8	73.1
Maintenance Monitors						
90010017	Connecticut	Fairfield	80.3	83	69.8	72.1
90013007	Connecticut	Fairfield	84.3	89	71.2	75.2
211110067	Kentucky	Jefferson	85.0	85	70.1	70.1
240251001	Maryland	Harford	90.0	93	71.4	73.8
260050003	Michigan	Allegan	82.7	86	69.0	71.8
360850067	New York	Richmond	81.3	83	71.9	73.4
361030002	New York	Suffolk	83.3	85	72.5	74.0
390610006	Ohio	Hamilton	82.0	85	65.0	67.4
421010024	Pennsylvania	Philadelphia	83.3	87	67.3	70.3
481210034	Texas	Denton	84.3	87	69.7	72.0
482010024	Texas	Harris	80.3	83	70.4	72.8
482011034	Texas	Harris	81.0	82	70.8	71.6
482011039	Texas	Harris	82.0	84	71.8	73.6

Through this modeling analysis, has all upwind states 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.

8.0 MODELING DOCUMENTATION AND DATA ARCHIVE

EPA recommends that certain types of documentation be provided along with a photochemical modeling attainment demonstration. Alpine Geophysics is committed to supplying the material needed to ensure that the technical support for this SIP revision is understood by all stakeholders, EPA and states.

Alpine Geophysics plans to archive all documentation and modeling input/output files generated as part of the 8-hour modeling analysis and will maintain a copy for additional internal use. Key participants in this modeling effort will be given data access to the archived modeling information.

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Summary/Response to Comments Received During the Public Comment Period for *Indiana's Infrastructure State Implementation Plan (SIP) Submittal under Clean Air Act Sections 110(a)(1) and 110(a)(2) for the 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS)*

The Indiana Department of Environmental Management (IDEM) from August 24 through September 24, 2018, solicited public comments and provided opportunity to request a public hearing on its draft *Indiana's Infrastructure State Implementation Plan (SIP) Submittal under Clean Air Act Sections 110(a)(1) and 110(a)(2) for the 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS)*. No requests were received for a public hearing and, therefore, one was not held. IDEM received written comments from the following parties:

- Richard A. Pirolli, Director, Planning and Standards Division, Connecticut Department of Energy & Environmental Protection (*CT DEEP*)
- Steven E. Flint, PE, Director, Division of Air Resources, New York State Department of Environmental Conservation (*N.Y. DEC*)
- Timothy J. Rushenberg, Vice President, Indiana Energy Association (*IEA*)
- David M. Flannery, Legal Counsel, Midwest Ozone Group (*MOG*)

Following is a summary of the comments received and IDEM's responses. It should be noted that although edits were made to ensure consistency in the final documents, no critical information pertaining to substantive content was altered.

Comment 1:

Comments were received concerning enforceable commitments for preventing significant downwind contributions:

- "Contrary to statements made on page 6 of IDEM's proposed infrastructure SIP, emission reductions and emissions limits for large electric generating units (EGUs) and heavy industry non-EGUs are not sufficient to conclude that Indiana's statewide emissions do not contribute significantly to nonattainment or maintenance problems in downwind states." (*CT DEEP Paragraph 2*)
- Commenter is concerned that "IDEM has neither made [Indiana's emissions] reductions enforceable nor shown that they are sufficient to result in prohibiting significant contribution to nonattainment or maintenance problems in downwind states." (*CT DEEP Paragraph 8*)
- "IDEM should make enforceable commitments for all control measures and operational changes in this transport analysis." "Without enforceable emission limits being implemented at facilities as assumed in the faulty 2023 modeling, there is no guarantee that any emission reductions will actually occur." "Without specific enforceable emissions limits and control measures, [the SIP] is

incomplete and does not meet the requirements of the CAA or implementing regulations." (N.Y. DEC Paragraphs 2 and 3)

Response 1:

As referenced in Section 5.3 of *Indiana's Interstate Transport "Good Neighbor" Provision Weight of Evidence Analysis for Indiana's Infrastructure State Implementation Plan (SIP) Submittal Under Clean Air Act Sections 110(a)(1) and 110(a)(2)* (referred to hereafter as the WOE analysis), IDEM stands behind its demonstration that large electric generating units (EGUs) and heavy industry non-EGUs have federally enforceable limits in place as mandated by several national rulemakings. These rulemakings have led to significant emission reductions from these source sectors over the last 10 years (2008-2017). The Ozone Transport NO_x SIP Call Rule (commonly referred to as the NO_x SIP Call Rule), Regional Haze Rule, Clean Air Interstate Rule (CAIR), Cross-State Air Pollution Rule (CSAPR) and Consent Decree Agreements have required many sources in Indiana to install best achievable retro-fit technologies (BART)/add-on controls, convert to natural gas or shut down affected units to comply with these rules and the associated compliance requirements. As a result, total annual NO_x emissions from EGUs in Indiana have decreased by nearly 70% since 2008 and 52% since 2008 for non-EGUs.

United States Environmental Protection Agency (U.S. EPA) and Lake Michigan Air Directors Consortium (LADCO) future year modeling runs have accounted for the imposed additional emission controls or adjusted operations to reduce emissions, thus meeting the requirements of the Clean Air Act and the Good Neighbor Provision for Interstate Transport. Modeled results have projected decreased ozone concentrations at nearby and downwind ozone monitoring sites. IDEM maintains its stance that the monitoring data shows the effects of Indiana's emission reductions as well as other states with lower 8-hour ozone design values in the Midwest, as demonstrated in Section 4 of the WOE analysis. It stands to reason that ozone values in the Northeast would be lower if the reduction in emissions from upwind states were truly impacting those monitors. However, coastal monitors along the Northeast still show elevated ozone design values.

Based on these modeling results, Indiana concludes the Northeast is impacted more from local mobile and nearby point source emissions, a conclusion drawn from U.S. EPA and LADCO's modeling results and stated in U.S. EPA's May 14, 2018 presentation by Norm Possiel (Appendix E of the WOE analysis). Indiana has demonstrated that necessary reductions have occurred throughout the state over time to meet its downwind transport obligations.

As such, Indiana continues to meet its Good Neighbor Interstate Transport obligations with current and future federally enforceable emissions limitations on its facilities. Indiana should not be held responsible for ozone values in the Northeast that are driven by local sources, as shown in photochemical modeling results in Section 6.5.2 of the WOE analysis.

Comment 2:

"IDEM has not shown that it cannot cost effectively control emissions within Indiana. IDEM must conduct a cost analysis of potential emission reductions before it can conclude that Indiana does not significantly contribute to linked receptors." (*CT DEEP Paragraph 3*) "[IDEM] should consider not only the size of its contribution relative to the downwind state contribution, but also the cost of reductions that the downwind state already incurs." (*CT DEEP Paragraph 8*) "IDEM should implement emission controls on its major stationary sources based on a more stringent control threshold." (*N.Y. DEC Paragraph 4*)

Response 2:

Indiana has demonstrated in Section 5.3 of its WOE analysis that additional wide-spread emission reductions for Indiana facilities are not cost effective at this time. Indiana continues to meet all federal requirements for its larger facilities. IDEM is not requiring non-EGU sources to install additional NOx controls because it is not a cost effective solution for future NOx emission reductions from Indiana's non-EGUs. The costs associated to retro-fit non-EGUs with additional NOx controls far outweigh the benefit of any additional NOx emissions reductions that would be realized. The 2017 NOx emissions from Indiana's EGUs far exceed the 2017 NOx emissions from non-EGUs by a factor of 15. Future NOx emission reductions from EGUs are, and will continue to be, the primary driver for reductions from fossil fuel-fired electric generating units. Therefore, U. S. EPA approval of state implementation of the CSAPR Programs and NOx Emissions from Large Affected Units rulemakings, along with existing consent decree agreements, planned fuel conversions and planned unit shutdowns over the next decade are expected to continue to reduce Indiana's annual NOx emissions. Expected changes to Indiana's EGU fleet over the next five years includes: nine planned EGU shut downs, three EGUs plan fuel switches to natural gas and eleven EGUs with consent decree caps to reduce emissions. As such, Indiana will continue to meet its Good Neighbor Interstate Transport obligations with current and future federally enforceable emissions limitations on its major stationary sources.

Comment 3:

Several comments were received concerning the use of 1 ppb or 1% of the 2015 NAAQS as the screening threshold to identify linkage to downwind receptors. They include:

- "IDEM has not justified using a one ppb linkage threshold and must either do so or fully evaluate its linkages at one percent of the standard." (*CT DEEP Paragraph 4*)
- "IDEM chose to utilize a 1 part per billion (ppb) contribution threshold in its analysis, rather than the longstanding contribution threshold of 1% of the standard for purposes of determining which states are 'linked' to downwind receptors at step 2 of the CASPR framework (i.e., 0.70 ppb for the 2015

NAAQS)." "Despite EPA's August 31, 2018 memorandum analyzing the use of a 1 ppb threshold, [commenter] believes there is not sound basis for IDEM's piecemeal adoption of such a threshold." (*N.Y. DEC Paragraph 5*)

- "[Commenter] agrees with the Weight of Evidence Analysis which accompanies the draft Infrastructure SIP. That analysis includes factors such as the use of a 1 ppb significance test (as recommended by EPA in its April 17, 2018 guidance memo)." (*IEA #1*)
- "The 1% significant contribution test is inappropriate and should not be applied." (*MOG Letter #4*) "IDEM is correct in calling for the application of an alternative significance threshold." (*MOG Comments #9*) "On August 31, 2018, EPA issued significant new guidance in which it analyzed 1 ppb and 2 ppb alternatives to the 1% significance level that it has historically used." "We urge IDEM to carefully evaluate these additional flexibilities as further support for the conclusion that Indiana has already satisfied the requirements of CAA section 110(a)(2)(D)(i)(I)." (*MOG Letter #4 and Comments #9*)

Response 3:

IDEM submitted its draft Infrastructure State Implementation Plan (SIP) addressing the 2015 Ozone National Ambient Air Quality Standards (NAAQS) for public comment on August 24, 2018, before U.S. EPA officially released its guidance memo on August 31, 2018, detailing their analysis of contributions thresholds. IDEM has opted to use 1 ppb as the significance threshold to determine whether an upwind state has a significant impact on downwind nonattainment or maintenance monitors. This conclusion is supported by U.S. EPA's August 31, 2018 guidance memo titled "Analysis of Contribution Thresholds for Use in Clean Air Act Section 110(a)(2)(D)(i)(I) Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards" and provides U.S. EPA's analysis of its photochemical modeling results on how much upwind contribution is captured by using different contribution threshold values at receptors predicted to either be in nonattainment or maintenance of the 2015 Ozone NAAQS in 2023. U.S. EPA concluded in their analysis that "the 1 ppb threshold still generally captures a substantial amount of transported contribution from upwind states to downwind receptors." IDEM agrees with this conclusion. Section 3 of the WOE analysis details Indiana's justification for selecting the 1 ppb threshold as the significance indicator.

Comment 4:

"If IDEM is to rely on the LADCO modeling, IDEM should analyze the discrepancies between LADCO and EPA model results at each receptor to which it may be linked, including the Milwaukee site, and explain why its results are superior to EPA's." (*CT DEEP Paragraph 5*)

Response 4:

The only differences between LADCO's and U.S. EPA's modeling analyses are the use of different EGU emissions and the methodology of post-processing grid cells containing a majority of water.

IDEM relied on U.S. EPA's "EN" emissions platform with the exception of EGU emissions. U.S. EPA's EGU emissions, generated by the Integrated Planning Model (IPM), were replaced with EGU emissions from the Eastern Regional Technical Advisory Committee (ERTAC). ERTAC's EGU emissions database represents a more complete and accurate representation of current and future EGU emissions. Section 6.2 of the WOE analysis details the selection of emissions data. This represents the only difference between the two emissions modeling platforms.

U.S. EPA modeled results are based on post-processing using the "no water" method, while IDEM's attainment results are based on including water cells. The "no water" method involves elimination of grid cells from the post-processing of modeled results that contained 50% or more water and no ozone monitors located within that grid cell. The elimination or inclusion of such grid cells were presented by U.S. EPA as a flexibility in the March 27, 2018 Peter Tsirigotis memo "Information on the Interstate Transport State Implementation Plan Submissions for the 2015 Ozone National Ambient Air Quality Standards under the Clean Air Act Section 110(a)(2)(D)(i)(I)". IDEM reviewed U.S. EPA's modeling results with water grid cells which gave an average value of 65.4 parts per billion (ppb), with a maximum projected value of 67.0 ppb, comparable to LADCO's average modeled value of 63.6 ppb and maximum modeled value of 66.6 ppb when accounting for the water grid cells. These results can be found in Table 11 of LADCO's "Interstate Transport Modeling for the 2015 Ozone National Ambient Air Quality Standard, Technical Support Document", found in Appendix C of the WOE analysis.

Comment 5:

Additional back trajectory analysis is needed for higher altitudes reflective of long range transport (*CT DEEP Paragraph 6*) (*N.Y. DEC Paragraph 7*) and a more robust selection of monitoring sites should be used (*CT DEEP Paragraph 6*).

Response 5:

IDEM has provided additional back trajectory analyses at a higher altitude in Section 6.10 of the WOE analysis to further demonstrate that the higher ozone concentration days in the Northeast are NOT significantly impacted by emissions transported from Indiana. The majority of the back trajectories at the higher altitudes do not pass over Indiana and, therefore, Indiana emissions would not be transported significantly downwind. On the few ozone exceedance days that the back trajectories indicated the air passed over Indiana, the higher altitude trajectories also passed over multiple states due to the atmospheric conditions present during the ozone event. The

10 meter trajectories show that the local emissions and stagnant weather conditions, present on those ozone exceedance days, had significant and more detrimental impacts on air quality in the Northeast. The 10 meter trajectories show the shorter path that local emissions took on the high ozone days, indicating the lighter winds and saturation of the Northeast area with the local area emissions. Indiana concentrated its efforts on the projected nonattainment and maintenance monitors in the Northeast, as these are the only pertinent monitors for this analysis.

Comment 6:

"IDEM has not addressed its contribution to marginal nonattainment areas. Given that Indiana sources are linked to nonattainment receptors in 2023, linkages are likely for 2020 as well, and those receptors should be analyzed for Indiana's significant contribution and remedied prior to the 2020 marginal nonattainment date." (*CT DEEP Paragraph 7*)

Response 6:

Due to LADCO's reliance on U.S. EPA's emission platform for 2011 base year and 2023 future year emissions and time constraints due to the delay in the ozone designations, IDEM feels the 2023 future year modeled projections are consistent with implementation guidance for the 2015 Ozone standard and appropriate for meeting its long range transport obligations. These future year dates are consistent with U.S. EPA's guidance and policy.

In addition, Section 5.3 of the WOE demonstration shows Indiana's EGUs and non-EGUs have made large emissions reductions that have already occurred since 2011 and will continue to be realized with future emission reductions anticipated. This will thereby lessen Indiana's impact on areas surrounding the state and downwind receptors even further away over the next few years.

Comment 7:

Comments were received concerning additional measures for addressing Indiana's "significant" contributions on New York. Commenter "requests that IDEM take additional measures to resolve its current significant contributions to the New York-Northern New Jersey-Long Island, NY-NJ-CT nonattainment area (NYMA) for the 2015 ozone National Ambient Air Quality Standards (NAAQS), rather than waiting to see whether its contributions are resolved years into the future." (*N.Y. DEC Paragraph 1*) Commenter states that "Indiana is obligated to resolve its current significant contributions to the New York City metropolitan area, which continues to record exceedances of the 2008 and 2015 ozone NAAQS." (*N.Y. DEC Paragraph 2*)

Response 7:

Indiana has been proactive in complying with local, state and national measures to make emission reductions in order to lessen its impacts on areas within Indiana, on all surrounding states, and downwind states. These emission control measures address the larger Indiana facilities with higher stack heights that could potentially transport ozone precursors downwind. These rulemakings have produced substantial reductions in emissions, as spelled out in Section 5.3 of Indiana's WOE analysis, lessening Indiana's impact on downwind receptors. Indiana will continue to work with U.S. EPA to ensure Indiana meets its obligations under the Clean Air Act.

IDEM reiterates that modeling indicates mobile and local emission sources in the Northeast are significant contributors to ozone in that area. Each of these source categories should be adequately addressed before requests are made for reductions that are beyond what is mandated by U.S. EPA. IDEM has demonstrated through its WOE analysis that the most current modeling information available shows Indiana emissions do not significantly impact the New York City metropolitan area or any ozone monitors residing in that area that are projected to be nonattainment.

Comment 8:

"IDEM relies on 2023 CAMx projection modeling conducted by U.S. Environmental Protection Agency (EPA) and the Lake Michigan Air Directors Consortium in its Good Neighbor demonstration. EPA's 2023 projection modeling is riddled with unenforceable assumptions and inaccuracies that render the results suspect." (*N.Y. DEC Paragraph 2*)

Response 8:

IDEM believes the commenter's assertions are unfounded and that the utmost care has been given to U.S. EPA's and LADCO's emission inventories development, the photochemical modeling, as well as the creation of appropriate meteorological files and model input data to accurately replicate model days to determine base-case and future year concentrations. The emissions development process involves state-supplied emissions data and is thoroughly reviewed by the states, technical committees and U.S. EPA. U.S. EPA's and LADCO's future-year photochemical modeling is the best available tool to determine projected impacts from sources controlled by local, state, regional and national emission control measures. Additionally, other technical organizations such as Alpine Geophysics have conducted refined photochemical modeling with similar results as LADCO and U.S. EPA.

In addition, emission trends over the past 10 years have demonstrated the federally enforceable reductions in NOx and VOC emissions complement the modeling results and have lessened long-range transport impacts from Indiana and other upwind states.

Comment 9:

"Future-year market trends are difficult to predict; EPA has discussed the uncertainty in U.S. Energy Information Administration fuel-use projections, and notes that "[b]ecause of the rapid pace of these power sector changes, it is difficult for sector analysts to fully account for these changing trends in near-term and long-term sector-wide projections.'" (N.Y. DEC Paragraph 2)

Response 9:

IDEM agrees that future-year market trends are difficult to predict. However, prediction tools exist to project future market trends as accurately as possible with a margin for safety built in to the projections. Indiana feels that the approach taken by the ERTAC EGU Tool accounts for the power generation, demand and fuel use projections, based on state and national input, and is credible, justified and are accurately characterized in the emissions modeling used in the photochemical modeling.

The primary sources of expected future change in power generation is the U.S. Energy Information Agency (EIA) annual projection of future generation and the National Energy Reliability Corporation (NERC) projection of peak generation rates. This information is available by region and fuel type. Local growth projections made by the states are preferred over national sources of the growth projections. Future power generation by unit is estimated by merging the national, regional and state growth files with state knowledge of unit level changes. Hourly future emissions of NO_x and SO₂ are calculated by multiplying hourly projected future heat input by future emission rates. If the available capacity is fully utilized, new generic units ("Generation Deficit Units") are created to carry demand that exceeds known unit capacity. Each EGU unit included in the model is assigned to a geographic region based on fuel type in the Unit Availability File. The geographic regional system used in ERTAC EGU tool version 2.7 reference and CSAPR compliant runs are a modified version of the EIA Electricity Market Module (EMM) regional system. Because the EIA and NERC regions are not identical, adjustments are required to align these regional systems to develop annual and peak growth rates. To match EIA and NERC projections, a "best fit" NERC regional growth factor is assigned to each EMM region.

This process is the best power projection method available. It is based on input from state, federal and utility/energy experts to make the best determinations for future power generation and demand.

Comment 10:

"IDEM should institute emission limits consistent with SCR optimization at all EGUs forecasted by U.S. EPA to operate at a 0.1 lb/mmBtu emission rate in 2023 [citing "2023en_Engineering_Analysis_Unit_File.xls: workbook released with October 27, 2017 Page Memorandum]." (N.Y. DEC Paragraph 3)

Response 10:

Several Indiana coal units, including Indiana Michigan Power – AEP Rockport, Indiana Kentucky Electric Corp - Clifty Creek, Hoosier Energy – Merom, Indianapolis Power & Light -Petersburg, Duke-Cayuga, Duke-Gibson, Vectren - A.B. Brown and Vectren - F.B. Culley had their NO_x controls optimized to be CSAPR compliant in the ERTAC EGU emissions files, thereby correlating permanent and federally enforceable emission limits for Indiana’s EGUs into the modeling. Most coal units in the Midwest (IN, IL, MI, MO, OH, and WI) were optimized in the same way for their NO_x selective catalytic reduction (SCRs) during the ozone season in 2023 and are accounted for in LADCO’s photochemical modeling, which utilized ERTAC’s EGU tool for future year emission projections.

Comment 11:

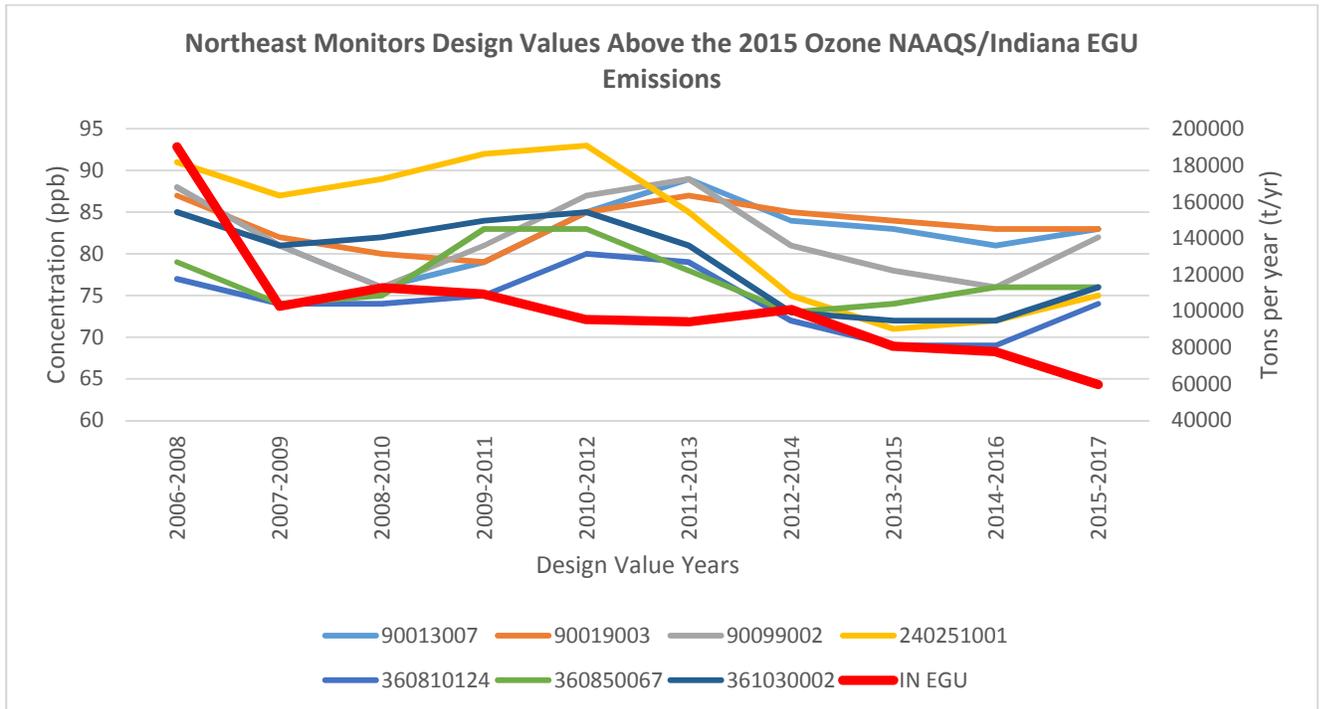
"It is true that ozone concentrations are declining over the long term at the Richmond County monitor (commenter referenced Chart 6 in IDEM's WOE analysis showing design values for 2004-2017), though the use of a linear trend line obscures the current trend in design values. [Commenter provides] ozone design values for the Richmond County monitor, which shows some variation, but design values that are higher in 2018 than 2009 and exhibit an overall *increasing* design value trend since 2009. Indeed, IDEM recognizes that 'ozone values and the number of exceedance days have remained steady or increased over the past few years in the Northeast.' This trend has developed despite continual NO_x and volatile organic compound reductions from New York, New Jersey, and Connecticut to fulfill their reasonable further progress obligations pursuant to 2008 ozone NAAQS requirements for the tri-state nonattainment area (with actual reductions having greatly exceeded the required three percent per year), further highlighting the need for upwind emission reductions." (*N.Y. DEC Paragraph 6*)

Response 11:

As the commenter noted, NO_x and VOC emission reductions have occurred at New York, New Jersey and Connecticut in accordance with their reasonable further progress obligations for the 2008 Ozone NAAQS. Indiana has made substantial emission reductions at its large industrialized facilities over the past several years that would greatly lessen its impact on downwind receptors. However, as mentioned in the comment, ozone design value trends have increased at some Northeast monitors over this time period. This indicates the need for emission reductions in other source categories nearer to the nonattainment areas as more localized impacts on ozone monitors along the Northeast coast are being realized.

The chart below shows the NO_x emission reductions realized by Indiana from 2008 through 2017. The chart shows a 69% reduction of NO_x emissions from Indiana’s EGUs during the period. The impact from this extremely significant reduction is lost on the Northeast coastal monitors as design values, while trending lower overall, are

showing higher design values during the past two years. This indicates that emissions from nearby sources are impacting the Northeast monitors and not Indiana's emissions.



Comment 12:

The proposed SIP appropriately addresses interstate transport. (IEA #1)

Response 12:

IDEM appreciates the statement and agrees that Indiana has demonstrated that its SIP addresses all interstate transport obligations for the 2015 8-Hour Ozone standard.

Comment 13:

Comments were received concerning the impacts of local emissions:

- Local area and mobile sources that have the most significant impacts on problem monitors in the Northeast must be addressed before Indiana sources are required to make additional emissions reductions to address the state's contribution to interstate transport. (IEA #2)
- Controls on local sources must be addressed first before any additional emission reductions can be imposed on sources in Indiana. The significance of the need for local controls to "address concern about any possible residual nonattainment area" should be a factor supporting the conclusion that no further emissions

requirements are necessary for Indiana to satisfy requirements of CAA section 110(a)(2)(D)(i)(I). *(MOG Comments #5)*

Response 13:

IDEM agrees with these comments and reiterates that the modeling demonstration in Section 6.5.2 of the WOE analysis shows that local onroad and nonroad mobile, commercial marine vessel and nonpoint emission sectors play a significant role in elevated ozone values along the Northeast coastal region and should be addresses before any additional emissions reductions are imposed on Indiana's sources.

Comment 14:

IDEM should review the emissions data in the proposed SIP and, if necessary, ensure that it accounts for all of the most recent coal-fired EGU retirements and projected retirements announced in the most recent Integrated Resource Plans. *(IEA #3 and #4)*

Response 14:

The LADCO modeling was based on a 2011 base year (v2.7) run which was later compared to the 2016 base year (v16) ERTAC run to determine if there were any new retirements that were not captured in the 2011 data that was used in this analysis. In addition to the emissions reductions in the current ERTAC EGU projections, it is expected that several retirements of coal-fired boilers or retrofits will occur within Indiana by 2024. Those retirements/retrofits and anticipated emissions reductions are listed in Section 5.3 of the WOE analysis. It should be noted that smaller EGU units (< 25MW) not in the ERTAC database are captured in the point source inventory and accounted for in the modeling.

Also, according to the latest Integrated Resource Plan (IRP) from Duke Energy (2015) and IPL (2016), three additional coal-fired EGU's are projected to retire beyond the 2023 future year date¹. These units include: Bailly Unit #5 (2031 projected retirement) and Indiana Power and Light (IPL) Petersburg Unit 1 (2032 projected retirement) and Unit 2 (2034 projected retirement).

Comment 15:

Independent modeling conducted on behalf of the commenter shows that all monitors in the Northeast are at or near attainment of the 2015 ozone NAAQS in 2023. *(MOG Letter #2 and Comments #2)*

¹ <https://www.in.gov/iurc/2630.htm>

Response 15:

IDEM appreciates the corroboration of the independent modeling and analyses by the Midwest Ozone Group (MOG). MOG's modeling results, taken from modeling runs made by Alpine Geophysics, reinforce the U.S. EPA and LADCO modeling results, indicating projected 8-hour ozone design values in the Northeast will attain or nearly attain the 2015 8-hour standard by 2023.

Comment 16:

Several emission reduction programs that will impact the East are not included in the 2023 modeling. Specifically, nine control programs identified by Maryland and recommended for implementation by the Ozone Transport Region (OTR) member states are estimated to reduce ozone season NO_x by 27,000 tons and ozone season VOCs by 22,000 tons. If the 2023 modeling were to include these programs, better air quality would be demonstrated. *(MOG Comments #4)*

Response 16:

IDEM agrees with the comment that the nine specific control programs identified will help to reduce the ozone impact from local sources in Maryland and the Northeast. As demonstrated in Indiana's WOE analysis, local mobile, non-road, off-shore, international and low-level point source emissions play a significant role in elevated ozone values in the Northeast and control measures for these local emissions will help to reduce ozone in the Northeast nonattainment areas.

Comment 17:

Commenter states that the Texas Commission on Environmental Quality (TCEQ) introduced in its 2015 Ozone NAAQS Transport SIP Revision 39 an approach for identifying maintenance monitors that differs from the approach used by the EPA in CSAPR and the 2015 Transport NODA. Commenter urges IDEM to consider the recalculation of maintenance monitors using the Texas approach as an alternative to EPA's approach. *(MOG Comments #10)*

Response 17:

IDEM, in collaboration with LADCO staff and other LADCO states, examined the possibility of using Texas' method of determining maintenance monitors. This method uses the last three-year design value that includes the base-year to define maintenance. For example, if the base year is 2011, the maintenance designation would be based on 2011, 2012, and 2013. In using this method, an issue arises when looking at the U.S. EPA definition of a nonattainment receptor also being a maintenance receptor. Using Texas' method, it would be possible for a receptor to model nonattainment, but not maintenance. For example, the Harford, MD monitor would have a 2023 design value of 71.0 ppb (based on 5-year weighted average of 2009-2013), but

a non-maintenance status of 67.0 ppb (based on 2011-2013). Texas also used a base year of 2012, meaning the maintenance designation is based on 2012-2014. 2013 and 2014 had cooler temperatures in the Midwest and Northeast during the summer. These time periods were less conducive for ozone development and would produce lower modeled values if used for attainment/maintenance designation purposes.

Comment 18:

"As an alternative to maintenance monitors being accorded the same weight as nonattainment monitors, we urge that IDEM take the position that no additional control would be needed to address a maintenance monitor if it is apparent that emissions and air quality trends make it likely that the maintenance monitor will remain in attainment."
(MOG Comments #11)

Response 18:

IDEM reiterates its position that current and future planned emission reductions, demonstrated through modeling, are sufficient to address any significant impact Indiana would have on downwind maintenance monitors, especially in the Northeast. IDEM's analysis demonstrates the one Northeast nonattainment monitor and one Northeast maintenance monitor significantly impacted by Indiana are also impacted by several nearby states at a much greater magnitude. Red-line calculations for the Harford, Maryland nonattainment monitor show Indiana's portion of significant contribution required for Harford to attain the 2015 8-hour ozone standard by 2023 is 0.0077 parts per billion. This portion is a fraction of the significance level and will be addressed by emissions reductions in Indiana that will occur over time

Comment 19:

"We strongly encourage IDEM not to apply [the] same red lines methodology to maintenance monitors as it has to nonattainment monitors. *(MOG Comments #12)*

Response 19:

IDEM agrees with this suggestion and did not apply the red lines methodology to maintenance monitors. In applying the red line methodology, one of the first steps is to determine how much reduction the receptor's projected average 2023 design values must achieve to get below the 8-hour ozone standard, or at or below 70.9 parts per billion. Since all identified maintenance monitors have projected average 2023 design values at or below 70.9 parts per billion, there is no need to apply this methodology.

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