Technical Support Document (TSD)
for the Final Federal Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards

Docket ID No. EPA-HQ-OAR-2021-0668

Ozone Transport Policy Analysis
Final Rule TSD

U.S. Environmental Protection Agency
Office of Air and Radiation
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The analysis presented in this document supports the EPA's final Federal Good Neighbor Plan for the 2015 Ozone National Ambient Air Quality Standards. This TSD includes analysis to help quantify upwind state emissions that significantly contribute to nonattainment or interfere with maintenance of the 2015 ozone NAAQS in downwind states and quantification of EGU emission budgets and the resulting effects on air quality of the EGU and non-EGU strategies included in the final rule. The analysis is described in Sections V and VI of the preamble to the rule. This TSD also describes how the EPA used historical data and the Integrated Planning Model (IPM) to inform air quality modeling, budget setting, and policy analysis aspects of this rule for EGUs, as well as describing analysis of the non-EGU policy scenarios, including for overcontrol. Finally, this TSD includes an assessment on the effects of ozone concentrations on forest health. This TSD is organized as follows:

A. Using Engineering Analytics and the Integrated Planning Model (IPM) in the Step 3 Assessment of Significant Contribution to Nonattainment and Interference with Maintenance

In order to establish EGU NO_X emissions control stringencies for each linked upwind state, EPA first identifies various possible uniform levels of NO_X control stringency based on available EGU NO_X control strategies and represented by cost thresholds.[1] The EGU emission reductions pertaining to each level of control stringency are derived using historical data, engineering analyses, and the Integrated Planning Model (IPM) for the power sector as described in section B of this TSD. A similar assessment for one scenario was done for non-EGUs. Next, EPA uses the ozone Air Quality Assessment Tool (AQAT) to estimate the air quality impacts of the upwind state emissions reductions on downwind ozone pollution levels for each of the assessed cost threshold levels. Specifically, EPA looks at the magnitude of air quality improvement at each receptor at each level of control; it also examines whether receptors change status (shifting from either nonattainment to maintenance, or from maintenance to attainment), and looks at the individual contributions of each state to each of its receptors. See section C in this TSD for discussion of the development and use of the ozone AQAT.

In this TSD, EPA assesses the EGU NO_X mitigation potential for all states in the contiguous U.S. EPA assessed the air quality impacts from emission reductions for all monitors in the contiguous U.S. for which air quality contribution estimates were available. In applying the multi-factor test for purposes of identifying the appropriate level of control, the EPA evaluated NO_X reductions and air quality improvements at the receptors determined to have a transport problem (see section IV.F. of the Preamble), and the 23 upwind states[2] that were linked to downwind receptors[3] in step two of the 4-Step Good Neighbor Framework. These states are listed in Table A-1 below. Since California EGUs are not covered in this final rule, this TSD's references to "affected states" or "states covered by this rule" *in EGU-related emissions materials* does not include California.[4]

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[1] See the EGU NO_X Mitigation Strategies Final Rule TSD.

[2] Note that 4 of the 23 upwind states are also states with non-attainment or maintenance receptors, or "home states."

[3] Monitor 490570002 in Weber County, UT ceased operation in 2019 and is no longer considered to be a receptor in this final rule. Including this monitoring site in the analysis for Step 3 is not determinative for the final results of this analysis.

[4] EPA notes that there are two receptors on tribal lands in California. The regulatory ozone monitor located on the Morongo Band of Mission Indians ("Morongo") reservation is a projected downwind receptor in 2023 and the Temecula, California regulatory ozone monitor is a projected downwind receptor in 2023 (and in past regulatory actions has been deemed representative of air quality on the Pechanga Band of Luiseño Indians ("Pechanga") reservation). As California EGUs are not covered in this action (and no other state would be linked to these receptors), EPA does not include these receptors when discussing receptors impacted by EGU reductions. However, these receptors and their corresponding design value change due to both EGU reductions and non-EGU reductions elsewhere and in California and are shown in the accompanying AQAT file. See Ozone_AQAT_Final.xlsx for results.

Table A-1. Upwind States Evaluated in the Multi-factor Test

Alabama+	Nevada
Arkansas	New Jersey
California*	New York
Illinois	Ohio
Indiana	Oklahoma
Kentucky	Pennsylvania
Louisiana	Texas
Maryland	Utah^
Michigan	Virginia
Minnesota+	West Virginia
Mississippi	Wisconsin+
Missouri	

**California EGUs are not covered by this rule.*

+Linkages for Alabama, Minnesota, and Wisconsin are projected to resolve before 2026. Therefore, those states have a lower level of emission control stringency compared to states that are projected to be linked in 2026.

^ In recognition of Utah's lack of state jurisdiction over an existing EGU in the Uintah and Ouray Reservation, the effects of the rule for that facility are presented independently from Utah in this document and fall under the descriptor "tribal" or "tribal data."

Similar to the CSAPR Update and the Revised CSAPR Update, EPA relied on adjusted historical data (engineering analytics) as part of the process to identify emissions control stringencies to eliminate significant contribution at step three within the 4-Step Good Neighbor Framework. Historical data were adjusted through the engineering analytics tool to analyze the ozone season NO_X emission reductions available from EGUs at various uniform levels of NO_X control stringency, represented by cost per ton, in each upwind state. Finally, IPM was used to evaluate compliance with the rule and the rule's regulatory control alternatives (i.e., compliance with the emission budgets, with a more stringent alternative, and with a less stringent alternative). In order to examine the impact of the recently passed Inflation Reduction Act (IRA), EPA also performed two additional scenarios, namely an updated baseline scenario that included key provisions of the IRA, and a run that included both the final rule and key IRA provisions. EPA also used its engineering analytics tool and IPM projections to perform air quality assessment and sensitivity analysis as part of step 3.

The engineering analysis tool uses 2021 ozone-season data as representative historical emissions and operating data reported under 40 CFR part 75 by covered units 4. It is a tool that builds estimates of future unit-level and state-level emissions based on exogenous changes to historical heat input and emissions data reflecting fleet changes that will occur subsequent to the last year of available data. See Section B. *Calculating Step 4 EGU Emission Budgets from Historical Data* for a detailed description of the engineering analytics tool.

IPM is a multiregional, dynamic, deterministic linear programming model of the U.S. electric power sector that EPA uses to analyze cost and emissions impacts of environmental [5]￼ All IPM cases for this rule included representation of the Title IV SO_2 cap and trade program; the NO_X SIP Call; the CSAPR, Update, and Revised CSAPR Update regional cap and trade programs; consent decrees and settlements; and state and federal rules as listed in the IPM documentation referenced above. For details on which measures are endogenously modeled within IPM and which are not, please see Appendix Table C-1.

Table A-2 below summarizes the reduction measures that are broadly available at various cost thresholds for EGUs.

Table A-2. Reduction strategies available to EGUs at each cost threshold.

Cost Threshold ($ per ton Ozone-Season NO_X)	Reduction Options
$1,800	-Retrofitting state-of-the-art combustion controls; -Optimizing idled SCRs; -Optimizing operating SNCRs
$11,000	-All options above and; -Installing SCR and SNCR on coal and oil/gas steam units greater than 100 MW and lacking post combustion controls.

For the Engineering Analytics:

- At $1,800/ton:
    - If 2021 adjusted baseline rate was greater than 0.08 lb/MMBtu for SCR controlled coal units, that rate and corresponding emissions were adjusted down to 0.08 lb/MMBtu starting in 2023;
    - for SCR controlled oil/gas units, if the adjusted historical rate was greater than 0.03 lb/MMBtu then the rate was adjusted downwards to 0.03 lb/MMBtu starting in 2023;
    - for SCR controlled combined cycle units, if the adjusted historical rate was greated than 0.012 lb/MMBtu then the rate was adjusted downwards to 0.012 lb/MMBtu in 2023;
    - for SCR controlled combustion turbine units, if the adjusted historical rate was greated than 0.03 lb/MMBtu then the rate was adjusted downwards to 0.03 lb/MMBtu in 2023; and
    - for units with LNB upgrade potential and an adjusted historical rate greater than 0.199 lb/MMBtu, their rates were adjusted downwards to 0.199 lb/MMBtu starting in 2023.

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[5] See “Documentation for EPA’s Power Sector Modeling Platform v6 using Updated Summer 2021 Reference Case”. Available at https://www. https://www.epa.gov/airmarkets/documentation-epas-power-sector-modeling-platform-v6-summer-2021-reference-case. See also the “Updated Summer 2021 Reference Case Incremental Documentation for the 2015 Ozone NAAQS Actions.” https://www.epa.gov/power-sector-modeling/supporting-documentation-2015-ozone-naaqs-actions

    - Starting in 2023 units with SNCRs were given their mode 2 NO_X rates[6] if they were not already operating at that level or better in 2019.

- At $11,000/ton:
    - Same as $1,800/ton; additionally:
    - Coal units greater than or equal 100 MW and lacking a SCR were given an emission rate equal to 0.05 lb/MMBtu reflecting SCR installation starting in 2026. Oil/gas steam units greater than or equal100 MW and with a three year (2019-2021) average of ozone season emissions of at least 150 tons were given an emission rate of 0.03 lb/MMBtu reflecting SCR installation starting in 2026.

B. Calculating Step 4 EGU Emission Budgets from Historical Data

1. Calculating 2023-2029 Engineering Baseline Heat Input and Emissions

The underlying data and calculations described below can be found in the workbook titled (Appendix A – Final Rule State Emission Budget Calculations and Engineering Analytics). They are *also available in the docket and on the EPA website.*

EPA starts with 2021 reported, seasonal, historical NO_X emissions and heat input data for each unit.[7] This reflects the latest representative owner/operator reported data available at the time of EPA analysis.[8] The NO_X emissions data for units that report data to EPA under the Acid Rain Program (ARP), Cross-State Air Pollution Rule (CSAPR), CSAPR Update, and Revised CSAPR Update are aggregated to the summer/ozone season period (May-September). Because the unit-level NO_X emissions for the summer/ozone-season period are relevant to determining ozone-season emissions budgets, those files are shown in the “Unit 2023” through “Unit 2029” sheets in the “Appendix A: Final Rule State Emission Budget Calculations and Engineering Analytics” file accompanying this document.[9] In that file, unit-level details such as facility name, unit ID, etc. are shown in columns A through H of the “Unit 2023” through “Unit 2029” worksheets. Reported historical data for these units such as unit type, capacity, fuel, existing post combustion controls, historical emissions, heat input, generation, etc. are shown in columns I through U. The 2021 historical emissions value is in column R. The assumed future year baseline emissions estimate (e.g., 2023-2029) is shown in column AD, and reflects either the same emissions level

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[6] For a unit with an existing post-combustion control, mode 1 reflects the existing post-combustion control not operating and mode 2 the existing post-combustion control operating. For details, please see Chapter 3.10 of the IPM documentation available at: https://www.epa.gov/airmarkets/documentation-epas-power-sector-modeling-platform-v6-summer-2021-reference-case.

[7] “Seasonal” refers to the ozone-season program months of May through September.

[8] As explained in VI.B.4 of the preamble, at the end of this procedure EPA is able to evaluate, as part of its quality assurance and quality check, whether the use of the most recent historical final data (e.g., 2021) is representative of the baseline heat input and emissions for each state and make any adjustments if needed.

[9] The EPA notes that historical unit-level ozone season EGU NO_X emission rates are publicly available and quality assured data. The emissions are monitored using continuous emissions monitors (CEMs) or other monitoring approaches available to qualifying units under 40 CFR part 75 and are reported to the EPA directly by power sector sources.

as that observed in 2021, or a modification of that value based on changes expected to the operational or pollution control status of that unit.[10] These modifications are made due to:

a. *Retirements* - Emissions from units with upcoming confirmed retirement dates are adjusted to zero for ozone seasons subsequent to that retirement date. Retirement dates are identified through a combination of sources including EIA Form 860, utility-announced retirements,[11] and stakeholder feedback provided to EPA, as reflected in the National Electricity Energy Data System (NEEDS) February 2023 file. For the purpose of the engineering analysis, when companies have announced they will either sell a unit or retire it by a certain date, the EPA assumed that the unit would retire unless there is news of a specific potential buyer. Retirement dates are shown in columns J and K and the impact of retirements on emissions is shown in column V. The retiring units are flagged in column W.[12,13]

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	*0 MMBtu* x 0.2 lb/MMBtu = *0 ton*

b. *Coal to Gas Conversion* – Emissions from coal units with scheduled conversions to natural gas fuel use are adjusted to reflect reduced emission rates associated with natural gas for years subsequent to that conversion date. To reflect a given unit's conversion to gas, that unit's future emission rates for NO_X are assumed to be half of its 2021 coal-fired emission rates while utilization levels are assumed to remain the same.[14] Therefore, the future year estimated emissions for these converting units are expected to be half of 2021 levels for NO_X. Units expected to convert to gas are flagged using EIA Form 860, utility announcements, and stakeholder feedback, as reflected in NEEDS February 2023. For the purpose of the engineering analysis, when units have a requirement to either convert to gas or retire (i.e., cease burning coal) but there has been no indication which option a unit will take, EPA assumed that the unit would convert to gas. The impact of coal to gas conversion for the future

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[10] Based on data and changes known at time of analysis.

[11] Starting with the June 2022 version of NEEDS, EPA has begun including announced retirements as that represents the most likely future behavior for the unit, unless compelling information suggests such retirement may not happen or may be delayed. EPA also determined that including announced retirements in the engineering analysis would be helpful in establishing pre-set budgets, particularly beyond 2024, as that would help ensure state emission budgets are reflective of the best information on the power sector's operating profile in future years. It has been EPA's experience that in recent years, units' announced retirements tend to be moved forward rather than pushed back in time, making the inclusion of announced retirements reasonable. For cases beyond 2024 where unit retirements may be pushed back, the calculation of the dynamic budgets would capture those delayed retirements and would adjust accordingly (i.e., they would continue to reflect the operation of the unit in question). Since states would receive the higher of the pre-set and dynamic budgets from 2026 through 2029, this would prevent states from being under-budgeted because of changes in projected retirements used to establish the preset budgets.

[12] EPA updated its inventory of units flagged as retiring in column N based on stakeholder input, including on previous rulemakings and the latest data from EIA 860 and the PJM retirement tracker.

[13] Units that are to retire by the start of the a year's ozone season are considered retired for that year in the engineering analysis. Units that will operate for at least part of the ozone season of a given year will not be considered retired until the following year for the engineering analysis.

[14] This is consistent with NO_X rate change used in IPM. See "Documentation for EPA's Power Sector Modeling Platform v6 using Summer 2021 Reference Case." table 5-18.

year is shown in column Z, flagged in column AA. The example below pertains to NO_X emission estimates. For any control decisions after the point of conversion, the unit is treated as an O/G Steam unit, shown in column I.

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x *0.1 lb/MMBtu = 0.5 ton*

c. *Retrofits* – Emissions from units with scheduled SCR or SNCR retrofits are adjusted to reflect the emission rates expected with new SCR installation (0.05 lb/MMBtu of NO_X for a coal unit, and 0.03 lb/MMBtu for an oil/gas steam unit) and new SNCR (25% decrease in previously reported emission rate for all boilers except circulating fluidized bed boilers that receive a 50% decrease in previously reported emission rate) and are assumed to operate at the same 2021 utilization levels.[15] These emission rates were multiplied by the affected unit's 2021 heat input to estimate the future year emission level. The impact of post-combustion control retrofits on future year emissions assumptions is shown in column AB, flagged in column AC.

For SNCR:

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x *0.15 lb/MMBtu = 0.75 ton*

For SCR:

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x *0.050 lb/MMBtu = 0.25 ton*

d. *Other* – EPA also made several unit-specific adjustments to 2021 emission levels to reflect forthcoming emission or emission rate requirements specified in consent decrees, BART requirements, state RACT rules, and/or other revised permit limits. The impacts for future year emission assumptions are shown in column AD, flagged in column AE.[16]

e. *New Units* – Emissions for new units are identified in the "New units" worksheet. They reflect under-construction and/or permitted units greater than 25 MW that are expected to be in commercial operation by the designated future year. These assumed emission values for new units are reflected in column F and the online years are in column I. To obtain these emissions, EPA identified all new fossil-fired EGUs coming online after 2021 according to EIA Form 860 and stakeholder comments, as reflected in NEEDS v6 October 2022. EPA then identified the heat rate and capacity values for these units using EIA Form 860, as reflected in NEEDS v6 October 2022, and stakeholder-provided data. Next, EPA identified the 2019 average seasonal capacity factor for similar units that came online between 2015-2019. EPA used these

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[15] *Ibid.*

[16] EPA checked its inventory of units impacted by consent decrees based on input provided stakeholders and comments on previous rulemakings. No units were determined to be impacted as described in the Allowance Allocation under the Final Rule TSD.

seasonal capacity factors (e.g., 65% for natural gas combined cycle units and 10% for combustion turbines), the unit's capacity, the unit's heat rate, and the unit's estimated NO_X rate to estimate future year emissions (capacity × capacity factor × number of hours in ozone season × heat rate × NO_X emission rate = NO_X emissions).[17] Additionally, for approximately fifteen additional units that are not new units but which have not previously reported data to EPA under 40 CFR part 75 and for purposes of the emissions budgets established under this rule are treated as new units starting in 2024, EIA data sources are used to obtain the necessary data.

	2021	Future Year (e.g., 2023)
Unit x	0 MMBtu x0.0 lb/MMBtu = 0 ton	100 MW *0.65 *(153x24) *8000 Btu/KWh *0.01 lb/MMBtu = 9 tons

After completing these steps, EPA has unit-level future year baselines that originate from the most recently reported representative data (2021) and incorporate known EGU fleet changes. The state-level file reflects a summation of the unit-level values..

2. Estimating impacts of combustion and post combustion controls on state-level emission rates

Next, EPA evaluates the impact of the different combustion and post-combustion controls. Similar to the methodology above, EPA continued to adjust the historical data to reflect a future year with specific uniform control assumptions. However, these adjustments were to capture changes incremental to the baseline reflecting different uniform control measures. EPA applied these adjustments for analytical purposes to all states, but only the affected states' adjustments are relevant for emission budgets in this rule. Each of these adjustments is shown incrementally for the relevant mitigation technology in the "Unit 2023" through "Unit 2029" worksheets.

a. SCR optimization – Emissions from units with existing SCRs, but that operated at an emission rate greater than a fuel and unit type optimized level (0.08 lb/MMBtu for coal steam, 0.03 for oil/gas steam, 0.03 for combustion turbine, and 0.012 for combined cycle) in 2021, were adjusted downwards to reflect expected emissions when the SCR is operated to the applicable optimized emission rate. The applicable optimized emission rate is multiplied by the baseline heat input level to arrive at the future year emissions estimate for a given unit. The impact on future year emission assumptions is shown in column AF and flagged in column AG of the "Unit 2023" through "Unit 2029" worksheets. EPA notes this assumption only applies to ozone-season NO_X as that is the season in which this rule would likely incentivize such operation. In the rule, EPA also incorporated a flag in column AG for units with SCRs and a shared stack. For units with an SCR that share a stack with a unit(s) that does not have SCR, , EPA did not assume potential emission reductions attributable to existing SCR optimization as the reported split of emissions between units may not reflect the actual split of emissions. Though some commenters provided their own emission splits or emission rates for each unit

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[17] Emission rate data is informed by historical data, as reflected in NEEDS, for like units coming online in the last five years. See "2019 and 2020 new NGCC Data" worksheet in the "EGU Power Sector 2019 and 2020 data" file in the docket. EPA-HQ-OAR-2021-0668-0142

sharing a stack, the EPA chose to consistently use the verified reported data. The EPA notes that in some cases, the adjustments to NO_X rates suggested by commenters would result in lower budget because either: the impled emissions rate for the non-SCR unit would be pushed above a 0.199 lb/MMBtu emissions rate and be eligible for a rate commensurate with a state-of-the-art combustion control upgrade; or because starting in 2026-2027 the implied higher emissions and emissions rate at the non-SCR unit would be reduced to the 0.05 lb/MMBtu commensurate with retrofitting a new SCR rather than higher 0.08 lb/MMBtu rate commensurate with optimizing an existing SCR.

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x *0.08 lb/MMBtu = 0.4 ton*

b. *State-of-the-art combustion controls* – Emissions from units that were operating in 2021 without state-of-the-art combustion controls were adjusted downwards to reflect assumed installation of, or upgrade to, these controls and their expected emission rate impact. EPA assumed a future year emission rate of 0.199 lb/MMBtu for units expected to install/upgrade combustion controls. This emission rate was multiplied by each eligible unit's future year baseline heat input to estimate its future emission level. Details of EPA's assessment of state-of-the-art NO_X combustion controls and corresponding emission rates are provided in the EGU NO_X Mitigation Strategies Final Rule TSD. The impact of state-of-the-art combustion controls on future year emission assumptions is shown in column AH and flagged in column AI of the "Unit 2023" through "Unit 2029" worksheets. EPA also incorporated a flag in column AI, based on stakeholder input, for units with a shared stack. For these units, based on stakeholder provided data, EPA did not assume potential emission reductions attributable to state-of-the-art combustion controls as explained in preamble section V.B. Note, these assumptions apply emissions adjustments throughout the entire year as the controls operate continuously once installed.

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.4 lb/MMBtu = 2 ton	10,000 MMBtu x *0.199lb/MMBtu = ~1 ton*

c. *SNCR optimization* - Emissions from units with existing SNCRs, but that operated at an emission rate greater than the SNCR optimization rate, were adjusted downwards to reflect expected emissions when the SNCR is optimized. This emission rate was identified specific to each unit based on historical data and is described in the EGU NO_X Mitigation Strategy Final Rule TSD. The optimized emission rate is multiplied by future year baseline heat input levels to arrive at the future year emissions estimate. For the units affected by this adjustment, the impact on future year emission assumptions is shown in column AJ and flagged in column AK of the "Unit 2023" through "Unit 2029" worksheets. Note, this assumption only applies to ozone-season NO_X as that is the season in which this rule's program would likely incentivize such operation.

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x *0.15 lb/MMBtu = 0.75 ton*

Post Combustion Control Retrofits (SNCR and SCR): Emissions for eligible coal and oil/gas steam units were adjusted to reflect expected emission reductions from the retrofit of either an SCR or SNCR. Table B-1 shows the eligibility of units assumed to receive each type of retrofit in the engineering analysis. Uncontrolled units at coal facilities that share a stack with an existing SCR but are also eligible to receive a new retrofit SCR are given an emission rate assuming an optimized new SCR in years for which this control measure is available. For more information on the retrofit assumptions, see section V.B of the Preamble.

i. SNCR retrofit– Emissions from coal steam units less than 100 MW without post-combustion controls as well as coal-fired circulating fluidized bed (CFB) boilers of any size without post-combustion controls were adjusted downwards to reflect expected emissions if an SNCR were to be retrofitted on the unit. The emission rate was identified as the higher of 75% of the unit's baseline emission rate level (i.e., reflecting a 25% reduction from the technology) or 0.08 lb/MMBtu (i.e., an emission rate floor for SNCR).[18] For CFB units, the emission rate was identified as the higher of 50% of the unit's baseline emission rate level or 0.08 lb/MMBtu. The adjusted emission rate is multiplied by future year baseline heat input levels to arrive at the future year emissions estimate for that technology. For the units affected by this adjustment, the impact on future year emission assumptions is shown in column AO and flagged in column AP of the "Unit 2023" through "Unit 2029" worksheets.

	2021	**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton	10,000 MMBtu x 0.*15 lb/MMBtu* = 0.75 *ton*

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[18] See https://www.epa.gov/airmarkets/retrofit-cost-analyzer for the "Retrofit Cost Analyzer (Update 1-26-2022)" Excel tool (EPA-HQ-OAR-2021-0668-0118) and for the documentation of the underlying equations in "IPM Model – Updates to Cost and Performance for APC Technologies: SNCR Cost Development Methodology for Coal-fired Boilers" (February 2023).

ii. SCR retrofit- Emissions from 1) coal units greater than 100 MW without SCR controls and 2) oil/gas steam units greater than 100 MW without an SCR and a three year (2019-2021) average of ozone season emissions of at least 150 tons were adjusted downwards to reflect expected emissions if an SCR were to be retrofitted on the unit.[19] The emission rate was identified as the higher of 10% of the unit's baseline emission rate or 0.05 lb/MMBtu for coal steam units and 0.03 lb/MMBtu for oil/gas steam units (i.e., a 90% reduction with an emission rate floor of 0.05 or 0.03 lb/MMBtu).[20] The adjusted emission rate is multiplied by future year baseline heat input levels to arrive at the future year emissions estimate for that technology. For the units affected by this adjustment, the impact on future year emission assumptions is shown in column AO and flagged in column AP of the "Unit 2023" through "Unit 2029" worksheets. Note, this assumption only applies to ozone-season NO_X. To inform quantification of state budgets for the 2026 ozone season control period as explained in preamble section VI.A.2.a, the EPA also quantifies an intermediate point halfway between the pre- and post-SCR rate is shown as "SCR (Half)" in column AN. For units with an SCR that share a stack with a unit(s) that does not have SCR an intermediate point halfway between pre- and post-SCR optimization is also shown in this column, mirroring the half-way phase in for SCR retrofits.

	2021		**Future Year (e.g., 2023)**
Unit x	10,000 MMBtu x 0.2 lb/MMBtu = 1 ton		10,000 MMBtu x 0.*05 lb/MMBtu* = 0.25 *ton*

Table B-1. Post-Combustion Control Retrofit Assumptions for Coal and Oil/Gas Steam Units in the Engineering Analysis.

Fuel	**Unit Type**	**Capacity (MW)**	**Average of 2019 to 2021 Ozone Season NO_X (tons)**	**Retrofit Type**	**Emission Rate (lb/MMBtu)**
Coal	not CFB	>=100	All	SCR	0.05
Coal	not CFB	<100	All	SNCR	25% reduction
Coal	CFB	All	All	SNCR	50% reduction
Oil/Gas	All	>=100	>=150	SCR	0.03

With all of these unit-level adjustments applied, the resulting unit-level heat input and unit-level emissions are summed up to the state level. New units' emissions and generation and

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[19] The EPA used a 3-year average of 2019-2021 reported ozone season emissions to derive a tons per ozone season value representative for each covered oil/gas steam unit. This three year period includes a variety of circumstances for the economy and demand for electricity and using the average avoids including or excluding units because of a single anomalous year of generation and emissions.

[20] "IPM Model – Updates to Cost and Performance for APC Technologies: SCR Cost Development Methodology for Coal-fired Boilers" (February 2023) ;
"IPM Model – Updates to Cost and Performance for APC Technologies: SCR Cost Development Methodology for Oil/Gas-fired Boilers" (February 2023)

other state level budget adjustments[21] are added after this step to inform the state-level totals. ; these state-level emissions are visible in the worksheets titled “State 2023” through “State 2029” in the *Appendix A: Final Rule State Emission Budget Calculations and Engineering Analytics* workbook accompanying this document.[22]

Finally, the EPA identified the column in each “state” tab that corresponds to the control stringency identified for that state and that year as described in Section V of the preamble. These values constitute the preset state emission budgets and are shown in column Q. Emission levels at each control stringency are shown in Tables B-2 through B-8 for all states in the contiguous United States, regardless of whether they were covered in the program. The preset state budgets for covered states are displayed in Tables B-9 through B-15.

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[21] The state level budget adjustment is described in Section VI.B.4.a. of the Preamble.

[22] Appendix A: Proposed Final Rule State Emission Budget Calculations and Engineering Analytics shows the unit-level details and calculations described in sections B.1 and B.2 of this TSD, before aggregating those values to use at the state and regional level. The unit-level values inform the state-level budgets and are not a prediction of how each unit will operate in the future. Although anchored in historical data, EPA recognizes at the unit-level some units will overperform and some units will underperform the unit-level values.

Table B-2. 2023 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2023 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Alabama	6,412	6,379	6,379	6,379
Arizona	7,723	7,639	7,570	7,439
Arkansas	8,955	8,927	8,927	8,927
California	1,731	1,340	1,340	1,340
Colorado	6,470	6,393	6,393	6,393
Connecticut	381	355	355	355
Delaware	423	388	388	384
Florida	13,541	11,000	11,000	11,000
Georgia	5,191	5,179	5,179	5,172
Idaho	240	240	240	240
Illinois	7,721	7,652	7,652	7,474
Indiana	13,298	12,442	12,442	12,440
Iowa	9,867	9,867	9,813	9,752
Kansas	6,231	5,484	5,484	5,484
Kentucky	13,900	13,601	12,999	12,999
Louisiana	9,974	9,459	9,459	9,363
Maine	108	86	86	86
Maryland	1,214	1,214	1,214	1,206
Massachusetts	297	265	265	265
Michigan	10,746	10,742	10,742	10,727
Minnesota	5,643	5,544	5,544	5,504
Mississippi	6,283	6,210	5,299	5,299
Missouri	20,094	12,755	12,755	12,598
Montana	3,071	3,071	3,071	3,071
Nebraska	8,931	8,894	8,381	8,381
Nevada	2,372	2,368	2,368	2,368
New Hampshire	330	267	267	267
New Jersey	915	773	773	773
New Mexico	2,289	2,259	2,259	2,259
New York	3,977	3,912	3,912	3,912
North Carolina	12,355	9,209	9,209	9,180
North Dakota	12,246	12,246	12,246	11,436
Ohio	10,264	9,110	9,110	9,110
Oklahoma	10,470	10,271	9,580	9,580
Oregon	342	292	292	292
Pennsylvania	8,573	8,238	8,238	8,138

State	2023 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Rhode Island	279	148	148	148
South Carolina	4,273	3,531	3,531	3,531
South Dakota	521	521	521	521
Tennessee	4,319	4,209	4,209	4,209
Texas	41,276	40,367	40,367	40,134
Utah	15,762	15,755	15,755	15,755
Vermont	54	54	54	54
Virginia	3,329	3,165	3,087	3,065
Washington	1,999	1,729	1,729	1,729
West Virginia	14,686	14,132	13,586	13,306
Wisconsin	6,321	6,315	6,315	6,295
Wyoming	11,643	11,561	10,966	10,953
Total	**337,041**	**315,557**	**311,498**	**309,292**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-3. 2024 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2024 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Alabama	6,522	6,489	6,489	6,489
Arizona	7,723	7,639	7,570	7,439
Arkansas	8,955	8,927	8,927	8,927
California	1,673	1,283	1,283	1,283
Colorado	6,470	6,393	6,393	6,393
Connecticut	381	355	355	355
Delaware	423	388	388	384
Florida	12,868	10,381	10,381	10,381
Georgia	5,191	5,179	5,179	5,172
Idaho	240	240	240	240
Illinois	7,555	7,486	7,486	7,325
Indiana	12,218	11,415	11,415	11,413
Iowa	9,867	9,867	9,813	9,752
Kansas	5,510	4,763	4,763	4,763
Kentucky	13,900	13,601	12,999	12,999
Louisiana	9,974	9,459	9,459	9,363
Maine	108	86	86	86
Maryland	1,214	1,214	1,214	1,206
Massachusetts	297	265	265	265
Michigan	10,294	10,290	10,290	10,275
Minnesota	4,197	4,099	4,099	4,058
Mississippi	6,042	5,969	5,058	5,058
Missouri	18,612	11,273	11,273	11,116
Montana	3,071	3,071	3,071	3,071
Nebraska	8,931	8,894	8,381	8,381
Nevada	2,592	2,589	2,589	2,589
New Hampshire	330	267	267	267
New Jersey	915	773	773	773
New Mexico	2,289	2,259	2,259	2,259
New York	3,977	3,912	3,912	3,912
North Carolina	12,355	9,209	9,209	9,180
North Dakota	12,246	12,246	12,246	11,436
Ohio	9,083	7,929	7,929	7,929
Oklahoma	10,274	10,075	9,384	9,384
Oregon	342	292	292	292
Pennsylvania	8,573	8,238	8,238	8,138

State	2024 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Rhode Island	279	148	148	148
South Carolina	4,273	3,531	3,531	3,531
South Dakota	521	521	521	521
Tennessee	4,064	3,983	3,983	3,983
Texas	41,276	40,367	40,367	40,134
Utah	15,924	15,917	15,917	15,917
Vermont	54	54	54	54
Virginia	3,019	2,855	2,778	2,756
Washington	1,999	1,729	1,729	1,729
West Virginia	13,185	12,784	12,239	11,958
Wisconsin	6,321	6,315	6,315	6,295
Wyoming	11,643	11,561	10,966	10,953
Total	**327,773**	**306,578**	**302,519**	**300,330**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-4. 2025 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2025 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Alabama	6,522	6,489	6,489	6,489
Arizona	7,723	7,639	7,570	7,439
Arkansas	8,955	8,927	8,927	8,927
California	1,672	1,282	1,282	1,282
Colorado	6,470	6,393	6,393	6,393
Connecticut	381	355	355	355
Delaware	423	388	388	384
Florida	12,913	10,426	10,426	10,426
Georgia	5,191	5,179	5,179	5,172
Idaho	240	240	240	240
Illinois	7,555	7,486	7,486	7,325
Indiana	12,218	11,415	11,415	11,413
Iowa	9,867	9,867	9,813	9,752
Kansas	5,510	4,763	4,763	4,763
Kentucky	13,211	12,911	12,472	12,472
Louisiana	9,717	9,203	9,203	9,107
Maine	108	86	86	86
Maryland	1,214	1,214	1,214	1,206
Massachusetts	288	256	256	256
Michigan	10,294	10,290	10,290	10,275
Minnesota	4,197	4,099	4,099	4,058
Mississippi	6,022	5,949	5,037	5,037
Missouri	18,612	11,273	11,273	11,116
Montana	3,071	3,071	3,071	3,071
Nebraska	8,931	8,894	8,381	8,381
Nevada	2,549	2,545	2,545	2,545
New Hampshire	330	267	267	267
New Jersey	915	773	773	773
New Mexico	2,232	2,201	2,201	2,201
New York	3,977	3,912	3,912	3,912
North Carolina	12,270	9,124	9,124	9,114
North Dakota	12,246	12,246	12,246	11,436
Ohio	9,083	7,929	7,929	7,929
Oklahoma	10,266	10,068	9,376	9,376
Oregon	350	300	300	300

State	2025 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization
Pennsylvania	8,573	8,238	8,238	8,138
Rhode Island	279	148	148	148
South Carolina	4,273	3,531	3,531	3,531
South Dakota	521	521	521	521
Tennessee	4,064	3,983	3,983	3,983
Texas	39,684	38,775	38,775	38,542
Utah	15,924	15,917	15,917	15,917
Vermont	54	54	54	54
Virginia	3,019	2,855	2,778	2,756
Washington	1,999	1,729	1,729	1,729
West Virginia	13,185	12,784	12,239	11,958
Wisconsin	6,014	6,008	6,008	5,988
Wyoming	10,429	10,347	9,752	9,739
Total	**323,543**	**302,348**	**298,451**	**296,282**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-5. 2026 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2026 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR (Half)/SNCR Retrofit	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Alabama	6,371	6,339	6,339	6,339	6,053	5,767
Arizona	5,342	5,258	5,188	5,058	4,157	3,256
Arkansas	8,728	8,700	8,700	8,700	6,365	4,031
California	1,672	1,282	1,282	1,282	1,282	1,282
Colorado	4,483	4,405	4,405	4,405	3,731	3,058
Connecticut	381	355	355	355	355	355
Delaware	423	388	388	384	384	384
Florida	11,298	8,811	8,811	8,811	8,111	7,411
Georgia	5,191	5,179	5,179	5,172	5,089	5,007
Idaho	240	240	240	240	240	240
Illinois	6,644	6,575	6,575	6,415	5,889	5,363
Indiana	9,468	8,700	8,700	8,698	8,410	8,135
Iowa	9,773	9,773	9,773	9,713	6,790	4,026
Kansas	5,510	4,763	4,763	4,763	3,938	3,112
Kentucky	13,211	12,911	12,472	12,472	10,190	7,908
Louisiana	9,704	9,189	9,189	9,093	6,370	3,810
Maine	108	86	86	86	86	86
Maryland	901	850	850	842	842	842
Massachusetts	287	256	256	256	256	256
Michigan	7,790	7,786	7,786	7,771	6,743	5,831
Minnesota	4,197	4,099	4,099	4,058	3,321	2,584
Mississippi	6,022	5,949	5,037	5,037	3,484	2,084
Missouri	18,612	11,273	11,273	11,116	9,248	7,381
Montana	3,071	3,071	3,071	3,071	2,124	1,177
Nebraska	8,931	8,894	8,381	8,381	5,672	3,070
Nevada	1,146	1,142	1,142	1,142	1,142	1,142
New Hampshire	330	267	267	267	267	267
New Jersey	915	773	773	773	773	773
New Mexico	2,029	1,998	1,998	1,998	1,833	1,668
New York	3,977	3,912	3,912	3,912	3,650	3,388
North Carolina	11,700	8,847	8,847	8,837	7,490	6,142
North Dakota	12,246	12,246	12,246	11,436	7,181	2,927
Ohio	9,083	7,929	7,929	7,929	7,929	7,929
Oklahoma	10,259	10,061	9,369	9,369	6,631	4,291
Oregon	350	300	300	300	300	300

State	**2026 Baseline**	**SCR Optimization**	**SCR Optimization + SOA CC**	**SCR Optimization + SOA CC + SNCR Optimization**	**SCR Optimization + SOA CC + SNCR Optimization + SCR (Half)/SNCR Retrofit**	**SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit**
Pennsylvania	8,362	8,010	8,010	7,910	7,512	7,158
Rhode Island	279	148	148	148	148	148
South Carolina	4,273	3,531	3,531	3,531	3,531	3,531
South Dakota	509	509	509	509	509	509
Tennessee	4,064	3,983	3,983	3,983	3,983	3,983
Texas	39,684	38,775	38,775	38,542	31,123	23,704
Utah	9,930	9,923	9,923	9,923	6,258	2,593
Vermont	54	54	54	54	54	54
Virginia	3,019	2,855	2,778	2,756	2,565	2,373
Washington	527	257	257	257	257	257
West Virginia	13,185	12,784	12,239	11,958	10,818	9,678
Wisconsin	5,016	5,010	5,010	4,990	4,692	4,394
Wyoming	9,174	9,093	8,499	8,486	6,149	3,811
Total	**298,470**	**277,538**	**273,697**	**271,528**	**223,923**	**177,473**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-6. 2027 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2027 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Alabama	6,268	6,236	6,236	6,236	5,741
Arizona	5,342	5,258	5,188	5,058	3,256
Arkansas	8,728	8,700	8,700	8,700	4,031
California	1,672	1,282	1,282	1,282	1,282
Colorado	4,285	4,208	4,208	4,208	2,860
Connecticut	381	355	355	355	355
Delaware	339	312	312	308	308
Florida	11,297	8,810	8,810	8,810	7,410
Georgia	5,191	5,179	5,179	5,172	5,007
Idaho	240	240	240	240	240
Illinois	6,644	6,575	6,575	6,415	5,363
Indiana	9,468	8,700	8,700	8,698	8,135
Iowa	9,773	9,773	9,773	9,713	4,026
Kansas	5,510	4,763	4,763	4,763	3,112
Kentucky	13,211	12,911	12,472	12,472	7,908
Louisiana	9,628	9,113	9,113	9,017	3,792
Maine	108	86	86	86	86
Maryland	901	850	850	842	842
Massachusetts	287	256	256	256	256
Michigan	7,097	7,094	7,094	7,078	5,691
Minnesota	3,044	2,945	2,945	2,905	1,990
Mississippi	6,022	5,949	5,037	5,037	2,084
Missouri	18,559	11,220	11,220	11,063	7,329
Montana	3,071	3,071	3,071	3,071	1,177
Nebraska	8,247	8,210	8,177	8,177	2,974
Nevada	1,115	1,113	1,113	1,113	1,113
New Hampshire	330	267	267	267	267
New Jersey	915	773	773	773	773
New Mexico	2,029	1,998	1,998	1,998	1,668
New York	3,977	3,912	3,912	3,912	3,388
North Carolina	11,700	8,847	8,847	8,837	6,142
North Dakota	12,246	12,246	12,246	11,436	2,927
Ohio	9,083	7,929	7,929	7,929	7,929
Oklahoma	9,317	9,119	8,427	8,427	3,917
Oregon	350	300	300	300	300
Pennsylvania	8,362	8,010	8,010	7,910	7,158

State	2027 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Rhode Island	279	148	148	148	148
South Carolina	4,273	3,531	3,531	3,531	3,531
South Dakota	509	509	509	509	509
Tennessee	2,747	2,666	2,666	2,666	2,666
Texas	37,261	36,352	36,352	36,119	23,009
Utah	9,930	9,923	9,923	9,923	2,593
Vermont	54	54	54	54	54
Virginia	3,019	2,855	2,778	2,756	2,373
Washington	527	257	257	257	257
West Virginia	13,185	12,784	12,239	11,958	9,678
Wisconsin	3,442	3,436	3,436	3,416	3,416
Wyoming	9,174	9,093	8,499	8,486	3,811
Total	**289,138**	**268,216**	**264,855**	**262,686**	**172,878**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-7. 2028 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2028 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Alabama	6,268	6,236	6,236	6,236	5,741
Arizona	5,117	5,033	4,964	4,834	3,193
Arkansas	8,728	8,700	8,700	8,700	4,031
California	1,672	1,282	1,282	1,282	1,282
Colorado	3,867	3,790	3,790	3,790	2,577
Connecticut	381	355	355	355	355
Delaware	339	312	312	308	308
Florida	10,863	8,489	8,489	8,489	7,089
Georgia	5,191	5,179	5,179	5,172	5,007
Idaho	240	240	240	240	240
Illinois	5,215	5,145	5,145	4,985	4,555
Indiana	8,613	7,845	7,845	7,843	7,280
Iowa	9,773	9,773	9,773	9,713	4,026
Kansas	5,510	4,763	4,763	4,763	3,112
Kentucky	12,839	12,540	12,189	12,189	7,837
Louisiana	9,628	9,113	9,113	9,017	3,792
Maine	108	86	86	86	86
Maryland	901	850	850	842	842
Massachusetts	287	256	256	256	256
Michigan	7,097	7,094	7,094	7,078	5,691
Minnesota	3,044	2,945	2,945	2,905	1,990
Mississippi	4,076	4,003	3,716	3,716	1,752
Missouri	18,559	11,220	11,220	11,063	7,329
Montana	3,071	3,071	3,071	3,071	1,177
Nebraska	8,247	8,210	8,177	8,177	2,974
Nevada	1,115	1,113	1,113	1,113	1,113
New Hampshire	330	267	267	267	267
New Jersey	915	773	773	773	773
New Mexico	2,029	1,998	1,998	1,998	1,668
New York	3,977	3,912	3,912	3,912	3,388
North Carolina	11,700	8,847	8,847	8,837	6,142
North Dakota	12,246	12,246	12,246	11,436	2,927
Ohio	8,047	6,911	6,911	6,911	6,911
Oklahoma	9,317	9,119	8,427	8,427	3,917
Oregon	350	300	300	300	300
Pennsylvania	8,362	8,010	8,010	7,910	7,158

State	2028 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Rhode Island	279	148	148	148	148
South Carolina	4,273	3,531	3,531	3,531	3,531
South Dakota	509	509	509	509	509
Tennessee	2,212	2,130	2,130	2,130	2,130
Texas	33,189	32,280	32,280	32,047	21,623
Utah	9,930	9,923	9,923	9,923	2,593
Vermont	54	54	54	54	54
Virginia	3,019	2,855	2,778	2,756	2,373
Washington	527	257	257	257	257
West Virginia	13,185	12,784	12,239	11,958	9,678
Wisconsin	3,442	3,436	3,436	3,416	3,416
Wyoming	6,722	6,640	6,640	6,627	3,294
Total	**275,363**	**254,572**	**252,518**	**250,349**	**166,688**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

Table B-8. 2029 Ozone Season NO_X Emissions for States at Different Uniform Control Scenarios

State	2029 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Alabama	5,210	5,105	5,105	5,105	4,610
Arizona	5,117	5,033	4,964	4,834	3,193
Arkansas	7,001	6,974	6,974	6,974	3,582
California	1,672	1,282	1,282	1,282	1,282
Colorado	3,348	3,270	3,270	3,270	2,057
Connecticut	381	355	355	355	355
Delaware	339	312	312	308	308
Florida	10,863	8,489	8,489	8,489	7,089
Georgia	3,849	3,837	3,837	3,830	3,665
Idaho	240	240	240	240	240
Illinois	4,170	4,101	4,101	4,050	4,050
Indiana	7,062	6,374	6,374	6,371	5,808
Iowa	9,138	9,138	9,138	9,077	3,549
Kansas	5,510	4,763	4,763	4,763	3,112
Kentucky	11,520	11,221	10,870	10,870	7,392
Louisiana	8,897	8,383	8,383	8,286	3,639
Maine	108	86	86	86	86
Maryland	901	850	850	842	842
Massachusetts	287	256	256	256	256
Michigan	6,063	6,059	6,059	6,044	4,656
Minnesota	2,654	2,618	2,618	2,578	1,663
Mississippi	4,076	4,003	3,716	3,716	1,752
Missouri	18,559	11,220	11,220	11,063	7,329
Montana	3,071	3,071	3,071	3,071	1,177
Nebraska	8,247	8,210	8,177	8,177	2,974
Nevada	882	880	880	880	880
New Hampshire	330	267	267	267	267
New Jersey	915	773	773	773	773
New Mexico	2,029	1,998	1,998	1,998	1,668
New York	3,977	3,912	3,912	3,912	3,388
North Carolina	9,088	6,588	6,588	6,588	5,139
North Dakota	12,246	12,246	12,246	11,436	2,927
Ohio	7,545	6,409	6,409	6,409	6,409
Oklahoma	9,317	9,119	8,427	8,427	3,917
Oregon	350	300	300	300	300
Pennsylvania	6,032	5,680	5,680	5,580	4,828

State	2029 Baseline	SCR Optimization	SCR Optimization + SOA CC	SCR Optimization + SOA CC + SNCR Optimization	SCR Optimization + SOA CC + SNCR Optimization + SCR/SNCR Retrofit
Rhode Island	279	148	148	148	148
South Carolina	3,031	2,804	2,804	2,804	2,804
South Dakota	509	509	509	509	509
Tennessee	1,198	1,198	1,198	1,198	1,198
Texas	30,134	29,225	29,225	28,992	20,635
Utah	9,930	9,923	9,923	9,923	2,593
Vermont	54	54	54	54	54
Virginia	2,578	2,414	2,337	2,334	1,951
Washington	527	257	257	257	257
West Virginia	13,185	12,784	12,239	11,958	9,678
Wisconsin	3,442	3,436	3,436	3,416	3,416
Wyoming	6,722	6,640	6,640	6,627	3,294
Total	**252,584**	**232,812**	**230,758**	**228,728**	**151,697**

Note: All states are included solely for illustrative purposes. Grayed out states are not covered by the program.

As described in Section V of the Preamble, EPA identified $11,000/ton as the level of control stringency for determining significant contribution from EGUs under the Step 3 multifactor test. However, EPA determined that retrofitting post-combustion could not be widely accomplished until the 2026 ozone season. Therefore, Section VI of the Preamble explains that EPA applied the reductions available at the $1,800/ton representative cost threshold for years 2023-2025 to arrive at a budget estimate for those years. Then, starting in 2026, EPA applied the reductions available at the $11,000/ton representative cost threshold to arrive at a budget estimate for that year, though for the 2026 budgets only, EPA used the “SCR (half)” rate for applicable units rather than the rate commensurate with SCR retrofits, as discussed in section VI.A.2.a of the Preamble. Those state-level emissions budgets for the affected states along with the corresponding percent reduction relative to 2021 and the state’s baseline emissions for that year are shown below in Tables B-9 through B-15.[23]

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[23] A table providing state emission budgets for these linked states is provided in Appendix F

Table B-9. OS NO_X: 2023 Emissions Budget and % Reduction

State	2016 OS NO_X (tons)	2021 OS NO_X (tons)	Baseline 2023 OS NO_X (tons)	2023 Budget (tons)	% Reduction from 2021	% Reduction from 2023 Baseline
Alabama	11,612	6,648	6,412	6,379	4%	1%
Arkansas	13,223	8,955	8,955	8,927	0%	0%
Illinois	14,550	11,335	7,721	7,474	34%	3%
Indiana	34,670	14,162	13,298	12,440	12%	6%
Kentucky	25,403	14,571	13,900	13,601	7%	2%
Louisiana	19,615	11,391	9,974	9,363	18%	6%
Maryland	4,471	1,428	1,214	1,206	16%	1%
Michigan	17,632	13,555	10,746	10,727	21%	0%
Minnesota	7,587	5,652	5,643	5,504	3%	2%
Mississippi	7,325	5,790	6,283	6,210	-7%	1%
Missouri	25,255	20,388	20,094	12,598	38%	37%
Nevada	2,275	2,457	2,372	2,368	4%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,912	2%	2%
Ohio	24,205	11,697	10,264	9,110	22%	11%
Oklahoma	12,761	10,470	10,470	10,271	2%	2%
Pennsylvania	31,896	12,785	8,573	8,138	36%	5%
Texas	54,668	42,746	41,276	40,134	6%	3%
Utah	12,955	15,762	15,762	15,755	0%	0%
Virginia	9,833	3,329	3,329	3,143	6%	6%
West Virginia	21,178	14,686	14,686	13,791	6%	6%
Wisconsin	7,946	6,321	6,321	6,295	0%	0%
Total	**368,055**	**239,450**	**222,184**	**208,119**	**13%**	**6%**

Table B-10. OS NO_X: 2024 Emissions Budget and % Reduction

State	2016 OS NO_X (tons)	2021 OS NO_X (tons)	Baseline 2024 OS NO_X (tons)	2024 Budget (tons)	% Reduction from 2021	% Reduction from 2024 Baseline
Alabama	11,612	6,648	6,522	6,489	2%	0%
Arkansas	13,223	8,955	8,955	8,927	0%	0%
Illinois	14,550	11,335	7,555	7,325	35%	3%
Indiana	34,670	14,162	12,218	11,413	19%	7%
Kentucky	25,403	14,571	13,900	12,999	11%	6%
Louisiana	19,615	11,391	9,974	9,363	18%	6%
Maryland	4,471	1,428	1,214	1,206	16%	1%
Michigan	17,632	13,555	10,294	10,275	24%	0%
Minnesota	7,587	5,652	4,197	4,058	28%	3%
Mississippi	7,325	5,790	6,042	5,058	13%	16%
Missouri	25,255	20,388	18,612	11,116	45%	40%
Nevada	2,275	2,457	2,592	2,589	-5%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,912	2%	2%
Ohio	24,205	11,697	9,083	7,929	32%	13%
Oklahoma	12,761	10,470	10,274	9,384	10%	9%
Pennsylvania	31,896	12,785	8,573	8,138	36%	5%
Texas	54,668	42,746	41,276	40,134	6%	3%
Utah	12,955	15,762	15,924	15,917	-1%	0%
Virginia	9,833	3,329	3,019	2,756	17%	9%
West Virginia	21,178	14,686	13,185	11,958	19%	9%
Wisconsin	7,946	6,321	6,321	6,295	0%	0%
Total	**368,055**	**239,450**	**214,624**	**198,014**	**17%**	**8%**

Table B-11. OS NO_X: 2025 Emissions Budget and % Reduction

State	**2016 OS NO_X (tons)**	**2021 OS NO_X (tons)**	**Baseline 2025 OS NO_X (tons)**	**2025 Budget (tons)**	**% Reduction from 2021**	**% Reduction from 2025 Baseline**
Alabama	11,612	6,648	6,522	6,489	2%	0%
Arkansas	13,223	8,955	8,955	8,927	0%	0%
Illinois	14,550	11,335	7,555	7,325	35%	3%
Indiana	34,670	14,162	12,218	11,413	19%	7%
Kentucky	25,403	14,571	13,211	12,472	14%	6%
Louisiana	19,615	11,391	9,717	9,107	20%	6%
Maryland	4,471	1,428	1,214	1,206	16%	1%
Michigan	17,632	13,555	10,294	10,275	24%	0%
Minnesota	7,587	5,652	4,197	4,058	28%	3%
Mississippi	7,325	5,790	6,022	5,037	13%	16%
Missouri	25,255	20,388	18,612	11,116	45%	40%
Nevada	2,275	2,457	2,549	2,545	-4%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,912	2%	2%
Ohio	24,205	11,697	9,083	7,929	32%	13%
Oklahoma	12,761	10,470	10,266	9,376	10%	9%
Pennsylvania	31,896	12,785	8,573	8,138	36%	5%
Texas	54,668	42,746	39,684	38,542	10%	3%
Utah	12,955	15,762	15,924	15,917	-1%	0%
Virginia	9,833	3,329	3,019	2,756	17%	9%
West Virginia	21,178	14,686	13,185	11,958	19%	9%
Wisconsin	7,946	6,321	6,014	5,988	5%	0%
Total	**368,055**	**239,450**	**211,707**	**195,259**	**18%**	**8%**

Table B-12. OS NO$_X$: Preset 2026 Emissions Budget and % Reduction

State	**2016 OS NO$_X$ (tons)**	**2021 OS NO$_X$ (tons)**	**Baseline 2026 OS NO$_X$ (tons)**	**Preset 2026 Budget (tons)**	**% Reduction from 2021**	**% Reduction from 2026 Baseline**
Alabama	11,612	6,648	6,371	6,339	5%	1%
Arkansas	13,223	8,955	8,728	6,365	29%	27%
Illinois	14,550	11,335	6,644	5,889	48%	11%
Indiana	34,670	14,162	9,468	8,410	41%	11%
Kentucky	25,403	14,571	13,211	10,190	30%	23%
Louisiana	19,615	11,391	9,704	6,370	44%	34%
Maryland	4,471	1,428	901	842	41%	7%
Michigan	17,632	13,555	7,790	6,743	50%	13%
Minnesota	7,587	5,652	4,197	4,058	28%	3%
Mississippi	7,325	5,790	6,022	3,484	40%	42%
Missouri	25,255	20,388	18,612	9,248	55%	50%
Nevada	2,275	2,457	1,146	1,142	54%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,650	9%	8%
Ohio	24,205	11,697	9,083	7,929	32%	13%
Oklahoma	12,761	10,470	10,259	6,631	37%	35%
Pennsylvania	31,896	12,785	8,362	7,512	41%	10%
Texas	54,668	42,746	39,684	31,123	27%	22%
Utah	12,955	15,762	9,930	6,258	60%	37%
Virginia	9,833	3,329	3,019	2,565	23%	15%
West Virginia	21,178	14,686	13,185	10,818	26%	18%
Wisconsin	7,946	6,321	5,016	4,990	21%	1%
Total	**368,055**	**239,450**	**196,225**	**151,329**	**37%**	**23%**

Table B-13. OS NO_X: Preset 2027 Emissions Budget and % Reduction

State	2016 OS NO_X (tons)	2021 OS NO_X (tons)	Baseline 2027 OS NO_X (tons)	Preset 2027 Budget (tons)	% Reduction from 2021	% Reduction from 2027 Baseline
Alabama	11,612	6,648	6,268	6,236	6%	1%
Arkansas	13,223	8,955	8,728	4,031	55%	54%
Illinois	14,550	11,335	6,644	5,363	53%	19%
Indiana	34,670	14,162	9,468	8,135	43%	14%
Kentucky	25,403	14,571	13,211	7,908	46%	40%
Louisiana	19,615	11,391	9,628	3,792	67%	61%
Maryland	4,471	1,428	901	842	41%	7%
Michigan	17,632	13,555	7,097	5,691	58%	20%
Minnesota	7,587	5,652	3,044	2,905	49%	5%
Mississippi	7,325	5,790	6,022	2,084	64%	65%
Missouri	25,255	20,388	18,559	7,329	64%	61%
Nevada	2,275	2,457	1,115	1,113	55%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,388	15%	15%
Ohio	24,205	11,697	9,083	7,929	32%	13%
Oklahoma	12,761	10,470	9,317	3,917	63%	58%
Pennsylvania	31,896	12,785	8,362	7,158	44%	14%
Texas	54,668	42,746	37,261	23,009	46%	38%
Utah	12,955	15,762	9,930	2,593	84%	74%
Virginia	9,833	3,329	3,019	2,373	29%	21%
West Virginia	21,178	14,686	13,185	9,678	34%	27%
Wisconsin	7,946	6,321	3,442	3,416	46%	1%
Total	**368,055**	**239,450**	**189,177**	**119,663**	**50%**	**37%**

Table B-14. OS NO_X: Preset 2028 Emissions Budget and % Reduction

State	**2016 OS NO_X (tons)**	**2021 OS NO_X (tons)**	**Baseline 2028 OS NO_X (tons)**	**Preset 2028 Budget (tons)**	**% Reduction from 2021**	**% Reduction from 2028 Baseline**
Alabama	11,612	6,648	6,268	6,236	6%	1%
Arkansas	13,223	8,955	8,728	4,031	55%	54%
Illinois	14,550	11,335	5,215	4,555	60%	13%
Indiana	34,670	14,162	8,613	7,280	49%	15%
Kentucky	25,403	14,571	12,839	7,837	46%	39%
Louisiana	19,615	11,391	9,628	3,792	67%	61%
Maryland	4,471	1,428	901	842	41%	7%
Michigan	17,632	13,555	7,097	5,691	58%	20%
Minnesota	7,587	5,652	3,044	2,905	49%	5%
Mississippi	7,325	5,790	4,076	1,752	70%	57%
Missouri	25,255	20,388	18,559	7,329	64%	61%
Nevada	2,275	2,457	1,115	1,113	55%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,388	15%	15%
Ohio	24,205	11,697	8,047	6,911	41%	14%
Oklahoma	12,761	10,470	9,317	3,917	63%	58%
Pennsylvania	31,896	12,785	8,362	7,158	44%	14%
Texas	54,668	42,746	33,189	21,623	49%	35%
Utah	12,955	15,762	9,930	2,593	84%	74%
Virginia	9,833	3,329	3,019	2,373	29%	21%
West Virginia	21,178	14,686	13,185	9,678	34%	27%
Wisconsin	7,946	6,321	3,442	3,416	46%	1%
Total	**368,055**	**239,450**	**179,467**	**115,193**	**52%**	**36%**

Table B-15. OS NO_X: Preset 2029 Emissions Budget and % Reduction

State	**2016 OS NO_X (tons)**	**2021 OS NO_X (tons)**	**Baseline 2029 OS NO_X (tons)**	**Preset 2029 Budget (tons)**	**% Reduction from 2021**	**% Reduction from 2029 Baseline**
Alabama	11,612	6,648	5,210	5,105	23%	2%
Arkansas	13,223	8,955	7,001	3,582	60%	49%
Illinois	14,550	11,335	4,170	4,050	64%	3%
Indiana	34,670	14,162	7,062	5,808	59%	18%
Kentucky	25,403	14,571	11,520	7,392	49%	36%
Louisiana	19,615	11,391	8,897	3,639	68%	59%
Maryland	4,471	1,428	901	842	41%	7%
Michigan	17,632	13,555	6,063	4,656	66%	23%
Minnesota	7,587	5,652	2,654	2,578	54%	3%
Mississippi	7,325	5,790	4,076	1,752	70%	57%
Missouri	25,255	20,388	18,559	7,329	64%	61%
Nevada	2,275	2,457	882	880	64%	0%
New Jersey	2,463	1,324	915	773	42%	16%
New York	6,534	3,997	3,977	3,388	15%	15%
Ohio	24,205	11,697	7,545	6,409	45%	15%
Oklahoma	12,761	10,470	9,317	3,917	63%	58%
Pennsylvania	31,896	12,785	6,032	4,828	62%	20%
Texas	54,668	42,746	30,134	20,635	52%	32%
Utah	12,955	15,762	9,930	2,593	84%	74%
Virginia	9,833	3,329	2,578	1,951	41%	24%
West Virginia	21,178	14,686	13,185	9,678	34%	27%
Wisconsin	7,946	6,321	3,442	3,416	46%	1%
Total	**368,055**	**239,450**	**164,053**	**105,201**	**56%**	**36%**

3. Variability Limits

Once EPA determined state-emission budgets representative of the control stringency, EPA calculated the minimum variability limits and assurance levels for each state based on the calculated emission budgets. Each state's minimum variability limit is calculated as 21% of its budget, and its assurance level is the sum of its budget and variability limit (or 121% of its budget).[24] The minimum variability limits and assurance levels are further described and shown in section VI of the preamble for this rule. (In a control period where a state's emissions budget is the dynamic budget rather than the preset budget, the variability limit will be computed as a percentage of the dynamic budget rather than a percentage of the preset budget.)

4. Calculating Dynamic Budgets Starting in 2026

The dynamic budgets methodology for 2026 and subsequent years begins with the data reported to CAMD, similar to the engineering analysis used to determine the preset 2023 through 2029 preset state budgets. Dynamic budgets utilize predetermined emission rates (relying on the same historical data and methodology described for the preset emission budgets) for each unit. The dynamic budget methodology differs from the methodology used to determine preset emission budgets in that the dynamic methodology takes that emission rate and multiplies it by heat-input values reported and calculated from the most recent data at the time of calculation (*i.e.*, data not yet available) instead of the most recent data available at time of rule promulgation (*e.g.*, 2021 heat input data) to estimate unit and state emissions (i.e., state emission budgets). Preamble Section VI.B.4.b describes how EPA uses a rolling, multi-year heat input data set to derive a normalized unit-level heat input value. This updating heat input value is the dynamic variable which makes the state emissions budgets dynamic. The dynamic heat inputs are multiplied by preset unit-level emission rates prescribed for each year in the dynamic budget templates in Appendix A: State Emissions Budget Calculations and Engineering Analytics to get an emissions amount for each unit, and the resulting unit-level emissions amounts for all the units in a state are summed to determine the dynamic state-level budget for the year. That Appendix has a worksheet titled "Dynamic Budget 2026 Template", and a second titled "Dynamic Budget 2027+ Template". These worksheets don't show the dynamic budgets for those future years, but they provide the unit-level NO_X rates and the heat input fields to be populated with future data that EPA will use to calculate dynamic budgets for each future year. These worksheets reflect the initial inventory of EGUs used to derive the dynamic ozone season state emissions budget for each control period in 2026 and thereafter.

Inventory of EGUs for determining dynamic budget

- The unit name and corresponding facility detail such as state, ORIS, Boiler, Plant Type are listed in columns A through Q of the "dynamic budget 2026" and "dynamic budget 2027+" worksheets.

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[24] As described in Section VI of the Preamble for this rule, the EPA is finalizing a minimum variability limit of 21%. Starting in the 2023 control period, the variability limit would be the higher of 21 percent or the percentage (if any) by which the total reported heat input of the state's affected EGUs in the control period exceeds the total reported heat input of the state's affected EGUs as reflected in the state's emissions budget for the control period. EPA expects that the minimum 21 percent value would apply in almost all instances.

- The inventory of units in these worksheets reflects EPA's assessment of the future inventory based on current data. It is not an applicability determination, and the eventual inventory of units comprising the dynamic budgets may be slightly expanded (e.g., reflecting new units that come online) or slightly reduced (e.g., reflecting units that have ceased operation) at the time of issuing the dynamic budgets.
- The anticipated inventory of units used to calculate the dynamic budget for each control period is identified as follows:
  - Units that, to the best of EPA's knowledge, are affected under the rule, that reported heat input for the historical control period two years before the year of control period for which the dynamic budget is being calculated (e.g., for calculation of the 2026 budgets, heat input was reported in 2024); and that had a deadline for certification of monitoring systems under § 97.1030(b) by May 1 of that historical control period (e.g., by May 1st of 2024 for the 2026 state budget calculation) will be included in the dynamic budget calculations.[25]
  - New units will be included in the dynamic budget calculations starting with the first control period for which the units have reported a full control period of data following their monitor certification deadlines. For example, a unit with a deadline for certification of monitoring systems under § 97.1030(b) by May 1st of 2024 that reports heat input during the 2024 control period will be included in the 2026 dynamic state budget calculation. EPA will rely on reported CAMD Power Sector Emissions data to identify these units.

Unit-level emission rate, heat input, and emissions data for dynamic budget

- For each of the units identified in the above inventory, EPA populates a pre-determined emission rate. Where available, this rate comes directly from the Engineering Analytic unit-files described above and used in preset budget calculations. EPA applies the emission rate reflecting the selected control stringency. For the "dynamic budget 2026" worksheet, these emission rates come from the "unit 2026" worksheet, and are calculated by dividing the unit-level emissions value from column AN into the unit-level heat input value from column X in the "unit 2026" worksheet. These unit-level emission rate reflects the control stringency identified in EPA's determination of significant contribution applied to these units in 2026. For the "dynamic budget 2027+" worksheet, these emission rates come from column AR in the "unit 2027" worksheet, which are calculated by dividing the unit-level emissions value from column AO into the unit-level heat input value from column X in the "unit 2027" worksheet. The "unit 2026" and "unit 2027" worksheets reflect lower emission rates for some units where post-combustion

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[25] For the 2026 budget calculation, this will generally be the same inventory of units included in the "unit 2026 file" for Group 3 states, except that a unit that actually operates in the 2024 control period will be included in calculating the state's 2026 dynamic budget even if, for purposes of calculating the 2026 preset budgets in this rulemaking, the unit was assumed to be retired in 2026.

control retrofit potential is identified.[26] 2027 reflects full implementation of EPA identified stringency measures, so the rates identified in the "Dynamic Budget 2027+ worksheet will not change to reflect any further stringency level, consequently it will be utilized for each dynamic budget year after 2027 as well.

- There are two types of units (new units, and 2021 non-operating units) for which the above step would not yield an assumed emission rate. Therefore, EPA populates an assumed emission rate based on the following:
    - For new units, EPA applies the following assumed emission rates for well controlled units identified for each generation type as discussed in the EGU NO_X Mitigation Strategies Final Rule TSD[27]:

Applied New Unit Emission Rates for Dynamic Budgets

Unit Type	**Assumed NO_X Emission Rate (lb/MMBtu)**
Coal Steam	0.05
Oil/Gas Steam	0.03
Combustion Turbine	0.011
Combined Cycle	0.011
All other fossil	0.05

    - For 2021 non-operating units (thus lacking any identified emission rate in the "unit 2024" file), EPA applies an emission rate based on that unit's last year in which it had ozone season operating data prior to 2021. These units are flagged as having "substitute data" in the dynamic budget templates. If that rate exceeds the assumed step 3 technology in effect for that year (e.g., SCR optimization in 2026 for a coal steam unit with an existing SCR), then the emission rate will be adjusted down to that level (e.g., 0.08 lb/MMBtu). If these units have no operating data from a prior ozone season, than they would be assigned rates according to the table above.
- These corresponding emission rates for all units are shown in column R of the "dynamic budget 2026", and "dynamic budget 2027+" worksheet.
- Columns T through X in the "dynamic budget" worksheets will reflect the updated heat input for the units as it becomes available. This is the dynamic variable, and it will be populated through future ministerial actions. For instance, these columns would be populated with heat input values from 2020-2024 for the 2026 dynamic budget

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[26] The emission rate for Alabama, Minnesota, and Wisconsin continue to be identified by column AQ at this step as those states are not subject to the post-combustion control stringency assumptions. For any expected unit-level coal-to-gas switch identified in the "Unit 2026" worksheet or later years, the emission rates in the dynamic budget worksheet reflects their expected plant type as of 2025.

[27] Combined cycle and combustion turbines with SCR retrofits can achieve emission rates as low as 0.002 lb/MMBtu (see "Combustion Turbine NOX Technology Memo" (January 2022) EPA-HQ-OAR-2021-0668-0085), although EPA assumes a floor rate of 0.011 lb/MMBtu for this analysis, marching the assumed floor rate used in IPM.

calculation. For the 2027 dynamic budget" worksheet, these columns will be populated with heat input values from 2021-2025, and so forth. and so forth.

- Column Y reflects the average heat input from the highest three heat input values from the five year baseline captured in columns T through X (this is the representative unit-level heat input).

- Column Z reflects the representative unit level heat input from column W divided by the state total of representative unit-level heat inputs.
- Column AA-AC reflect the state's heat input over the last three available and column AD reflects the average of these three years (this is the Representative State Level Heat Input value).[28]
- Column AE reflects the unit's normalized unit-level heat input obtained by multiplying the representative unit-level percent of state total (column Z) by the representative state level heat input (column AD).[29]
- Column AF reflects the unit-level assumed emissions for the purposes of state emissions budget quantification. This value will be obtained by multiplying the emission rate (in column R) by the normalized unit-level heat input value (column AE). The product is divided by 2,000 to convert from pounds to short tons.

Summation of the unit-level emission estimates to derive the given year's dynamic budget

After completing the above steps, the unit-level emission values that will be identified in column AF of each "dynamic budget" worksheet are summed to the state level. These states (those 22 covered for EGU Group 3 under this action) and state-level values (in tons) are displayed in columns AH and AI of the same "dynamic budget" worksheet. These tonnage values in column AI reflect the state dynamic budgets for the given year (starting in 2026). At this step, a rounding function is applied to express the values to the nearest ton. These state dynamic budgets will be calculated and made public approximately 1 year prior to the beginning of the control period for that vintage year (e.g., 2026 dynamic budgets will be announced in summer of 2025) through the schedule identified in Section VI.A of the preamble.

The procedure for computing a state's dynamic emissions budget for a control period can be expressed in terms of the following formula:

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[28] For the 2022 and 2023 state heat input totals, the EPA incorporated heat input adders at this step for Utah and Nevada to reflect the total estimated heat input and emissions from fifteen units that are likely to be considered existing units for purposes of the dynamic budget calculations starting with the 2026 control period but that do not report data under the Acid Rain Program and consequently did not report data for the 2022 control period and are not expected to report data for the 2023 control period. The units and the amounts of ozone season heat input assumed for each unit are listed in preamble Table VI.B.3-1.

[29] This value is left blank for unit that reports no heat input in the year two years before the year of the control period for which the dynamic trading budget is being calculated.

$$DB_P = \sum_{i=1}^{n} \left(\frac{Avg\ HI_i}{\sum_{i=1}^{n} Avg\ HI_i} \times Avg\ HI_S \times ER_i \right)$$

Where:

DB_P = the dynamic emissions budget for a state for control period “p” in pounds;

Avg HI_S = the average of the sum of the total control period heat input values reported under 40 CFR part 75 for all affected units in the state for the control periods in the years two, three, and four years before control period “p” (whether or not the units operated during the control period two years before control period “p”) (This is referred to as the “Representative State-Level Heat Input”);

Avg HI_i = the average of the three highest of the five total control period heat input values reported under 40 CFR part 75 for unit “i” for the control periods in the years two, three, four, five, and six years before control period “p” (excluding any control period that commenced before the unit’s first deadline to begin reporting heat input under 40 CFR part 75 under any regulatory program), or if there are fewer than three non-zero values for the unit from the five control periods, the average of all the non-zero values (This is referred to as the “Representative Unit-Level Heat Input”);

ER_I = the NO_X emissions rate shown for unit “i” and control period “p” in the document “Unit-Specific Ozone Season NO_X Emissions Rates for Dynamic Budget Calculations” posted at www.regulations.gov in docket EPA-HQ-OAR-2021-0668 or, for a unit not listed in that document, the NO_X emissions rate identified according to the type of unit and (where applicable) the type of fuel combusted by the unit during the control period containing the unit’s deadline for certification of monitoring systems for the Group 3 trading program under 40 CFR 97.1030(b) as follows:

- 0.011 lb/MMBtu, for a simple cycle combustion turbine or a combined cycle combustion turbine other than an integrated coal gasification combined cycle unit;
- 0.030 lb/MMBtu, for a boiler combusting only fuel oil or gaseous fuel (other than coal-derived fuel) during such control period; or
- 0.050 lb/MMBtu, for a boiler combusting any amount of coal or coal-derived fuel during such control period or any other unit not covered by the two preceding paragraphs;

p = designator for the control period in a given year;

i = designator for an individual affected unit in the state whose first deadline to begin reporting heat input under 40 CFR part 75 under any regulatory program was on or before May 1 of the control period two years before control period “p” and that reported heat input under 40 CFR part 75 during the control period two years before control period “p”; and

n = number of affected units in the state whose first deadline to begin reporting heat input under 40 CFR part 75 under any regulatory program was on or before May 1 of the control period two years before control period “p” and that reported heat input under 40 CFR part 75 for the control period two years before control period “p”.

C. Analysis of Air Quality Responses to Emission Changes Using an Ozone Air Quality Assessment Tool (AQAT)

EPA has defined each linked upwind state's significant contribution to nonattainment and interference with maintenance of downwind air quality using a multi-factor test (described in the preamble at section V.A-D applying Step 3 of the 4-Step Good Neighbor Framework) which is based on cost, emissions, and air quality factors. A key quantitative input for this analysis is the predicted downwind ambient air quality impacts at various levels of NO_X emission control assessed for upwind EGU and non-EGU sources. The emission reductions associated with the various cost thresholds analyzed for this rule are expected to result in different amounts of air quality improvement at the downwind receptors. The downwind air quality impacts are also used to inform EPA's assessment of potential overcontrol, as discussed in more detail below.

Air quality modeling would be the optimal way to estimate the air quality impacts at each cost threshold level from EGU and non-EGU emissions reductions. However, due to time and resource limitations EPA was unable to use photochemical air quality modeling for all but a few emissions scenarios. Therefore, in order to estimate the air quality impacts for the various levels of emission reductions and to ensure that each step of its analysis is informed by the evolving emissions data, EPA used a simplified air quality assessment tool (AQAT) to interpolate between existing photochemical modeling cases.[30] The simplified tool allows the Agency to analyze many more levels of NO_X control stringency than would otherwise be possible.[31] EPA recognizes that AQAT is not the equivalent of photochemical air quality modeling but in the Agency's view is adequate to this purpose. AQAT is built using air quality modeling data and facilitates the use of existing photochemical air quality modeling estimates.

The use of AQAT to generate "appropriately reliable projections of air qualtiy conditions and contributions" when there is limited time to conduct full-scale photochemical grid modeling was upheld by the D.C. Circuit in *MOG v. EPA*, No. 21-1146 (D.C. Cir. March 3, 2023):,

> Based on the record before us, EPA appears to have chosen analytical techniques rationally connected to the Revised Rule and appropriately explained its use of the linear interpolation and subsequent methods for establishing the Revised Rule. In addition, EPA's methodology did also incorporate photochemical modeling, [petitioner's] preferred technique, as the "foundation for its projections" and "merely layered an additional mathematical function, linear interpolation" over the original projected data to generate 2021 ozone concentrations. EPA then performed further data analysis by checking its 2021 interpolated projection against both a sensitivity analysis and engineering analytics approach.
>
> […] EPA also was cognizant of the CAA's statutory directive that emissions reductions should be done "as expeditiously as practicable." [CAA section 181(a)(1)]. Given the

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[30] EPA used CAMx to model several base cases (i.e., one of 2016, one of 2023, and one of 2026). The EPA calculated air quality contributions for each state for both the 2023 and 2026 cases. In addition, EPA modeled with source apportionment the 2026 final policy control case. At proposal, EPA also modeled the 2026 base case and a 2026 case with air quality contributions where EGU and non-EGU emissions were uniformly reduced by 30%.

[31] As an example, each AQAT estimate under the Step 3 methodology focuses on the specific air quality linkages for an individual receptor and the air quality effects of emission reductions from those specific states. Consequently, for ~700 receptors, each with a specific pattern of states contributing greater than or equal to the 1% threshold, and 6 levels of stringency, this would entail 4,200 individual photochemical air quality modeling simulations to replicate.

> limited amount of time EPA had to complete the rulemaking for the Revised Rule, we discern that EPA reasonably chose to use existing air quality modeling and contribution information to derive an appropriately reliable projection of air quality conditions and contributions in 2021. . . . [I]n the context of the deferential standard afforded EPA, [petitioner] has not established that EPA's linear interpolation method is oversimplified or that the agency has produced unreasonable results.

Midwest Ozone Group v. EPA, No. 21-1146 (D.C. Cir.), Slip Op. at 11 (internal cites omitted). *See id.* (quoting *Appalachian Power Co. v. EPA*, 135 F.3d 791, 802 (D.C. Cir. 1998)) ("[S]o long as EPA 'acted within its delegated statutory authority, . . . we will not interfere with its conclusion." (quoting *Ethyl Corp. v. EPA*, 51 F.3d 1053, 1064 (D.C. Cir. 1995)).

In this rulemaking, as in the Revised CSAPR Update, the Agency also determines there is utility in the AQAT methodology for estimating downwind air quality impacts for various NO_X emission reduction strategies, particularly in light of the timing considerations explained in the preamble in section IV.A. As explained above, assessing downind air quality impacts using CAMx photochemical air quality modeling would require running hundreds, if not thousands, of time-and resource-intensive simulations. In comparison to the AQAT tool used to support Revised CSPAR Update, the EPA has updated the AQAT tool using the most recent air quality modeling available and improved the tool by making it more state-specific as explained in more detail section C.2 of this TSD. And, using AQAT, the EPA conducted the same types of sensitivity analyses generated to support the Revised CSPAR Update (sections C.3, C.4, and Appendix J) as well as some additional sensitivity analyses (Appendices H and K). The results of these sensitivity analyses confirm the reliability of EPA's assessment of downwind air quality impacts using the AQAT tool for this rulemaking.

AQAT has evolved through iterative development under the original CSAPR, the CSAPR Update, and the Revised CSAPR Update. One evolution was incorporating a second source apportionment photochemical modeling emissions case in order to improve the interpolation. This was done by aligning the change in air quality concentration with the change in emissions using a calibration factor. This creates a specific calibration factor for each state for each receptor, rather than a single calibration factor uniformly to states for each receptor. EPA examined several emissions scenarios for the year 2026 using two different calibration factors as a mechanism to estimate the range of results.

The inputs and outputs of the tool can be found in the "Ozone_AQAT_Final.xlsx" excel workbook.[32]

The remainder of section C of this document will:

- Present an introduction and overview of the ozone AQAT;
- Describe the construction of the ozone AQAT; and
- Provide the results of the NO_X emissions cost threshold analyses.

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[32] The AQAT estimates in the workbook are based on EGU emission estimates completed on Jan 20, 2023 and may not represent the final emission estimates used in the rule.

1. Introduction

The ozone AQAT was developed for use in the Step 3 air quality analysis as part of the multi-factor test. Specifically, the AQAT was designed to evaluate air quality improvements in response to emissions changes, allowing evaluation of total air quality improvement at each receptor, an assessment of whether each receptor is above or below the NAAQS, and an assessment of each state's air quality contribution relative to the linkage threshold. EPA described and used a similar tool in the original CSAPR to evaluate good neighbor obligations with respect to the ozone and fine particulate matter ($PM_{2.5}$) NAAQS and in both the CSAPR Update and final Revised CSAPR Update to evaluate good neighbor obligations with respect to ozone. For the CSAPR Update, EPA refined the construction and application of the assessment tool to improve estimates of changes in ozone concentrations in response to changes in NO_X emissions. This methodology was used again in the Revised CSAPR Update. Here, we extend the methodology developed in the CSAPR Update rulemaking to calibrate the response of a pollutant using two CAMx simulations at different emission levels where we have full sets of state level emissions and contribution data.[33,34]

A critical factor in the assessment tool is the establishment of a relationship between ozone season NO_X emission reductions and reductions in ozone. Within AQAT, on a state-by-state and receptor-by-receptor basis, we assume that the reduction of a ton of emissions of NO_X from the upwind state results in a particular level of improvement in air quality downwind.[35] For the purposes of developing and using an assessment tool to compare the air quality impacts of NO_X emission reductions under various emission reduction cost threshold scenarios, we determine the relationship between changes in emissions and changes in ozone contributions on a state-by-state and receptor-by-receptor basis. Specifically, EPA assumed that, within the range of total NO_X emissions being considered (as defined by the cost threshold emission scenarios), a change in ozone season NO_X emissions leads to a proportional change in downwind ozone contributions.[36] This proportional relationship was then modified using calibration factors based on state-specific source apportionment (i.e., contribution) air quality modeling from proposal (the 2026 base case and the sector-specific reduction scenario where the 2026 base case EGU and non-EGU NO_X emissions were reduced by 30% in each state). At final, the air quality contributions from these two air quality modeling scenarios from proposal were reassessed, with the contributions recalculated based on the contribution days identified in the 2023 final rule contribution modeling. These "primary" calibration factors were used for all scenarios at final.

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[33] In CSAPR, we estimated changes in sulfate using changes in SO_2 emissions.

[34] In this rule, we used CAMx to calibrate the assessment tool's predicted change in ozone concentrations to changes in NO_X emissions. This primary calibration is state and receptor-specific and is derived using air quality modeling from the proposed rule based on the changes in NO_X emissions and resulting ozone concentrations between the 2026 base case and a 2026 control scenario where EGU and non-EGU emissions were simultaneously reduced by 30%. As a sensitivity assessment, we used the alternative state and receptor-specific calibrations using the state and receptor specific differences in air quality contributions and emissions between the 2026 base case and the 2023 base case.

[35] As discussed in more detail in section C.5 of this TSD.

[36] As discussed in more detail in section C.4 of this TSD.

Additionally, the 2023 and 2026 base case contribution modeling results from the final rule were utilized to create an independent set of "alternative" calibration factors that were used, in turn, to assess the AQAT results created using the primary calibration factors (see section C.4 of this TSD for more details of this assessment). Since these "alternative" calibration factors are based on reductions from multiple source sectors that changed between 2023 and 2026 (e.g., mobile sources and all other anthropogenic sources of NO_X), an AQAT using these "alternative" factors could be used to evaluate cases that included emissions reductions outside of the EGU and non-EGU sectors. Since the primary calibration factors are based exclusively on emissions reductions from the source sectors being regulated in this rule and exclude emission reductions from sectors that are not being regulated (and which may have different emissions patterns and emissions release heights), EPA elected to use the primary calibration factors for the AQAT-based assessment for Step 3 and for its overcontrol assessment. Section C.5 describes the factors and assumptions that affect the calibration factors.

The calibration factors are designed for the purpose of adjusting the ozone response in response to emissions changes in order to reflect the non-linear, non-one-to-one proportional relationship between changes in NO_X emissions and the associated changes in ozone. For example, given a particular state and receptor in 2026, we could assume that a 20% decrease in an upwind state's emissions leads to a 20% decrease in its downwind ozone contribution in the "uncalibrated" ozone AQAT, while following the application of the primary calibration factor the downwind ozone contribution may only decrease by 10% in "calibrated" AQAT (where the calibration factor is 0.5). Typically, the calibration factors were substantially less than one, often to the order of 0.3, for the downwind states containing the receptors, (thus, a 10% decrease in emissions from a particular state would result in a 3% decrease in the ozone contribution from that state), while the calibration factors for upwind states farther from the downwind receptor increased to values around 1 (where a 10% reduction in emissions would result in a 10% decrease in ozone contribution from the emitting state). Consequently, in a relative sense (i.e., on a percentage basis), emission reductions from farther away states are more-effective than states near the receptor in reducing that state's contribution,[37] The reason for this relationship is the difference in the chemical state of the emissions as they cycle between NO_X and ozone due to encounters with various oxidative/reductive chemical regimes and meteorological conditions during transport. The creation of the calibration factors is described in detail in section C.2.c (1) of this TSD.

Section C.2, below, is a technical explanation of the construction of the ozone AQAT. Readers who prefer to access the results of the analysis using the ozone AQAT are directed to section C.3.

In summary, EPA conducted a variety of AQAT scenarios[38] summarized in the table below to inform its primary Step 3 evaluation. The results discussed in the remainder of the document pertain to the scenarios described in Table C-1, which reflect alternative views of future emissions. Each of these scenarios was examined using two configurations of AQAT where the patterns of reductions were adjusted between a single-receptor oriented "Step 3"

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[37] The CAMx photochemical modeling used to create the state- and receptor-specific calibration factors (that was developed in this rule) allows EPA to make this observation.

[38] EPA uses the word scenario and case interchangeably, referring to a cost threshold level of OS NO_X emissions reductions from EGUs and non-EGUs.

configuration (the approach used in Step 3) and a full geography control configuration (where the overall effects of the rule are applied to all receptors). The "Full Geography" configuration results are shown in Appendix D. Next, we examined the results when a separate calibration approach was applied.

Table C-1 – Summary of Scenarios Evaluated with AQAT

Scenario	Summary
$0	Baseline
$1,600	Baseline + SCR optimize
$1,600	Baseline +SCR optimize + SOA CC
$1,800	Baseline +SCR/SNCR optimize
$1,800	Baseline +SCR/SNCR optimize + SOA CC
$11,000 (i.e., "Full Step 3, EGU only")	Baseline +SCR/SNCR optimize + SOA CC + SCR Retrofit
$11,000 +_ non-EGUs (i.e., "Full Step 3")	Baseline +SCR/SNCR optimize + SOA CC + SCR Retrofit + non-EGUs
$1,800 +_ non-EGUs	Baseline +SCR/SNCR optimize + SOA CC + non-EGUs
CAMx AQ Modeling Final Rule Policy Control	Emission levels associated with the CAMx photochemical AQ modeling of the final rule policy control scenario.
$0 w/IRA	Baseline + delta in emissions between IPM base and IPM base w/IRA
$11,000 w/IRA	Baseline +SCR/SNCR optimize + SOA CC + SCR Retrofit + delta in emissions between IPM final policy and IPM final policy w/IRA
$11,000 +_ non-EGUs w/IRA	Baseline +SCR/SNCR optimize + SOA CC + SCR Retrofit + non-EGUs + delta in emissions between IPM final policy and IPM final policy w/IRA

*All "baseline" references entail Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs.
All non-EGU scenarios were only evaluated in 2026.
"Non-EGUs" in the context of this TSD refer to the suite of emissions controls and emissions reductions identified at Step 3 for all of the non-EGU industries.

Configuration and Calibration Factor Sensitivities: For each scenario above, EPA ensured the robustness of its finding by doing the analysis with its "Primary" calibration approach as well an "Alternative" AQAT calibration approach.

> *Primary Calibration* – state- and monitor-specific calibrations created using the relationships between NO_X emissions reductions and air quality improvements derived using the 2026 base case and 2026 reduction case (where EGUs and non-EGUs had their emissions reduced by 30%). Both of these model runs were done at proposal.
>
> *Alternative AQAT Calibration* - state- and monitor-specific calibrations created using the relationships between NO_X emissions reductions and air quality improvements derived

using the 2023 base case and 2026 base cases (where source sectors across the emissions inventory made reductions). Results from this calibration are discussed in Section C.4.

We also performed sensitivities for each of the rows in Table C-1 reflecting two different approaches to assessing the effects of the rule, which we will refer to as "configurations." These approaches are summarized here and further discussed in section C.2.(c).2 below.

Step 3 Configuration - For the "Step 3" configurations, all states that contributed at or above 1% of the NAAQS to a *particular* monitor in the air quality modeling base case for the year being analyzed (either 2023 or 2026), as well as the state containing the monitor were simultaneously adjusted to the emission levels for each of the scenarios in Table C-1. At that particular monitor all other states were adjusted to the engineering base case level. This approach forms our primary analysis, the results of which are discussed in the preamble of the final rule.

Full Geography Configuration - For the "Full Geography" configuration, all states that were linked to any receptor in the 2023 or 2026 base cases (i.e., only states included in the rule), but no other states[39], were simultaneously adjusted to the emission levels for each of the scenarios in Table C-1. This approach presents an alternative way of thinking about the effect of the rule, in a more holistic way, but this approach introduces a "who goes first" problem and the potential for capturing incidental overcontrol resulting from emissions reductions in states not linked to a particular receptor above 1% of the NAAQS. The results of the "full geography" configuration are shown in Appendix D.

2. Details on the construction of the ozone AQAT for this rule

(a) Overview of the ozone AQAT

This section describes the step-by-step development process for the ozone AQAT. All the input and output data can be found in the Excel worksheets described in Appendix B. In the ozone AQAT, EPA links state-by-state NO_X emission reductions (derived from the photochemical model, the non-EGU assessment and/or the IPM EGU modeling combined with the EGU engineering assessment) with 2026 CAMx modeled ozone contributions in order to estimate ozone concentrations at monitoring sites associated with different levels of emissions control for each of the scenarios described in Table C-1.

In applying AQAT to analyze air quality improvements at a given receptor for the Step 3 configuration analyzing each of the cost-threshold scenarios, emissions were reduced in only those upwind states that were "linked" to that receptor in step 2 of the Good Neighbor Framework (i.e., those states that contributed an air quality impact at or above 1 percent of the NAAQS). Emissions were also reduced in the state that contained that receptor (regardless of the

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[39] For the purposes of the AQAT "Full Geography" estimates, we included California as being included in the rule and making any available reductions. See the preamble section I for how this state is treated in the rule.

level of that state's contribution or whether that state was linked to another state) at a level of control stringency consistent with the stringency level applied in upwind states.[40]

Specifically, the key estimates from the ozone AQAT for each receptor are:

- The ozone contribution as a function of emissions at each cost threshold scenario, for each upwind state contributing above the 1 percent air quality threshold and the state containing the receptor.
- The ozone contribution under engineering analysis base case NO_X emissions in the various years, for each upwind state that is not above the 1 percent air quality threshold for that receptor.
- The non-anthropogenic (i.e., background, boundary, biogenic, and wildfire) ozone concentrations. These are assumed to vary linearly in direct proportion to the total anthropogenic contribution change relative to the total change in these components between the 2026 final base case source apportionment modeling and the 2023 final base case source apportionment modeling scenario.[41]

The results of the ozone AQAT Step 3 analysis for each emissions scenario can be found in section C.3 of this document. The results for the "full geography" configuration can be found in Appendix D.

(b) Data used to construct the ozone AQAT for this rule

Several air quality modeling and emissions inventory sources were used to construct the calibrated ozone AQAT for this rule. As described in the Air Quality Modeling TSD, EPA performed contribution modeling for 2023 and 2026 using base case emissions to quantify the amount of ozone formed from several source "tags." In the modeling for 2023 and 2026, EPA tagged anthropogenic emissions from each state individually as well as total anthropogenic emissions from Canada and Mexico combined, offshore drilling platforms and shipping, wild and prescribed fires, lightning, biogenic sources, and initial/boundary conditions (which represent the net contribution from all sources outside the modeling domain). In addition, at proposal, EPA also performed state-specific contribution modeling for a 2026 scenario in which EGU and Non-EGU NO_X emissions were reduced by 30 percent. Note that the 2026 base case emissions for air quality modeling at proposal used IPM emission estimates. In the ozone AQAT, any emission differences between the 2026 air quality modeling base case and a scenario would result in changes in air quality contributions and ozone concentrations at the downwind monitors. The emission inventories used in the air quality modeling for the 2023 and 2026 base case are

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[40] In this Step 3 configuration, EPA assumes that the downwind state will implement (if it has not already) an emissions control strategy for their sources that is of the same stringency as each upwind control strategy examined in the scenario. Under this approach, EPA accounts for what may be considered the downwind state's "fair share."

[41] In previous versions of AQAT, EPA has held these components constant at the base case levels. The emissions are held constant in the photochemical modeling for the various cases, so changes in the resulting contributions are a result of changing chemistry. In the photochemical modeling, we observe that these AQ contributions change in response to changing chemistry in response to changes in anthropogenic emissions and contributions from the states. In other words, the anthropogenic emission changes result in slightly different chemistry that affects the nonanthropogenic contributions. The impact of the change is usually a small fraction of a ppb.

discussed in the Final Rule Emissions Modeling TSD Preparation of Emissions Inventories for the 2016v3 North American Emissions Modeling Platform[42] while the inventories from proposal are discussed in the TSD Preparation of Emissions Inventories for 2016v2 North American Emissions Modeling Platform and in the Air Quality Modeling TSD used at proposal (Docket ID: EPA-HQ-OAR-2021-0668-0099). Finally, for each of the EGU and non-EGU scenarios examined with the AQAT, the EGU and non-EGU emissions were created from the engineering analysis emission inventory described in section B. The ozone season NO_X EGU and non-EGU emissions for each emission scenario including the base case as modeled in AQAT are described in section C of this TSD.

(c) Detailed outline of the process for constructing and utilizing the ozone AQAT

The ozone AQAT was created and used in a multi-step process. In brief, the ozone AQAT was created using the contributions and emissions inventory from the 2023 and 2026 base case air quality modeling from the final rule as well as the relationships between emissions reductions and air quality improvements derived using the 2026 base case and 2026 30% NO_X reduction cases from proposal. This primary-calibration AQAT was used to evaluate all policy scenarios listed in Table C-1. As a first step, EPA developed calibration factors to account for the nonlinear response of ozone to NO_X reductions. To calculate the expected change in ozone for each emissions cost threshold scenario evaluated, EPA identified the fractional change in anthropogenic NO_X emissions relative to the 2026 base case in each state from the final rule and then multiplied this fractional change by the state and receptor-specific primary calibration factor as well as by the state- and receptor-specific contribution from the final rule. This resulted in a state- and receptor-specific "calibrated change in contribution" relative to the 2026 base case from the final rule. Each state's change in contribution value was then added to its 2026 base case contribution and the results summed for all states for each receptor.[43] Next, the receptor-specific base case contributions from the other source-categories[44] were added to the sum of each state's contribution. Note that the contributions from these other source categories were modified according to the ratio of the total change in anthropogenic contribution from the 2026 base. This was accomplished by taking the ratio of the change in nonstate contribution to the change in state contribution between the 2026 base and the 2023 scenario and multiplying it (the ratio) by the expected change in total state contribution. This accounted for the interaction between changes in US anthropogenic emissions and ozone, principally formed from these other categories. Summing up all the contributions, the net result of these calculations is an estimated average design value for each receptor that reflects the emissions changes associated with each scenario evaluated.[45]

This primary-calibrated ozone AQAT was used to project the ozone concentrations for each level of NO_X control stringency as implemented through emission budgets on a state-by-

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[42] https://www.epa.gov/air-emissions-modeling/2016-version-3-technical-support-document

[43] In some cases (where emissions are lower than modeled in the 2026 base case) the change in contribution can be negative.

[44] The other source categories include contributions from anthropogenic emission from Canada and Mexico, offshore drilling platforms and shipping, wild and prescribed fires, biogenic emissions, lightning, and initial/boundary conditions which represent the net contribution from all sources outside the modeling domain.

[45] Details on procedures for calculating average and maximum design values can be found in the Air Quality Modeling TSD.

state and receptor-by-receptor basis for every monitor throughout the modeling domain. EPA conducted these runs using both the Step 3 configuration approach and the Full Geography configuration approach. The results using the primary calibration approach for the Step 3 Cases are presenting in Section C.3 of this document. The results of the primary calibration approach for the Full Geography Cases are in Appendix D.

(1) Steps to create the primary calibration factors

The process for creating the calibration factors follows the basic premise of the approach used in the CSAPR Update and Revised CSAPR Update, but is updated to make the factors state as well as receptor specific.

For the primary approach, for each state, EPA summed the ozone season total anthropogenic NO_X emissions across all relevant source sectors for the 2026 base case and 2026 30% EGU and non-EGU NO_X reduction case from proposal. For each state, EPA calculated the "fractional reduction ratio" as the ratio of the difference in anthropogenic emissions relative to the total anthropogenic emissions for its 2026 base case. In other words, the difference in emissions in the fractional reduction ratio consists of OS anthropogenic NO_X emissions in the 2026 30% NO_X reduction case from proposal minus the OS NO_X in the 2026 base case from proposal. This difference in tons is then divided by the 2026 base case emissions from proposal, resulting in a "fractional reduction" for the 30% NO_X reduction case. The total anthropogenic emissions data and resulting fractional reduction ratios can be found in Table C-2 and in the ozone AQAT worksheet titled "calib_emiss_f" in the "Ozone_AQAT_final.xlsx" workbook.

In order to facilitate understanding the next steps of the calibration process for the primary approach, EPA describes below a demonstrative example: the Westport monitor number 090019003 in Fairfield County, Connecticut, with a 2026 base case projected ozone average design value of 74.6 parts per billion (ppb) and maximum design value of 74.8 ppb. The air quality modeling contributions for this receptor for the various modeled cases are included in Table C-2.

For each monitor, the "uncalibrated" change in contribution from each upwind state (Table C-2 for Westport) was found by multiplying each state's 2026 base case ozone contribution by the reduction fraction ratio (i.e., the difference in emissions as a fraction of the 2026 base case emissions). The equation for these calculations is shown in equation 1.

Uncalibrated ozone change in air quality contribution = 2026 base case contribution from proposal x ((2026 30 NO_X *case anthropogenic emissions from proposal – 2026 base case anthropogenic emissions from proposal)/2026 base case anthropogenic emissions from proposal) Eqn C-1*

Thus, when the 2026 30% NO_X reduction case had lower emissions than the 2026 base case, the net result was a negative number. Then, each state's fractional change in emissions ratio was multiplied by its 2026 base case contribution to get a state-specific change in contribution (Table C-2). For each state, this change in concentration reflects its total "uncalibrated" change.

Table C-2. The Primary Approach for Creating Calibration Factors Illustrated Using Air Quality Modeling from Proposal for the Westport Monitor Number 090019003 in Fairfield County, Connecticut.

	A	B	C	D	E	F	G	H
State	**Modeled 2026 Base Case NO_X Emissions**	**Modeled 2026 30% EGU/non-EGU Reduction NO_X Emissions**	**2026 Fractional Reduction in Emissions Ratio ((Column B-Column A)/ Column A)**	**Westport 2026 Base Case Ozone Contributions**	**Westport 2026 30% NO_X Cut Ozone Contributions**	**Uncalibrated AQAT Ozone Change (Column C* Column D)**	**Modeled Ozone Change (Column E - Column D)**	**Calibration Factor for EGUs and non-EGUs (Column G/Column F)**
Alabama	61,759	52,853	-0.14	0.105	0.095	-0.015	-0.010	0.67
Arizona	33,463	32,313	-0.03	0.012	0.012	0.000	0.000	0.60
Arkansas	39,488	35,333	-0.11	0.137	0.127	-0.014	-0.010	0.69
California	133,629	127,270	-0.05	0.032	0.031	-0.002	-0.001	0.67
Colorado	49,825	45,877	-0.08	0.051	0.048	-0.004	-0.003	0.85
Connecticut	10,887	10,256	-0.06	2.762	2.777	-0.160	0.015	-0.09
Delaware	6,447	6,135	-0.05	0.421	0.408	-0.020	-0.012	0.61
District of Columbia	1,302	1,245	-0.04	0.037	0.036	-0.002	-0.001	0.53
Florida	92,166	84,786	-0.08	0.063	0.058	-0.005	-0.004	0.88
Georgia	60,266	55,302	-0.08	0.140	0.133	-0.012	-0.007	0.61
Idaho	17,321	16,296	-0.06	0.023	0.023	-0.001	-0.001	0.58
Illinois	91,069	83,536	-0.08	0.634	0.611	-0.052	-0.023	0.44
Indiana	68,291	59,091	-0.13	0.930	0.875	-0.125	-0.054	0.43
Iowa	41,049	36,033	-0.12	0.119	0.110	-0.014	-0.009	0.59
Kansas	59,107	53,798	-0.09	0.091	0.087	-0.008	-0.005	0.56
Kentucky	50,887	43,739	-0.14	0.847	0.762	-0.119	-0.085	0.72
Louisiana	100,361	86,348	-0.14	0.250	0.226	-0.035	-0.024	0.70
Maine	12,918	11,982	-0.07	0.006	0.006	0.000	0.000	0.57
Maryland	23,671	22,513	-0.05	1.089	1.064	-0.053	-0.024	0.45
Massachusetts	26,353	25,321	-0.04	0.064	0.063	-0.003	-0.002	0.69
Michigan	75,940	66,736	-0.12	1.339	1.254	-0.162	-0.085	0.52
Minnesota	55,972	49,439	-0.12	0.158	0.144	-0.018	-0.014	0.76
Mississippi	33,156	29,336	-0.12	0.096	0.088	-0.011	-0.007	0.65
Missouri	67,664	60,958	-0.10	0.288	0.268	-0.029	-0.020	0.71
Montana	25,642	23,333	-0.09	0.064	0.059	-0.006	-0.005	0.91
Nebraska	38,322	34,126	-0.11	0.057	0.054	-0.006	-0.004	0.59
Nevada	16,178	14,980	-0.07	0.010	0.010	-0.001	-0.001	0.72
New Hampshire	6,719	6,596	-0.02	0.016	0.016	0.000	0.000	0.14
New Jersey	31,805	30,607	-0.04	8.023	8.079	-0.302	0.057	-0.19
New Mexico	62,210	58,527	-0.06	0.045	0.043	-0.003	-0.002	0.75
New York	65,642	61,970	-0.06	13.288	13.198	-0.743	-0.090	0.12
North Carolina	51,986	46,303	-0.11	0.389	0.360	-0.043	-0.029	0.68
North Dakota	55,294	52,126	-0.06	0.077	0.074	-0.004	-0.003	0.75
Ohio	78,681	70,003	-0.11	1.947	1.814	-0.215	-0.133	0.62
Oklahoma	83,411	76,046	-0.09	0.139	0.131	-0.012	-0.008	0.66
Oregon	29,345	27,680	-0.06	0.024	0.023	-0.001	-0.001	0.69
Pennsylvania	103,565	95,081	-0.08	6.581	6.211	-0.539	-0.370	0.69
Rhode Island	4,187	4,011	-0.04	0.008	0.008	0.000	0.000	0.59
South Carolina	38,939	34,839	-0.11	0.154	0.144	-0.016	-0.010	0.62
South Dakota	11,084	10,494	-0.05	0.036	0.035	-0.002	-0.001	0.40
Tennessee	47,475	43,303	-0.09	0.254	0.243	-0.022	-0.011	0.51
Texas	280,717	261,613	-0.07	0.490	0.469	-0.033	-0.021	0.62
Utah	29,762	26,807	-0.10	0.026	0.025	-0.003	-0.002	0.69
Vermont	3,378	3,363	0.00	0.011	0.011	0.000	0.000	-2.51
Virginia	46,496	43,302	-0.07	1.135	1.097	-0.078	-0.038	0.49
Washington	47,754	45,338	-0.05	0.043	0.042	-0.002	-0.001	0.45
West Virginia	39,500	35,285	-0.11	1.236	1.139	-0.132	-0.098	0.74
Wisconsin	41,032	37,456	-0.09	0.176	0.167	-0.015	-0.008	0.54
Wyoming	32,928	28,322	-0.14	0.061	0.054	-0.009	-0.007	0.79
Tribal Data	4,052	3,352	-0.17	0.002	0.002	0.000	0.000	0.99

Table C-3. The Total Anthropogenic NO_X Emissions (tons) used in the CAMx Photochemical Modeling for the Final 2026 and 2023 Base Cases.

State	Modeled 2026 Base Case NO_X Emissions (final)	Modeled 2023 Base Case NO_X Emissions (final)
Alabama	56,096	62,236
Arizona	35,514	45,689
Arkansas	44,639	48,316
California	137,932	143,158
Colorado	49,742	53,682
Connecticut	10,201	11,320
Delaware	6,492	7,001
District of Columbia	1,057	1,158
Florida	88,786	99,464
Georgia	61,626	74,320
Idaho	17,024	19,977
Illinois	84,913	93,730
Indiana	70,963	80,266
Iowa	46,523	51,561
Kansas	56,844	62,841
Kentucky	49,829	54,497
Louisiana	98,585	105,825
Maine	13,617	15,739
Maryland	23,023	25,546
Massachusetts	28,194	30,375
Michigan	69,697	74,659
Minnesota	55,848	63,850
Mississippi	32,407	37,544
Missouri	68,407	78,783
Montana	25,336	28,391
Nebraska	42,355	47,930
Nevada	18,043	23,066
New Hampshire	6,830	7,514
New Jersey	31,368	34,030
New Mexico	70,923	73,072
New York	64,616	69,157
North Carolina	55,518	65,920
North Dakota	69,173	73,341
Ohio	75,421	81,856
Oklahoma	77,225	85,520
Oregon	28,271	31,783
Pennsylvania	87,453	100,143
Rhode Island	4,172	4,601
South Carolina	40,161	44,381
South Dakota	12,372	14,390
Tennessee	46,637	55,463
Texas	299,134	332,363
Utah	31,387	40,748
Vermont	3,447	3,960
Virginia	45,636	51,041
Washington	46,143	52,545
West Virginia	45,466	47,380
Wisconsin	41,877	49,713
Wyoming	35,517	41,055
Tribal Data	5,522	5,976

Next, the state- specific ozone responses under the 2026 30% NO_X reduction case from the CAMx modeling from proposal was used to derive the primary calibration factors and calibrate the ozone AQAT. The calibration factors were calculated by taking the change in modeled ozone from CAMx and dividing by the change in ozone predicted by the uncalibrated AQAT (Eqn. C-1). This resulted in state- specific calibration factors (see Table C-2 for an example calculation of the primary calibration factors using the Westport CT monitor 090019003 in Fairfield County). This procedure was separately repeated for each monitor, with the result being state- and monitor-specific calibration factors.

The use of these state- and monitor-specific calibration factors provided EPA with the ability to align the ozone response predicted by the "uncalibrated" ozone AQAT to the ozone response predicted by CAMx. In other words, this provides EPA with a method to systematically interpret the existing CAMx air quality modeling data. Following the creation of the "primary" calibration factors, EPA created a set of "alternative" set of calibration factors using the source apportionment modeling of the 2023 and 2026 base cases from the final rule following the procedure outlined here (section C.4 for results comparing the primary and alternative approaches for select scenarios).

The ozone AQAT calibration factors for all monitors can be found in the "Ozone_AQAT_Final.xlsx" excel workbook in columns I through BF, on worksheets "primary_calibration" and "alternative_calibration" for the primary and "alternative" calibration scenarios, respectively. The calibration factor, when multiplied by an "uncalibrated" air quality change results in a "calibrated" change in air quality contribution. The "uncalibrated" air quality change is calculated by taking the fractional change in emissions ratio for a scenario and multiplying that by the state-specific air quality contributions.

The final step in the creation of a calibrated AQAT is to develop an adjustment approach for the non-anthropogenic air quality contributions that are not being directly varied within the AQAT – and that generally have constant emissions for all cases. While the emissions are constant, the air quality contributions from these sources do vary slightly as the chemistry throughout the domain changes in response to anthropogenic emissions changes from the states. The adjustment approach affects the air quality contributions from Canada and Mexico, offshore drilling platforms and shipping, wild and prescribed fires, lightning, biogenic sources, and initial/boundary conditions (i.e., "all other" contributions). In previous versions of AQAT, these contributions were held fixed at the base case values. For this final rule, because we have full source apportionment estimates for both cases used in the calibration process, we are able to adjust these contributions by relating their change to a change in the anthropogenic contributions. We do this based on multiplying the change in the total anthropogenic contributions from the states between the scenario and the base case by the ratio of the change from the sum of the "all other" contributions divided by the change in the total anthropogenic contribution from the base and calibration cases. For example, at the Westport CT receptor, the difference between the 2026 base case and the 2023 base case was -0.113 ppb for "all other" contributions and 2.113 ppb for the anthropogenic contributions, resulting in a ratio of -0.053. In other words, a 1 ppb increase in the anthropogenic contribution could be expected to result in a 0.053 ppb decrease in the contribution from the "all other" emissions (even though these emissions have not changed).

As an example application of this adjustment, in the 2026 engineering base case using the primary version of AQAT, the total anthropogenic contribution was 42.5145 (compared to a 2026 modeled base case value of 42.22 ppb). The difference between the engineering base case of the total anthropogenic emissions and the modeled base case values were then multiplied by the resultant ratio above to get a calibrated change in the “all other” contributions of -0.0157 ppb. Thus, the “all other” contribution changed from the 2026 modeled base case value of 29.08054 ppb to an engineering base case value of 29.0648 ppb.

(2) Create a calibrated version of the ozone AQAT for emission control stringency level analysis for the rule

EPA examined the changes in the 2026 air quality contributions due to changes in EGU and non-EGU emissions for various scenarios relative to the final 2026 base case emissions (while using the calibration factors). The AQAT, as calibrated above, was used for each emissions cost threshold level evaluated for EGUs and non-EGUs (see Table C-1 for the list and description of the scenarios). For 2023 simulations, EPA calculated a calibrated change in contribution that was then applied to the 2023 contributions. In 2023, the calibrated change in contribution was found by taking the change in emissions from the 2023 final base case to the 2023 cost threshold level and dividing this emissions change by the 2026 base case emission level. The emissions for 2023 and 2026 photochemical modeling base cases can be found in Table C-3. This fractional emission change was then multiplied by the 2026 contribution and the calibration factor.

For each scenario in AQAT, we assembled a complete NO_X emission inventory representing all anthropogenic sources for each state for each year. This inventory is composed of the EGU inventory and the remaining portion of the inventory. As described in sections A and B of this TSD regarding an important component of the total EGU emission inventory, EPA identified various cost threshold levels of emissions (i.e., scenarios) based on potential changes in emissions rates and adjusted historical data. The remaining portion of the total anthropogenic NO_X emission inventory (excluding the EGU emissions) are presented in Table C-4 for each state and year.

The total EGU point emissions inventory is composed of emissions from units that report emissions to EPA's Clean Air Markets Division (CAMD) under 40 CFR Part 75 (most emissions from these sources are measured by CEMS) and units that are typically included in EPA's power sector modeling using the Integrated Planning Model (IPM) but that do not report to CAMD and typically lack CEMS (i.e., the non-CEM units). Within the air quality modeling platform, different approaches are taken to create the total EGU point inventory depending on whether an emissions inventory for EGUs is created using IPM or engineering analysis, with each have a different non-CEM emission component. The non-CEM component for the 2016 base case air quality model platform using EGU emissions based on CEMS is comparable to that needed for engineering analysis. The non-CEM component for the 2023 and 2026 air quality modeling cases are based on IPM EGU emissions. All three non-CEM emission values are shown in Table C-4. In AQAT, for each engineering analysis based scenario, the 2016-based non-CEM component was added to the engineering analysis EGU emissions.

For each scenario in AQAT, we assembled a complete emission inventory representing all anthropogenic sources for each state. In other words, we combine the year-specific anthropogenic emissions from Table C-4 (where the EGU point emissions have been removed), with a replacement EGU point inventory comprised of the relevant EGU non-CEM component from Table C-4, and one of the engineering analysis EGU estimates from Section B of this TSD.

The complete anthropogenic emission inventory totals for each state, including the non-CEM components, are compared to the final 2026 base case that was included in the air quality modeling. For each state, for each emissions scenario, EPA calculated the ratio of the emission differences from the scenario and the final 2026 air quality modeling base case to the total NO_X emissions for the final 2026 air quality modeling base case (see Tables C-5 and C-6). Scenarios that are not viable, for technical or policy reasons, have been grayed out in these tables.

In Tables C-4 and C-6, respectively, we examined the emission reduction potential for the non-EGUs, and then included these emission reductions along with the emission reductions from EGUs where new post-combustion controls have been applied and where all EGU emissions have been applied except new post-combustion controls. We, then, calculated the ratio of the emission difference relative to the 2026 air quality modeling base case.[46]

Once the reduction ratios were calculated, they could be applied to a particular state's air quality contribution at a particular monitor along with the calibration factor to get a calibrated change in concentration. These changes were then applied to the original air quality contribution to get an adjusted contribution.

As described above, two AQAT estimates were created for each of the scenarios based on the "Step 3" configuration and the "Full Geography" configuration. These apply different patterns of emission reductions to the states at various monitors. For each scenario analyzed using the Step 3 configuration, on a receptor-by-receptor basis, the emissions change for each upwind state is associated with one of two emission levels (either the engineering base case emission level for that year or the particular cost threshold level) depending on whether the upwind state is contributing at or above 1% of the NAAQS in the air quality modeling base case to that receptor or if the receptor is located within the state.[47] In these scenario assessments using the Step 3 configuration, each monitor is treated completely independently, and the modifications are applied regardless of whether the state is included in the rule and regardless of whether the monitor is considered a receptor for the rule. In other words, states that are contributing above the air quality threshold (i.e., greater than or equal to 1 percent of the NAAQS) to that specific monitor, as well as the state containing the monitor (regardless of whether that state is included in the rule or not (e.g., for Colorado and Connecticut), make NO_X emission reductions that are available at the particular cost threshold level for that year. The emissions for all other states are adjusted to the engineering base case level for that year regardless of whether they are linked to another receptor. Consequently, for the Step 3 configuration for a single scenario (where there are 730 monitors), there are potentially 730 individual patterns of linked and unlinked states, and, thus, 730 potential AQAT simulations. When we assess the maximum air quality contributions to remaining receptors, we limit the analysis to those receptors originally identified using the photochemical air quality modeling in the base case.

For the scenarios assessed using the "Full Geography" configuration, all states that were linked to any receptor in the 2023 or 2026 base cases (i.e., only states included in the rule) were simultaneously adjusted to one of the cost threshold levels shown in Table C-1, regardless of whether (or not) the state was "contributing at or above the 1% of the NAAQS in the base case air quality modeling to a particular receptor. In other words, all states that were included in the rule were adjusted for each receptor, while all other states were adjusted to the base case. In

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[46] With the EPA 2026 AQAT analysis, EPA looked at full implementation of SCR retrofit potential in 2026 when examining that mitigation strategy (recognizing that program implementation and compliance allows some flexibility to realize a portion of these reductions in 2027). This ensures an appropriate analysis of the effects of the rule with respect to the determination of "significant contribution" and overcontrol analysis, *See* Section V.D of the preamble for further discussion. It ensures all Step 3 related reductions are tested for overcontrol, regardless of any timing flexibility offered during implementation regarding the 2026/2027 phase in or the backstop rate extension up to 2030.

[47] For purposes of AQAT analysis, tribal EGU emissions are adjusted based on linkages using either the tribal contribution or the contribution from Utah. In this way, for the Colorado receptors to which Utah is linked, we make sure we account for emission reductions from tribal EGUs located within the borders of Utah.

these scenarios using the “full geography” configuration, the emissions of the state containing the monitor were adjusted only if it was linked to a monitor in another state. So, for example, Connecticut was adjusted to engineering analysis base case levels since the state is not “linked” to a receptor in another state and is not included in the final rule. The scenarios assessed using the “full geography” configuration examine the air quality results when emission reductions have been applied to the final rule geography. EPA views this analysis as not appropriate for Step 3 because it introduces the problem of allowing linked states to potentially free ride on reductions from non-linked states (i.e., EPA views this situation as having the potential to display potential overcontrol that is only incidental). It therefore introduces an issue where the order of individual states making emissions reductions could affect the results (i.e., a “who goes first” problem). Nonetheless, this analysis can be used to show that—even if this approach were acceptable or for some reason legally required—emission reductions made for states that are not specifically linked at or above 1% of the NAAQS to a monitor are not anticipated to affect the air quality at that monitor to a degree that would change any results in the Step 3 analysis.

As described above, for each monitor, the predicted change in contribution of ozone from each state is calculated by multiplying the state-specific 2026 base case ozone contributions from the air quality modeling by the state- and receptor-specific calibration factor as well as by the ratio of the change in emissions (Tables C-5 or C-6 for either the emissions cost threshold level or the engineering base case emission level depending on whether the state is linked in 2023 or 2026).[48] This state- and receptor-specific calibrated change in ozone is then added to the ozone contribution from either the 2023 or 2026 base case air quality modeling, depending on whether the scenario is for 2023 or 2026. The result is the state- and receptor- specific “calibrated” total ozone contribution taking into account the emissions remaining at a particular emission reduction cost threshold level.

For each monitor, these state-level “calibrated” contributions are then summed to estimate total ozone contribution from all states to a particular receptor. “Other” ozone contributions, as described above in section C.2.(b), are added to the state contributions to account for other sources of ozone affecting the monitor. The change in concentration from the “other” nonanthropogenic ozone categories are found by multiplying the change in the total anthropogenic concentration, between the scenario and the base case, by the “nonState” calibration factors (calculated as the ratio of the change from these “all other” contributions divided by the change in the total anthropogenic contribution from the 2026 base case to the 2023 case).[49] This change in the “other” contribution is then added to the base case value to get the total “other” contribution for the scenario. The total ozone from all the states and “other” contributions equals the average design values estimated in the assessment tool. The maximum design values were estimated by multiplying the estimated average design values by the ratio of the modeled 2026 base case maximum and average design values.

Generally, as the emissions cost threshold stringency increased, the estimated average and maximum design values at each receptor decreased. In the assessment tool, the estimated average design value was used to further estimate whether the location will be out of attainment. Meanwhile, the estimated maximum design value was used to further estimate whether the

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[48] The change in concentration can be positive or negative, depending on whether the state’s total anthropogenic ozone season NO_X emissions for the scenario are larger or smaller than the air quality modeling base case emission level for that year.

[49] See column BV in “2023_Scenario_primary” or “2026_Scenario_primary” in the Ozone AQAT Final Rule Excel file

location will have problems maintaining compliance with the NAAQS. An area was noted as having a nonattainment or maintenance issue if either estimated air quality level was greater than or equal to 71 ppb.

Table C-4. Ozone Season Anthropogenic NO_X Emissions (Tons) without the EGU Point Inventory for Each State for 2023 and 2026, the non-CEM EGU Emissions from 2016, 2023, and 2026, and the non-EGU Emissions Reductions (tons).

State	2023 OS NO_X Emissions w/out EGUs (tons)	2026 OS NO_X Emissions w/out EGUs (tons)	2016 non-CEM EGU Emissions (tons)	2023 IPM non-CEM EGU Emissions (tons)	2026 IPM non-CEM EGU Emissions (tons)	2026 non-EGU Emission Reductions (tons)
Alabama	56,301	50,689	482	409	375	-
Arizona	37,767	32,429	684	413	430	-
Arkansas	37,601	33,911	144	125	151	1,546
California	137,682	131,712	1,855	4,900	5,472	1,600
Colorado	45,691	42,286	333	2,195	2,600	-
Connecticut	10,057	9,047	1,272	1,001	898	-
Delaware	6,808	6,289	80	58	59	-
District of Columbia	1,143	1,042	0	15	16	-
Florida	86,562	77,663	5,803	5,615	5,176	-
Georgia	65,100	57,396	1,614	1,286	608	-
Idaho	19,538	16,745	509	370	112	-
Illinois	87,678	80,699	55	598	705	2,311
Indiana	64,377	58,607	611	764	865	1,976
Iowa	40,960	36,510	635	475	575	-
Kansas	56,535	51,888	103	224	334	-
Kentucky	41,631	37,915	1	314	417	2,665
Louisiana	94,803	89,607	3,885	790	1,316	7,142
Maine	13,531	12,333	1,972	1,735	1,030	-
Maryland	24,165	21,885	901	1,044	1,098	157
Massachusetts	27,843	25,766	1,949	2,097	2,079	-
Michigan	63,275	58,837	1,367	1,327	1,523	2,985
Minnesota	55,212	50,422	1,740	1,549	722	-
Mississippi	33,233	30,560	1,663	299	426	2,499
Missouri	62,434	54,563	469	124	152	2,065
Montana	24,264	21,361	933	208	58	-
Nebraska	36,217	32,360	665	574	579	-
Nevada	19,169	16,592	155	689	1,209	-
New Hampshire	7,263	6,578	327	205	205	-
New Jersey	32,305	29,546	1,064	1,212	1,206	242
New Mexico	72,061	70,090	98	56	91	-
New York	63,581	59,425	1,989	3,145	3,129	958
North Carolina	49,369	43,878	739	1,439	1,206	-
North Dakota	58,778	55,705	156	0	16	-
Ohio	69,906	63,465	722	1,350	1,472	3,105
Oklahoma	76,860	70,318	1	185	357	4,388
Oregon	31,284	27,178	704	495	1,086	-
Pennsylvania	89,024	82,296	2,005	2,843	3,192	2,184
Rhode Island	4,327	3,908	35	252	243	-
South Carolina	36,183	32,417	643	758	555	-
South Dakota	13,820	11,803	14	0	3	-
Tennessee	49,954	44,362	6	233	287	-
Texas	290,799	271,630	1,996	2,118	2,078	4,691
Utah	25,768	22,990	561	134	410	252
Vermont	3,911	3,436	41	49	11	-
Virginia	46,978	41,933	2,995	2,707	2,551	2,200
Washington	51,605	45,280	1,536	940	862	-
West Virginia	33,465	32,071	1	6	6	1,649
Wisconsin	43,533	39,136	61	523	596	-
Wyoming	31,006	29,366	11	2	4	-
Tribal Data	3,096	2,979	57	44	0	-

Table C-5. 2023 Fractional Difference in Emissions for each Scenario.[50]

State	Engineering Baseline	Optimize SCR	~~Optimize SCR + SOA CC~~	Optimize SNCR+ SCR	~~Optimize SNCR+ SCR + SOA CC~~	~~New SCR/SNCR + Optimize SNCR+ SCR + SOA CC ("Full Step 3 – EGU only")~~
Alabama	0.02	0.02	0.02	0.02	0.02	0.00
Arizona	0.01	0.01	0.01	0.01	0.00	-0.11
Arkansas	-0.04	-0.04	-0.04	-0.04	-0.04	-0.15
California	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
Colorado	-0.02	-0.03	-0.03	-0.03	-0.03	-0.08
Connecticut	0.04	0.04	0.04	0.04	0.04	0.04
Delaware	0.05	0.04	0.04	0.04	0.04	0.04
District of Columbia	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Florida	0.07	0.04	0.04	0.04	0.04	0.01
Georgia	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Idaho	0.02	0.02	0.02	0.02	0.02	0.02
Illinois	0.02	0.02	0.02	0.02	0.02	0.01
Indiana	-0.03	-0.04	-0.04	-0.04	-0.04	-0.07
Iowa	0.00	0.00	0.00	0.00	0.00	-0.13
Kansas	0.00	-0.01	-0.01	-0.01	-0.01	-0.05
Kentucky	0.02	0.01	0.00	0.01	0.00	-0.10
Louisiana	0.03	0.02	0.02	0.02	0.02	-0.03
Maine	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Maryland	0.03	0.03	0.03	0.03	0.03	0.03
Massachusetts	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Michigan	0.01	0.01	0.01	0.01	0.01	-0.04
Minnesota	-0.02	-0.02	-0.02	-0.02	-0.02	-0.05
Mississippi	0.11	0.11	0.08	0.11	0.08	-0.02
Missouri	0.06	-0.05	-0.05	-0.05	-0.05	-0.11
Montana	0.00	0.00	0.00	0.00	0.00	-0.08
Nebraska	-0.05	-0.05	-0.06	-0.05	-0.06	-0.19
Nevada	-0.08	-0.08	-0.08	-0.08	-0.08	-0.14
New Hampshire	0.06	0.05	0.05	0.05	0.05	0.05
New Jersey	0.01	0.00	0.00	0.00	0.00	0.00
New Mexico	0.00	0.00	0.00	0.00	0.00	0.00
New York	0.01	0.01	0.01	0.01	0.01	0.00
North Carolina	-0.06	-0.12	-0.12	-0.12	-0.12	-0.17
North Dakota	-0.03	-0.03	-0.03	-0.04	-0.04	-0.17
Ohio	-0.01	-0.03	-0.03	-0.03	-0.03	-0.03
Oklahoma	0.02	0.02	0.01	0.02	0.01	-0.06
Oregon	0.02	0.02	0.02	0.02	0.02	0.02
Pennsylvania	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
Rhode Island	0.01	-0.02	-0.02	-0.02	-0.02	-0.02
South Carolina	-0.08	-0.10	-0.10	-0.10	-0.10	-0.10
South Dakota	0.00	0.00	0.00	0.00	0.00	0.00
Tennessee	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Texas	0.01	0.00	0.00	0.00	0.00	-0.05
Utah	-0.02	-0.02	-0.02	-0.02	-0.02	-0.36
Vermont	0.01	0.01	0.01	0.01	0.01	0.01
Virginia	0.05	0.05	0.04	0.05	0.04	0.04
Washington	0.06	0.05	0.05	0.05	0.05	0.03
West Virginia	0.02	0.00	-0.01	0.00	-0.01	-0.06
Wisconsin	0.00	0.00	0.00	0.00	0.00	-0.01
Wyoming	0.05	0.04	0.03	0.04	0.03	-0.15
Tribal Data	0.04	0.04	0.04	0.04	0.04	-0.22

Note: Scenarios that are not <u>viable</u> have had column heads struck through and associated data has been grayed out and

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[50] The fractional changes in emissions are essentially "percent changes" in emissions. These fractions are changes relative to the 2026 air quality modeling base emission inventory for each state. Negative numbers indicate emission decreases, while positive numbers indicate emission increases.

Table C-6. 2026 Fractional Difference in Emissions for each Scenario.[51]

State	Engineering Baseline	Optimize SCR	Optimize SCR + SOA CC	Optimize SNCR+ SCR	Optimize SNCR+ SCR + SOA CC	New SCR/SNCR + Optimize SNCR+ SCR + SOA CC (“Full Step 3 – EGU only”)	non-EGU +New SCR/SNCR + Optimize SNCR+ SCR + SOA CC (“Full Step 3”)
Alabama	0.03	0.03	0.03	0.03	0.03	0.02	0.02
Arizona	0.08	0.08	0.07	0.07	0.07	0.02	0.02
Arkansas	-0.04	-0.04	-0.04	-0.04	-0.04	-0.15	-0.18
California	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03
Colorado	-0.05	-0.05	-0.05	-0.05	-0.05	-0.08	-0.08
Connecticut	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Delaware	0.05	0.04	0.04	0.04	0.04	0.04	0.04
District of Columbia	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Florida	0.07	0.04	0.04	0.04	0.04	0.02	0.02
Georgia	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Idaho	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Illinois	0.03	0.03	0.03	0.03	0.03	0.01	-0.01
Indiana	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.08
Iowa	0.01	0.01	0.01	0.01	0.01	-0.12	-0.12
Kansas	0.01	0.00	0.00	0.00	0.00	-0.03	-0.03
Kentucky	0.03	0.02	0.01	0.02	0.01	-0.08	-0.13
Louisiana	0.05	0.04	0.04	0.04	0.04	-0.01	-0.09
Maine	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Maryland	0.03	0.03	0.03	0.03	0.03	0.03	0.02
Massachusetts	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Michigan	-0.02	-0.02	-0.02	-0.02	-0.02	-0.05	-0.10
Minnesota	0.01	0.01	0.01	0.01	0.01	-0.02	-0.02
Mississippi	0.18	0.18	0.15	0.18	0.15	0.06	-0.02
Missouri	0.08	-0.03	-0.03	-0.03	-0.03	-0.09	-0.12
Montana	0.00	0.00	0.00	0.00	0.00	-0.07	-0.07
Nebraska	-0.01	-0.01	-0.02	-0.01	-0.02	-0.15	-0.15
Nevada	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
New Hampshire	0.06	0.05	0.05	0.05	0.05	0.05	0.05
New Jersey	0.01	0.00	0.00	0.00	0.00	0.00	-0.01
New Mexico	0.00	0.00	0.00	0.00	0.00	0.00	0.00
New York	0.01	0.01	0.01	0.01	0.01	0.00	-0.01
North Carolina	0.01	-0.04	-0.04	-0.04	-0.04	-0.08	-0.08
North Dakota	-0.02	-0.02	-0.02	-0.03	-0.03	-0.15	-0.15
Ohio	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.08
Oklahoma	0.04	0.04	0.03	0.04	0.03	-0.03	-0.09
Oregon	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pennsylvania	0.06	0.06	0.06	0.05	0.05	0.05	0.02
Rhode Island	0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
South Carolina	-0.07	-0.09	-0.09	-0.09	-0.09	-0.09	-0.09
South Dakota	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tennessee	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Texas	0.05	0.04	0.04	0.04	0.04	-0.01	-0.02
Utah	0.01	0.01	0.01	0.01	0.01	-0.18	-0.19
Vermont	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Virginia	0.05	0.05	0.05	0.05	0.04	0.04	-0.01
Washington	0.03	0.02	0.02	0.02	0.02	0.02	0.02
West Virginia	0.00	-0.01	-0.03	-0.02	-0.03	-0.08	-0.12
Wisconsin	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Wyoming	0.09	0.08	0.07	0.08	0.07	-0.06	-0.06
Tribal Data	0.10	0.10	0.10	0.10	0.10	-0.16	-0.16

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[51] The fractional changes in emissions are essentially “percent changes” in emissions. These fractions are changes relative to the 2026 air quality modeling base emission inventory for each state. Negative numbers indicate emission decreases, while positive numbers indicate emission increases.

3. Description of the analytic results using the primary approach for the Step 3 AQAT configuration.

For each year, 2023 and 2026, EPA used the ozone AQAT to estimate improvements in downwind air quality at base case levels and at each of the cost threshold scenarios. For each scenario, EPA examined the average and maximum design values for each of the receptors. EPA evaluated the degree of change in ozone concentration and assessed whether it decreased the average or maximum design values to below 71 ppb (at which point their nonattainment and maintenance issues, respectively, would be considered resolved). In each scenario, EPA also examined each state's air quality contributions, assessing whether a state maintained at least one linkage (i.e., greater than or equal to 1% (0.70 ppb) to a receptor located in a downwind state that was estimated to remain in nonattainment and/or maintenance. EPA examined incrementally the engineering base case, and all of the mitigation steps described in Section V of the preamble and calculated in the engineering analysis (with the exception of the "half SCR" scenario) (see section B and Table C-1 of this TSD for details and a list, respectively). EPA also assessed changes in air quality for the non-EGU mitigation potential for 2026.

The key findings of this analysis are 1) no states have their contribution to a receptor identified in the base case CAMx air quality modeling drop below 1% at any mitigation level assessed for as long as that receptor remained in nonattainment or maintenance, and 2) all covered states remain linked to a downwind problematic receptor up through the penultimate mitigation step. These findings affirm EPA's identification of the final rule control stringency and also verify that the final stringency level does not constitute overcontrol. These findings held through EPA's alternative assessments as well (i.e., using the Alternative AQAT Calibration factor and the Full Geography Configuration). The preamble explains how EPA considered the results of the air quality analyses described in this TSD to determine the appropriate emission levels for eliminating significant contribution to nonattainment and interference with maintenance. Additional details on receptor impacts are described in the remainder of this section below.

There are 31 receptors outside California in 2023 and 17 receptors in 2026 that are projected to be in nonattainment or maintenance status according to the base case CAMx air quality modeling results (see the Air Quality Modeling TSD for details). In other words, we did not include monitors whose average or maximum concentrations increased to 71 ppb or higher when we assessed any of the emissions scenarios (e.g., the engineering analysis base case scenario).

For each year, using the Step 3 configuration of AQAT with the primary calibration, the average and maximum design values (in ppb) were estimated. Air quality values for each identified receptor and cost threshold level can be found in Tables C-7 through C-10. The values have been rounded to hundredths of a ppb. Scenarios that have been deemed nonviable are grayed out in these tables.

In 2023, we observe that all monitors consistently have their average and/or maximum design values at or above 71 ppb for all viable scenarios (Tables C-7 and C-8). We observe that there is air quality improvement at increasing cost threshold levels. In 2023 (but also for 2026) we observe that receptors 350151005 and 350250008 in Eddy County and Lea County New Mexico, respectively, do not have calibration factors based on the “primary” approach.[52]

In 2026, of the 17 receptors, two receptors have their average design values drop below 71 ppb when going from the engineering analysis base case to a scenario reflecting full implementation of identified Step 3 EGU mitigation measures. The average design values for receptor 090013007 in Fairfield County Connecticut and receptor 481671034 in Galveston Texas drop below 71 ppb in this scenario reflecting all EGU reductions through SCR retrofit (inclusive of comparable reductions in Connecticut for the former, which is not linked to a receptor in another state). The change in these two receptors from attainment to maintenance does not completely resolve these receptors and does not resolve any upwind states’ linkage to a downwind state due to remaining linkages at these or other receptors.

The maximum design value for monitor 080690011 in Larimer County Colorado drops below 71 ppb when EGU emission reductions associated with new SCRs are applied (inclusive of comparable reductions in Colorado, which is not linked to a receptor in another state). The maximum design values for receptors 480391004 in Brazoria County Texas and receptor 481671034 in Galveston Texas have their maximum design values drop below 71 ppb when the “Full Step 3” Scenario is applied. See Table C-10 for the values.

In regards to upwind contributions, we are able to use the calibrated AQAT to estimate the change in the air quality contributions of each upwind state to each receptor (see the description of the state and receptor-specific contributions in section C.2.c.(2)) in order to determine whether any state’s contribution is below the 1 percent threshold used in step 2 of the 4-Step Good Neighbor Framework to identify “linked” upwind states. For this assessment, we compared each state’s adjusted ozone concentration against the 1% air quality threshold at each of the cost threshold levels at each remaining receptor, using the Step 3 configuration of AQAT using the primary calibration factor. For 2023 and 2026, these results are shown in Tables C-11 and C-12, respectively.

To see static air quality contributions and design value estimates for the receptors of interest for each year and cost level scenario, see the individual worksheets (labeled in Appendix B). For interactive worksheets, refer to the “202X_scenario_primary” worksheets after setting the desired scenario in the “summary_DVs_202X” worksheet. In the summary_DVs worksheet, adjust cells I1 and I2 to match the desired scenario of interest. The numbering for the various scenarios is shown in Table C-13. For a cost threshold scenario estimate, cell I1 would be a value of 0 through 8 (note that 6, and 7 are invalid), while cell I2 should be fixed with a value of 0.

Generally, for all linked states, in all years, across all cost level scenarios, we did not see instances where all of the state’s contributions dropped below 1% of the NAAQS assessed across all its linkages to remaining downwind receptors. That is, for a single receptor, if a state was linked to that receptor in the base case for that year the state almost always remained linked with a contribution greater than or equal to 1% of the NAAQS in all scenarios. This is not a surprising result because, for a linkage to be resolved by emission reductions of just a few percent, the original base contribution would need to be within a few percent of the threshold. As a hypothetical example, if the state is making a 6% emission reduction in its overall anthropogenic

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[52] In the air quality modeling for the proposal, we do not have air quality contributions for these monitors for either (or both) the 2026 base case and the 2026 case where EGU and non-EGU emissions have been reduced by 30%. Consequently, using the ”primary” approach in AQAT, we also do not have design value or contribution calculations for these receptors. Using the “alternative“ approach, we have estimates for these receptors (see ”Ozone_AQAT_Final.xlsx“ for the values.

ozone season NO_X emissions, and the calibration factor was 0.5, its original base case maximum contribution to a remaining unresolved nonattainment and/or maintenance receptor would need to be just under 1.03% of the NAAQS or 0.72 ppb, to drop below the 0.70 ppb linkage threshold. Note that, for Wyoming, the 2023 air quality modeling base case air quality contribution is below 0.70 ppb. Consequently, in AQAT when the adjustment is made to states with air quality modeling contributions above the linkage threshold, Wyoming is designated as "below the threshold" and is assigned the engineering analysis base case value (which raises its contribution above the linkage threshold). The result is that the contribution remains constant, appearing to be "linked" at progressively higher cost level scenarios. A similar situation is present for Alabama in 2026, where the contribution remains constant at the engineering analysis base case value. We would expect that if emission reductions for these two states were made from the engineering analysis base case level to the level used in the air quality photochemical modeling (which incorporate projected fleet turnover from IPM in addition to the known fleet turnover used in the engineering analysis as described in section C.2 and preamble Section IV.C.2 would result in a lower total EGU point emission value), it would result in the air contributions dropping below the 0.70 ppb linkage threshold in AQAT.

In this final rule, using the Step 3 configuration of AQAT using the primary calibration factor, there are some instances where the maximum remaining contribution to a remaining receptor that has a maximum design value at or above 71 drops below the contribution threshold. In all cases where this happens, it is due to particular receptors dropping below the NAAQS, rather than changes to the contributions to an individual monitor. In 2026, when emissions reductions from new SCR and non-EGUs are applied, the highest AQAT-estimated contributions for Arkansas, Mississippi, and Oklahoma drop below the linkage threshold of 0.70 ppb. The change in violating monitors, described above, and the shift in contributions between receptors, explains the large changes in contributions that occurs for these states (Table C-12). In some cases, for individual linkages, a state drops below the contribution threshold. However, aside from the instances noted above, in all such cases the state remained linked above the threshold to at least one other receptor (Table C-12). In the scenario where emissions reductions from new SCR and non-EGUs are applied, we observe that Oklahoma's contribution to Galveston Texas drops below the linkage threshold at the same time the cumulative air quality improvements from other states cause the receptor to have its maintenance problem resolved.

As explained in section V.D.4 of the preamble, using the Step 3 configuration of AQAT using the primary calibration factor, EPA performed the overcontrol test at Step 3 using an identical methodology to that used in prior CSAPR Rules. That analysis indicated that there was no overcontrol at full implementation of the mitigation strategies in 2026 identified in this action. Even with full implementation of EGU and non-EGU reductions, nonattainment/maintenance receptors and corresponding linkages persisted for most of the covered states. The exceptions were the Brazoria and Galveston receptors in Texas. These receptors were projected to be in attainment in 2026 at full implementation, and this was the case in AQAT using the primary calibration factors as well as in the CAMx modeling of the final rule.[53] There are three states with downwind linkages only to one or both of these receptors (Oklahoma, Mississippi, and Arkansas). Therefore, at the Step 3 overcontrol evaluation, the EPA specifically evaluated

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[53] EPA notes that using the Step 3 configuration of AQAT using the alternative calibration factor, that the maximum design value for the Galveston, Texas receptor remains above 71 ppb and Arkansas, Mississippi, and Oklahoma have contributions that are greater than or equal to 0.70 ppb at the full implementation of EGU and non-EGU emissions reductions. See Appendix D for details.

whether a less stringent policy prior to full implementation of the finalized EGU and non-EGU stringencies would have shifted these receptors into projected attainment and/or resolved the upwind air quality contributions (i.e., Step 2 linkages) at this less-stringent control level. Neither of these conditions occurred, and therefore the EPA concluded that there is no evidence for overcontrol at the final rule's control level, and, in light of the otherwise applicable Step 3 determinations regarding the appropriate level of emissions control to eliminate significant contribution, there is evidence for undercontrol if these states were subject to a lesser stringency. Consequently, as discussed in the preamble, the EPA concludes that the uniform control stringencies identified at Step 3 applied for all other states linked in 2026 also represent the appropriate level of control for the states linked to the two Texas receptors.

A review of the larger context for the projections used in conducting our analysis lends further support for our conclusion that the full suite of emissions controls for 2026 is appropriate, given the need to balance both overcontrol and undercontrol concerns in the complex arena of forecasting interstate ozone transport. Even with full implementation of the final rule, based on the CAMx photochemical modeling of the Final Rule Policy Control Scenario, these two receptors are only projected to come into attainment by a relatively small degree, and these projections reflect a combination of both this rule's requirements and anticipated but unenforceable economic and meteorological projections for 2026. Moreover, the form of implementation of this rule for both EGUs and non-EGUs, as discussed in Section VI of the preamble, is designed to ensure a certain degree of emissions control performance (as determined at Step 3) without dictating the operational levels of any facility. The form of implementation does not place an enforceable cap on total emissions such that the total estimated emissions reductions from the rule that inform our overcontrol analysis can be considered to be absolutely certain or legally enforceable. Under these circumstances, attempting to parse out some lesser stringency of control for any state whose linkage just barely resolves in 2026 under the rule would go beyond the Agency's obligation to avoid "over-control" and impinges the equally compelling imperative to avoid "under-control." The projected resolution of an air quality receptor to just barely achieving attainment should generally be considered a positive result of the EPA's good neighbor rulemakings, not a result to be avoided.

Table C-7. 2023 Average Ozone DVs (ppb) for NO$_X$ Emissions Cost Threshold Levels ($/ton) Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	Engineering Analysis Base	SCR Optimize	~~SCR Optimize + SOA CC~~	SCR Optimize + SNCR Optimize	~~SCR Optimize + SOA CC + SNCR Optimize~~	~~SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")~~
40278011	Arizona	Yuma	70.36	70.35	70.34	70.34	70.34	70.30
80350004	Colorado	Douglas	71.12	71.10	71.10	71.10	71.10	70.34
80590006	Colorado	Jefferson	72.63	72.61	72.61	72.61	72.61	71.99
80590011	Colorado	Jefferson	73.29	73.27	73.27	73.27	73.27	72.42
80690011	Colorado	Larimer	70.79	70.78	70.78	70.78	70.78	70.25
90010017	Connecticut	Fairfield	71.62	71.58	71.57	71.57	71.56	71.42
90013007	Connecticut	Fairfield	72.99	72.93	72.91	72.91	72.90	72.68
90019003	Connecticut	Fairfield	73.32	73.28	73.26	73.27	73.25	73.05
90099002	Connecticut	New Haven	70.61	70.54	70.52	70.53	70.51	70.30
170310001	Illinois	Cook	68.13	68.11	68.11	68.11	68.11	67.92
170314201	Illinois	Cook	67.92	67.88	67.88	67.88	67.88	67.76
170317002	Illinois	Cook	68.47	68.38	68.38	68.37	68.37	68.22
350130021	New Mexico	Dona Ana	70.83	70.82	70.82	70.82	70.82	70.61
350130022	New Mexico	Dona Ana	69.73	69.72	69.72	69.72	69.72	69.51
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	70.59	70.53	70.53	70.52	70.52	69.61
481210034	Texas	Denton	69.93	69.90	69.88	69.89	69.88	69.35
481410037	Texas	El Paso	69.82	69.82	69.81	69.81	69.81	69.57
481671034	Texas	Galveston	71.82	71.75	71.72	71.73	71.70	70.49
482010024	Texas	Harris	75.33	75.27	75.27	75.25	75.25	74.30
482010055	Texas	Harris	71.19	71.13	71.11	71.12	71.10	70.07
482011034	Texas	Harris	70.32	70.26	70.26	70.25	70.25	69.31
482011035	Texas	Harris	68.01	67.95	67.95	67.94	67.94	67.06
490110004	Utah	Davis	71.88	71.87	71.87	71.87	71.87	70.79
490353006	Utah	Salt Lake	72.48	72.47	72.47	72.47	72.47	71.44
490353013	Utah	Salt Lake	73.21	73.20	73.20	73.20	73.20	72.32
550590019	Wisconsin	Kenosha	70.75	70.65	70.65	70.65	70.65	70.42
551010020	Wisconsin	Racine	69.59	69.46	69.46	69.46	69.46	69.25
551170006	Wisconsin	Sheboygan	72.64	72.46	72.46	72.46	72.46	72.19

Note: Scenarios that are not viable have had column heads struck through and associated data has been grayed out and

Table C-8. 2023 Maximum Ozone DVs (ppb) for NO$_X$ Emissions Cost Threshold Levels ($/ton) Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	Engineering Analysis Base	SCR Optimize	~~SCR Optimize + SOA CC~~	SCR Optimize + SNCR Optimize	~~SCR Optimize + SOA CC + SNCR Optimize~~	~~SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")~~
40278011	Arizona	Yuma	72.05	72.04	72.04	72.04	72.04	71.99
80350004	Colorado	Douglas	71.71	71.70	71.70	71.70	71.70	70.93
80590006	Colorado	Jefferson	73.32	73.31	73.31	73.31	73.31	72.68
80590011	Colorado	Jefferson	73.89	73.87	73.87	73.87	73.87	73.01
80690011	Colorado	Larimer	71.99	71.98	71.98	71.98	71.98	71.44
90010017	Connecticut	Fairfield	72.22	72.18	72.17	72.17	72.16	72.02
90013007	Connecticut	Fairfield	73.89	73.83	73.81	73.81	73.80	73.57
90019003	Connecticut	Fairfield	73.62	73.58	73.56	73.57	73.55	73.35
90099002	Connecticut	New Haven	72.71	72.65	72.62	72.63	72.61	72.39
170310001	Illinois	Cook	71.82	71.80	71.80	71.80	71.80	71.61
170314201	Illinois	Cook	71.41	71.37	71.37	71.37	71.37	71.24
170317002	Illinois	Cook	71.27	71.17	71.17	71.17	71.17	71.00
350130021	New Mexico	Dona Ana	72.13	72.12	72.12	72.12	72.12	71.91
350130022	New Mexico	Dona Ana	72.43	72.42	72.42	72.42	72.42	72.20
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	72.69	72.63	72.63	72.62	72.62	71.69
481210034	Texas	Denton	71.73	71.70	71.68	71.69	71.68	71.14
481410037	Texas	El Paso	71.43	71.42	71.41	71.41	71.41	71.16
481671034	Texas	Galveston	73.13	73.05	73.02	73.03	73.01	71.77
482010024	Texas	Harris	76.93	76.87	76.87	76.85	76.85	75.88
482010055	Texas	Harris	72.20	72.13	72.12	72.12	72.10	71.06
482011034	Texas	Harris	71.52	71.46	71.46	71.45	71.45	70.49
482011035	Texas	Harris	71.52	71.46	71.46	71.45	71.45	70.52
490110004	Utah	Davis	74.08	74.07	74.07	74.07	74.07	72.96
490353006	Utah	Salt Lake	74.07	74.06	74.06	74.06	74.06	73.02
490353013	Utah	Salt Lake	73.71	73.70	73.70	73.70	73.70	72.81
550590019	Wisconsin	Kenosha	71.65	71.55	71.55	71.55	71.55	71.32
551010020	Wisconsin	Racine	71.39	71.25	71.25	71.25	71.25	71.04
551170006	Wisconsin	Sheboygan	73.54	73.36	73.36	73.36	73.36	73.08

Note: Scenarios that are not viable have had column heads struck through and associated data has been grayed out and

Table C-9. 2026 Average Ozone DVs (ppb) for NOX Emissions Cost Threshold Levels ($/ton) Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit (“Full Step 3 – EGU only”)	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU (“Full Step 3”)
40278011	Arizona	Yuma	69.87	69.86	69.86	69.86	69.86	69.84	69.80
80590006	Colorado	Jefferson	71.70	71.69	71.69	71.69	71.69	71.36	71.34
80590011	Colorado	Jefferson	72.06	72.05	72.05	72.05	72.05	71.59	71.57
80690011	Colorado	Larimer	69.84	69.83	69.83	69.83	69.83	69.54	69.53
90013007	Connecticut	Fairfield	71.25	71.20	71.18	71.18	71.17	70.98	70.66
90019003	Connecticut	Fairfield	71.58	71.53	71.52	71.52	71.51	71.34	71.06
350130021	New Mexico	Dona Ana	70.06	70.05	70.05	70.05	70.05	69.89	69.86
350130022	New Mexico	Dona Ana	69.17	69.16	69.15	69.15	69.15	69.00	68.96
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	69.89	69.84	69.84	69.82	69.82	68.96	68.50
481671034	Texas	Galveston	71.29	71.22	71.19	71.20	71.17	70.02	69.28
482010024	Texas	Harris	74.83	74.77	74.77	74.76	74.76	73.86	73.39
490110004	Utah	Davis	69.90	69.90	69.90	69.90	69.90	69.34	69.28
490353006	Utah	Salt Lake	70.50	70.49	70.49	70.49	70.49	69.96	69.91
490353013	Utah	Salt Lake	71.91	71.91	71.91	71.91	71.91	71.45	71.40
551170006	Wisconsin	Sheboygan	70.83	70.66	70.66	70.65	70.65	70.51	70.27

Table C-10. 2026 Maximum Ozone DVs (ppb) for NO$_X$ Emissions Cost Threshold Levels ($/ton) Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU ("Full Step 3")
40278011	Arizona	Yuma	71.47	71.46	71.46	71.46	71.46	71.44	71.40
80590006	Colorado	Jefferson	72.30	72.29	72.29	72.29	72.29	71.95	71.93
80590011	Colorado	Jefferson	72.66	72.65	72.65	72.65	72.65	72.19	72.16
80690011	Colorado	Larimer	71.04	71.03	71.03	71.03	71.03	70.73	70.72
90013007	Connecticut	Fairfield	72.06	72.00	71.98	71.99	71.97	71.78	71.46
90019003	Connecticut	Fairfield	71.78	71.73	71.72	71.72	71.71	71.54	71.26
350130021	New Mexico	Dona Ana	71.36	71.35	71.35	71.35	71.35	71.19	71.16
350130022	New Mexico	Dona Ana	71.77	71.76	71.76	71.76	71.76	71.60	71.56
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	72.02	71.96	71.96	71.95	71.95	71.06	70.58
481671034	Texas	Galveston	72.51	72.44	72.41	72.42	72.39	71.22	70.47
482010024	Texas	Harris	76.45	76.39	76.39	76.38	76.38	75.46	74.98
490110004	Utah	Davis	72.10	72.10	72.10	72.10	72.10	71.52	71.46
490353006	Utah	Salt Lake	72.10	72.09	72.09	72.09	72.09	71.55	71.50
490353013	Utah	Salt Lake	72.31	72.31	72.31	72.31	72.31	71.84	71.80
551170006	Wisconsin	Sheboygan	71.73	71.55	71.55	71.55	71.55	71.41	71.17

Table C-11. 2023 Maximum Air Quality Contribution (ppb) to a Remaining Receptor.[54]

state	Engineering Analysis Base	SCR Optimize	~~SCR Optimize + SOA CC~~	SCR Optimize + SNCR Optimize	~~SCR Optimize + SOA CC + SNCR Optimize~~	~~SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")~~
Alabama	0.77	0.77	0.77	0.77	0.77	0.76
Arkansas	1.18	1.18	1.18	1.18	1.18	1.06
California	6.27	6.26	6.26	6.26	6.26	6.26
Illinois	19.08	19.08	19.08	19.08	19.08	19.09
Indiana	9.88	9.82	9.82	9.82	9.82	9.66
Kentucky	0.85	0.85	0.84	0.85	0.84	0.79
Louisiana	9.70	9.66	9.66	9.66	9.66	9.30
Maryland	1.31	1.31	1.31	1.31	1.31	1.31
Michigan	1.60	1.60	1.60	1.60	1.60	1.58
Minnesota	0.85	0.85	0.85	0.85	0.85	0.84
Mississippi	1.42	1.42	1.39	1.42	1.39	1.31
Missouri	1.95	1.82	1.82	1.82	1.82	1.74
Nevada	1.05	1.05	1.05	1.05	1.05	0.99
New Jersey	8.37	8.38	8.38	8.38	8.38	8.38
New York	16.12	16.12	16.12	16.12	16.12	16.10
Ohio	2.04	2.02	2.02	2.02	2.02	2.02
Oklahoma	1.03	1.02	1.02	1.02	1.02	0.98
Pennsylvania	5.99	5.97	5.97	5.97	5.97	5.94
Texas	4.75	4.75	4.75	4.75	4.75	4.64
Utah	1.29	1.29	1.29	1.29	1.29	0.93
Virginia	1.82	1.81	1.81	1.81	1.81	1.80
West Virginia	1.52	1.50	1.49	1.50	1.48	1.43
Wisconsin	2.87	2.87	2.87	2.87	2.87	2.85

Note: Scenarios that are not viable have had column heads struck through and associated data has been grayed out and

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[54] Values greater than or equal to 0.70 ppb indicate the state remains linked to a remaining downwind receptor.

Table C-12. 2026 Maximum Air Quality Contribution (ppb) to a Remaining Receptor.[55]

State	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU ("Full Step 3")
Arkansas	1.12	1.12	1.12	1.12	1.12	1.01	0.57
California	6.09	6.08	6.08	6.08	6.08	6.08	6.04
Illinois	13.60	13.60	13.60	13.60	13.60	13.59	13.57
Indiana	8.34	8.27	8.27	8.27	8.27	8.22	8.05
Kentucky	0.81	0.80	0.80	0.80	0.80	0.75	0.72
Louisiana	9.67	9.64	9.64	9.63	9.63	9.29	4.30
Maryland	1.08	1.08	1.08	1.08	1.08	1.08	1.08
Michigan	1.47	1.47	1.47	1.47	1.47	1.46	1.45
Mississippi	1.32	1.32	1.29	1.32	1.29	1.21	0.35
Missouri	1.78	1.65	1.65	1.65	1.65	1.59	1.55
Nevada	0.90	0.90	0.90	0.90	0.90	0.90	0.90
New Jersey	8.09	8.10	8.10	8.10	8.10	8.10	8.11
New York	12.68	12.67	12.67	12.67	12.67	12.66	12.64
Ohio	1.92	1.90	1.90	1.90	1.90	1.90	1.85
Oklahoma	0.77	0.77	0.77	0.77	0.77	0.72	0.61
Pennsylvania	5.70	5.68	5.68	5.68	5.68	5.65	5.55
Texas	4.44	4.44	4.44	4.43	4.43	4.34	4.30
Utah	1.07	1.07	1.07	1.07	1.07	0.89	0.88
Virginia	1.14	1.14	1.14	1.14	1.13	1.13	1.10
West Virginia	1.36	1.35	1.34	1.34	1.33	1.28	1.24

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[55] Values greater than or equal to 0.70 ppb indicate the state remains linked to a remaining downwind receptor.

Table C-13. Description of the Various Scenarios Evaluated in AQAT.

Scenario	Cost Threshold Level	Description
0	$0	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs
1	$1,600	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR optimize
2	$1,600	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR optimize + SOA CC
3	$1,800	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize
4	$1,800	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC
5	$11,000	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC + SCR Retrofit
8	$11,000 +_ non-EGUs	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC + SCR Retrofit + non-EGUs
9	$1,800 +_ non-EGUs	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC + non-EGUs
10	AQ Modeling Control Scenario	Emission levels associated with the AQ modeling of the control scenario.
14	$0 w/IRA	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs + delta in emissions between IPM base and IPM base w/IRA
15	$11,000 w/IRA	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC + SCR Retrofit + delta in emissions between IPM final policy and IPM final policy w/IRA
16	$11,000 +_ non-EGUs w/IRA	Baseline Engineering Analysis 202x OS NO_X + engineering non-CEMs +SCR/SNCR optimize + SOA CC + SCR Retrofit + non-EGUs + delta in emissions between IPM final policy and IPM final policy w/IRA

4. Comparison between the air quality assessment tool estimates using the primary and alternative calibration factors

As described earlier, the “primary” version of AQAT was calibrated using modeled ozone data from the proposed rule using a 2026 case where EGUs and non-EGUs were reduced by 30%. Since the primary calibration factors were developed by modulating the sectors being regulated in this rulemaking, we conclude that these calibration factors were the most appropriate ones to use within the Step 3 methodology. However, we also created a second set of “alternative” calibration factors, reflecting changes between the 2023 and 2026 base cases using AQ modeling from the final rule. Each of these sets of calibration factors represents a different assessment of a linear relationship between emissions reductions and changes in air quality based on the different emission levels and reductions from various sectors. Thus, it was possible to produce air quality estimates from the tool for emissions scenarios using the “primary” calibration factors as well as similar results using the “alternative” calibration factors. Comparing those results, we are able to assess the importance of the particular calibration factor (i.e., linearity assumption assumed) on the conclusions. The two calibration factors implicitly have different assumptions about the spatial distribution of the emissions reductions and of the sectors being reduced. While EPA believes its primary version is the most appropriate calibration approach, the use of alternatives calibration factors for sensitivity analysis allows EPA to ensure its findings are consistent and robust across a range of assumptions regarding source, location, and degree of emission changes.

The two calibration scenarios bracket the policy range explored using the AQAT. In this section, we assessed the effects of the calibration factors, focusing on two separate policy-relevant emissions scenarios. Appendix J presents an additional comparison using the two calibration factors – comparing against the CAMx Final Rule Policy Control scenario.

Using the primary and alternative calibration factors for the Step 3 configuration of AQAT, we assessed the maximum design values for two policy-relevant scenarios: the 2026 engineering analysis base case scenario and the "Full Step 3” Scenario. For each of these scenarios, EPA looked at the difference in maximum design values using the primary calibration and the alternative calibration. The results are shown in Tables C-14 and C-15, respectively. The AQAT values and the differences in the tables have been rounded to a hundredth of a ppb. For these two scenarios, the differences are moderate between the two AQAT calibrations, with a largest difference of 0.59 ppb for the engineering analysis base. The largest difference was 0.57 ppb for the “Full Step 3” Scenario. This largest difference occurred at the Galveston Texas receptor.

In this assessment, most receptors maintain the same attainment condition (i.e., showing average and/or maximum design values either above or below the level of the NAAQS) regardless of the calibration factor utilized. This indicates EPA’s air quality findings are robust to the remaining nonlinearity in ozone chemistry and uncertainties in the geographical distribution of the sources (after accounting for the majority of this nonlinearity using the calibration factor). Specifically, by using multiple calibration factors that arrive at the same conclusions regarding linkages and overcontrol, this analysis illustrates that the nonlinearity of the ozone chemistry that is not accounted for using a single linear calibration factors across the range of emission reductions assessed here and/or the difference in spatial location and intensity of the sources and/or differences in the sectors are not affecting the conclusions about whether receptors are resolved and whether states continue to have contributions above the linkage threshold to those receptors. For the engineering base case, all receptors had maximum design values at or above the NAAQS using both calibration factors. This tends to confirm the air quality and contribution modeling using CAMx that the states linked to these receptors are appropriately included in the rule.

In the “Full Step 3” Scenario, there are some differences in the receptor status between primary and alternative calibration factors. However, none of these differences would impact EPA’s overcontrol finding. Evidence of overcontrol would, at a minimum, require 1) all receptors to which an upwind state is linked to drop below the NAAQS at both the full implementation of mitigation measures (i.e., “Full Step 3”) and in the scenario where the last increment of reductions is removed (i.e., “Full Step 3 – EGU only”) or 2) show a state’s contribution to drop below 1% in both cases. These conditions are not met under either primary or alternative calibration factors. For example, the Galveston Texas receptor is estimated to be resolved using the version of AQAT with the primary calibration factor but is estimated to remain above the NAAQS using the alternative calibration factors. However, there is no difference in the receptor status in the penultimate Step 3 increment (i.e., “Full Step 3 – EGU only”) using either calibration factor (and thus no evidence of overcontrol). One other difference in regulatory status for a receptor occurs using the alternative calibration factors: the maximum design value for the Salt Lake Utah receptor (490353006) remains above the NAAQS using the version of AQAT with the primary calibration factor but is just barely below 71 ppb (less than 0.01 ppb) using the alternative calibration factors. However, this change in status has no impact in terms of eliminating all of any upwind state’s linkages. This assessment, again, suggests that the control level selected in Step 3 is appropriate.

Finally, using the alternative calibration factor, we examined the maximum contribution to the highest remaining receptor for each upwind state (Table C-16). In this case, all states remain linked when the emissions reductions from the ”Full Step 3” scenario are applied. This further affirms no overcontrol for upwind states only linked to the Galveston Texas receptor. For instance, Oklahoma presents possibly the closest case for analysis. Under the primary calibration approach, analyzing the “Full Step 3” scenario of the final rule, the air quality contribution for Oklahoma drops below the 1% contribution threshold to the Galveston Texas receptor, and the receptor’s maximum design value also drops below 71 ppb, but there is no overcontrol as no such conditions occurred in the penultimate step (i.e., “Full Step 3 – EGU only”) as described above. Under the alternative calibration scenario, however, Oklahoma’s contribution remains above the linkage threshold to this receptor in the “Full Step 3” scenario (and the receptor also remains above 71 ppb), putting even more distance between Oklahoma and any potential overcontrol.[56]

In the past, some opponents of EPA’s transport regulatory actions have misconstrued the overcontrol test to require that EPA should investigate hypothetical ever-more-thinly-sliced “stopping points” within the emissions control program on the mistaken premise that regulators can somehow stop on a dime where not one pound of emissions reduction more than is purportedly necessary would be required of that state. Neither the EPA nor the Supreme Court of the United States endorse this perspective as an appropriate understanding of the overcontrol test.

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[56] EPA notes that the Galveston Texas receptor is estimated to be in attainment and maintenance in both the CAMx Final Rule Policy Control scenario as well as the AQAT estimates using both the ”primary” and ”alternative” calibration factors. This ”CAMx Final Rule Policy Control” emissions scenario is different than the “Full Step 3” emissions scenario used in Step 3, where in the ”Alternative” version of AQAT the receptor’s maintenance issues remain unresolved.

However, the alternative calibration factor analysis presents a plausible alternative method of assessing the rule’s effects in AQAT, and under this method, the debate over that hypothetical concept of a perfectly precise stopping point would be moot. Since the alternative method indicates that the state’s linkage does not resolve even in the full emissions control scenario of the final rule, it cannot be established with sufficient certainty based on the present record that there is any overcontrol with respect to Oklahoma. In short, these findings from the use of the alternative calibration approach support the conclusions in the preamble that there is no overcontrol.

The results of this comparison, which are relatively similar, demonstrate that the AQAT provides reasonable estimates of air quality concentrations for each receptor. Considering the time and resource constraints faced by the EPA, AQAT can provide reasonable inputs for the multi-factor and overcontrol assessments.

Table C-14. 2026 Maximum Ozone DVs (ppb) for the Engineering Analysis Base Scenario Using Two Calibration Factors.

Site	state	county	Primary Calibration	Alternative Calibration	Delta AQ between Calibration Approaches
40278011	Arizona	Yuma	71.47	71.51	-0.04
80590006	Colorado	Jefferson	72.30	72.46	-0.16
80590011	Colorado	Jefferson	72.66	72.76	-0.10
80690011	Colorado	Larimer	71.04	71.02	0.02
90013007	Connecticut	Fairfield	72.06	72.12	-0.06
90019003	Connecticut	Fairfield	71.78	71.89	-0.11
350130021	New Mexico	Dona Ana	71.36	71.45	-0.09
350130022	New Mexico	Dona Ana	71.77	71.79	-0.02
350151005	New Mexico	Eddy			
350250008	New Mexico	Lea			
480391004	Texas	Brazoria	72.02	71.73	0.28
481671034	Texas	Galveston	72.51	71.92	0.59
482010024	Texas	Harris	76.45	76.03	0.42
490110004	Utah	Davis	72.10	72.16	-0.06
490353006	Utah	Salt Lake	72.10	72.11	-0.01
490353013	Utah	Salt Lake	72.31	72.36	-0.05
551170006	Wisconsin	Sheboygan	71.73	71.93	-0.20

Table C-15. 2026 Maximum Ozone DVs (ppb) for the "Full Step 3" Scenario Using Two Calibration Factors.

Site	state	county	Primary Calibration	Alternative Calibration	Delta AQ between Calibration Approaches
40278011	Arizona	Yuma	71.40	71.40	0.00
80590006	Colorado	Jefferson	71.93	72.20	-0.26
80590011	Colorado	Jefferson	72.16	72.38	-0.22
80690011	Colorado	Larimer	70.72	70.73	-0.01
90013007	Connecticut	Fairfield	71.46	71.57	-0.11
90019003	Connecticut	Fairfield	71.26	71.31	-0.05
350130021	New Mexico	Dona Ana	71.16	71.13	0.03
350130022	New Mexico	Dona Ana	71.56	71.54	0.01
350151005	New Mexico	Eddy			
350250008	New Mexico	Lea			
480391004	Texas	Brazoria	70.58	70.89	-0.30
481671034	Texas	Galveston	70.47	71.04	-0.57
482010024	Texas	Harris	74.98	75.25	-0.27
490110004	Utah	Davis	71.46	71.03	0.44
490353006	Utah	Salt Lake	71.50	70.99	0.51
490353013	Utah	Salt Lake	71.80	71.65	0.15
551170006	Wisconsin	Sheboygan	71.17	71.33	-0.16

Table C-16. 2026 Maximum Air Quality Contribution (ppb) to a Remaining Receptor Using the Alternative Calibration.[57]

State	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU ("Full Step 3")
Arkansas	1.14	1.14	1.14	1.14	1.14	1.08	0.76
California	6.09	6.07	6.07	6.07	6.07	6.07	6.03
Illinois	13.67	13.67	13.67	13.66	13.66	13.62	13.54
Indiana	8.44	8.41	8.41	8.41	8.41	8.39	8.31
Kentucky	0.81	0.80	0.80	0.80	0.80	0.75	0.72
Louisiana	9.46	9.45	9.45	9.45	9.45	9.35	9.21
Maryland	1.08	1.08	1.08	1.08	1.08	1.08	1.08
Michigan	1.44	1.44	1.44	1.44	1.44	1.39	1.32
Mississippi	1.34	1.34	1.31	1.34	1.31	1.22	1.14
Missouri	1.78	1.65	1.65	1.65	1.65	1.58	1.54
Nevada	0.90	0.90	0.90	0.90	0.90	0.90	0.83
New Jersey	8.12	8.10	8.10	8.10	8.10	8.10	8.08
New York	12.71	12.71	12.71	12.71	12.71	12.67	12.60
Ohio	1.92	1.90	1.90	1.90	1.90	1.90	1.85
Oklahoma	0.77	0.77	0.76	0.77	0.76	0.73	0.70
Pennsylvania	5.69	5.68	5.68	5.67	5.67	5.64	5.55
Texas	4.51	4.50	4.50	4.50	4.50	4.33	4.27
Utah	1.07	1.07	1.07	1.07	1.07	0.93	0.92
Virginia	1.13	1.12	1.12	1.12	1.12	1.12	1.10
West Virginia	1.36	1.36	1.35	1.35	1.35	1.33	1.33

5. Assumptions made in the air quality assessment tool

There are some key assumptions about the relationship between emission and air quality within the AQAT. In particular, we assume that the downwind air quality improvement is indifferent to the geographic location and to the physical characteristics of the particular emission source within the state where a particular ton was reduced. We also assume that the emissions are reduced in a proportional way across the ozone-season and are not preferentially eliminated on particular days or at particular hours. We also assume that the air quality impact is indifferent to height of release or to the particular source sector from which it was reduced. For example, reducing one ton of NOX emissions from the power sector is assumed to have the same downwind ozone reduction as reducing one ton of NOX emissions from the non-EGU source sector. Note that, in this particular AQAT, the emissions reductions assessed under various scenarios in the rule are exclusively from the EGU and non-EGU sectors and these sectors match the sectors on which the calibration factors are based. Though, the distribution of sources may be different. As described in the section on the construction of AQAT, the calibration factors are built using the pattern of emission reduction and the resulting air quality changes between the two photochemical modeling runs (from the proposal).

In actuality, emission reductions will be concentrated at individual sources. The resulting air quality improvements from these emission reductions will be larger in the immediate vicinity of the source. At larger downwind distances, the unit-by-unit variations in emission behavior

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[57] Values greater than or equal to 0.70 ppb indicate the state remains linked to a remaining downwind receptor.

(relative to the calibration scenario) will be substantially less important as transport and dispersion reduces the gradients in concentration. The closer the distribution of sources and the magnitudes of reductions at those sources match the pattern of reductions used to construct the calibration factor, the less uncertainty there will be in the results.

One additional source of uncertainty within AQAT is the relationship between NOX emissions and ozone concentrations. This relationship is known to be non-linear when examined over large ranges of NOX emissions (e.g., J.H. Seinfeld and S.N. Pandis, Atmospheric Chemistry and Physics From Air Pollution to Climate Change, 2nd Edition, John Wiley and Sons, 2006, Hoboken, NJ, pp 236-237). Figure C-1 is an adaptation of this figure, where we have isolated the ozone isopleths at 70 and 80 ppb. One can readily find examples in the scientific literature (e.g., Kinosian, 1982; Luo et al., 2021; and Koplitz et al., 2021) where similar figures are presented.[58],[59],[60]

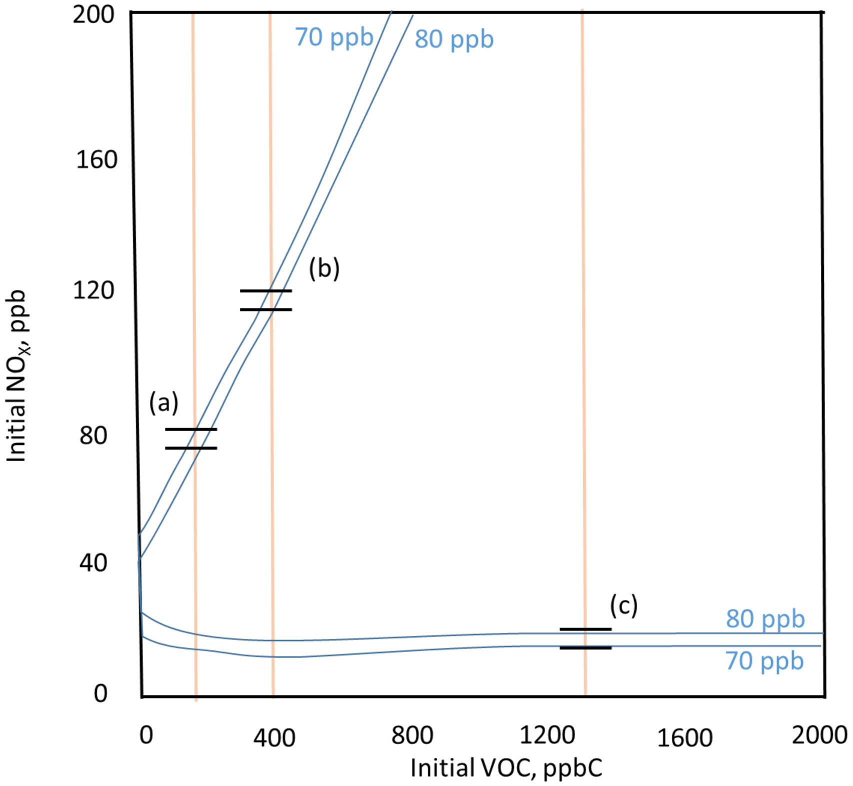

Figure C-1. An adaptation of the ozone isopleth diagram from Seinfeld and Pandis (2006). The ozone isopleths show nonlinear relationships between NOX and VOC emissions. At locations a, b, and c, the isopleth lines are parallel to each other, suggesting a linear relationship at each of those emissions regimes.

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[58] S. Koplitz, H. Simon, B. Henderson, J. Liljegren, G. Tonnesen, A. Whitehill, B. Wells
Changes in ozone Chemical Sensitivity in the United States from 2007 to 2016
ACS Environ. Au (2021), 10.1021/acsenvironau.1c00029
1c00029. https://pubs.acs.org/doi/full/10.1021/acsenvironau.1c00029

[59] J.R.Kinosian. 1982. Ozone-Precursor relationships from EKMA Diagrams. Environ. Sci. Technol., Vol. 16, No. 12, 1982. https://pubs.acs.org/doi/pdf/10.1021/es00106a011

[60] H. Luo, K. Zhao, Z.Yuan, L.Yang, J. Zheng, Z. Huang, X. Huang. 2021. Emission source-based ozone isopleth and isosurface diagrams and their significance in ozone pollution control strategies. Journal of Environmental Sciences, Volume 105, July 2021, Pages 138-149. https://doi.org/10.1016/j.jes.2020.12.033

This nonlinearity can be seen by following one of the ozone isopleth lines and observing that there are various combinations of NOX and VOC that result in a constant level of ozone, that the lines are not straight over the entire emissions regime. For example, there are particular levels of VOC emissions with different level of NOX emissions that can result in the same ozone concentration (Figure C-1). The nonlinearities are evident over tens of percent changes in the overall emission inventories and tens of ppb of ozone changes. Focusing in on small areas in the figure (see, for example, locations a, b, and c), one can observe that the isopleths are often parallel to each other (when looking at some smaller range of NOX and/or VOC changes). This suggests that, for that particular emissions and ozone regime, that one could expect a linear relationship between emissions change and concentration change (assuming that the meteorology is held constant). The linearity would be present even with simultaneous VOC emission changes (particularly if they vary in proportion to the NO_X emission changes). In some cases the linear relationship between NO_X emission change and ozone change can be positive (i.e., emission reductions result in decreases in ozone (see for example location c in Figure C-1)) while in other cases it is negative (i.e., emission reductions result in increases in ozone, see for example, locations a and b in Figure C-1). The relationship between emissions and ozone concentration depends on the levels and composition of the NO_X and VOC emissions as well as on the particular meteorology in that area. For a particular location, the relationship can vary from one day to the next as the emissions and meteorology change. As described in the Air Quality Modeling TSD, in this action, the air quality modeling average and maximum design values and state contributions are based on averaging multiple days together. So, the relationship between NO_X, VOC, and the resulting concentration change in the contributions is also based on averaging the response over these days.

Relationships between emissions and ozone concentrations comparable to that shown in Figure C-1 are usually created for particular locations and focus on local relationships, but the general principles can apply for each of the chemical constituents including those transported to the location. As described in the Air Quality Modeling TSD, during transport, the emissions form ozone (which can undergo additional transformations as it passes from one chemical regime to the next). Consequently, pollution from one upwind state may be in the form of ozone or NO_X, for example, as it encounters the downwind area, while local emissions of NO_X or VOCs may still be in the process of transforming into ozone. In both cases, we would expect a linear relationship between emissions changes and changes in concentration. But those relationships could be different. The relationships for a particular receptor and state can be seen in the calibration factor for that receptor and state. The calibration factors range from positive values to negative values, though most are positive (and they tend to go toward a value of 1 (or higher) for states that are farther away from particular monitors indicating that a particular percent change in NO_X emissions would result in the same percent change in ozone contribution from that state. For the state containing the monitor, the values tend to be lower (meaning the monitor is less responsive to emission changes from that state on a percentage basis).

For the states evaluated here, under the various control scenarios, the changes in the emission inventory are on the order of a few percent and the resulting air quality changes are on the order of a fraction of a ppb. Consequently, as described above, the changes in air quality in response to emissions changes are likely to be linear over this small range. In this assessment tool, we are assuming a linear relationship between NO_X emissions and ozone concentrations, but this relationship is calibrated using two CAMx simulations (basically giving us known points on the figure (conceptually similar to where the parallel lines cross the ozone isopleths at locations a, b, or c in Figure C-1). Note that the emissions differences and the resulting changes in air quality between the two CAMx simulations is less than 10 ppb (making it even more likely that the relationship is linear). This relationship should hold for emission reductions around the area that calibration factor was created for (both in the emission regime between those two CAMx simulations and the area immediately above and below those modeled emission levels). Thus, while emissions and ozone are demonstrably nonlinear, CAMx photochemical modeling allows us to identify an area on the emissions and ozone curve and describe it using a linear relationship. Errors and uncertainty in the linear calibration approach will occur if the reduction between the two air quality model simulations is too large, or if the two simulations are too close together (i.e., with little emission change between the scenarios).

Using an earlier version of the tool, EPA had the tool and methodology peer-reviewed (see AQAT Review Summary Memo included in the docket). This review focused on applying the methodology to SO2 emissions and sulfate concentrations for estimating PM2.5, highlighting some of the primary assumptions that were made in that version of the tool and offering suggestions. In the case of this tool, a number of the improvements (such as individual state and receptor calibration factors, calibration factors based on emission changes from a particular source sector (and corresponding heights of emissions release), and holding the days used in the creation of the average contributions) conform to suggestions made by the reviewers.

Finally, as done in the earlier section of this TSD (Section C.4), we can assess the effects of the uncertainty resulting from the assumptions within AQAT (including nonlinearity in the emissions to ozone relationship, variation in geographic location of the sources, time and magnitude of emission release, and source sector) by using an alternative set of calibration factors created using another emissions scenario modeled in CAMx. As described, above, this comparison confirms the results.

D. Selection of Backstop Emission Rate

For the reasons described in the preamble, EPA is complementing the longer-term mass-based trading program (premised on seasonal emission rate performance) with a short-term “backstop” emission rate for some units. This section discusses how that rate was set. At proposal, EPA considered hourly, 24-hour, 7-day and 30-day periods as potentially appropriate averaging lengths for the rate. While all these time periods would likely provide appropriate assurance for post-combustion controls to operate on an hourly and daily basis, including during ozone episodes, as described in the preamble, EPA is finalizing the daily (e.g., 24-hr) period as an appropriate length of averaging time for the backstop rate.

As described in the preamble, in implementing the daily backstop emission rates, the EPA is accounting for emissions during start-up and shutdown where the emission rate may exceed the daily limit by including a 50-ton buffer.

As described in the preamble, in establishing the appropriate rate, EPA evaluated several methods and data sets. These are:

1. EPA evaluated daily emission patterns for units that have SCRs with seasonal rates in the range of the average seasonal emission rates identified in the rulemaking (i.e., at 0.08 lb/MMBtu or below).
2. EPA applied the concept of “comparable stringency” developed in the 2014 1-hr SO2 attainment area guidance for converting emission rates so they provide comparable stringency over different time frames. In this case, we convert longer-term emission rate assumptions (e.g., seasonal and monthly rates at 0.08 lb/MMBtu to daily rates at 0.14 lb/MMBtu)
3. EPA evaluated start up and shut down events and identified a 50-ton threshold before any additional 2 allowances per ton surrender requirement is triggered in an effort to accommodate these events.

Each of these methods is discussed in more detail, below.

1. <u>Observations of fleet operation for well-controlled units</u>

EPA examined the daily operation of coal-fired units with SCR in 2021, comparing the daily rate to the seasonal average rate. We counted the number of days that had values higher than particular values (e.g., 0.12 lb/MMBtu, 0.14 lb/MMBtu, and 0.16 lb/MMBtu) as a function of the seasonal average emission rate. Knowing that there is variation in emission rate, with values above and below the seasonal average, we wanted to identify the frequency and magnitude of some of the higher emission rate values for units that typically had low seasonal rates. A low seasonal rate suggests that the post-combustion controls on the unit are well-designed and modern and are being well-run and well-maintained. The results are shown in Figure D-1. As an example, for a unit with a seasonal rate of 0.08, we could expect, on average, about 4.7% of the daily rate values to be higher than 0.14 lb/MMBtu.

Focusing on the 0.14 lb/MMBtu rate, EPA identified 164 units that had ozone season rates at or below 0.08 lb/MMBtu in the 2021 ozone season.[61] As described above, daily emission rates from these units rarely exceeded 0.14 lb/MMBtu. On the days that the rate did exceed, it was frequently close to the 0.14 lb/MMBtu rate. There were a total of 572 tons of "excess" emissions (i.e., emissions above what would have been emitted had the emission rate been capped at 0.14 lb/MMBtu on those days). This compares with 60,339 tons of total seasonal emissions from those units. Thus, these "excess" emissions are about 0.9% of their seasonal emissions.

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[61] See the Excel workbook, Daily Backstop rate for existing SCRs - accommodating startup shutdown.xlsx for details.

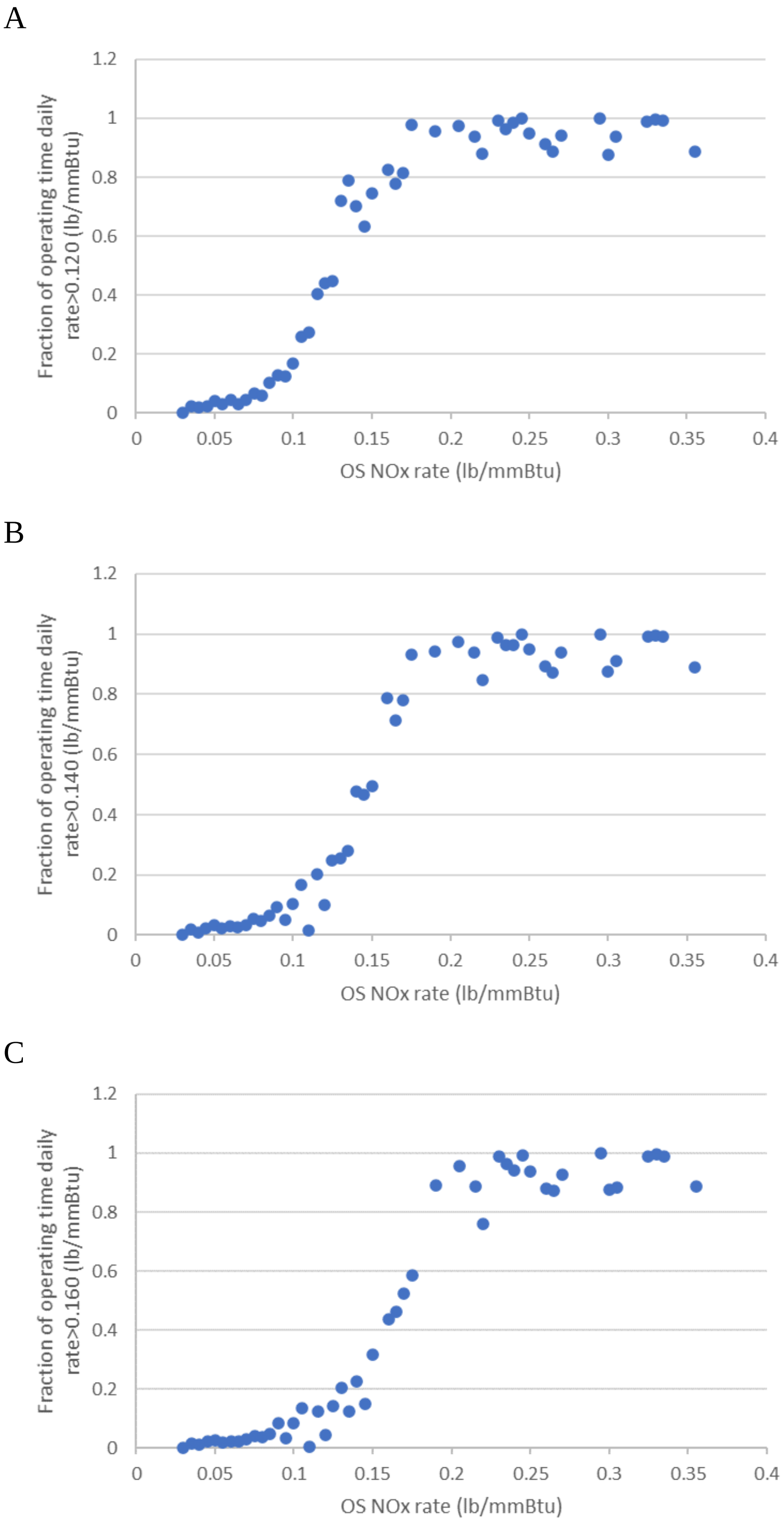

Figure D-1. Examination of the fraction of operating time where the daily rate was higher than 0.12, 0.14, or 0.16 lb/MMBtu in 2021 (in A, B, and C, respectively) as a function of the average ozone season emission rate for the unit.

2. Creating “comparably stringent” emission rates using the 2014 1-hour SO2 concepts

a. Background

In the 2014 Guidance for 1- Hour SO2 Nonattainment Area SIP Submissions, EPA introduced concepts and methods for ensuring that NAAQS violations of the 1-hr SO2 NAAQS do not occur.[62,63] For example, the 2014 1-hr SO2 Guidance defined a "critical emission value" to refer to the hourly emission rate that an air quality model predicts would result in the 5-year average of the annual 99th percentile of daily maximum hourly concentrations at the level of the 1-hour NAAQS, given representative meteorological data for the area. In the guidance EPA explained that, for that standard, establishing 1-hour limits at the critical emission value is an approach to developing a control strategy that ensures that NAAQS violations do not occur. Consequently, the EPA recommended that approach in the September 2011 draft guidance, as it was consistent with the EPA’s longstanding SO2 policy that source emission limits should match the averaging time of the relevant SO2 NAAQS. However, EPA notes that different averaging time-based limits require a case-by-case analysis of specific facts and data, and “comparable stringency” is not an assumed approvable result.

The EPA continues to consider that approach to be acceptable. As discussed in the subsequent 2014 Guidance, in order to provide adequate assurance that the NAAQS will be met, the EPA noted that any emissions limits based on averaging periods longer than 1 hour should be designed to have comparable stringency to a 1-hour average limit at the critical emission value. A limit based on the 30-day average of hourly emissions levels, for example, at a given numeric level is likely to be a less stringent limit than a 1-hour limit at the same numeric level since the control level needed to meet a 1-hour limit every hour is likely to be greater than the control level needed to achieve the same limit on a 30-day average basis. Therefore, as a general matter, the EPA expects that any emission rates with a longer averaging time would reflect a lower numeric emission rate and emission rates with shorter averaging time would reflect a higher numeric emission rate. Although the emission rate values are different numerically, they are of comparable stringency when the averaging time is applied.

b. Application

In this rule, EPA is looking to ensure that emission reductions achieved are commensurate with the installation and operation of post-combustion control devices for portions of the fossil EGU fleet. Consistent with the 8-hour ozone NAAQS time frame, EPA is meeting its statutory obligation to eliminate significant contribution from upwind states, in part, by ensuring the operation of these post-combustion controls (or commensurate reductions) every day of the ozone season when the units are operating. To achieve this, EPA converts its seasonal emission rate performance assumptions for such post-combustion control technology (used to determine seasonal state mass limits) to a daily emission rate of comparable stringency. EPA does this by utilizing the concepts applied in the 2014 1-hour SO2 Guidance. That Guidance was developed for a similar purpose, to identify “comparably stringent” emissions limits over

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[62] Docket ID: EPA-HQ-OAR-2021-0668-0123, https://www.epa.gov/sites/default/files/2016-06/documents/20140423guidance_nonattainment_sip.pdf

[63] We note that given the form of the emission rate metric, the emissions and operational data used in the calculation, as well as the NAAQS being addressed are important to consider when setting an emission rate and that procedures that may be applicable for one NAAQS (i.e., the 2015 8-hr Ozone) would not necessarily be applicable for another (e.g., 1-hour SO2).

different time periods. EPA notes that concept could be applied to help identify daily (e.g., 24-hour) rates that are comparably stringent to rates based on longer averaging times. In other words, because we have clear definitions of longer-term (e.g., seasonal) emissions rates that eliminate significant contribution, we could use the 1-hr SO2 methodology to identify complementary short-term rates that are "comparably stringent" that would ensure control operation on a daily basis. In this case, we are not looking for 1-hr emission limits, nor are we looking to limit emissions on a pounds per hour basis to match a modeled "critical emissions value." Rather, we have seasonal emission rates of 0.08 lb/MMBtu (demonstrating full SCR operation for units with this existing technology) which can be converted to 24-hour rates in a pound per unit of heat input rather than a pound per hour framework. As with the 1-hr SO2 limit, we expect that the longer-term rates would be lower than 24-hour rates that would be adjusted higher to accommodate the variation in operation, demand for electricity, variation in fuel, and other technical and engineering limitations.

The EPA issued the 2014 1-hr SO2 guidance based on consideration of the statistical nature of the NAAQS and based on analyses of selected cases suggesting that comparably stringent short term average limits can commonly be expected to provide adequate assurance of control operation.

Here, EPA expects that an emission rate established for a source with an averaging time shorter than 30-day or seasonal would be set at a higher level, yet would provide a comparable degree of stringency as the longer-term emission rate assumption (that would provide assurance that significant contribution and interference with maintenance are being eliminated). In theory, the longer-term emission rate assumptions would allow occasional emission spikes, but this longer-term emission rate (or comparable mass limit implemented in the trading program) would also require emissions to be lower for most of the averaging period than they would be required to be with a short-term emission rate (i.e., 24-hour). Here, the EPA envisions that meeting both the short-term rate and longer-term emission rate assumption in practice would require similar emission control levels and would commonly result in similar emission patterns, yet having the short-term backstop rate provides additional assurance that sources will reliably operate their SCRs each day throughout the ozone season.

In the 2014 1-hour SO2 guidance Appendix C presented example calculations in which the level of the longer-term emission rate is derived from a statistical analysis of a set of data that reflect the emissions variability that the controlled source is expected to exhibit. The analysis underlying those example calculations compared the set of emission values averaged over the longer averaging time against the set of 1-hour emission values from which the longer-term averages were derived.[64] The example calculations in Appendix C reflected a comparison of 99th percentile values of the sets of 30-day averages and 1-hour averages. Alternative averaging times were also explored, including 24-hr time-periods. In applying the 1-hour SO2 guidance concepts, here, we envision that the control strategy needed to meet a comparably stringent longer term emission rate would be essentially the same as the control strategy needed to meet a daily rate, specifically the operation of SCR post-combustion controls.

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[64] In the 2014 1-hour SO2 guidance, EPA suggested that hourly data for at least 3 to 5 years of stable operation (i.e., without changes that significantly alter emissions variability) may be needed to obtain a suitably reliable analysis. For EGUs such data sets are widely available, as required by 40 CFR part 75 and reported to the EPA. Similar emissions monitoring is required for a few additional source types under 40 CFR part 51, Appendix P, though these hourly data are not commonly made publicly available.

c. Methods and Results

Starting with the coal-fired EGUs that are currently equipped with SCRs, EPA followed the methodology laid out in the guidance evaluating daily, 7-day, and 30-day variability on a lb/MMBtu basis (Table D-1).[65,66] We show the estimated rates using the ratios for a seasonal rate at 0.08 lb/MMBtu. In all cases, we assume a daily emission rate of 0.14 lb/MMBtu (i.e., the value assumed across the coal steam fleet) is appropriate given that fuel mix does not appear to substantially change the values.

To convert between the various rates, we can use the ratios of the 99th percentile values for the various time-periods. As an example, under the 2014 guidance, if we wanted to calculate a 30-day average rate that was comparably stringent to an hourly rate, we would take the ratio of the 99th percentile values (the 30-day value divided by the hourly value). This “adjustment factor” would then be multiplied by the hourly value that we want to convert (usually the hourly critical emission value, or CEV). Similarly, if we wanted to calculate a daily value, we would multiply the ratio of the 99th percentile values (the daily value divided by the hourly value) by the hourly critical emission value.

Comparably stringent 30-day rate = Hourly CEV*Ratio of 30-Day to hourly 99th Percentiles

Comparably stringent Daily rate = Hourly CEV*Ratio of Daily to hourly 99th Percentiles

Combining these two equations, by rearranging both to have the hourly CEV equal in both, and then solving for the comparably stringent daily rate:
Comparably stringent daily rate =
30-day rate * Ratio of Daily to hourly 99th Percentiles/ Ratio of 30-Day to hourly 99th Percentiles

EPA computed the following ratios or adjustment factors using the same data procedures used in creating the ratios in the 2014 guidance. The resulting unit-level 99th percentile ratios for various averaging times as well as various fleet-wide averages are shown in the excel file (Units_daily_rate_conversions_proposal.xlsx) included in the docket for the rule. Summary values are included in Table D-1. Substituting values from Table D-1 into the above equations 0.08 lb/MMBtu (a seasonal value taken to be equal to the 30-day rate)*0.97/0.56 = 0.14 lb/MMBtu. Thus, here, following the methodology that EPA outlined in the 2014 guidance, EPA concludes that a long-term rate of 0.08 lb/MMBtu could be considered to be comparably stringent to a short-term rate of 0.14 lb/MMBtu. The graphs in Figure D-1 show that for units fully operating their controls (i.e., achieving the 0.08 lb/MMBtu seasonal rate), the daily rate is unlikely to necessitate any change in performance or behavior.

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[65] Because of the method for calculating the rate, which is the sum of the daily emissions divided by the daily heat input utilized, hours where the unit does not operate will not impact the calculation.

[66] For this assessment, we assume that the 30-day and seasonal rates would be at comparable levels. Typically, a 30-day rate would have a larger variability than a seasonal rate inclusive of those particular 30 days, but this should be relatively small since a seasonal value would include roughly one fifth of the values in the 30-day rate. Here, with just a few ozone seasons included, EPA did not believe it could reasonably estimate a 99th percentile variability in seasonal values.

Table D-1. Ratios to convert between various time-averages, applied to a 0.08 lb/MMBtu seasonal rate.

Unit Plant Type	Fuel	Ratio of NO_X OS 99th Percentiles (30 Day Over Hour)	Ratio of NO_X OS 99th Percentiles (Day Over Hour)	Ratio of NO_X OS 99th Percentiles (Hour Over Hour)	Conversion of Default Seasonal SCR Rate to a Comparably Stringent Day Rate (lb/MMBtu)
coal steam	Fleet avg	0.56	0.97	1	0.14
coal steam	Bituminous	0.53	0.93	1	0.14
coal steam	Bituminous, Subbituminous	0.56	0.99	1	0.14
coal steam	Lignite	0.73	1.14	1	0.12
coal steam	Subbituminous	0.64	1.01	1	0.13

3. Accommodating startup and shutdown emissions using a 50-ton buffer

EPA examined units with SCR controls at coal fired units that operated during the 2021 ozone season with a seasonal average NO_X rate under 0.08 lb/MMBtu. We identified 164 coal units nationwide with SCRs operating in this way – during a time period for which there was not a daily rate applied to those EGUs by the CSAPR program in effect at that time. As described in section D.1 of this TSD, for these units we found that only 0.9% (572 of 60,350 tons) of their emissions occurred above the 0.14 lb/MMBtu emission rate that we are finalizing as the backstop rate under this rule.[67] These 572 tons were widely distributed across the 164 coal units, such that only two units had over 30 tons of such emissions and none had over 50 tons of such emissions. In 2021, there were 124 coal SCR units that had *ozone season* NO_X rates above 0.08 lb/MMBtu. 121 of these units had a total of 18,629 tons of "excess" emissions (above the 0.14 lb/MMBTU daily backstop rate), representing 23.0% of their total ozone-season emissions, ranging from under 1 ton to 3,623 tons of excess emissions at the individual EGU level. Even if 50 tons were excluded for each unit, there would still be 15,374 excess tons subject to a 3-for-1 allowance surrender ratio, and thus this relatively poor performance would still be disincentivized.

For these 164 units in 2021 that had emission rates below 0.08 lb/MMBTU, we also examined their emissions in the 2022 ozone-season relative to the 0.14 daily backstop rate. Again, we found that all units would not have issues when a 50-ton buffer was applied, with the closest being a unit having 47.5 tons of "excess" emissions. See section VI.B of the preamble for further discussion on this 50-ton buffer's incorporation into the final rule.

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[67] See the Excel workbook, Daily Backstop rate for existing SCRs - accommodating startup shutdown.xlsx for details.

E. Preliminary Environmental Justice Screening Analysis for EGUs

EPA conducted a screening analysis regarding potential environmental justice concerns associated with emissions from EGUs.[68] This analysis, discussed in this section, is distinct from the EJ impacts analysis for the full rule in Chapter 7 of the RIA. EPA's EJ Technical Guidance[69] states that: "A regulatory action may involve potential environmental justice concerns if it could: (1) create new disproportionate impacts on minority populations, low-income populations, and/or indigenous peoples; (2) exacerbate existing disproportionate impacts on minority populations, low-income populations, and/or indigenous peoples; or (3) present opportunities to address existing disproportionate impacts on minority populations, low-income populations, and/or indigenous peoples through the action under development." In this TSD, EPA uses a screening analysis to identify the potential for coal-fired EGUs to contribute to air pollution in areas with potential EJ concerns.

This initial screening analysis examines two groups of coal-fired EGUs within the geography: those EGUs with existing SCRs that will receive a backstop rate in 2024, and those EGUs currently lacking SCRs that will receive a backstop rate by no later than 2030. It considers whether each group demonstrates a greater potential to expose areas of potential EJ concern to air pollution, relative to the national coal-fired EGU fleet. This screening-level analysis helped EPA identify potential EJ concerns during the process of rule development, while subsequent analysis presented in the RIA provides an evaluation of the distributional impacts of the requirements finalized in this action. These two sets of analyses are distinct but complementary – the screening analysis presented in this TSD evaluates the potential for environmental justice concerns associated particularly with EGUs, and the environmental justice analyses presented in the RIA estimate the ultimate impacts of the final rule.

Based on this screening analysis, both groups of EGUs demonstrated relatively high potential to expose areas of potential EJ concern to further pollution. While this screening analysis does not identify all potentially impacted downwind areas or quantify the downwind air quality impacts, exposures, and potential health effects of these sources (the aggregate impact of which is evaluated and discussed in the RIA), it does demonstrate that a relatively high potential exists for the sources in these two groups to affect areas facing pre-existing disproportionate susceptibility to exposure. Ultimately, all final rule determinations are justified under the EPA's interstate transport framework for implementing the good neighbor provision for the 2015 ozone NAAQS. This analysis indicates whether two groups of EGUs receiving backstop rates under the final rule exhibit a relatively high potential to expose areas of potential EJ concern to further pollution. An overview of the methodology is described below.

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[68] A potential EJ concern is defined as "the actual or potential lack of fair treatment or meaningful involvement of minority populations, low-income populations, tribes, and indigenous peoples in the development, implementation and enforcement of environmental laws, regulations and policies" (U.S. EPA, 2015). For analytic purposes, this concept refers more specifically to "disproportionate impacts on minority populations, low-income populations, and/or indigenous peoples that may exist prior to or that may be created by the proposed regulatory action" (U.S. EPA, 2015).

[69] U.S. Environmental Protection Agency (EPA), 2015. Guidance on Considering Environmental Justice During the Development of Regulatory Actions, Docket ID: EPA-HQ-OAR-2021-0668-0087

Methodology

The screening assessment in this TSD is based on EPA's peer-reviewed[70] Power Plant Screening Methodology (PPSM) and is carried out in three parts. First, to estimate which census block groups have some potential to be exposed by emissions from each EGU, EPA used NOAA's Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model to generate forward trajectories for large coal-fired EGUs located in linked upwind states under this final rule.[71] A forward trajectory is a modeled parcel of air that moves forward (i.e., downwind) due to winds and other meteorological factors. For each EGU, we used the HYSPLIT model to simulate the downwind path of air parcels passing individual EGUs four times per day—12:00 AM, 6:00 AM, 12:00 PM, and 6:00 PM (local standard time). For simplicity, EPA limited the modeling to the period June 1 to August 31 (the period over which ozone concentrations are the most likely to be elevated) for the years 2018 to 2020. In addition, EPA ran each trajectory for only 24 hours. While the horizontal spatial resolution of the HYSPLIT model is based on 12-km meteorology (in some respects limiting our ability to resolve spatial differences less than 12 kilometers), we ran model simulations over 1,100 times for each facility (4 runs a day across 92 ozone season days for 3 years). These trajectories reflect a modeled air parcel's coordinates and elevation at every hour downwind of each EGU stack.[72] For simplicity in this initial screen, we limit our evaluation to coordinates of those trajectories that are within the contiguous United States. While the 24-hour transport time used in this screening analysis identifies many of the near-source areas that are most frequently impacted, emissions can travel over larger distances and longer times and have substantive air quality impacts downwind, particularly when contributions from individual sources from geographically distinct areas (each of which could be relatively small) are aggregated to have a larger collective impact. Those collective air quality impacts are analyzed using photochemical air quality modeling in this final rule's RIA.[73]

It is important to note that unlike the other models used to quantify downwind ozone concentrations related to this rule, the HYSPLIT model is not a photochemical model – the model does not include chemical transformation and does not provide estimates of downwind pollutant concentrations.[74] We are using HYSPLIT trajectories in a qualitative way to examine

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[70] The Peer Review Summary Report and EPA's Response will be available on EPA's website.

[71] The HYSPLIT model determines the pathway of a modeled parcel of air using the NOAA's National Center for Environmental Information North American Mesoscale Forecast System 12 kilometer forecast gridded meteorology dataset (NAM-12) (https://www.ncei.noaa.gov/access/metadata/landing-page/bin/iso?id=gov.noaa.ncdc:C00630). The horizontal resolution of the NAM-12 dataset is 12.191 kilometers, the vertical resolution is 26-layers from 1000 to 50 hecto Pascals, and the temporal resolution is 3-hours. (Stein et al., 2015, Draxler and Hess, 1998).

[72] The EPA uploaded into an Oracle database the HYSPLIT model output results for each forward trajectory, including the originating EGU, the coordinates and elevation above ground for each hour of the trajectory, and the trajectory elapsed time since release from the EGU. Within the Oracle database, the trajectory coordinates are used to construct line segments that can be displayed within a geographic information system (GIS) software package to overlay each modeled forward trajectory. The use of GIS allows a user to overlay HYSPLIT trajectories over census blocks of interest display the likely path that EGU emissions may travel in the absence of atmospheric residence time, chemical dispersion, or atmospheric deposition.

[73] For example, in 2016, the EPA used HYSPLIT to examine 96-hour trajectories and altitudes up to 1,500 meters in a corollary analysis to the source apportionment air quality modeling to corroborate upwind state-to-downwind linkages. Details of this analysis can be found in Appendix E ("Back Trajectory Analysis of Transport Patterns") of the Air Quality Modeling Technical Support Document for the Final Cross State Air Pollution Rule Update, which is available at: https://www.epa.gov/sites/default/files/2017-05/documents/aq_modeling_tsd_final_csapr_update.pdf

[74] The HYSPLIT model is run assuming the air parcel is neutrally buoyant and inert (i.e., without any dispersion, deposition velocity, or atmospheric residence time constraints).

the spatial patterns of pollutant transport from EGUs.[75] The model results simply simulate the path that the wind would carry a modeled parcel of air from the stack(s) of each EGU.[76]

Next, EPA screened each of the downwind areas that intersected with a HYSPLIT trajectory to identify census block groups with potential environmental justice concerns. The intent of this screen in this application is to generally identify areas of potentially higher susceptibility to environmental factors such as air pollution. The screen was performed using data from EPA's EJScreen, an environmental justice mapping and screening tool that includes 11 different environmental indicators and 6 different demographic indicators.[77] For this analysis, EPA evaluated the available information at the census block group level and calculated the average of the following four socioeconomic indicators found in EJScreen: low-income, unemployment rate, limited English speaking, and less than high school education. This average, converted to a percentile, is similar to the supplemental demographic index in EJScreen. However, unlike the supplemental demographic index, the index used in this screen does not include low-life expectancy, which was not available at the time the assessment was conducted. Note that the index used in this screen does not consider the exposure and vulnerability of communities to multiple environmental burdens and their cumulative impacts, nor does it quantify ozone-specific health risks. Rather, this aggregate indicator offers a general look at the relative potential susceptibility of each block group to environmental exposure. For further discussion of these indicators and the other indicators currently available in the EJScreen tool, see the EJScreen Technical Documentation available at https://www.epa.gov/ejscreen.

In the final step of the screening analysis, EPA combined the results of the previous two steps by layering the modeled HYSPLIT trajectories over census block groups and associated combined socioeconomic values to produce a relative score for each EGU that considers the population-weighted average combined socioeconomic value of the population that is potentially affected by that EGU. This score is calculated for each EGU by identifying each block that intersects with each trajectory originating from that EGU, summing the product of each block group's combined socioeconomic value and its population, and then dividing that aggregated total by the total population of all those intersected block groups. The resulting value is converted to a percentile relative to the scores generated for the entire coal steam fleet. Higher scores are assigned to EGUs with trajectories that intersect areas with higher population weighted average combined socioeconomic values. The intent of this approach is to highlight EGUs with the potential to affect areas where people who might be more vulnerable on average might live. While these values are useful in a screening context to identify relative differences across the EGU fleet, they do not provide any absolute or relative measure of exposure or risk.

EPA compared the relative scores across each group of EGUs to the fleet to determine whether the groups exhibit a higher potential to expose areas of EJ concern than the fleet on average. The scores for the fleet are distributed such that half of the EGUs score above the 50th percentile, and half score below the 50th percentile. For each of the two groups of EGUs screened in this analysis, more than half score higher than the 50th percentile. This distribution suggests that each of these two groups demonstrates a higher relative potential to expose people who

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[75] In general, pollutant concentrations are the result of transport, dispersion, and transformation. As noted, this analysis does not consider photochemical transformations.

[76] Consistent with the intent of this screening analysis, this model provides information about where non-reactive pollutants might initially travel from each EGU over a limited 24-hour period but does not quantify the magnitude of impact at any given location.

[77] U.S. Environmental Protection Agency (EPA), 2022. EJSCREEN Technical Documentation and EJScreen Technical Document Appendix.

might be more susceptible to air pollution, on average, compared with the EGU fleet assessed across the entire contiguous United States.

Furthermore, EPA found that each group contained many individual EGUs with scores above the 80th percentile (20 EGUs with existing SCRs and 9 EGUs lacking SCRs). This means that these EGUs rank among the top 20% of EGUs in the country based on the scoring approach described above. The 80th percentile threshold has been identified by the Agency in early applications of EJScreen as an initial screening filter and has been used in past screening experience to identify areas that may warrant further review, analysis, or outreach.[78]

The findings of this screening analysis suggest that this rule's imposition of a backstop emissions rate on the EGUs included in these two groups may benefit areas of potential environmental justice concern.

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[78] U.S. Environmental Protection Agency (EPA), 2022. EJSCREEN Technical Documentation.

F. Assessment of the Effects of Ozone on Forest Health

Air pollution can impact the environment and affect ecological systems, leading to changes in the ecological community and influencing the diversity, health, and vigor of individual plant species. When ozone is present in the environment, it enters the plant through the stomata and can interfere with carbon gain (photosynthesis) and allocation of carbon within the plant, making fewer carbohydrates available for plant growth, reproduction, and/or yield (2020 PA, section 4.3.1 and 2013 ISA, p. 1-15).[79],[80] Ozone can impact a variety of commercial and ecologically important species throughout the United States. These include forest tree and herbaceous species as well as crops. Such effects at the plant scale can also be linked to an array of effects at larger spatial scales and higher levels of biological organization, causing impacts to ecosystem productivity, water cycling, ecosystem community composition and alteration of below-ground biogeochemical cycles (2020 PA, section 4.3.1 and 2013 ISA, p. 1-15)..[81] With the data sets available to the Agency, here, we focus on selected forest tree species.

Assessing the impact of ozone on forests in the United States involves understanding the risk to tree species from ozone concentrations in ambient air and accounting for the prevalence of those species within the forest. Across several reviews of the ozone NAAQS and based on longstanding body of scientific evidence, EPA has evaluated concentration-response functions which relate ozone exposure to growth-related effects in order to consider the risk of ozone-related growth impacts on forest trees (2020 PA, section 4.3.3, 2013 ISA and 2020 ISA). For this purpose, EPA has focused on cumulative, concentration-weighted indices of exposure, such as the W126-based cumulative exposure index (2020 PA, section 4.3.3.1.1, 2020 ISA, section ES.3). Measured ozone concentrations in ambient air of the United States are used to calculate the W126-based index as the annual maximum 3-month sum of daytime hourly weighted ozone concentrations, averaged over 3 consecutive years. The sensitivity of different trees species varies about the growth impacts of ozone exposure. Based on well-studied datasets relating W126 index to reduced growth, exposure response functions have been developed for 11 tree species (2020 PA, section 4.3.3.1.2 and Figure 4-3 and 2013 ISA, section 9.6). For these species, the impact from ozone exposure has been determined by exposing seedlings to different levels of ozone concentrations over one or more seasons (which have been summarized in terms of W126 index) and measuring reductions in growth (which are then summarized as "relative biomass loss"). The magnitude of ozone impact on a forest community will depend on the prevalence of different tree species of relatively more versus less sensitivity to ozone and the abundance in the community.

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[79] U.S. EPA (2020). Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards, Health and Environmental Impacts Division, Research Triangle Park, NC. EPA-452/R-20-001. Available *https://www.epa.gov/sites/production/files/2020-05/documents/o3-final_pa-05-29-20compressed.pdf* . Docket ID: EPA-HQ-OAR-2021-0668-0164

[80] U.S. EPA (2020). Integrated Science Assessment for Ozone and Related Photochemical Oxidants. U.S. Environmental Protection Agency. Washington, DC. Office of Research 3A-35 and Development. EPA/600/R-20/012. Available at: *https://www.epa.gov/isa/integrated-science-assessment-isa-ozone-and-related-photochemical-oxidants*. Docket ID: EPA-HQ-OAR-2021-0668-0078

[81] U.S. EPA (2013). Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). Office of Research and Development, National Center for Environmental Assessment. Research Triangle Park, NC. U.S. EPA. EPA-600/R-10-076F. February 2013. Available at: *https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100KETF.txt*. Docket ID: EPA-HQ-OAR-2021-0668-0075

Some of the most common tree species in the eastern United States, where the benefits from this rule will be most pronounced, are black cherry (*Prunus serotina*), yellow or tulip-poplar (*Liriodendron tulipifera*), sugar maple (*Acer saccharum*), eastern white pine (*Pinus strobus*), Virginia Pine (*Pinus virginiana*), red maple (*Acer rubrum*), and quaking aspen (*Populus trenuloides*). Since 2008, EPA has assessed the impact of ozone on these tree species within the eastern United States for the period from 2000 to 2021 as part of the Clean Air Market Division (CAMD) annual power sector programs progress report.[82] Over this time period ozone concentrations have improved substantially because of various emission reduction programs, such as NBP, CAIR, CSAPR, CSAPR Update, Revised CSAPR Update, and other local and mobile source reductions such as Tier2 and Tier3 rules. Past EPA assessments have shown that the improvements in ozone are evident both for the regulatory metric, 3-year average of 4th highest 8-hr daily maximum ozone concentration, and for the W126 metric. [83] In forests where certain sensitive species dominate the forest community, the estimates of relative biomass loss from ozone have decreased substantially. However, for the period from 2019–2021, the eastern United States still has areas where the species-weighted relative biomass loss estimated from ozone for the seven common trees listed above is up to 11.0% (Figure F-1)[84].

Ozone levels are expected to continue to decrease through 2026 based on model projection of the impacts on ozone concentrations resulting from baseline “on the books” control programs as well as by emission reductions under this rule. In a past analysis, as ozone declines, estimates of relative biomass loss of these trees’ species will also decline as they have from 2000 to 2021, indicating this proposed rule would result in increased protection of forest ecosystems and resources. Under this rule, ozone concentrations are expected to decline faster than without the rule (e.g., under the base case). While EPA does not have the tools to quantify the expected level of improvement at this time, based on the previous relationships between ozone design values and W126 determined as part of the review of the 2020 ozone NAAQS (2020 PA, section 4D.3.2.3 and Table 4D-12), W126 values are expected to improve as design values decrease. As described in the preamble, the rule is expected to improve air quality as controls are optimized and installed between 2023 and 2026.

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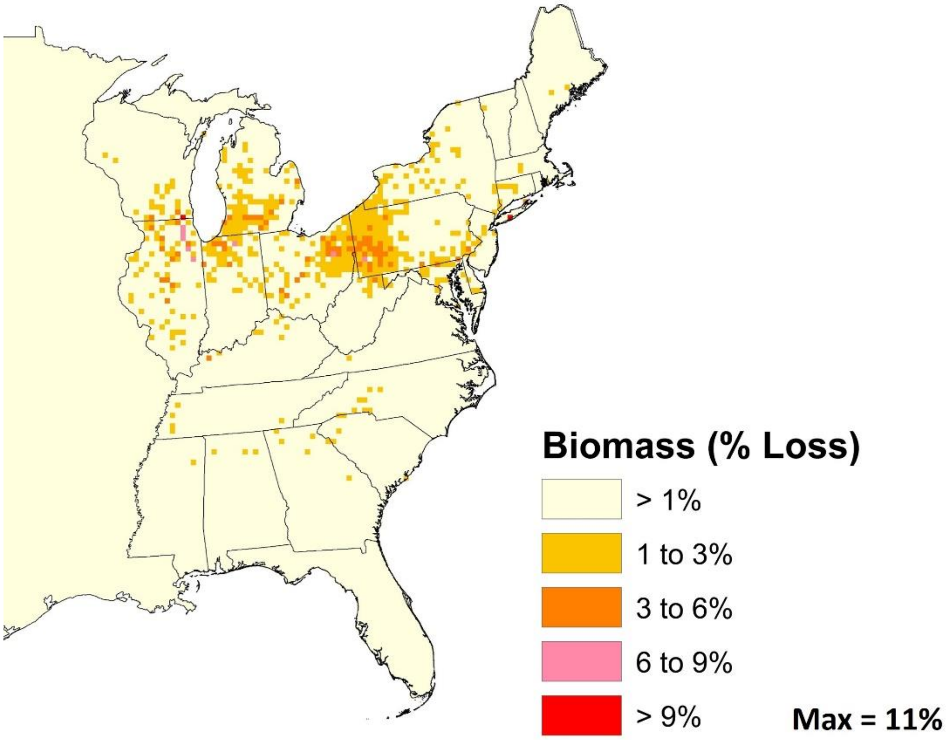
[82] See the annual progress reports for several recent years at https://www3.epa.gov/airmarkets/progress/reports/index.html, https://www3.epa.gov/airmarkets/progress/reports/pdfs/2020_full_report.pdf [Docket ID: Docket ID EPA-HQ-OAR-2021-0668-0170], https://www3.epa.gov/airmarkets/progress/reports/pdfs/2019_full_report.pdf [Docket ID EPA-HQ-OAR-2021-0668-0077], and https://www3.epa.gov/airmarkets/progress/reports/pdfs/2018_full_report.pdf [Docket ID EPA-HQ-OAR-2021-0668-0076]

[83] U.S. EPA (2020). Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards. U.S. Environmental Protection Agency. Office of Air Quality Planning and Standards, Health and Environmental Impacts Division, Research Triangle Park, NC. EPA-452/R-20-001. Available *https://www.epa.gov/sites/production/files/2020-05/documents/o3-final_pa-05-29-20compressed.pdf* . Docket ID: EPA-HQ-OAR-2021-0668-0164

[84] To estimate the biomass loss for forest ecosystems across the eastern United States, the biomass loss for each of the seven tree species was calculated using the three-month, 12-hour W126 exposure metric at each location, along with each tree’s individual C-R functions. The W126 exposure metric was calculated using monitored ozone data from CASTNET and AQS sites, and a three-year average was used to minimize the effect of variations in meteorological and soil moisture conditions. The biomass loss estimate for each species was then multiplied by its prevalence in the forest community using the U.S. Department of Agriculture (USDA) Forest Service IV index of tree abundance calculated from Forest Inventory and Analysis (FIA) measurements.

The reductions from this rule are likely to provide further protection to natural forest ecosystems by reducing the potential for ozone-related impacts.

Figure F-1: Estimated Black Cherry, Yellow Poplar, Sugar Maple, Eastern White Pine, Virginia Pine, Red Maple, and Quaking Aspen Biomass Loss due to Ozone Exposure for 2019-2021.



See the annual progress reports at https://www3.epa.gov/airmarkets/progress/reports/index.html

Appendix A: State Emission Budget Calculations and Engineering Analytics

See Excel workbook titled “Final Rule State Emission Budget Calculations and Engineering Analytics” on EPA’s website and in the docket for this rulemaking

Appendix B: Description of Excel Spreadsheet Data Files Used in the AQAT

EPA placed the Ozone_AQAT_Final.xlsx Excel workbook file in the docket that contains all the emission and CAMx air quality modeling inputs and resulting air quality estimates from the AQAT. The following bullets describe the contents of various worksheets within the AQAT workbook:

State-level emissions

- "2026_EA" and "2023_EA" contain EGU emissions measurements and estimates for each state. Various columns contain the 2021 OS measured emissions, and then emissions for the engineering base along with each of the cost thresholds.
- "NO_X_non-CEM" has a breakdown of the point EGU non-CEM emission inventory component used in the air quality modeling.
- "non-EGU emiss" has the total anthropogenic emission reductions by state.
- "2026_OS NO_X" and "2023_OS NO_X" each of these worksheets reconstructs total anthropogenic emissions for the year, with various EGU emission inventories for different cost threshold (including the engineering base case). The total anthropogenic emissions can be found for each state in columns AG through AL. These totals are then compared to the 2026gf emission level (column Y on the "2026_OS NOx" worksheet) to make a fractional change in emissions in columns AV through BA. For 2026, Non-EGU emissions change and fractional change) are found in columns BC through BF.

Air quality modeling design values and contributions from CAMx

- "2023gf_All" contains average and maximum design values as well as state by state contributions for the 2023gf base case modeled in CAMx.
- "2026gf_All" contains average and maximum design values as well as state by state contributions for the 2026gf base case modeled in CAMx.
- "23gf_days.2026gf_cntl" contains average and maximum design values as well as state by state contributions for the 2026gf final policy control case modeled in CAMx.
- "2026fj_All_proposal_calib" contains average and maximum design values as well as state by state contributions for the 2026fj base case modeled in CAMx from proposal.
- "2026fj_30NOx_proposal_calib" contains average and maximum design values as well as state by state contributions for the case modeled in CAMx where EGU and non-EGU emissions were reduced by 30% from proposal.
- "receptor_list" contains a list of the receptors whose average and/or maximum design values are greater than or equal to 71 ppb in 2023 and 2026 in the final base case air quality modeling.

Calibration factor creation and assessment

- "primary_calibration" includes the state-by-state and receptor-by-receptor calculation of the calibration factors based on the 2026 base and 2026 air quality modeling where EGU and non-EGU NO_X emissions were reduced by 30% from proposal. The calibration factors can be found in columns I through BF.

- "alternative_calibration" includes the state-by-state and receptor-by-receptor calculation of the calibration factors based on the 2026 base and 2023 base contributions and emissions using the air quality modeling from the final rule. The calibration factors can be found in columns I through BF.

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Air quality estimates

- ”summary_DVs_2026” contains the average and maximum design value estimates (rounded to two decimal places) for receptors that were nonattainment or maintenance in the 2026 air quality modeling base case. Values using the Step 3 configuration and primary calibration factor for each cost threshold level are shown starting in column L. Under this approach, the maximum contribution to remaining receptors is shown in columns AG through AR. Furthermore, a set of design value estimates are shown (columns AT through BG) for the full geography configuration scenarios, where all states that are originally linked in the base make adjustments to different cost levels. Adjustment to cells I1 and I2 will result in interactive adjustment for the other worksheets and will adjust the design values in columns I (the Step 3 configuration) and J (a “full geography” configuration where the geography remains fixed) and the maximum contributions to remaining linkages in column AE. The alternative calibration factor simulation results are shown in columns BJ through CC. .
- ”summary_DVs_2023” contains the average and maximum design value estimates (rounded to two decimal places) for receptors that were nonattainment or maintenance in the 2023 air quality modeling base case. Values using the Step 3 configuration and primary calibration factor for each cost threshold level are shown starting in column L. Under this approach, the maximum contribution to remaining receptors is shown in columns AF through AM. Furthermore, a set of design value estimates are shown (columns AO through BE) for the full geography configuration scenarios, where all states that are originally linked in the base make adjustments to different cost levels. Adjustment to cells I1 and I2 will result in interactive adjustment for the other worksheets and will adjust the design values in columns I (the Step 3 configuration) and J (a “full geography” configuration where the geography remains fixed) and the maximum contributions to remaining linkages in column AD.
- “2023_scenario_primary”and “2026_scenario_primary” contains the average and maximum design value estimates (as well as the individual state’s air quality contributions) for a particular scenario identified in cells H2 and H3 using the primary AQAT calibration factor. The fractional emission changes for each of the linked and unlinked states are shown in rows 2 and 3.
- “2023_scenario_primary_links” and “2026_scenario_primary_links” contains the individual state’s air quality contributions for a particular receptors that remain at or above 71 ppb for the scenario identified in cells I1 and I2.
- “2026_full_geo_primary” and “2023_full_geo_primary” contains the average and maximum design value estimates (as well as the individual state’s air quality contributions) for a particular scenario identified in cells H2 and H3. States that are “linked” to any receptor in the geography are assigned the values in row 2 while nonlinked states are assigned the values in row 3. Note that, only the “home” states, that are linked to receptors in other states are assigned the “linked” state values in row 2.
- “2026_scenario_alt” contains the average and maximum design value estimates (as well as the individual state’s air quality contributions) for a particular scenario identified in cells H2 and H3. The fractional emission changes for each of the linked and unlinked

states are shown in rows 2 and 3. This uses the “alternative” calibration factor based on the 2023 air quality modeling, rather than the “primary” calibration factor based on the proposal 2026 air quality modeling with the 30% reduction from EGUs and non-EGUs.

- The individual scenario worksheets labeled:
    - “2023_ step3_base”,
    - “2023_ step3_SCRopt”,
    - “2023_ step3_SCRoptwCC”,
    - “2023_ step3_SNCRopt”,
    - “2023_ step3_SNCRoptwCC”,
    - “2023_ step3_newSCR”,
    - “2026_ step3_base”,
    - “2026_ step3_SCRopt”,
    - “2026_ step3_SCRoptwCC”,
    - “2026_ step3_SNCRopt”,
    - “2026_ step3_SNCRoptwCC”,
    - “2026_ step3_newSCR”,
    - “2026_ step3_nonEGU”,
    - “2023_full_geo_base”,
    - “2023_full_geo_SCRopt”,
    - “2023_full_geo_SCRoptwCC”,
    - “2023_full_geo_SNCRopt”,
    - “2023_full_geo_SNCRoptwCC”,
    - “2023_full_geo_newSCR”,
    - “2026_full_geo_base”,
    - “2026_full_geo_SCRopt”,
    - “2026_full_geo_SCRoptwCC”,
    - “2026_full_geo_SNCRopt”,
    - “2026_full_geo_SNCRoptwCC”,
    - “2026_full_geo_newSCR”,
    - “2026_full_geo_nonEGU”,
    - “2026_full_geo_nonEGU_1st”,
    - “2023_ step3_base_wIRA”,
    - “2023_ step3_newSCR_wIRA”,
    - “2026_ step3_base_wIRA”,
    - “2026_ step3_newSCR_wIRA”,
    - “2026_ step3_nonEGU_wIRA”,
    - “2026_ step3_nonEGU_1st”,
    - “2026_AQ_Model_Policy_Control”
    - “2026_ step3_base_alt”,
    - “2026_ step3_SCRopt_alt”,
    - “2026_ step3_SCRoptwCC_alt”,
    - “2026_ step3_SNCRopt_alt”,
    - “2026_ step3_SNCRoptwCC_alt”,
    - “2026_ step3_newSCR_alt”,
    - “2026_ step3_nonEGU_alt”,
    - “2026_AQ_Model_Policy_Contr_alt”

- “2026_ step3_nonEGU_1st_alt”,
- contain static air quality contributions and design value estimates for all monitors for the particular year and scenario.

Appendix C: IPM Runs Used in Transport Rule Significant Contribution Analysis

Table Appendix C-1 lists IPM runs used in analysis for this rule. The IPM runs can be found in the docket for this rulemaking under the IPM file name listed in square brackets in the table below.

Table Appendix C-1. IPM Runs Used in Transport Rule Significant Contribution Analysis

Run Name [IPM File Name]	**Description**
Air Quality Modeling Base Case [EPA620_TR_14c]	Model run used for the air quality modeling base case at steps 1 and 2, which includes the national Title IV SO2 cap-and-trade program; NO_X SIP Call; the Cross-State Air Pollution trading programs, and settlements and state rules. It also includes key fleet updates regarding new units, retired units, and control retrofits that were known by Summer of 2022.
Illustrative Final Rule [EPA620_TR_21]	Model run used for 2026 air quality analysis of the Final rule. Includes the national Title IV SO2 cap-and-trade program; NO_X SIP Call; the Cross-State Air Pollution trading programs, and settlements and state rules. It also includes key fleet updates regarding new units, retired units, and control retrofits that were known by Summer of 2022. Includes the illustrative final rule. For details, please see Chapter 4 of the RIA.
Air Quality Modeling Base Case + IRA [EPA620_TR_19]	Model run used for the air quality modeling base case sensitivity analysis in the presence of the IRA at steps 1 and 2, which includes all information from the Air Quality Modeling Base Case [EPA620_TR_14c] as well as parameters reflecting the key provisions of the Inflation Reduction Act of 2022. For details please see Appendix 4A of the RIA for this rulemaking.

Appendix D: Description of the Analytic Results using the Primary Approach for the "Full Geography" AQAT Configuration in 2026

As an alternative assessment, it was possible to estimate air quality concentrations in what we call a "full geography" configuration at each downwind receptor using the ozone AQAT. Here, we apply an approach where all states covered by the rule (regardless of whether they are linked to a particular receptor or to a different receptor in the geography) have the same cost threshold scenario "full geography" estimates.[85] We also kept the states containing the receptor (such as Colorado and Connecticut) that are not linked to receptors in other states at the base case emission levels (rather than modulate them up to the same cost threshold level as the linked upwind states). This allows us to assess the effects of the rule as a whole, and only the rule, in that year on the receptors. In this assessment, we used the primary calibration factor for all scenarios.

In general, assessed across the scenarios, the receptor difference between the Step 3 configuration and the "full geography" configuration are relatively small. For the "Full Step 3" scenario in which non-EGU controls are applied, we observe a difference in status for the Sheboygan County, Wisconsin receptor. In this scenario in the "Step 3" configuration, the receptor remains maintenance, while in the "full geography" configuration, the receptor's maintenance status is resolved to a very marginal degree, at 70.96 ppb. Even if EPA were to rely on this "full geography scenario" for its overcontrol analysis (which we do not think appropriate for reasons explained in section C of this TSD), it would not change the outcome of our overcontrol finding, because 1) states still remain linked to one or more problematic receptors, and/or 2) the penultimate increment of reductions (i.e., "Full Step 3 – EGU only" scenario) shows the maintenance status persists – suggesting that an earlier stopping point would be undercontrol. The average and maximum design values for 2026 are shown in Tables Appendix D-1 and Appendix D-2.

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[85] For the purposes of the AQAT "Full Geography" estimates, we included California as being included in the rule and making any available reductions. See the preamble section I for how this state is treated in the rule.

Table Appendix D-1. 2026 Average Ozone DVs (ppb) for Each Scenario Assessed using the "Full Geography" AQAT Configuration.

Site	state	county	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU ("Full Step 3")
40278011	Arizona	Yuma	69.87	69.86	69.86	69.86	69.86	69.84	69.80
80590006	Colorado	Jefferson	71.70	71.70	71.70	71.70	71.70	71.54	71.52
80590011	Colorado	Jefferson	72.06	72.06	72.06	72.06	72.06	71.81	71.78
80690011	Colorado	Larimer	69.84	69.84	69.84	69.84	69.84	69.69	69.67
90013007	Connecticut	Fairfield	71.25	71.17	71.15	71.16	71.14	70.89	70.52
90019003	Connecticut	Fairfield	71.58	71.51	71.49	71.50	71.48	71.25	70.93
350130021	New Mexico	Dona Ana	70.06	70.05	70.05	70.05	70.05	69.91	69.87
350130022	New Mexico	Dona Ana	69.17	69.16	69.16	69.16	69.16	69.01	68.97
350151005	New Mexico	Eddy							
350250008	New Mexico	Lea							
480391004	Texas	Brazoria	69.89	69.81	69.80	69.80	69.79	68.85	68.32
481671034	Texas	Galveston	71.29	71.19	71.16	71.18	71.15	69.95	69.17
482010024	Texas	Harris	74.83	74.76	74.75	74.75	74.74	73.74	73.22
490110004	Utah	Davis	69.90	69.90	69.90	69.90	69.90	69.34	69.28
490353006	Utah	Salt Lake	70.50	70.49	70.49	70.49	70.49	69.96	69.91
490353013	Utah	Salt Lake	71.91	71.90	71.90	71.90	71.90	71.44	71.40
551170006	Wisconsin	Sheboygan	70.83	70.65	70.64	70.64	70.64	70.39	70.07

Table Appendix D-2. 2026 Maximum Ozone DVs (ppb) for Each Scenario Assessed using the "Full Geography" AQAT Configuration.

Site	state	county	Engineering Analysis Base	SCR Optimize	SCR Optimize + SOA CC	SCR Optimize + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit ("Full Step 3 – EGU only")	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit + non-EGU ("Full Step 3")
40278011	Arizona	Yuma	71.47	71.46	71.46	71.46	71.46	71.44	71.40
80590006	Colorado	Jefferson	72.30	72.30	72.29	72.30	72.29	72.14	72.11
80590011	Colorado	Jefferson	72.66	72.66	72.66	72.66	72.66	72.40	72.38
80690011	Colorado	Larimer	71.04	71.04	71.04	71.04	71.04	70.88	70.87
90013007	Connecticut	Fairfield	72.06	71.97	71.95	71.96	71.94	71.69	71.31
90019003	Connecticut	Fairfield	71.78	71.71	71.69	71.70	71.68	71.45	71.13
350130021	New Mexico	Dona Ana	71.36	71.36	71.36	71.36	71.35	71.21	71.17
350130022	New Mexico	Dona Ana	71.77	71.76	71.76	71.76	71.76	71.62	71.57
350151005	New Mexico	Eddy							
350250008	New Mexico	Lea							
480391004	Texas	Brazoria	72.02	71.94	71.92	71.92	71.91	70.94	70.39
481671034	Texas	Galveston	72.51	72.41	72.38	72.39	72.36	71.15	70.36
482010024	Texas	Harris	76.45	76.38	76.37	76.36	76.35	75.33	74.80
490110004	Utah	Davis	72.10	72.10	72.10	72.10	72.10	71.52	71.46
490353006	Utah	Salt Lake	72.10	72.09	72.09	72.09	72.09	71.55	71.49
490353013	Utah	Salt Lake	72.31	72.30	72.30	72.30	72.30	71.84	71.79
551170006	Wisconsin	Sheboygan	71.73	71.55	71.54	71.54	71.53	71.29	70.96

Appendix E: Feasibility Assessment for Engineering Analytics Baseline

Similar to the Revised CSAPR Update Final Rule, EPA analyzed and confirmed that the assumed power sector fleet operations in its baseline emissions and emission control stringency control levels as implemented through estimated budgets were compatible with future load requirements by verifying that new units in addition to the existing fleet would provide enough generation, assuming technology-specific capacity factors, to replace the retiring generation that is assumed to occur in years 2023 through 2027. EPA assessed generation adequacy specific to the states covered under this action. EPA uses these observations to determine whether any assumed replacement generation from the existing fleet is necessary to offset the announced retirements and continue to satisfy electricity load. Additionally, EPA looked at whether the combination of new units (both fossil and non-fossil) provide sufficient new generation to replace retiring generation. In this case, EPA found that the new unit generation from fossil and renewable generation would exceed the generation from retiring units in all three scenarios examined, indicating that no further replacement generation from existing units is needed. Moreover, EPA found the change in generation from the covered fossil units to be within the observed historical trend.

- EPA first identified the collective Engineering Analytics baseline heat input and generation for 2023-2027 from the states covered in this action and compared it to historical trends between 2017-2021 for these same states (Scenario 1). This illustrated that the assumed heat input and generation from fleet turnover reflected in the Engineering Analytics was well within with recent historical trends (see tables Appendix E-1, and Appendix E-2 below).
- EPA then compared the collective baseline heat input and generation from the states covered in this action to a scenario where fossil generation remains at 2021 levels instead of continuing to decline (Scenario 2).
- Finally, EPA identified the 2022 Energy Information Administration’s Annual Energy Outlook (EIA AEO) annual growth projections from 2021 through 2027 total electricity demand levels (0.7%) from its reference case and estimated an upper bound future year scenario where covered fossil generation grew at levels matching this fleet-wide total growth rate (Scenario 3).[86]
- EPA’s assessment illustrates the amount of generation in its Engineering Analytics baseline, factoring in retirements and new fossil units, is more than sufficient to accommodate all three scenarios.[87] For instance, generation from fossil sources in these states has dropped at an average rate of 2% per year between 2018 and 2021 (799 TWh to 750 TWh). However, EPA’s assumed baseline generation from covered fossil sources for the states reflects a rate of decline of 1.7% per year between 2023 and 2027. See Table Appendix E-2.

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[86] Department of Energy, Annual Energy Outlook 2022. Available at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=62-AEO2022&cases=ref2022&sourcekey=0

[87] Based on historical trends, modeling, and company statements, EPA expects levels similar to scenario 1 and scenario 2 to be most likely.

- EPA then identified new RE capacity under construction, testing, or in site prep by 2022. For years beyond 2022, EPA also identified new RE capacity that was planned but with regulatory approvals pending for years 2023 and beyond (as this capacity is unlikely to have yet started construction).[88]
- EPA calculated and added the RE generation values to the fossil baseline to estimate future year generation in the state (see Table Appendix E-2). EPA used a capacity factor of 42.7% for wind, 21.6% for solar, and 65% for NGCC.
- Using these technology-specific capacity factors based on past performance and IPM documentation, EPA anticipated over 36 TWh from new non-fossil generation already under construction or being planned with regulatory approval received. This level of expected new generation combined with the baseline generation from existing units exceeds the expected load for the states under all three scenarios.[89]

- Not only is the future baseline generation level assumed in EPA's engineering analysis well within the recent historical fossil generation trend (See Table Appendix E-2) on its own (which illustrates no need for replacement generation), but when added to the amount of potential new generation from RE (over 36 TWh), exceeds the generation assuming no change (scenario 2) and the upper bound analysis for future covered fossil generation that assumes 0.7% growth from the existing fossil fleet (scenario 3). This indicates that available capacity and generation assumed would serve load requirements in this upper bound scenario.

  Not included in the tables below nor in EPA's baseline, but listed in the latest EIA 860m is even more planned NGCC combined cycle for years 2023 and 2024 that is pending regulatory approval. Assuming some of this generation becomes available in the outer years, that constitutes additional generation that further exceeds EPA's upper bound generation levels below – further bolstering the observation that no replacement generation from existing units needs to be assumed to fill generation from retiring units.

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[88] Department of Energy, EIA Form 860, Generator Form 3-1. 2020. Available at https://www.eia.gov/electricity/data/eia860/

[89] While EPA notes the baseline generation exceeds the covered fossil load in all three scenarios in Table F-3, EPA anticipates scenarios 1 and 2 being more representative of likely covered fossil load based on historical trends, future modeling, and utility resource plans.

Table Appendix E-1: Heat Input (TBtu) Change Due to Fleet Turnover (Historical and Future)
Values for 2018-2021 reflect reported data, while 2023-2026 reflects assumed heat input.

Region	2018	2019	2020	2021	2023	2024	2025	2026	2027
Alabama	388	352	327	323	313	313	313	310	309
Arkansas	220	203	160	193	193	193	193	191	191
Illinois	397	332	283	334	256	250	250	217	217
Indiana	479	404	371	411	356	330	330	302	302
Kentucky	354	316	270	303	301	301	296	296	296
Louisiana	312	318	282	281	271	271	269	269	268
Maryland	105	92	82	88	71	71	71	71	71
Michigan	349	326	283	309	273	258	258	217	217
Minnesota	144	132	108	129	129	108	108	108	94
Mississippi	218	211	224	190	184	180	180	180	180
Missouri	313	269	254	288	284	249	249	249	248
Nevada	108	98	100	103	103	103	103	94	89
New Jersey	152	146	119	120	112	112	112	112	112
New York	238	202	234	240	233	233	233	233	233
Ohio	405	402	395	400	364	338	338	338	338
Oklahoma	276	235	232	213	213	211	211	211	196
Pennsylvania	487	509	535	565	535	535	535	535	535
Texas	1,530	1,501	1,355	1,403	1,385	1,385	1,375	1,375	1,347
Utah	144	133	132	165	165	165	165	125	125
Virginia	251	249	261	215	203	195	194	194	194
West Virginia	309	295	268	313	307	273	273	273	273
Wisconsin	222	192	195	221	221	221	213	185	151
Total	7,397	6,915	6,472	6,806	6,471	6,294	6,269	6,085	5,986

Appendix E-2: Assumed Baseline OS Generation and Expected New Build Generation from Covered Fossil Units (TWh)

	2023	**2024**	**2025**	**2026**	**2027**
Scenario 1 - Generation Levels (with continued pace of 2.7% decline)	707	687	669	650	632
Scenario 2 - Generation Levels (no change from 2021)	747	747	747	747	747
Scenario 3 - Generation Levels (0.7% growth from covered fossil)	758	763	768	774	779
Assumed Baseline Fossil Generation with Reported Fossil Retirement and Reported New Build	729	712	709	690	681
New Build (Non-Fossil)	59	87	90	93	107
Total Baseline Generation	**788**	**798**	**799**	**784**	**788**

Appendix F: Preset State Emission Budgets

State	2023 Illustrative Emission Budgets Before Prorating (tons)	2024 Emission Budgets (tons)	2025 Emission Budgets (tons)	2026 Preset Emission Budgets (tons)	2027 Preset Emission Budgets (tons)	2028 Preset Emission Budgets (tons)	2029 Preset Emission Budgets (tons)
Alabama	6,379	6,489	6,489	6,339	6,236	6,236	5,105
Arkansas	8,927	8,927	8,927	6,365	4,031	4,031	3,582
Illinois	7,474	7,325	7,325	5,889	5,363	4,555	4,050
Indiana	12,440	11,413	11,413	8,410	8,135	7,280	5,808
Kentucky	13,601	12,999	12,472	10,190	7,908	7,837	7,392
Louisiana	9,363	9,363	9,107	6,370	3,792	3,792	3,639
Maryland	1,206	1,206	1,206	842	842	842	842
Michigan	10,727	10,275	10,275	6,743	5,691	5,691	4,656
Minnesota	5,504	4,058	4,058	4,058	2,905	2,905	2,578
Mississippi	6,210	5,058	5,037	3,484	2,084	1,752	1,752
Missouri	12,598	11,116	11,116	9,248	7,329	7,329	7,329
Nevada	2,368	2,589	2,545	1,142	1,113	1,113	880
New Jersey	773	773	773	773	773	773	773
New York	3,912	3,912	3,912	3,650	3,388	3,388	3,388
Ohio	9,110	7,929	7,929	7,929	7,929	6,911	6,409
Oklahoma	10,271	9,384	9,376	6,631	3,917	3,917	3,917
Pennsylvania	8,138	8,138	8,138	7,512	7,158	7,158	4,828
Texas	40,134	40,134	38,542	31,123	23,009	21,623	20,635
Utah	15,755	15,917	15,917	6,258	2,593	2,593	2,593
Virginia	3,143	2,756	2,756	2,565	2,373	2,373	1,951
West Virginia	13,791	11,958	11,958	10,818	9,678	9,678	9,678
Wisconsin	6,295	6,295	5,988	4,990	3,416	3,416	3,416

Appendix G: Comparison of CSAPR 2012 Budgets to Actual 2012 Emissions

This appendix provides a comparison of the budgets for the first year of the four original CSAPR trading programs[90] to actual emissions in the year when those budgets were originally scheduled to be implemented. Specifically, it compares the state emissions budgets originally planned for 2012, which were not actually implemented until 2015 because of a judicial stay, to the respective states' actual emissions for 2012.

This comparison shows that for all four trading programs, even without the implementation of CSAPR, the affected region as a whole had 2012 emissions lower than the sum of the state budgets that would have applied in that year had the programs' implementation not been delayed. As shown in the tables below, in each of the four trading programs, the affected EGUs in all of the covered states collectively emitted below the sum of the state budgets for the program. Furthermore, the analysis shows that the affected EGUs in most covered states, even without the rule in place, collectively emitted below their individual state budgets in 2012.

The collective 2012 emissions from a given state's affected EGUs exceeded the state's intended 2012 budget by more than what would later have been the state's variability limit in only four instances: Illinois for annual NO_X, Louisiana for OS NO_X, and Missouri for both annual and OS NO_X.[91] However, further analysis indicates a strong possibility that even these few exceedances would not have occurred had the rule actually been in place. EGUs in Missouri, for example, emitted 34,275 tons of NO_X in the 2012 ozone season, exceeding their OS NO_X budget of 22,788 tons by 11,487 tons (see table). During this same 2012 ozone season, New Madrid and Thomas Hill, two facilities located in Missouri, emitted 16,449 tons of NO_X. All five units at these two facilities had SCRs. If these five units had run their SCRs so as to achieve average NO_X emissions rates of 0.12 lb/MMBtu, they would have emitted 12,297 fewer tons of NO_X, and Missouri's EGUs collectively would have emitted less than the state's 2012 OS NO_X emissions budget. As another example, Kincaid units 1 and 2 and Marion unit 4 in Illinois are all coal units with SCR controls. In 2012, these units achieved annual average emissions rates of 0.40, 0.33, and 0.23 lb/MMBtu, but in the 2009 ozone season the units ran their SCRs so as to achieve much lower NO_X emissions rates of 0.06, 0.06, and 0.12 lb/MMBtu, respectively. If these three units had run their SCRs in 2012 so as to achieve the same average emissions rates the same units achieved during the 2009 ozone season, their emissions would have dropped by 9,633 tons, very close to the 9,812 tons by which Illinois EGUs' collective 2012 annual NO_X emissions exceeded the state's 2012 annual NO_X budget.

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[90] Original CSAPR, 76 FR 48208 (August 8, 2011), including the changes to the budgets by the Final February and Final June Revision Rules. 77 FR 10324 (Feb. 21, 2012); 77 FR 34830 (June 12, 2012).

[91] The CSAPR trading programs include variability limits of 18% for SO_2 and annual NO_X emissions and 21% for ozone season NO_X emissions. The programs' assurance provisions generally require additional allowance surrenders when a state's emissions exceed the state's emissions budget by more than the variability limit. While the assurance provisions did not apply for the first two years of the CSAPR programs – so the 2012 exceedances shown in the tables would not have triggered any extra allowance surrenders – the variability limits still serve as a useful metric for the degree of state-level emissions variability that would generally be accommodated by the programs' design.

Note: CSAPR Budgets shown here include the Final February Revisions Rule and Final June Revisions Rule, where applicable.

Table Appendix G-1. Pre-stay 2012 Annual CSAPR SO_2 Budgets, 2012 Annual SO_2 Emissions, and Percent Emitted Difference Between the Budgets and Actual Emission in 2012 by State

State	Pre-stay 2012 Annual SO2 Budget (short tons)	Sum of 2012 SO2 Mass (short tons)	% Emitted Above or Below State Budget (compare to variability limit of 18% starting two years later)
Alabama	216,033	128,828	-40.4%
Georgia	158,527	101,072	-36.2%
Illinois	234,889	152,172	-35.2%
Indiana	290,762	273,628	-5.9%
Iowa	107,085	81,368	-24.0%
Kansas	41,980	32,947	-21.5%
Kentucky	232,662	186,180	-20.0%
Maryland	30,120	22,884	-24.0%
Michigan	229,303	194,702	-15.1%
Minnesota	41,981	25,286	-39.8%
Missouri	207,466	138,833	-33.1%
Nebraska	68,162	62,389	-8.5%
New Jersey	7,670	3,661	-52.3%
New York	36,296	17,637	-51.4%
North Carolina	136,881	58,295	-57.4%
Ohio	315,393	323,977	2.7%
Pennsylvania	278,651	249,716	-10.4%
South Carolina	96,633	44,973	-53.5%
Tennessee	148,150	66,258	-55.3%
Texas	294,471	339,160	15.2%
Virginia	70,820	31,488	-55.5%
West Virginia	146,174	83,265	-43.0%
Wisconsin	79,480	61,565	-22.5%
Total	3,469,589	2,680,283	-22.7%
SO2 Group 1	2,551,802	1,945,627	-23.8%
SO2 Group 2	917,787	734,656	-20.0%

Table Appendix G-2. Pre-stay 2012 Annual CSAPR NO_X Budgets, 2012 Annual NO_X Emissions, and Percent Emitted Difference Between the Budgets and Actual Emission in 2012 by State

State	Pre-Stay 2012 Annual NO_X Budget	Sum of 2012 NO_X Mass (short tons)	% Emitted Above or Below State Budget (compare to variability limit of 18% starting two years later)
Alabama	72,691	48,781	-32.9%
Georgia	62,010	34,892	-43.7%
Illinois	47,872	57,684	20.5%
Indiana	109,726	105,713	-3.7%
Iowa	38,335	34,827	-9.2%
Kansas	31,354	33,295	6.2%
Kentucky	85,086	80,299	-5.6%
Maryland	16,633	18,334	10.2%
Michigan	65,421	66,810	2.1%
Minnesota	29,572	24,353	-17.6%
Missouri	52,400	69,814	33.2%
Nebraska	30,039	26,906	-10.4%
New Jersey	8,218	6,300	-23.3%
New York	21,722	24,823	14.3%
North Carolina	50,587	51,057	0.9%
Ohio	95,468	84,281	-11.7%
Pennsylvania	119,986	132,094	10.1%
South Carolina	32,498	19,066	-41.3%
Tennessee	35,703	26,182	-26.7%
Texas	137,701	129,367	-6.1%
Virginia	33,242	26,219	-21.1%
West Virginia	59,472	52,783	-11.2%
Wisconsin	34,101	24,850	-27.1%
Total	1,269,837	1,178,729	-7.2%

Table Appendix G-3. Pre-stay 2012 Ozone Season CSAPR NO$_X$ Budgets, 2012 Ozone Season NO$_X$ Emissions, and Percent Emitted Difference Between the Budgets and Actual Emission in 2012 by State

State	Pre-stay 2012 OS NO$_X$ Budget	Sum of 2012 NO$_X$ OS Mass (short tons)	% Emitted Above or Below State Budget (compare to variability limit of 21% starting two years later)
Alabama	31,746	24,963	-21.4%
Arkansas	15,110	16,407	8.6%
Florida	28,644	30,764	7.4%
Georgia	27,944	14,957	-46.5%
Illinois	21,208	23,526	10.9%
Indiana	46,876	45,007	-4.0%
Iowa	16,532	15,550	-5.9%
Kentucky	36,167	35,982	-0.5%
Louisiana	18,115	22,084	21.9%
Maryland	7,179	8,298	15.6%
Michigan	28,041	30,161	7.6%
Mississippi	12,429	10,713	-13.8%
Missouri	22,788	34,275	50.4%
New Jersey	4,128	3,650	-11.6%
New York	10,369	12,364	19.2%
North Carolina	22,168	25,021	12.9%
Ohio	41,284	40,277	-2.4%
Oklahoma	36,567	31,242	-14.6%
Pennsylvania	52,201	62,916	20.5%
South Carolina	13,909	9,747	-29.9%
Tennessee	14,908	14,388	-3.5%
Texas	65,560	61,292	-6.5%
Virginia	14,452	13,106	-9.3%
West Virginia	25,283	24,314	-3.8%
Wisconsin	14,784	11,851	-19.8%
Total	628,392	622,855	-0.9%

Appendix H: Sensitivity for order of emissions reductions from EGUs and nonEGUs

This appendix provides a comparison of the AQAT estimates using the Step 3 configuration approach where we examine the effects of including EGU SCR retrofit emissions reductions prior to or after the non-EGU emission reductions. The average and maximum design values in 2026 are shown in Table Appendix H-1. In essence, if non-EGU emission reductions occur prior to EGU SNCR and SCR retrofits, all of the monitors (with the exception of Larimer, Colorado) maintain the same status (either in nonattainment and/or maintenance) with their average or maximum design values greater than or equal to 71 ppb. In the case of Larimer, the monitor is estimated to have a maintenance issue if the non-EGU emission reductions occur with less-stringent EGU emission reductions (consisting of optimizing existing SCR and SNCR and installing SOA CC). Alternatively, if only EGU emission reductions occur (consisting of optimizing existing SCR and SNCR, installing SOA CC, and retrofitting SCRs and/or SNCRs) and not non-EGU emission reductions, the maximum design value drops below 71 ppb indicating that it no longer would have a maintenance issue at this level of stringency. However, no states have their last remaining linkage to this receptor. Consequently, the order of the EGU and non-EGU emission reductions make no difference to the conclusions in this final rule about overcontrol.

Table Appendix H-1. 2026 Average and Maximum Ozone DVs (ppb) for the AQAT Step 3 Scenarios Assessed for All Receptors.

Site	state	county	Engineering Analysis Base (Avg. DV)	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit (Avg. DV)	SCR Optimize + SOA CC + SNCR Optimize + non-EGU (Avg. DV)	Engineering Analysis Base (Max. DV)	SCR Optimize + SOA CC + SNCR Optimize + SCR/SNCR Retrofit (Max. DV)	SCR Optimize + SOA CC + SNCR Optimize + non-EGU (Max. DV)
40278011	Arizona	Yuma	69.87	69.84	69.82	71.47	71.44	71.42
80590006	Colorado	Jefferson	71.70	71.36	71.67	72.30	71.95	72.26
80590011	Colorado	Jefferson	72.06	71.59	72.02	72.66	72.19	72.62
80690011	Colorado	Larimer	69.84	69.54	69.82	71.04	70.73	71.01
90013007	Connecticut	Fairfield	71.25	70.98	70.85	72.06	71.78	71.65
90019003	Connecticut	Fairfield	71.58	71.34	71.23	71.78	71.54	71.43
350130021	New Mexico	Dona Ana	70.06	69.89	70.01	71.36	71.19	71.32
350130022	New Mexico	Dona Ana	69.17	69.00	69.12	71.77	71.60	71.72
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	69.89	68.96	69.36	72.02	71.06	71.47
481671034	Texas	Galveston	71.29	70.02	70.43	72.51	71.22	71.64
482010024	Texas	Harris	74.83	73.86	74.29	76.45	75.46	75.90
490110004	Utah	Davis	69.90	69.34	69.84	72.10	71.52	72.04
490353006	Utah	Salt Lake	70.50	69.96	70.43	72.10	71.55	72.03
490353013	Utah	Salt Lake	71.91	71.45	71.86	72.31	71.84	72.26
551170006	Wisconsin	Sheboygan	70.83	70.51	70.41	71.73	71.41	71.31

Appendix I: Figures Related to Preamble Section V and Section VI

Figure 1 to Section V.D.1 – EGU Ozone Season NO_X Reduction Potential in 22 Linked States and Corresponding Total Reductions in Downwind Ozone Concentration at Nonattainment and Maintenance Receptors for Each Cost Threshold Level Evaluated (2023)

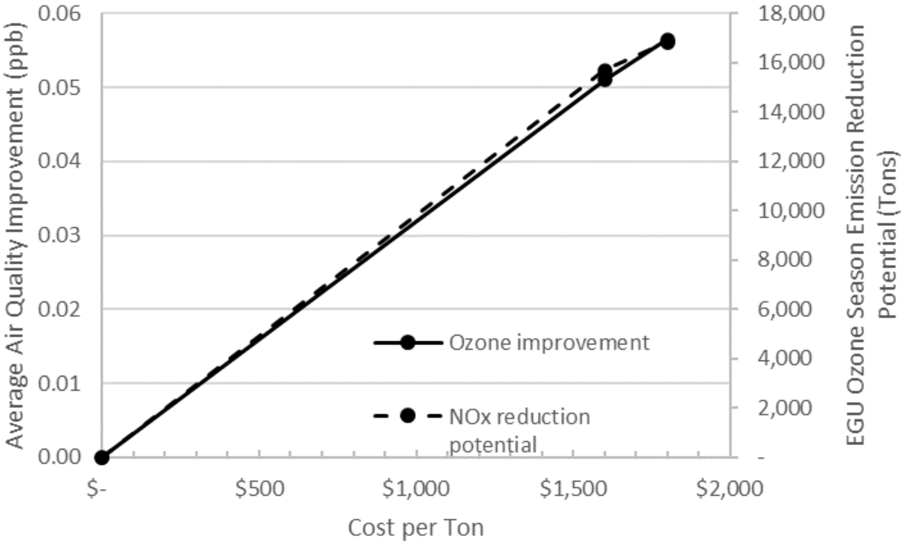


Figure 2 to Section V.D.1: EGU Ozone Season NO_X Reduction Potential in 19 Linked States and Corresponding Total Reductions in Downwind Ozone Concentration at Nonattainment and Maintenance Receptors for Each Cost Threshold Level Evaluated (2026)

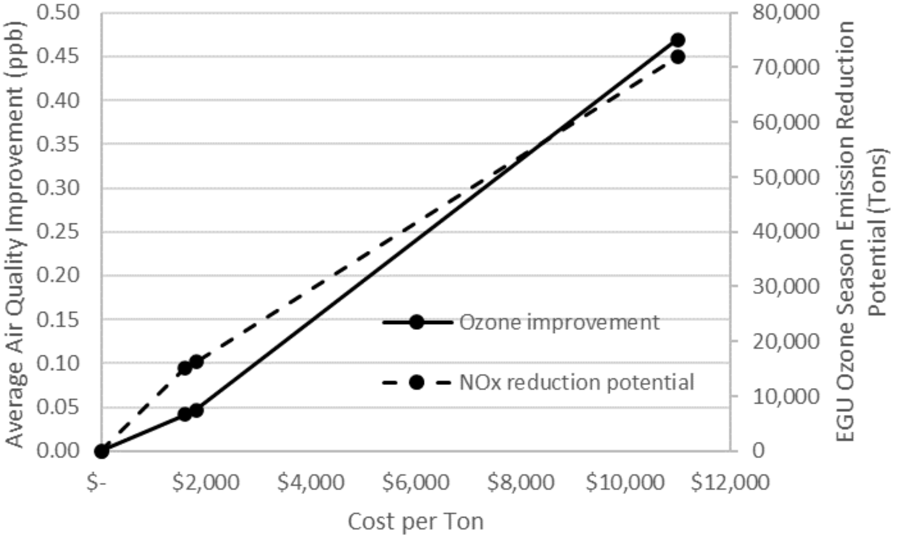
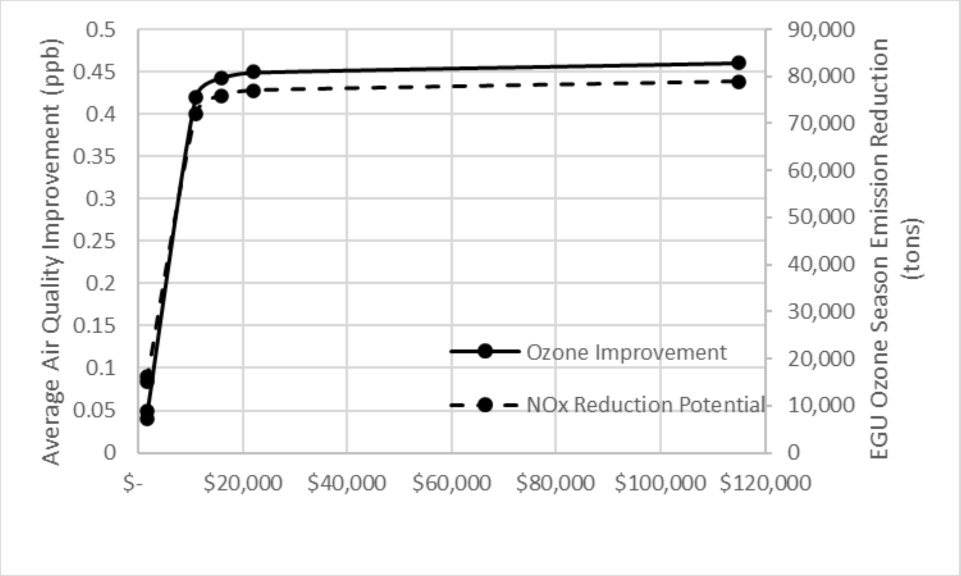


Figure 3 to Section V.D.1: : EGU Ozone Season NO_X Reduction Potential in 19 Linked States and Corresponding Total Reductions in Downwind Ozone Concentration at Nonattainment and Maintenance Receptors for Each Cost Threshold Level Evaluated and Illustrative Evaluation of Cost Thresholds beyond Identified Technology Breakpoints (2026)[92]



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[92] For the evaluation of air quality impacts for the cost levels beyond our technology breakpoints (i.e., beyond $11,000 per ton), the EPA relies on an average air quality per ton reduction factor derived from its AQAT analysis. The EPA notes that these illustrative points (those beyond $11,000 per ton) reflect SCRs on steam units less than 100 MW and oil/gas steam units < 150 tons per season, combustion control upgrade on combustion turbines, and SCRs on combustion turbines > 100 MW respectively. Although, not shown above, EPA also observes that we evaluated SCR on combined cycle unit and identified higher cost and higher resource intensity (i.e., higher ratio of retrofit projects per ton reduced). These mitigation measures and costs are further discussed in the EGU NO_X Mitigation Strategies Final Rule TSD.

Appendix J: Additional Sensitivity Examining the AQAT Calibration Factors

This appendix describes another sensitivity evaluating the primary and alternative calibration factors used in the Step 3 configuration of AQAT. As described in section C.2, the AQAT was calibrated using modeled ozone data from the proposed rule using a 2026 case where EGUs and non-EGUs were reduced by 30%. We refer to this as the "primary calibration" AQAT. As discussed in section C.4, we also evaluated an alternative set of calibration factors, reflecting changes between the 2023 and 2026 base cases using AQ modeling from the final rule. That analysis tends to confirm that the regulatory conclusions presented in the preamble are robust to alternative approaches to calculating the air quality effects of the rule.

As described in the AQ Modeling TSD, EPA conducted photochemical air quality modeling for the control scenario of the final rule (CAMx 2026 Final Rule Policy Control Case). The emissions and the emission changes projected in this modeling and the emission reduction fractions (relative to the 2026 photochemical modeling base case) are shown in Table Appendix J-1. This additional photochemical air quality modeling offered us another opportunity to evaluate the performance of AQAT.

As described in section C.2 and evaluated in C.4, each of the two calibrated AQATs represent a different assessment of a linear relationship between emissions reductions and changes in air quality based on the different emission levels and reductions from various sectors. Using the primary and alternative calibration approaches, the average and maximum design values from AQAT for the control scenario for the air quality modeling along with the CAMx Final Rule Policy Case results are shown in Tables Appendix J-2 and J-3, respectively. The CAMx Final Rule Policy Control Case design values, the AQAT design values using both calibration factors, and the differences between the CAMx design value and each of the AQAT values in the tables have been rounded to a hundredth of a ppb. For this scenario, the differences in the average design values between the CAMx modeling and AQAT are moderate, with a maximum value of 0.30 for the primary approach and 0.68 ppb for the alternative approach (both for Davis, Utah receptor) (Table Appendix J-2). Most monitors had difference much lower than those values.[93] In response to comment, EPA performed further statistical evaluation of AQAT consistency with CAMx. Averaged across all air quality monitors, the mean bias was -0.01 ppb (-0.02%) and -0.03 ppb (-0.05%) using the primary and alternative calibration factors, respectively.[94] Focusing on the 2026 receptors that are at or above 71 ppb in the air quality modeling base case (outside of California), the mean bias was -0.07 ppb (-0.1%) and -0.06 ppb (-0.08%) using the primary and alternative calibration factors, respectively. Collectively, these comparisons against an independent photochemical air quality modeling simulation further affirmed that a calibrated AQAT can create reasonable estimates of air quality concentrations for each receptor.

In this assessment, all receptors had the same condition for the average design value (i.e., showing values either above or below the level of the NAAQS) regardless of the calibration

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[93] Additional evaluation values and metrics (e.g., mean bias and root mean square error) can be found in the "AQAT_ozone_final.xlsx" results worksheets "2026_AQ_Model_Policy_Control" and "2026_AQ_Model_Policy_Contr_alt" using the primary and alternative calibration factors, respectively.

[94] These metrics (and the others presented in the Excel file) compare favorably with those found by researchers. See, for example, K.W. Appel, A.B. Gilliland, G. Sarwar, R.C. Gilliam. Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: sensitivities impacting model performance: part I-ozone. Atmos. Environ., 41 (40) (2007), pp. 9603-9615, 10.1016/j.atmosenv.2007.08.044.

factor utilized. When examining the maximum design values, in the CAMx Final Rule Policy Control Case the maximum design value for the Larimer Colorado receptor dropped below 71 ppb, while it remained above 71 ppb for both the primary and alternative calibration approach. For the Fairfield Connecticut receptor, the maximum design value remained above 71 ppb in the CAMx Final Rule Policy Control Case and for the primary calibration approach but dropped below 71 ppb (to 70.99 ppb) for the alternative calibration approach. These potential changes in status for these two monitors (i.e., for Larimer Colorado or for Fairfield Connecticut) did not affect the linkage status of any state. This assessment, again, indicates that the uncertainties created by the nonlinearity of the ozone chemistry that is not accounted for by using the linear calibration factors across the range of emission reductions assessed here and/or the difference in spatial location and intensity of the sources and/or differences in the sectors usually do not affect the conclusions about whether receptors are resolved and whether states continue to have contributions above the linkage threshold to those receptors. In other words, the regulatory conclusions set out in the preamble are robust to the particular calibration factors used in AQAT.

Table Appendix J-1. The Total Anthropogenic NO_X Emissions Used in the 2026 Base and Final Rule Policy Control Case CAMx Modeling and the Fractional Change in Emissions Between Those Cases.

State	Modeled 2026 Base Case NO_X Emissions (final)	Modeled 2026 Control Case NO_X Emissions (final)	2026 NO_X Reduction vs 2026 Base Case Fractional Reduction in Emissions
Alabama	56,096	55,912	-0.003
Arizona	35,514	35,260	-0.007
Arkansas	44,639	37,449	-0.161
California	137,932	136,266	-0.012
Colorado	49,742	49,802	0.001
Connecticut	10,201	10,212	0.001
Delaware	6,492	6,494	0.000
District of Columbia	1,057	1,057	0.000
Florida	88,786	88,782	0.000
Georgia	61,626	61,674	0.001
Idaho	17,024	17,078	0.003
Illinois	84,913	82,914	-0.024
Indiana	70,963	68,035	-0.041
Iowa	46,523	46,862	0.007
Kansas	56,844	57,227	0.007
Kentucky	49,829	43,968	-0.118
Louisiana	98,585	87,536	-0.112
Maine	13,617	13,617	0.000
Maryland	23,023	22,872	-0.007
Massachusetts	28,194	28,197	0.000
Michigan	69,697	65,956	-0.054
Minnesota	55,848	54,685	-0.021
Mississippi	32,407	29,740	-0.082
Missouri	68,407	61,594	-0.100
Montana	25,336	25,338	0.000
Nebraska	42,355	42,407	0.001
Nevada	18,043	18,014	-0.002
New Hampshire	6,830	6,839	0.001
New Jersey	31,368	31,053	-0.010
New Mexico	70,923	70,933	0.000
New York	64,616	63,446	-0.018
North Carolina	55,518	55,889	0.007
North Dakota	69,173	69,262	0.001
Ohio	75,421	70,764	-0.062
Oklahoma	77,225	69,864	-0.095
Oregon	28,271	28,271	0.000
Pennsylvania	87,453	85,354	-0.024
Rhode Island	4,172	4,164	-0.002
South Carolina	40,161	40,332	0.004
South Dakota	12,372	12,392	0.002
Tennessee	46,637	46,648	0.000
Texas	299,134	293,557	-0.019
Utah	31,387	26,472	-0.157
Vermont	3,447	3,448	0.000
Virginia	45,636	44,741	-0.020
Washington	46,143	46,143	0.000
West Virginia	45,466	42,167	-0.073
Wisconsin	41,877	41,995	0.003
Wyoming	35,517	36,054	0.015
Tribal Data	5,522	4,200	-0.239

Table Appendix J-2. 2026 Average Ozone DVs (ppb) for the CAMx AQ Modeling of the Final Rule Policy Control Case Using the Two Calibration Factors.

Site	state	county	AQ Modeling	AQAT Estimate using Primary Calibration Factor	AQAT Estimate using Alternative Calibration Factor	Delta AQ between Primary Calibration Approach and AQ Modeling	Delta AQ between Alternative Calibration Approach and AQ Modeling
40278011	Arizona	Yuma	69.80	69.84	69.82	-0.04	-0.02
80590006	Colorado	Jefferson	71.80	71.86	71.88	-0.06	-0.08
80590011	Colorado	Jefferson	72.30	72.18	72.24	0.12	0.06
80690011	Colorado	Larimer	69.70	69.87	69.91	-0.17	-0.21
90013007	Connecticut	Fairfield	70.40	70.39	70.41	0.01	-0.01
90019003	Connecticut	Fairfield	70.80	70.85	70.79	-0.05	0.01
350130021	New Mexico	Dona Ana	69.90	69.82	69.79	0.08	0.11
350130022	New Mexico	Dona Ana	68.90	68.92	68.92	-0.02	-0.02
350151005	New Mexico	Eddy	69.10		69.05		0.05
350250008	New Mexico	Lea	69.20		69.17		0.03
480391004	Texas	Brazoria	68.20	68.25	68.54	-0.05	-0.34
481671034	Texas	Galveston	69.20	69.01	69.63	0.19	-0.43
482010024	Texas	Harris	73.20	73.13	73.38	0.07	-0.18
490110004	Utah	Davis	69.70	69.40	69.02	0.30	0.68
490353006	Utah	Salt Lake	70.30	70.02	69.62	0.28	0.68
490353013	Utah	Salt Lake	71.70	71.49	71.33	0.21	0.37
551170006	Wisconsin	Sheboygan	70.50	70.25	70.26	0.25	0.24

Table Appendix J-3. 2026 Maximum Ozone DVs (ppb) for the CAMx AQ Modeling Final Rule Policy Control Scenario Using the Two Calibration Factors.

Site	state	county	CAMx Modeling	AQAT Estimate using Primary Calibration Factor	AQAT Estimate using Atlernative Calibration Factor	Delta AQ between Primary Calibration Approach and CAMx Modeling	Delta AQ between Alternative Calibration Approach and CAMx Modeling
40278011	Arizona	Yuma	71.40	71.44	71.42	-0.04	-0.02
80590006	Colorado	Jefferson	72.50	72.46	72.47	0.04	0.03
80590011	Colorado	Jefferson	72.90	72.78	72.84	0.12	0.06
80690011	Colorado	Larimer	70.90	71.07	71.10	-0.17	-0.20
90013007	Connecticut	Fairfield	71.30	71.19	71.20	0.11	0.10
90019003	Connecticut	Fairfield	71.10	71.05	70.99	0.05	0.11
350130021	New Mexico	Dona Ana	71.10	71.12	71.08	-0.02	0.02
350130022	New Mexico	Dona Ana	71.50	71.52	71.52	-0.02	-0.02
350151005	New Mexico	Eddy	73.30		73.35		-0.05
350250008	New Mexico	Lea	71.60		71.57		0.03
480391004	Texas	Brazoria	70.30	70.32	70.62	-0.02	-0.32
481671034	Texas	Galveston	70.40	70.19	70.82	0.21	-0.42
482010024	Texas	Harris	74.80	74.72	74.97	0.08	-0.17
490110004	Utah	Davis	71.80	71.58	71.19	0.22	0.61
490353006	Utah	Salt Lake	71.80	71.61	71.20	0.19	0.60
490353013	Utah	Salt Lake	72.20	71.89	71.72	0.31	0.48
551170006	Wisconsin	Sheboygan	71.40	71.14	71.15	0.26	0.25

Appendix K: Additional AQAT sensitivity including the IRA

As described in preamble section V.D, we assessed the effects of including the Inflation Reduction Act (IRA) on the emissions projections. EPA then assessed the effects of these potential IRA-related emissions changes on air quality using AQAT to verify it did not alter EPA's geographic or overcontrol findings. EPA evaluated air quality contributions and receptor status for the base case in 2023, for the base case in 2026, the "Full Step 3" scenario in 2026, and the "Full Step 3 – EGU only" scenario in 2026 using the Step 3 configuration of AQAT with the primary calibration factor. These are the four scenarios that are most relevant for the construction of the policy. For these scenarios, EPA accounted for the effects of the IRA by calculating the emission differences (i.e., deltas) for each state between the IPM case without the IRA and then with the same IPM case but including the IRA. It then applied this delta to the respective AQAT scenario. See the worksheet "IRA_cases" in the ozone_AQAT_final.xlsx to see the calculations of how these emissions differences were applied. In short, we took the difference in expected emissions (an IPM case with and without the IRA). To create the engineering analysis base including the IRA, we subtracted the state emission deltas (from the IPM base case with and without the IRA) from the engineering analysis base emissions for that state. For the penultimate and final cost threshold cases (i.e., "Full Step 3 – EGU only" and "Full Step 3" Scenarios, respectively), the emission difference was similarly obtained by identifying the difference between the IPM Final Policy Case with and without the IRA.

The air quality contributions for the four scenarios incorporating the IRA are shown in Table Appendix K-1. Comparing these values with the respective policy case (without the IRA) from Tables C-11 and C-12, we observe that while there are minor differences in contributions there are no differences in which states remain linked in 2023 or 2026. Comparing the 2023 average and maximum design values for the base cases with and without IRA using Tables C-7, C-8, and Appendix K-2, we can observe that there are no changes in receptor status.[95] Next, comparing the 2026 average and maximum design values for the base cases, from the "Full Step 3 – EGU only," or from the "Full Step 3" cases with and without the IRA using Tables C-9, C-10, and Appendix K-3 and Appendix K-4, we can observe that, again, there are no changes in receptor status (i.e., the receptor is consistently above or below 71 ppb comparing the with- and without-IRA cases). Consequently, EPA concludes that even factoring in the projected effects of the IRA the conclusions in the final rule regarding geographic scope and overcontrol remain valid.

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[95] We also examined the hypothetical Step 3 case for 2023 where SCRs are retrofit, both with and without RIA (i.e., the 2023 "Full Step 3 – EGU only" scenario). In this case, we see no changes in linkage status. All states continue to remain linked at or above 1% of the NAAQS to a remaining nonattainment or maintenance receptor.

Table Appendix K-1. 2023 and 2026 Maximum Air Quality Contribution (ppb) to a Remaining Receptor.[96]

State	2023 Base Case w/ IRA	2026 Base Case w/ IRA	2026 "Full Step 3 – EGU only" Case w/ IRA	2026 "Full Step 3" Casew/ IRA
Alabama	0.77			
Arkansas	1.18	1.12	1.01	0.57
California	6.27	6.10	6.09	6.05
Illinois	19.08	13.60	13.59	13.56
Indiana	9.90	8.31	8.22	8.05
Kentucky	0.86	0.82	0.75	0.72
Louisiana	9.68	9.64	9.29	4.30
Maryland	1.31	1.09	1.09	1.09
Michigan	1.60	1.46	1.46	1.45
Minnesota	0.85			
Mississippi	1.41	1.32	1.21	0.35
Missouri	1.94	1.78	1.59	1.55
Nevada	1.06	0.90	0.90	0.90
New Jersey	8.37	8.09	8.10	8.11
New York	16.12	12.68	12.66	12.64
Ohio	2.04	1.90	1.90	1.85
Oklahoma	1.02	0.77	0.72	0.61
Pennsylvania	5.93	5.66	5.61	5.52
Texas	4.75	4.45	4.34	4.31
Utah	1.29	1.07	0.90	0.89
Virginia	1.83	1.14	1.13	1.10
West Virginia	1.51	1.35	1.28	1.24
Wisconsin	2.88			

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[96] Values greater than or equal to 0.70 ppb indicate the state remains linked to a remaining downwind receptor.

Table Appendix K-2. 2023 Average and Maximum Ozone DVs (ppb) for the Engineering Analysis Base Case Including the IRA Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	2023 Engineering Analysis Base Case (Avg. DV)	2023 Engineering Analysis Base Case w/IRA (Avg. DV)	2023 Engineering Analysis Base Case (Max. DV)	2023 Engineering Analysis Base Case w/IRA (Max. DV)
40278011	Arizona	Yuma	70.36	70.36	72.05	72.06
80350004	Colorado	Douglas	71.12	71.17	71.71	71.77
80590006	Colorado	Jefferson	72.63	72.67	73.32	73.37
80590011	Colorado	Jefferson	73.29	73.35	73.89	73.95
80690011	Colorado	Larimer	70.79	70.83	71.99	72.02
90010017	Connecticut	Fairfield	71.62	71.57	72.22	72.17
90013007	Connecticut	Fairfield	72.99	72.95	73.89	73.85
90019003	Connecticut	Fairfield	73.32	73.28	73.62	73.58
90099002	Connecticut	New Haven	70.61	70.59	72.71	72.69
170310001	Illinois	Cook	68.13	68.14	71.82	71.83
170314201	Illinois	Cook	67.92	67.93	71.41	71.42
170317002	Illinois	Cook	68.47	68.47	71.27	71.27
350130021	New Mexico	Dona Ana	70.83	70.83	72.13	72.13
350130022	New Mexico	Dona Ana	69.73	69.73	72.43	72.43
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	70.59	70.56	72.69	72.67
481210034	Texas	Denton	69.93	69.91	71.73	71.72
481410037	Texas	El Paso	69.82	69.82	71.43	71.42
481671034	Texas	Galveston	71.82	71.79	73.13	73.09
482010024	Texas	Harris	75.33	75.30	76.93	76.91
482010055	Texas	Harris	71.19	71.16	72.20	72.17
482011034	Texas	Harris	70.32	70.29	71.52	71.50
482011035	Texas	Harris	68.01	67.98	71.52	71.49
490110004	Utah	Davis	71.88	71.90	74.08	74.10
490353006	Utah	Salt Lake	72.48	72.50	74.07	74.10
490353013	Utah	Salt Lake	73.21	73.23	73.71	73.73
550590019	Wisconsin	Kenosha	70.75	70.75	71.65	71.65
551010020	Wisconsin	Racine	69.59	69.61	71.39	71.40
551170006	Wisconsin	Sheboygan	72.64	72.65	73.54	73.55

Table Appendix K-3. 2026 Average Ozone DVs (ppb) for the Base, “Full Step 3 – EGU only”, and “Full Step 3” Cases with and without the IRA Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	2026 Engineering Analysis Base Case (Avg. DV)	2026 Engineering Analysis Base Case w/ IRA (Avg. DV)	2026 “Full Step 3 – EGU only” Case (Avg. DV)	2026 “Full Step 3 – EGU only” Case w/ IRA (Avg. DV)	2026 “Full Step 3” Case (Avg. DV)	2026 “Full Step 3” Case w/ IRA (Avg. DV)
40278011	Arizona	Yuma	69.87	69.89	69.84	69.85	69.80	69.81
80590006	Colorado	Jefferson	71.70	71.73	71.36	71.40	71.34	71.38
80590011	Colorado	Jefferson	72.06	72.10	71.59	71.64	71.57	71.62
80690011	Colorado	Larimer	69.84	69.87	69.54	69.58	69.53	69.56
90013007	Connecticut	Fairfield	71.25	71.18	70.98	70.95	70.66	70.63
90019003	Connecticut	Fairfield	71.58	71.51	71.34	71.31	71.06	71.03
350130021	New Mexico	Dona Ana	70.06	70.08	69.89	69.91	69.86	69.88
350130022	New Mexico	Dona Ana	69.17	69.19	69.00	69.02	68.96	68.98
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	69.89	69.90	68.96	69.01	68.50	68.54
481671034	Texas	Galveston	71.29	71.28	70.02	70.07	69.28	69.33
482010024	Texas	Harris	74.83	74.85	73.86	73.91	73.39	73.45
490110004	Utah	Davis	69.90	69.91	69.34	69.39	69.28	69.33
490353006	Utah	Salt Lake	70.50	70.50	69.96	70.01	69.91	69.95
490353013	Utah	Salt Lake	71.91	71.92	71.45	71.48	71.40	71.44
551170006	Wisconsin	Sheboygan	70.83	70.80	70.51	70.51	70.27	70.27

Table Appendix K-4. 2026 Maximum Ozone DVs (ppb) for the Base, “Full Step 3 – EGU only”, and “Full Step 3” Cases with and without the IRA Assessed Using the Ozone AQAT for All Receptors.

Site	state	county	2026 Engineering Analysis Base Case (Max. DV)	2026 Engineering Analysis Base Case w/ IRA (Max. DV)	2026 “Full Step 3 – EGU only” Case (Max. DV)	2026 “Full Step 3 – EGU only” Case w/ IRA (Max. DV)	2026 “Full Step 3” Case (Max. DV)	2026 “Full Step 3” Case w/ IRA (Max. DV)
40278011	Arizona	Yuma	71.47	71.49	71.44	71.45	71.40	71.41
80590006	Colorado	Jefferson	72.30	72.33	71.95	71.99	71.93	71.97
80590011	Colorado	Jefferson	72.66	72.70	72.19	72.23	72.16	72.21
80690011	Colorado	Larimer	71.04	71.07	70.73	70.77	70.72	70.76
90013007	Connecticut	Fairfield	72.06	71.99	71.78	71.75	71.46	71.42
90019003	Connecticut	Fairfield	71.78	71.71	71.54	71.51	71.26	71.23
350130021	New Mexico	Dona Ana	71.36	71.38	71.19	71.21	71.16	71.18
350130022	New Mexico	Dona Ana	71.77	71.79	71.60	71.62	71.56	71.58
350151005	New Mexico	Eddy	0.00	0.00	0.00	0.00	0.00	0.00
350250008	New Mexico	Lea	0.00	0.00	0.00	0.00	0.00	0.00
480391004	Texas	Brazoria	72.02	72.02	71.06	71.10	70.58	70.63
481671034	Texas	Galveston	72.51	72.50	71.22	71.27	70.47	70.52
482010024	Texas	Harris	76.45	76.47	75.46	75.51	74.98	75.04
490110004	Utah	Davis	72.10	72.11	71.52	71.57	71.46	71.51
490353006	Utah	Salt Lake	72.10	72.10	71.55	71.60	71.50	71.54
490353013	Utah	Salt Lake	72.31	72.32	71.84	71.88	71.80	71.84
551170006	Wisconsin	Sheboygan	71.73	71.70	71.41	71.41	71.17	71.17