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The Clean Air Act's Good Neighbor Provision: Overview of Interstate Air Pollution Control

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SUMMARY

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The Clean Air Act's Good Neighbor Provision: Overview of Interstate Air Pollution Control

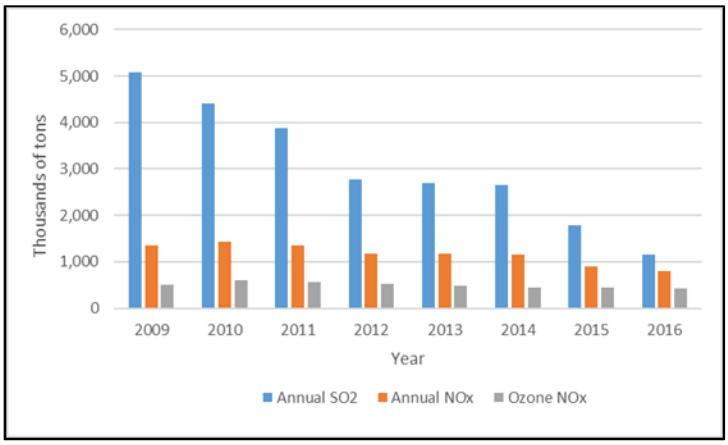
Notwithstanding air quality progress since 1970, challenges remain to reduce pollution in areas exceeding federal standards and to ensure continued compliance elsewhere. The movement of air pollutants across state lines, known as interstate transport, has made it difficult for some downwind states to attain federal ozone and fine particulate matter ($PM_{2.5}$) standards, partly because states lack authority to limit emissions from other states.

The Clean Air Act's "Good Neighbor" provision (Section 110(a)(2)(D)) seeks to address this issue and requires states to prohibit emissions that significantly contribute to another state's air quality problems. It requires each state's implementation plan (SIP)—a collection of air quality regulations and documents—to prohibit emissions that either "significantly contribute" to nonattainment or "interfere with maintenance" of federal air quality standards in another state. The act also authorizes states to petition EPA to issue a finding that emissions from "any major source or group of stationary sources" violate the Good Neighbor provision (Section 126(b)).

EPA and the states have implemented regional programs to address interstate ozone and $PM_{2.5}$ transport and comply with the Good Neighbor provision. These programs set emission "budgets" for ozone and $PM_{2.5}$ precursor emissions—specifically, sulfur dioxide (SO_2) and nitrogen oxide (NO_x) as $PM_{2.5}$ precursors and seasonal NO_x emissions as an ozone precursor. The current program—the Cross State Air Pollution Rule (CSAPR)—focuses on limiting interstate transport of power sector SO_2 and NO_x emissions to eastern states.

Power sector emissions in CSAPR states are below emission budgets as a result of regulatory and market factors (see figure). Annual SO_2, annual NO_x, and ozone season NO_x emissions from CSAPR sources decreased 77%, 41%, and 15%, respectively, between 2009 and 2016.

CSAPR Emission Trends: 2009-2016



Source: EPA Air Markets Program Data, https://ampd.epa.gov/ampd/.

Notes: The Clean Air Interstate Rule was in effect 2009 through the end of 2014 and was replaced by CSAPR on January 1, 2015.

EPA has concluded that regional SO_2 and NO_x programs have reduced interstate transport of $PM_{2.5}$ and ozone. The Energy Information Administration's national-scale analysis identifies market and regulatory factors contributing to emission reductions. It is unclear whether emissions will remain well below budgets, given recent prices of ozone season NO_x allowances (i.e., authorization for each ton emitted) and the supply of banked allowances for future use in lieu of emission reductions.

Research indicates that ozone transport harms air quality in downwind states. However, stakeholder views vary regarding the extent to which interstate transport impacts air quality. Some note that some coal-fired power plants do not fully use already-installed pollution controls. Several states have sought additional upwind reductions in

ozone precursors through Section 126(b) petitions. Others have questioned the feasibility of achieving additional reductions in ozone precursors, raising concerns about emissions from international or natural sources.

EPA recently proposed to determine that CSAPR fully addresses Good Neighbor obligations for the 2008 ozone standard but has not yet made a "Good Neighbor" determination for the more stringent 2015 ozone standard. The agency has therefore not yet determined whether and how it will update the CSAPR budgets with respect to the 2015 ozone standard.

Members of Congress may have an interest in better understanding how EPA and states implement the Clean Air Act's Good Neighbor provision, particularly as EPA continues its assessment of Good Neighbor obligations under the 2015 ozone standard.

The following issues, among others, may inform deliberations about interstate air transport. First, the extent to which existing programs will improve air quality in areas not meeting the 2015 ozone standard is to be determined. CSAPR has not addressed NO_x emissions from non-power sector sources, such as large industrial boilers. EPA concluded that industrial sources have potential to cost-effectively reduce NO_x emissions but is less certain about the structure of potential NO_x control strategies. Second, some have questioned whether additional regulatory incentives are necessary to fulfill Good Neighbor obligations, particularly given current NO_x allowance prices. These prices are below the marginal abatement cost, which may result in higher emissions. Third, EPA's current air quality initiatives may indirectly affect its Good Neighbor assessments. EPA recently sought comment on potential flexibilities for the development of Good Neighbor SIPs.

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Introduction

The movement of air pollutants across state lines, known as interstate transport, has posed a decades-long challenge to air quality protection. The Clean Air Act (CAA) assigns responsibility to states to limit emissions from sources within their borders as needed to attain federal health-based air quality standards. A state's air quality, however, may be affected by emissions from upwind sources located in a different state. Hence, controlling emissions within the border of a state may not be sufficient to attain the air quality standard. The downwind state lacks authority to limit emissions from the sources in the upwind state(s) but is nonetheless responsible for attaining the federal standards.

Interstate transport has made it difficult for some downwind states to attain federal standards for ozone and fine particulate matter ($PM_{2.5}$). Both of these pollutants are formed by precursor emissions that can travel long distances. Specifically, sulfur dioxide (SO_2) and nitrogen oxide (NO_x) contribute to the formation of $PM_{2.5}$ in the air.[1] NO_x and volatile organic compounds (VOCs) react in sunlight to form ground-level ozone, the main component of smog.[2] Studies have shown that these precursor emissions, as well as ozone and $PM_{2.5}$, are regional pollutants, meaning that they can travel hundreds of miles through the atmosphere.[3] For example, Bergin et al.'s study of the eastern United States concluded that regional transport affected air quality in most eastern states. They attributed an average of 77% of each state's ozone and $PM_{2.5}$ concentrations to emissions from upwind states.[4]

These regional emissions are associated with health impacts and are therefore of concern. For example, research shows that ground-level ozone is associated with aggravated asthma, chronic bronchitis, heart attacks, and premature death.[5] Studies have also linked exposure to particulate matter to respiratory illnesses, such as aggravated asthma, as well as heart attacks and premature death.[6]

The CAA's "Good Neighbor" provision recognizes such interstate issues and requires states to prohibit emissions that significantly contribute to air quality problems in another state (Section

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[1] $PM_{2.5}$ is also directly emitted by sources (e.g., construction sites, unpaved roads, smokestacks, or fires). See U.S. Environmental Protection Agency (EPA), *Particulate Matter (PM) Basics*, https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#main-content. For detailed information about PM and the formation of PM, see National Research Council, *Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States*, 2010, pp. 67-76.

[2] EPA, *Basic Information about Ozone*, https://www.epa.gov/ozone-pollution/basic-information-about-ozone.

[3] EPA, *Interstate Air Pollution Transport*, https://www.epa.gov/airmarkets/interstate-air-pollution-transport. See also EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74514, October 26, 2016; and EPA, *Fact Sheet. The Cross-State Air Pollution Rule: Reducing the Interstate Transport of Fine Particulate Matter and Ozone*, July 2011, p. 1, https://www.epa.gov/sites/production/files/2016-09/documents/csaprfactsheet.pdf.

[4] Michelle S. Bergin et al., "Regional Air Quality: Local and Interstate Impacts of NO_x and SO_2 Emissions on Ozone and Fine Particulate Matter in the Eastern United States," *Environmental Science & Technology*, vol. 41, no. 13 (2007), pp. 4677-4689. In addition, EPA summarizes studies about regional transport. See EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74514.

[5] In addition, ground-level ozone is associated with environmental effects, such as negative impacts on forests and crop yields. For information about the health and environmental effects of ozone, see EPA, *Basic Information about Ozone*; and EPA, *Integrated Science Assessment (ISA) of Ozone and Related Photochemical Oxidants*, February 2013, https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492.

[6] EPA, *Health and Environmental Effects of Particulate Matter (PM)*, https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm. See also EPA, *Integrated Science Assessment for Particulate Matter*, December 2009, https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=216546.

110(a)(2)(D)). It requires each state's implementation plan—a collection of air quality regulations and documents—to include adequate provisions to prohibit emissions that either "contribute significantly" to nonattainment or "interfere with maintenance" of federal air quality standards in another state.[7]

Since the 1990s, the U.S. Environmental Protection Agency (EPA) and the states have implemented various regional programs to address interstate air transport. Many of these programs have since concluded. The current program—the Cross State Air Pollution Rule (CSAPR, pronounced "Casper")—is an emissions trading program for 28 states in the eastern part of the United States. EPA established CSAPR to limit interstate transport of power sector SO_2 and NO_x emissions and help states comply with the 1997 and 2006 $PM_{2.5}$ standards as well as the 1997 and 2008 ozone standards.

EPA has attributed emission reductions to CSAPR and the agency's other emissions trading programs, such as the Acid Rain Program: annual SO_2 emissions from power plants participating in CSAPR were 1.2 million tons in 2016, an 87% reduction from 2005 levels.[8] CSAPR power plants also emitted 420,000 tons of NO_x in the 2016 ozone season, roughly an 80% reduction from the 1990 ozone season NO_x emissions.[9]

Emissions reduction progress notwithstanding, some areas of the country do not meet federal air quality standards for pollutants like ozone and particulate matter. In 2018, EPA designated 52 areas with approximately 200 counties or partial counties as "nonattainment" with respect to the 2015 ozone standard.[10]

Members of Congress representing both downwind and upwind states may have an interest in how EPA and states implement the CAA's Good Neighbor provision, particularly as states begin to develop plans for nonattainment areas to come into compliance with the 2015 ozone standards. Some downwind states with nonattainment areas have attributed their ozone violations—at least in part—to emission sources from upwind states.[11] Downwind states have also expressed concerns that transported air pollution contributes to harmful human health impacts and adversely affects economic growth.[12] For example, a Maryland state agency reported that transport of

[7] CAA §110(a)(2); 42 U.S.C. §7410(a)(2).

[8] EPA reports emissions reductions achieved under several cap-and-trade programs designed to reduce SO_2 and NO_x from power plants, including the Acid Rain Program, the Clean Air Interstate Rule (CAIR), and CSAPR (which replaced CAIR in 2015). EPA reports that most of the SO_2 and NO_x emission reductions since 2005 occurred in response to CAIR. See EPA, *2016 Program Progress*, "Emission Reductions," https://www3.epa.gov/airmarkets/progress/reports/pdfs/2016_full_report.pdf, and "Emission Reductions: SO_2 Emission Trends," https://www3.epa.gov/airmarkets/progress/reports/pdfs/2016_full_report.pdf.

[9] EPA, *2016 Program Progress*, "Emission Reductions: Ozone Season NO_x Emission Trends." https://www3.epa.gov/airmarkets/progress/reports/pdfs/2016_full_report.pdf

[10] On April 30, 2018, EPA designated 51 areas as nonattainment with the 2015 ozone standard. EPA designated one more area as nonattainment on July 17, 2018. For the designations of 51 nonattainment areas, see EPA, "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards," 83 *Federal Register* 25776, June 4, 2018. For the July 2018 designation, see EPA, "Additional Air Quality Designations for the 2015 Ozone National Ambient Air Quality Standards—San Antonio, Texas Area," 83 *Federal Register* 35136, July 25, 2018. For more information about the 2015 ozone standard and EPA's recent designations, see CRS Report R43092, *Implementing EPA's 2015 Ozone Air Quality Standards*, by James E. McCarthy and Kate C. Shouse.

[11] In their recommendations to EPA regarding designation of nonattainment areas, Delaware, New Jersey, and Wisconsin attributed ozone violations in their jurisdiction to emissions transported from other states. See state recommendation letters to EPA, https://www.epa.gov/ozone-designations/2015-ozone-standards-state-recommendations-epa-responses-and-technical-support.

[12] For example, see U.S. Senator Richard Blumenthal et al., letter to Honorable Scott Pruitt, Administrator, EPA, February 23, 2018, https://www.blumenthal.senate.gov/imo/media/doc/

emissions from upwind states has required Maryland's sources to compensate with "deeper in-state emissions reductions," thereby adding economic costs to the state's business community.[13] Upwind states have disagreed with the approach used by EPA to determine whether emissions from upwind sources contribute to downwind air quality problems. For instance, Ohio's state environmental agency described EPA's transport approach as "deeply flawed," concluding that it would place "an unfair amount of responsibility" on upwind power plants to reduce emissions.[14]

To assist Members and staff in understanding interstate transport issues, this report presents background information about the CAA's interstate transport provision, provides a brief history of regional programs leading up to CSAPR, discusses key aspects of the CSAPR program and program results, summarizes the status of Good Neighbor determinations with respect to ozone standards, and concludes with issues for congressional consideration.

Background

The CAA requires EPA to establish national standards for air pollutants that meet the criteria in Section 108(a)(1). These pollutants—the "criteria pollutants"—are those that EPA has determined "may reasonably be anticipated to endanger public health or welfare" and whose presence in "ambient air results from numerous or diverse mobile or stationary sources."[15] EPA must design two types of National Ambient Air Quality Standards (NAAQS) for the criteria pollutants. Primary NAAQS must protect public health with an "adequate margin of safety," and secondary NAAQS must "protect public welfare from any known or anticipated adverse effects."[16] The NAAQS are concentration standards measured in parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).[17] The NAAQS do not set direct limits on emissions but rather define what EPA considers to be clean air for the pollutant in question.[18]

Section 109(d) of the act requires periodic NAAQS reviews. Every five years, EPA must review the NAAQS and the science upon which the NAAQS are based and then revise the NAAQS if necessary. This multi-step process is rarely completed within the five-year review cycle and is often the subject of litigation that results in court-ordered deadlines for completion of NAAQS

2018.02.23%20Letter%20to%20Pruitt%20re%20CT%20Clean%20Air%20Act%20Petition.pdf; and U.S. Congress, Senate Environment and Public Works Committee, Subcommittee on Clean Air and Nuclear Safety, *Cooperative Federalism Under the Clean Air Act: State Perspectives*, 115th Cong., 2nd sess., April 10, 2018. See testimony of Shawn Garvin, Department of Natural Resources and Environmental Control, p. 3, https://www.epw.senate.gov/public/_cache/files/7/9/79fab6e4-ae5d-4e6f-af30-d4cd30d7b3d7/18D52D3F4801CCF26167EC7F17CD4C16.garvin-testimony-04.10.2018.pdf.

[13] Maryland Department of Environment, "Governor Larry Hogan Announces State Lawsuit Against EPA," press release, September 27, 2017, http://news.maryland.gov/mde/2017/09/27/governor-larry-hogan-announces-state-lawsuit-against-epa/.

[14] Craig Butler, Director, Ohio Environmental Protection Agency, letter to Honorable Gina McCarthy, Administrator, EPA, February 1, 2016, p. 1. See EPA-HQ-OAR-2015-0500-0283 at http://www.regulations.gov.

[15] CAA §108(a)(1), codified at 42 U.S.C. §7408(a)(1). EPA determined that the following pollutants meet the Section 108 criteria: (1) carbon monoxide, (2) lead, (3) nitrogen dioxide, (4) ozone, (5) particulate matter, and (6) sulfur dioxide. For more information about the act's requirements, see CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*, by James E. McCarthy.

[16] CAA §109(b), codified at 42 U.S.C. §7409(b).

[17] EPA, "NAAQS Table," https://www.epa.gov/criteria-air-pollutants/naaqs-table.

[18] CRS Report R43092, *Implementing EPA's 2015 Ozone Air Quality Standards*, by James E. McCarthy and Kate C. Shouse.

reviews.[19] Since January 1997, EPA has completed at least one review for each of the six criteria pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide), with standards being made more stringent for five of the six.[20] Most of the revisions finalized in this time period were for the ozone and particulate matter standards.[21]

The CAA assigns responsibility to states to establish procedures to attain and maintain the NAAQS within their borders. In particular, the act requires each state to submit a new or revised state implementation plan (SIP) to EPA within three years of a NAAQS promulgation or revision.[22] This SIP submission, also known as an "infrastructure SIP," outlines how the state will implement, maintain, and enforce the NAAQS.[23] The infrastructure SIP allows EPA to "review the basic structural requirements of [a state's] air quality management program in light of each new or revised NAAQS."[24] Examples of the basic structural requirements include enforceable emission limits, an air monitoring program, an enforcement program, air quality modeling capabilities, and "adequate personnel, resources, and legal authority."[25]

The state's SIP must also address its interstate transport obligations under the CCAA. EPA refers to this section of the SIP submission as the "Good Neighbor SIP." The Good Neighbor SIP must prohibit "certain emissions of air pollutants because of the impact they would have on air quality in other states."[26] Specifically, the state's Good Neighbor SIP must prohibit sources in that state from "emitting any air pollutant in amounts which will … contribute significantly to nonattainment in, or interfere with maintenance" of a NAAQS in another state.[27]

EPA reviews SIPs to ensure they meet statutory requirements. The agency also has authority to require states to revise their SIPs. Furthermore, the act requires EPA, under certain conditions, to

[19] On May 9, 2018, the EPA Administrator announced five principles—one of which was meeting statutory deadlines—for EPA to follow in future NAAQS reviews. See E. Scott Pruitt, EPA Administrator, memorandum to Assistant Administrators, May 9, 2018, https://www.epa.gov/criteria-air-pollutants/back-basics-process-reviewing-national-ambient-air-quality-standards.

[20] EPA has not revised the carbon monoxide (CO) NAAQS since 1985, when it revoked the secondary CO NAAQS. See EPA, *Table of Historical Carbon Monoxide (CO) National Ambient Air Quality Standards (NAAQS)*, https://www.epa.gov/co-pollution/table-historical-carbon-monoxide-co-national-ambient-air-quality-standards-naaqs. For a summary of current NAAQS for all six criteria pollutants and links to the history of standards for each of these pollutants, see EPA, "NAAQS Table."

[21] For a summary of the most recent ozone NAAQS revision, see CRS Report R43092, *Implementing EPA's 2015 Ozone Air Quality Standards*, by James E. McCarthy and Kate C. Shouse. For a summary of the most recent particulate matter NAAQS revision, see CRS Report R42934, *Air Quality: EPA's 2013 Changes to the Particulate Matter (PM) Standard*, by Robert Esworthy.

[22] CAA §110(a)(1); 42 U.S.C. §7410(a)(1).

[23] EPA, *Guidance on Infrastructure State Implementation Plan (SIP) Elements under the Clean Air Act Sections 110(a)(1) and 110(a)(2)*, September 2013, p. 1, https://www.epa.gov/sites/production/files/2015-12/documents/guidance_on_infrastructure_sip_elements_multipollutant_final_sept_2013.pdf.

[24] EPA, *Guidance on Infrastructure State Implementation Plan*, p. 2.

[25] EPA, *Guidance on Infrastructure State Implementation Plan*, p. 2.

[26] The Good Neighbor SIP is part of the infrastructure SIP. States with nonattainment areas must also submit "nonattainment SIPs" that address more detailed statutory requirements for coming into attainment. See EPA, "Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals," 76 *Federal Register* 48216, August 8, 2011. See also EPA, "Notice of Availability of the Environmental Protection Agency's Preliminary Interstate Ozone Transport Modeling Data for the 2015 Ozone National Ambient Air Quality Standard (NAAQS)," 82 *Federal Register* 1734, January 6, 2017.

[27] CAA §110(a)(2)(D)(i)(I); 42 U.S.C. §7410(a)(2)(D)(i)(I).

impose sanctions and to issue a Federal Implementation Plan (FIP) if a state fails or declines to submit or implement an adequate SIP.[28]

Recognizing ongoing challenges with ozone transport, the 1990 CAA Amendments established regional planning provisions specific to ozone. For example, CAA Section 184 created a multi-state ozone transport region, known as the Ozone Transport Region (OTR), and established the northeast Ozone Transport Commission (OTC) to advise EPA about ozone controls in the OTR.[29] The OTR is comprised of 12 Northeastern and Mid-Atlantic states (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, certain counties in Northern Virginia) and Washington, DC.[30] The CAA required states in the OTR to impose controls on sources in all specified areas, regardless of attainment status. Such controls included enhanced vehicle inspection and maintenance programs and reasonably available control technology for sources of VOCs.[31]

In addition, CAA Section 176A allows EPA to establish transport regions to address regional pollution problems contributing to violations of a primary NAAQS. The agency must establish a commission, comprised of EPA and state officials, for each transport region that makes recommendations to EPA on appropriate mitigation strategies.

Implementing the Good Neighbor Provision

The CAA provides two independent statutory authorities to facilitate compliance with the Good Neighbor provision: (1) the SIPs process under Section 110 and (2) a petition process under Section 126(b). While these authorities are separate, they each address the same objective—that is, the Good Neighbor provision in Section 110(a)(2)(D)(i).[32] The remainder of this section describes how these authorities may be used to enforce the Good Neighbor provision.

SIPs Process

As previously noted, a state's SIP must prohibit sources in that state from "emitting any air pollutant in amounts which will … contribute significantly to nonattainment in, or interfere with maintenance" of a NAAQS in another state.[33] If EPA finds an existing SIP inadequate, it must require the state to revise the SIP.[34] This procedure is known as a "SIP call" and it can be issued to multiple states at the same time. Specifically, EPA must issue a SIP call whenever the agency determines that the SIP is "substantially inadequate to attain or maintain" a particular NAAQS, to ensure that the state's sources do not contribute significantly to a downwind state's

[28] Regarding EPA's authority to issue FIPs, see CAA Section 110(c)(1); 42 U.S.C. Section 7410(c)(1). Regarding the sanctions EPA may impose, see CAA Section 110(m); 42 U.S.C. Section 7410(m).

[29] CAA §184; 42 U.S.C. §7511(c). See also Philip E. Karmel, "Interstate Transport and Regional Approaches to Regulating Air Pollution," in *The Clean Air Act Handbook*, ed. Julie R. Domike and Alec C. Zacaroli, 4th ed. (Chicago: American Bar Association, 2016), pp. 115-136.

[30] CAA §184(a); 42 U.S.C. §7511(c).

[31] CAA §184; 42 U.S.C. §7511(c). For further analysis of this provision, see also Philip E. Karmel, "Interstate Transport and Regional Approaches to Regulating Air Pollution," in *The Clean Air Act Handbook*, ed. Julie R. Domike and Alec C. Zacaroli, 4th ed. (Chicago: American Bar Association, 2016), pp. 115-136.

[32] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26675, June 8, 2018.

[33] CAA §110(a)(2)(D)(i)(I); 42 U.S.C. §7410(a)(2)(D)(i)(I).

[34] CAA §110(k)(5); 42 U.S.C. §7410(k)(5).

nonattainment, or if it is otherwise inadequate to meet any CAA requirement.[35] EPA can also issue a SIP call if states do not meet the CAA Section 184 requirements of the OTR.

Section 126(b) Petitions

Under CAA Section 126(b), any state or political subdivision can petition EPA to issue a "finding that any major source or group of stationary sources emits or would emit any air pollutant in violation" of the Good Neighbor provision.[36] Section 126(b) requires EPA to make a decision within 60 days. If EPA grants the petition, the sources identified in the petition must cease operations within three months unless they comply with emission controls and compliance schedules set by EPA.

While Section 126(b) and a SIP call each enforce the Good Neighbor provision, they differ in their implementation.[37] First, a state or political subdivision must initiate the 126(b) petition, whereas EPA initiates the SIP call. Second, unlike a SIP call, the 126(b) petition is limited to a "major source or group of stationary sources" and cannot be used to address minor or mobile sources.[38] Third, EPA may directly regulate upwind sources when it grants a 126(b) petition, whereas a SIP call results in direct EPA regulation only if EPA issues a FIP in response to a state's failure to respond adequately to the SIP call.

EPA's review of 126(b) petitions has sometimes coincided with the agency's SIP call process. For example, in 1998, EPA coordinated its review of eight 126(b) petitions when it promulgated a SIP call. EPA acknowledged the distinction between the CAA authorities for the 126(b) petition process and the SIP call but coordinated the two actions because they were both designed to reduce ozone transport in the eastern United States.[39]

States have also submitted 126(b) petitions ahead of the deadlines for Good Neighbor SIPs.[40] For example, in 2011, EPA granted a 126(b) petition from New Jersey, finding that a coal-fired generating station in Pennsylvania contributed significantly to nonattainment with the SO_2 NAAQS in New Jersey.[41] Some considered EPA's approval of this petition to reflect a more expansive interpretation of Section 126 in which 126(b) petitions are not necessarily limited to

[35] CAA §110(k)(5); 42 U.S.C. §7410(k)(5).

[36] CAA §126(b); 42 U.S.C. §7426(b). Section 302(j) defines *major stationary source* as "any stationary facility or source of air pollutants which directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutant, as determined by rule by the Administrator)" (CAA §302(j); 42 U.S.C. §7602(j)). Section 126(b) cannot be used to address emissions from mobile sources, such as cars and trucks. Another section of the CAA—Title II (42 U.S.C. §§7521-7590)—contains most of the act's provisions for mobile sources.

[37] CAA §126(b); 42 U.S.C. §7426(b). For additional discussion of the differences between 126(b) petitions and a SIP call, see Philip E. Karmel, "Interstate Transport and Regional Approaches to Regulating Air Pollution," in *The Clean Air Act Handbook*, pp. 133-134.

[38] Karmel, "Interstate Transport," in *The Clean Air Act Handbook*, p. 133.

[39] EPA, "Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone," 63 *Federal Register* 57361-57362, October 27, 1998.

[40] As previously noted, the Good Neighbor SIP is part of the infrastructure SIP. States with nonattainment areas must also submit "nonattainment SIPs" that address more detailed statutory requirements for coming into attainment. See EPA, "Federal Implementation Plans," 76 *Federal Register* 48216.

[41] EPA, "Final Response to Petition from New Jersey Regarding SO_2 Emissions from the Portland Generating Station," 76 *Federal Register* 69052, November 7, 2011.

the time frame of Good Neighbor SIP updates.[42] Whereas EPA had previously considered 126(b) petitions several years after revising a NAAQS—and after making attainment and nonattainment designations for revised standards—EPA approved New Jersey's 126(b) petition before Pennsylvania was required to complete its Good Neighbor SIP for the 2010 revision to the SO_2 NAAQS.[43] EPA promulgated an emissions limit for the generating station that would reduce its SO_2 emissions by 81% and set a compliance deadline of three years.[44] In 2013, the U.S. Court of Appeals for the Third Circuit upheld EPA's interpretation of Section 126, concluding that the CAA allows EPA to make a Section 126 finding independently of the Section 110 SIP process.[45]

States have continued to submit Section 126(b) petitions related to ozone interstate transport. For example, Connecticut, Delaware, Maryland, and New York have submitted 126(b) petitions related to compliance with the 2008 and/or 2015 ozone NAAQS.[46] As of July 2018, EPA has denied the petition from Connecticut and has proposed to deny petitions from Delaware and Maryland.[47] Among the various reasons for denying Connecticut's petition, EPA found that the petition did not reflect current operations at the named source—a power plant located in Pennsylvania.[48] In particular, EPA stated that the air quality modeling in Connecticut's petition was based on 2011 emissions data and therefore did not account for subsequent NO_x reductions, noting that the named source "primarily burned natural gas with a low NO_x emission rate in the 2017 ozone season."[49] In addition, EPA conducted its own analysis using the agency's current multi-step framework for determining what constitutes a significant contribution.[50] The agency's analysis did not identify additional "highly cost-effective controls available at the source and thus no basis to determine that [the named source] emits or would emit in violation of the good neighbor provision with respect to the 2008 ozone NAAQS."[51] While EPA "expects the facility to

[42] Karmel, "Interstate Transport," in *The Clean Air Act Handbook*, p. 134.

[43] For EPA's discussion about the timing of 126(b) petitions and Good Neighbor SIPs, see EPA, "Final Response to Petition from New Jersey Regarding SO_2 Emissions from the Portland Generating Station," 76 *Federal Register* 69053-69056, November 7, 2011. For the 2010 SO_2 NAAQS revision, see EPA, "Primary National Ambient Air Quality Standard for Sulfur Dioxide; Final Rule," 75 *Federal Register* 35520, June 22, 2010.

[44] EPA, "Final Response to Petition from New Jersey Regarding SO_2 Emissions from the Portland Generating Station," 76 *Federal Register* 69066-69068, November 7, 2011.

[45] GenOn REMA, LLC v. EPA, 722 F.3d 513, 521-22 (3d Cir. 2013).

[46] EPA, *Ozone National Ambient Air Quality Standards (NAAQS) Section 126 Petitions*, June 2018, https://www.epa.gov/ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs-section-126-petitions.

[47] For the final decision on Connecticut's petition, see EPA, "Response to June 1, 2016 Clean Air Act Section 126(b) Petition from Connecticut," 83 *Federal Register* 16064, April 13, 2018. For the proposed denial of Delaware and Maryland's petitions, see EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26675, June 8, 2018.

[48] EPA also concluded that Connecticut's petition did not provide enough information regarding the source's impact on air quality in Connecticut on high ozone days. For example, EPA stated that the petition did not demonstrate whether the days in which emissions from the named source had the largest impact on Connecticut's air quality monitors coincided with the highest modeled ozone days at the Connecticut monitors. EPA, "Response to June 1, 2016 Clean Air Act Section 126(b) Petition from Connecticut," 83 *Federal Register* 16064, 16071-16072, April 13, 2018. See also Connecticut Department of Energy and Environmental Protection, *Petition to the U.S. EPA Pursuant to Section 126 of the Clean Air Act for Abatement of Emissions from the Brunner Island Coal Fired Generating Units in Pennsylvania, as Such Generating Units Significantly Contribute to Nonattainment of, and Interfere with Maintenance of, the 2008 Ozone NAAQS in the State of Connecticut*, June 1, 2016.

[49] EPA, "Response to June 1, 2016 Clean Air Act Section 126(b) Petition from Connecticut," 83 *Federal Register* 16072, April 13, 2018.

[50] Regulatory actions and litigation have led to EPA's establishment of the current framework that it uses to assess Good Neighbor obligations. The framework establishes a screening threshold and accounts for both cost and air quality improvements. See "Framework to Assess Good Neighbor Provision" in this report for complete discussion.

[51] EPA, "Response to June 1, 2016 Clean Air Act Section 126(b) Petition from Connecticut," 83 *Federal Register*

continue operating primarily by burning natural gas in future ozone seasons,"[52] others have expressed concern that there is no "enforceable requirement prohibiting" the named source from switching back to coal.[53]

Similarly, in June 2018, EPA proposed to deny petitions from Delaware and Maryland, in part because EPA found "several elements of the states' analyses … insufficient to support the states' conclusions."[54] For example, EPA said that Delaware's petitions did "not provide any analysis indicating that Delaware may be violating or have difficulty maintaining the 2008 or 2015 ozone NAAQS in a future year associated with the relevant attainment dates."[55] EPA also noted that Delaware used 2011 emissions data, which EPA characterized as "generally higher than, and therefore not representative of, current and future projected emissions levels at these [named sources] and in the rest of the region."[56] Delaware has disagreed with EPA's proposed denial on various grounds. Among other things, Delaware stated that EPA has not "shown valid modeling or justification that Delaware will attain the 2015 ozone standard by its 2021 Marginal nonattainment deadline."[57] In particular, EPA's projections analyzed the year 2023, which is the attainment deadline for areas designated as moderate nonattainment with respect to the 2015 ozone standard.[58]

Finally, EPA proposed to deny Maryland's petition, in part because the agency disagreed with Maryland that NO_x limits for 36 named sources should be based on the respective units' lowest observed emissions rates.[59] Specifically, Maryland's petition concluded that the 36 named sources were operating pollution controls "sub-optimally based on a comparison of their lowest observed NO_x emissions rates between 2005 and 2008, which Maryland describes as the 'best' observed

16065.

[52] EPA, "Response to June 1, 2016 Clean Air Act Section 126(b) Petition from Connecticut," 83 *Federal Register* 16072.

[53] Arthur N. Marin, Executive Director, Northeast States for Coordinated Air Use Management, letter to William Wehrum, Assistant Administrator, Office of Air and Radiation, EPA, March 26, 2018, http://www.nescaum.org/documents/nescaum-comments-ct-126-petition-20180326.pdf/.

[54] EPA also proposed to find that, based on its own analysis, there are "no additional highly cost-effective emissions reductions available at the sources, and, thus, that none of the named sources currently emit or would emit in violation of the good neighbor provision with respect to the relevant ozone standard." EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26677, June 8, 2018.

[55] For complete discussion, see EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26676, June 8, 2018; and Delaware's four 126(b) petitions (Brunner Island, Conemaugh, Harrison, Homer City), available at Delaware Department of Natural Resources and Environmental Control, *Delaware's 126(b) Petitions for Clean Air*, http://www.dnrec.delaware.gov/Air/Pages/126-Petitions.aspx.

[56] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26676, June 8, 2018. Delaware has responded that EPA's 2017 data show two of the named sources operating with emissions rates similar to those in 2011, see Delaware Department of Natural Resources and Environmental Control, *Testimony on EPA's Proposed Denial of Delaware's 126(b) Petitions*, June 22, 2018, p. 2, http://www.dnrec.delaware.gov/Air/Documents/06-22-Dave-Fees-testimony-at-EPA-public-hearing.pdf.

[57] Delaware Department of Natural Resources and Environmental Control, *Testimony on EPA's Proposed Denial*, p. 3.

[58] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26678. See also EPA, *Ozone NAAQS Timelines*, https://www.epa.gov/ozone-pollution/ozone-naaqs-timelines.

[59] For complete discussion, see EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26677, and Maryland Department of Environment, *Petition to the U.S. EPA Pursuant to Section 126 of the Clean Air Act for Abatement of Emissions from 36 Coal-Fired Electric Generating Units at 19 Plants in Five States that Significantly Contribute to Nonattainment of, and Interfere with Maintenance of, the 2008 Ozone NAAQS in the State of Maryland*, November 16, 2016, http://news.maryland.gov/mde/wp-content/uploads/sites/6/2016/11/MD_126_Petition_Final_111616.pdf.

emissions rates, to emissions rates from the 2015 and 2016 ozone seasons."[60] EPA disagreed that the lowest historical NO_x emissions rate is representative of "ongoing achievable NO_x rates" in part because over time, some NO_x controls (e.g., selective catalytic reduction [SCR] systems) "may have some broken-in components and routine maintenance schedules entailing replacement of individual components." EPA stated that in a 2016 rulemaking addressing regional ozone transport, the agency determined that the "third lowest fleetwide average coal-fired [power plant] NO_x rate" for power plants using SCR to be "most representative of ongoing, achievable emission rates."[61] Maryland has disagreed with EPA's proposed denial, noting that it will "testify in opposition to the proposal and use all available tools, including litigation."[62]

Interpreting "Significant Contribution"

Enforcement of the CAA's interstate transport provisions hinges on a key test in Section 110(a)(2)(D)(i)—whether one state "significantly contributes" to a violation of the NAAQS in another state. The CAA does not, however, define what constitutes a significant contribution. Instead, this phrase has been interpreted through EPA rulemakings addressing interstate air pollution. The agency's interpretation has been contentious at times, given that it "inherently involves a decision on how much emissions control responsibility should be assigned to upwind states, and how much responsibility should be left to downwind states."[63] Stakeholders have challenged the legality of EPA's interpretations over the years.[64]

The regulatory actions and litigation have led to EPA's establishment of the current framework to address the Good Neighbor provision for ozone and particulate matter.[65] The framework establishes a screening threshold—interstate pollution that exceeds 1% of the NAAQS—to identify states with sources that may contribute significantly to air quality problems in downwind states.[66] Upwind states that exceed this threshold for interstate pollution are evaluated further—considering cost and air quality factors—to determine whether emission reductions are needed.[67] EPA has clarified that it generally uses this framework to determine what constitutes a significant contribution when evaluating Good Neighbor SIPs and when evaluating a 126(b) petition.[68] See "Framework to Assess Good Neighbor Provision" for detailed discussion of the framework.

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[60] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26677.

[61] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26677.

[62] Maryland Department of Environment, "Maryland Environment Secretary Grumbles Statement on EPA's Proposed Denial of the Maryland Department of the Environment's Clean Air Act Petition," press release, June 1, 2018, http://news.maryland.gov/mde/2018/06/01/maryland-environment-secretary-grumbles-statement-on-epas-proposed-denial-of-the-maryland-department-of-the-environments-clean-air-act-petition/.

[63] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248.

[64] For a summary of how litigation has influenced implementation of the Good Neighbor provision, see CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[65] EPA, "Federal Implementation Plans," 76 *Federal Register* 48208 (see in particular Section VI). For brief summary of the framework, see Peter Tsirigotis, Director, EPA Office of Air Quality Planning and Standards, memorandum to Regional Air Division Directors, EPA Regions 1-10, March 27, 2018, https://www.epa.gov/sites/production/files/2018-03/documents/transport_memo_03_27_18_1.pdf.

[66] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248. Under this approach, 1% of the 2015 ozone NAAQS (70 ppb) equals 0.7 ppb.

[67] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74507-74508.

[68] EPA stated, "While either provision may be applied to address interstate transport, they are also closely linked in that a violation of the prohibition in CAA Section 110(a)(2)(D)(i) is a condition precedent for action under CAA Section

Programs Addressing Interstate Pollution

Pursuant to the CAA, EPA and states have implemented various market-based programs that target regional emissions of SO_2 and NO_x from power plants. One type of market-based program, known as emissions trading, sets a limit (or "cap") on total emissions within a defined geographic area or economic sector and requires covered entities to surrender an allowance for each unit—typically a ton—of emissions.[69] Such programs are also known as "cap-and-trade."

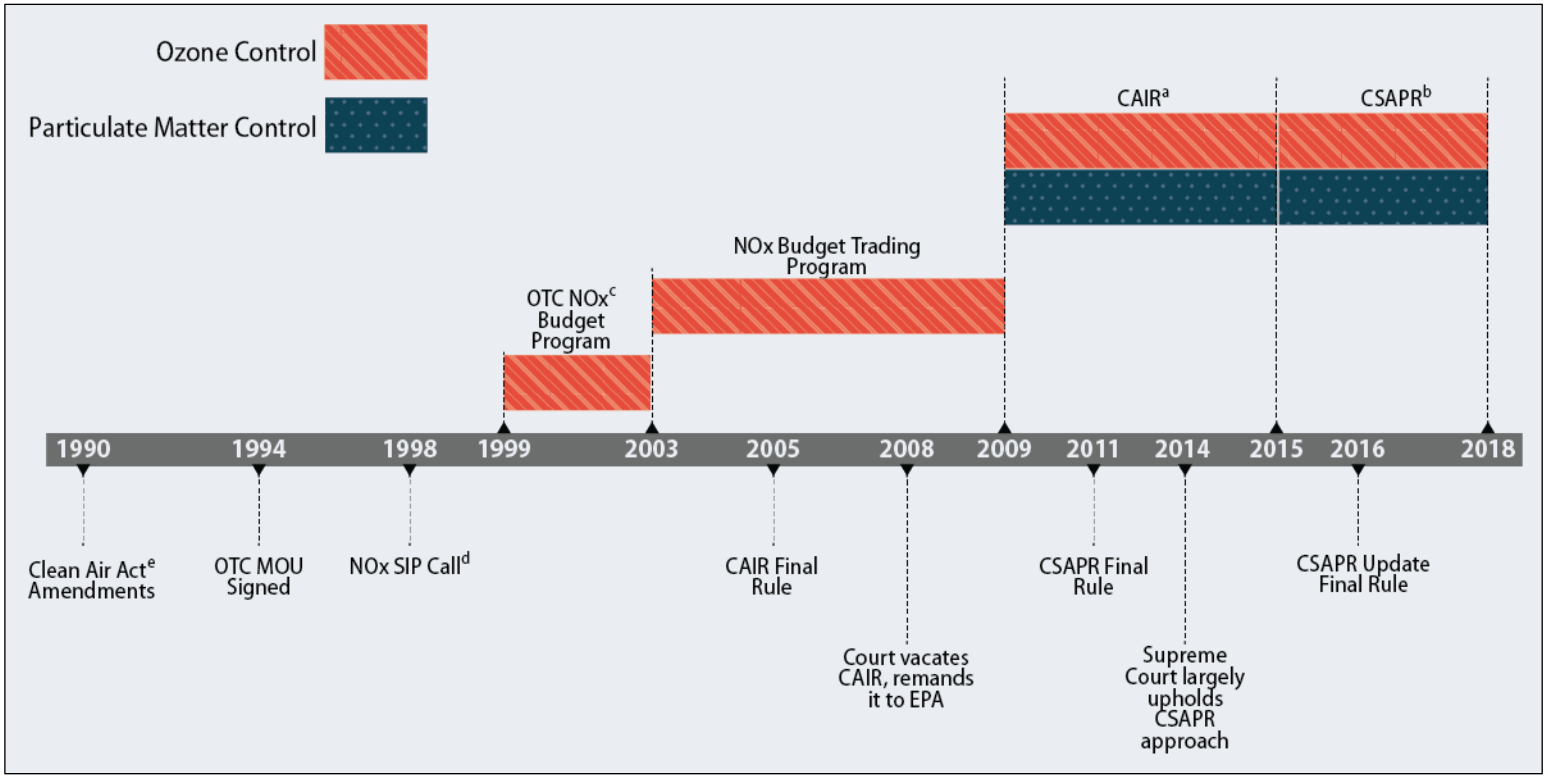
Under an emissions cap, covered entities with relatively low emission-reduction costs have a financial incentive to reduce emissions because they can sell unused allowances to entities that face higher costs to reduce their facility emissions. The requirements vary by each program. For example, policymakers may decide to distribute the emission allowances to covered entities at no cost (based on, for example, previous years' emissions), sell the allowances (e.g., through an auction), or use some combination of these strategies. In addition, some programs may permit covered entities to "bank" or save surplus allowances for future use while others may not.

The remainder of this section presents a brief history of the interstate transport programs implemented prior to 2015, given their cumulative impact on regional emission reductions. The "Cross State Air Pollution Rule" section then provides more detail about CSAPR, the current emissions trading program intended to limit interstate transport of power sector SO_2 and NO_x emissions. **Figure 1** summarizes the timeline of the regional programs for ozone and particulate matter control.

126(b) and, critically, that significant contribution to nonattainment and interference with maintenance are construed identically for purposes of both provisions (since the identical terms are naturally interpreted as meaning the same thing in the two linked provisions)." See EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26675.

[69] EPA, *What Is Emissions Trading?*, https://www.epa.gov/emissions-trading-resources/what-emissions-trading.

Figure 1. Implementation Timeline of Regional Ozone and Particulate Matter Control Programs



Source: CRS analysis

Notes: The program dates in the figure represent the timeline for implementation and not enactment of statutory mandates. In addition, the Acid Rain Program, which seeks to reduce power sector emissions that cause acid rain (i.e., SO_2 and NO_x), was established under the 1990 CAA Amendments and remains in effect today.

a. CAIR refers to the Clean Air Interstate Rule.

b. CSAPR refers to the Cross State Air Pollution Rule.

c. OTC NO_x refers to the Ozone Transport Commission Nitrogen Oxide Budget Program.

d. NO_x SIP Call refers to the Nitrogen Oxide State Implementation Plan Call.

e. Clean Air Act (CAA) of 1970 initially mandated the "Good Neighbor" provision, which was subsequently amended under the 1977 CAA and the 1990 amendments.

Acid Rain Program

EPA established the Acid Rain Program (ARP) under Title IV of the 1990 CAA Amendments to reduce power sector emissions that cause acid rain.[70] Specifically, the ARP targets SO_2 emissions through cap-and-trade and addressed NO_x emissions through an emissions-rate-based program.[71] Since its inception over two decades ago, the ARP has achieved notable reductions in these regional pollutants at lower-than-predicted costs. The market-based program also served as the basis for subsequent programs addressing interstate pollution.[72]

Under Title IV of the CAA, EPA implemented the ARP in two phases. The first phase—1995 to 1999—included 110 high-emitting coal-fired power plants, which had been identified in the statute and spanned 21 eastern and midwestern states.[73] The second phase began in 2000 and included more coal-fired power plants as well as those firing oil and natural gas, accounting for nearly all fossil-fueled power plants in the lower 48 states.[74] EPA set the annual SO_2 emissions cap at 9.97 million allowances in 2000 and decreased it in subsequent years. The ARP remains in effect today. The annual SO_2 cap—8.95 million tons of SO_2 per year—has not changed since 2010. The annual cap is roughly half of the SO_2 emitted by the power sector in 1980.[75]

EPA distributed SO_2 allowances based on statutory formulas and accounted for historical emission rates and fuel consumption.[76] The "existing" power plant units—those in operation prior to November 15, 1990—received allowances for free.[77] The "new" power plant units—those commencing operations after November 15, 1990—generally did not receive free allowances and had to purchase them on the market.[78] At the end of each year, covered power plants have to surrender one allowance for each ton of SO_2 emitted. Unused allowances can either be sold or

[70] CAA §401; 42 U.S.C. §7651.

[71] CAA Title IV set goals for the year 2000 of reducing annual SO_2 emissions by 10 million tons from 1980 levels and reducing annual NO_x emissions by 2 million tons, also from 1980 levels. CAA §401(b); 42 U.S.C. §7651(b). See also CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*, by James E. McCarthy.

[72] According to EPA's *2016 Progress Report*, covered sources in the ARP emitted 1.5 million tons of SO_2 on an annual basis—a 91% reduction below 1990 levels—and 1.2 million tons of NO_x on an annual basis—an 81% reduction below 1990 levels. See EPA, *2016 Progress Report: Cross-State Air Pollution Rule and Acid Rain Program*, "Program Basics," 2016, pp. 7-8, https://www3.epa.gov/airmarkets/progress/reports/pdfs/2016_full_report.pdf. For additional discussion about the results of the ARP, see Gabriel Chan et al., *The SO2 Allowance Trading System and the Clean Air Act Amendments of 1990: Reflections on Twenty Years of Policy Innovation*, Harvard Environmental Economics Program, January 2012, https://heep.hks.harvard.edu/files/heep/files/so2-brief_digital_final.pdf.

[73] CAA §404(e), Table A; 42 U.S.C. §7651(c)(e), Table A.

[74] EPA, *Acid Rain Program*, SO_2 Reductions, https://www.epa.gov/airmarkets/acid-rain-program. See also Richard Schmalensee and Robert Stavins, "Lessons Learned from Three Decades of Experience with Cap and Trade," *Review of Environmental Economics and Policy*, vol. 11, no. 1 (Winter 2017), p. 61.

[75] EPA, *2016 Progress Report*, p. 8. EPA reports the cap in units of allowances: The annual SO_2 cap is 8.95 million allowances. The CAA defines each allowance as one ton. See definition of *allowance* in CAA §402(3); 42 U.S.C. §7651(a)(3).

[76] CAA §403; 42 U.S.C. §7651(b). EPA elaborated on and codified the distribution criteria at 40 C.F.R. 73.10.

[77] For statutory definition, see CAA §402(8); 42 U.S.C. §7651(a)(8). For statutory direction on distribution of SO_2 allowances, see CAA §403; 42 U.S.C. §7651(b).

[78] New power plants that met statutory criteria could receive some allowances from EPA. For statutory definition, see CAA §402(10); 42 U.S.C. §7651(a)(10). For statutory direction on distribution of SO_2 allowances to new units, see CAA §403(e); 42 U.S.C. §7651(b)(e).

banked for use in later years.[79] The market value of unused allowances, therefore, serves as an incentive for power plants to "reduce emissions at the lowest cost."[80]

The NO_x portion of the ARP does not involve cap-and-trade but follows a more traditional regulatory approach. It is implemented through boiler-specific NO_x emission rates.[81] This program has provided power plants with some compliance flexibility, for example, by allowing the use of emissions rate averaging plans for units under common control, provided they meet certain conditions.[82] According to one analysis of the ARP, the NO_x portion "helped demonstrate the cost-effectiveness of NO_x controls," and by 2000, it "encouraged the installation of advanced NO_x combustion controls, such as low-NO_x burners, and the development of new power plant designs with lower NO_x emission rates."[83]

While the ARP reduced SO_2 and NO_x emissions from the power sector, additional reductions were needed to meet ambient air quality standards under the CAA and to address the statute's Good Neighbor provision.[84] For example, in 1997, EPA revised the NAAQS for ozone and particulate matter—which are formed by SO_2 and NO_x—to be more stringent.[85] The next sections summarize some of the programs designed to achieve these reductions.

Ozone Control: Regional NO_x Programs

Ozone control strategies had focused on VOC emissions until the mid-1990s, when market-based programs began targeting another ozone precursor, NO_x, given its "important role … in ozone formation and transport."[86] Specifically, two regional trading programs were implemented between 1999 and 2009 to address ozone by reducing NO_x emissions. The first one, the "Ozone Transport Commission NO_x Budget Program," was in effect between 1999 and 2002. It was then replaced by the second program, the "NO_x Budget Trading Program," which ran until 2009.

Ozone Transport Commission NO_x Budget Program

The OTC—a multistate organization established under the 1990 CAA Amendments to advise EPA on ozone transport issues—developed the NO_x Budget Program and implemented it through a Memorandum of Understanding (MOU) with nearly all of the OTC states.[87] The OTC NO_x Budget Program set a regional budget (i.e., cap) on NO_x emissions from electric utilities and large

[79] For more implementation details, see EPA, *Acid Rain Program*.

[80] Chan et al., *The SO_2 Allowance Trading System*, p. 4.

[81] EPA, *Acid Rain Program*, Overview.

[82] EPA, *2016 Progress Report*, p. 10.

[83] Sam Napolitano et al., "The U.S. Acid Rain Program: Key Insights from the Design, Operation, and Assessment of a Cap-and-Trade Program," *Electricity Journal*, vol. 20, no. 7 (August/September 2007), p. 50.

[84] Chan et al., *The SO_2 Allowance Trading System*, p. 17.

[85] For the 1997 ozone NAAQS revision, see EPA, "National Ambient Air Quality Standards for Ozone," 62 *Federal Register* 38856, July 18, 1997. For the 1997 particulate matter NAAQS revision, see EPA, "National Ambient Air Quality Standards for Particulate Matter," 62 *Federal Register* 38652, July 18, 1997.

[86] EPA and OTC, *NO_x Budget Program*, 1999-2002 Progress Report, March 2003, p. 1, https://www.epa.gov/sites/production/files/2015-08/documents/otcreport.pdf.

[87] The OTC is comprised of the governors of the 12 states in the OTR (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Virginia) and the mayor of the District of Columbia. CAA §184; 42 U.S.C. §7511(c). All states in the OTC signed the MOU except for Virginia. EPA and OTC, *NO_x Budget Program*, p. 1. For the MOU, see https://otcair.org/upload/Documents/Memorandums/att2.htm.

industrial boilers during the "ozone season" (May through September), which is the time of year weather conditions are most favorable for ozone formation.[88] Under the MOU, states "were responsible for adopting regulations, identifying sources, allocating NO_x allowances, and ensuring compliance," while EPA was "responsible for approving the states' regulations and tracking allowances and emissions."[89]

Before emissions trading began under the OTC NO_x Budget Program, sources under the ARP were required to meet CAA emission rate standards that were in effect at that time. Sources could not emit above the NO_x level expected if using Reasonably Available Control Technology.[90] Next, the cap-and-trade program began in 1999 and ran until 2002, at which point the OTC NO_x Budget Program was effectively replaced by the NO_x Budget Trading Program (see next section).

In 2002, the sources participating in the OTC NO_x Budget Program reduced ozone season NO_x emissions 60% below 1990 baseline levels.[91] Despite the NO_x reductions in the Northeast, many northeastern and mid-Atlantic states were unable to meet a statutory deadline to attain the one-hour ozone NAAQS. EPA concluded that these areas had not met this statutory deadline largely because of ozone transport from upwind areas.[92]

NO_x Budget Trading Program

The NO_x Budget Trading Program (NBP) effectively replaced the OTC NO_x Budget Program and was implemented between 2003 and 2009. The NBP encompassed a wider geographic area than the OTC NO_x Budget Program and targeted NO_x reductions from electric utilities and non-utility sources (e.g., large industrial boilers).[93] EPA established the NBP under the NO_x SIP Call, which required a number of eastern and midwestern states, plus the District of Columbia, to revise their SIPs to address regional ozone transport.[94] The NO_x SIP Call set a NO_x ozone season budget for each state and required upwind states to adopt SIPs that would reduce NO_x emissions to a level that would meet the budgets.

In the NO_x SIP Call, EPA observed that "virtually every nonattainment problem is caused by numerous sources over a wide geographic area," leading the agency to conclude that "the solution to the problem is the implementation over a wide area of controls on many sources, each of which may have a small or unmeasurable ambient impact by itself."[95] Ultimately, EPA expected that this

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[88] EPA and OTC, *NO_x Budget Program*, pp. 1-3.

[89] EPA, *Ozone Transport Commission NO_x Budget Program*, https://www.epa.gov/airmarkets/ozone-transport-commission-nox-budget-program.

[90] The NO_x component of the ARP—boiler-specific NO_x emission rates on an annual basis—was in effect at the same time as the ozone NO_x trading programs, which addressed NO_x emissions in the summer (i.e., ozone season). The ARP NO_x program remains in effect today and applies to "ARP-affected units that are older, historically coal-fired boilers." EPA, *2016 Progress Report*, p. 15. See also EPA and OTC, *NO_x Budget Program*, p. 4. For summary and detailed analysis of the OTC NO_x Budget Program, see Dallas Burtraw and Sarah Jo Szambelan, *U.S. Emissions Trading Markets for SO_2 and NO_x*, Resources for the Future, October 2009, pp. 21-24, http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-09-40.pdf.

[91] EPA and OTC, *NO_x Budget Program*, p. 6.

[92] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57361.

[93] *Non-utility sources* refers to industrial sources that produce electricity or steam primarily for internal use. Examples include boilers and turbines at manufacturing facilities, such as paper mills and petroleum refineries. See EPA, *The NO_x Budget Program: 2008 Emission, Compliance, and Market Analyses*, July 2009, p. 3, https://www.epa.gov/sites/production/files/2015-08/documents/nbp_2008_ecm_analyses.pdf.

[94] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57356.

[95] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57377.

would "eliminat[e] the emissions that significantly contribute to nonattainment or interference with maintenance of the ozone NAAQS in downwind states."[96]

EPA based the NOx SIP Call in part on recommendations from the Ozone Transport Assessment Group (OTAG), a group created by EPA and the 37 easternmost states.[97] Of most relevance, OTAG recommended strategies to reduce NO_x emissions from utilities as well as large and medium non-utility sources in a trading program.[98]

EPA accounted for the cost of NO_x controls when establishing the NO_x budgets.[99] EPA identified cost-effective reductions in the electric utility and non-utility source sectors. These control strategies informed the establishment of the NO_x emission budgets.[100] EPA did not identify cost-effective controls in other sectors—namely, area sources (i.e., non-mobile sources that emit less than 100 tons of NO_x per year),[101] non-road engines (i.e., mobile sources that do not operate on roads and highways, such as engines used to power snowmobiles, chainsaws, or lawnmowers),[102] or highway vehicles. Under the NO_x SIP Call, states could require their sources to comply with the emissions budget or participate in a regional cap-and-trade program. EPA developed a model rule for a regional emissions trading program—known as the NO_x Budget Trading Program—to assist states interested in the trading option. All of the jurisdictions—20 states and the District of Columbia—adopted the NBP into their SIPs and participated in the NBP.[103]

In 2008, NBP emissions were 9% below the 2008 cap, representing a 75% reduction compared to 1990 baseline levels.[104] This also represented a 62% reduction below a 2000 baseline, which accounted for emission reductions that occurred under the 1990 CAA Amendments before implementation of the NBP.[105]

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[96] EPA, "Response to Clean Air Act Section 126(b) Petitions from Delaware and Maryland," 83 *Federal Register* 26668.

[97] The westernmost OTAG states ranged from North Dakota to Texas, with all remaining OTAG states located eastward of these states. For a map of OTAG states, see EPA, *Supplemental Ozone Transport Rulemaking Regulatory Analysis*, April 7, 1998, p. 1-2, https://archive.epa.gov/ttn/ozone/web/pdf/supregan.pdf.

[98] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57358-57359.

[99] In 2000, the D.C. Circuit held in *Michigan v. EPA* that nothing in Section 110(a)(2)(D) bars EPA from considering costs. For additional information, see CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[100] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57405.

[101] EPA, "Finding of Significant Contribution," 63 *Federal Register* 57498. Examples of area sources of NO_x emissions include wildfires and residential water heaters. EPA, "Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone," 62 *Federal Register* 60353, November 7, 1997.

[102] Additional examples of non-road engines are those used for agricultural, construction, and mining equipment as well as aircraft and train engines. EPA, "Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone," 62 *Federal Register* 60359.

[103] The NO_x SIP Call included 22 states and the District of Columbia, but a later ruling removed one state (Wisconsin) and parts of two other states (Missouri and Georgia). The court left requirements for the remaining 19 states in place. See *Michigan v. EPA*, 213 F.3d 663 (D.C. Cir. 2000) *cert. denied* 532 U.S. 904 (2001). See also EPA, *2016 Program Progress*, "Program Basics."

[104] EPA, *The NO_x Budget Program: 2008 Emission, Compliance, and Market Analyses*, July 2009, p. 4, https://www.epa.gov/sites/production/files/2015-08/documents/nbp_2008_ecm_analyses.pdf.

[105] EPA, *The NO_x Budget Program*, p. 4.

EPA observed that ozone season NO_x emissions decreased each year between 2003 and 2008 and attributed these reductions in part to the installation of NO_x controls.[106] The agency noted that emissions vary year-to-year due to variables such as weather, electricity demand, and fuel costs. For example, EPA attributed the NO_x reductions between 2007 and 2008 primarily to lower electricity demand. However, analysis of the entire NBP period—2003 to 2008—shows a reduction in ozone season NO_x emissions despite a slight increase in demand for electricity. EPA reported that the average NO_x emission rate for the 10 highest electricity demand days (i.e., hot days when use of air conditioning is high) decreased in each year of the NBP. This metric for peak electricity days was 44% lower in 2008 compared to 2003.[107]

EPA reported that ozone concentrations decreased by 10% between the years 2002 and 2007 across all states participating in the NBP.[108] EPA also observed a "strong association between areas with the greatest NO_x emission reductions from NBP sources and downwind monitoring sites measuring the greatest improvements in ozone."[109] Progress notwithstanding, some NBP areas remained in nonattainment status with the ozone NAAQS as the NBP program concluded by the end of 2008.[110]

Ozone and PM Control: Regional SO_2 and NO_x Trading Programs

In 2005, EPA determined that interstate transport of SO_2 and NO_x contributed significantly to ozone and $PM_{2.5}$ nonattainment.[111] Specifically, EPA found that (1) interstate transport of NO_x from 25 states and the District of Columbia contributed significantly to nonattainment, or interfered with maintenance, of the 1997 eight-hour ozone NAAQS; and (2) interstate transport of SO_2 and NO_x from 23 states and the District of Columbia contributed significantly to nonattainment, or interfered with maintenance, of the 1997 $PM_{2.5}$ NAAQS.[112] To address these findings, EPA promulgated a rule that applied to 28 eastern states and the District of Columbia.[113] This rulemaking is known as the Clean Air Interstate Rule (CAIR).

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[106] EPA, *The NO_x Budget Program*, pp. 5-6.

[107] EPA, *The NO_x Budget Program*, p. 6.

[108] Based on ozone concentrations averaged over an eight-hour time interval and after adjusting for meteorological conditions. See EPA, *NOx Budget Trading Program: Compliance and Environmental Results*, December 2008, p. 44, https://www.epa.gov/sites/production/files/2015-08/documents/2007-nbp-report.pdf.

[109] Based on ozone concentrations averaged over an eight-hour time interval and after adjusting for meteorological conditions. See EPA, *NOx Budget Trading Program: Compliance and Environmental Results*, p. 44.

[110] EPA, *The NO_x Budget Program: 2008 Emission, Compliance, and Market Analyses*, July 2009, p. 6, https://www.epa.gov/sites/production/files/2015-08/documents/nbp_2008_ecm_analyses.pdf. The NBP was effectively replaced by the ozone season NO_x component of the Clean Air Interstate Rule. See EPA, *2016 Program Progress*, p. 8.

[111] EPA identified the geographic areas and interstate air emissions transport through a series of modeling runs. EPA also used several criteria to determine what constituted a "significant contribution" for ozone nonattainment and for $PM_{2.5}$ nonattainment. EPA changed this approach in CSAPR, which replaced CAIR. The CSAPR approach is discussed later in this report.

[112] EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Revisions to Acid Rain Program; Revisions to the NOx SIP Call; Final Rule," 70 *Federal Register* 25167, May 12, 2005.

[113] EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule)," 70 *Federal Register* 25170. The totals reported in this paragraph include Minnesota, which EPA included in the CAIR final rule. EPA subsequently promulgated a final rule to stay the effectiveness of CAIR and associated CAIR FIP requirements for Minnesota. More recent publications may therefore exclude Minnesota from the total number of states that were subject to CAIR. For Final Stay of CAIR and CAIR FIP for Minnesota, see EPA, "Administrative Stay of Clean Air Interstate Rule for Minnesota; Administrative Stay of Federal Implementation Plan to Reduce Interstate

A legal challenge, however, vacated and remanded CAIR to EPA.[114] CAIR remained in effect while EPA responded to the court decision and developed a new regional program addressing air transport, known as CSAPR. CSAPR replaced CAIR on January 1, 2015, and remains in effect today.[115] The remainder of this section discusses each program in turn.

Clean Air Interstate Rule

CAIR established a regional cap-and-trade program to reduce power sector SO_2 and NO_x emissions. Specifically, CAIR established emission budgets for each of the 28 states as well as a model rule for a multi-state cap-and-trade program in the power sector.[116] Under CAIR, states could achieve their emission budgets by requiring their sources to participate in the cap-and-trade program.

CAIR set three emissions caps: Two were annual emissions caps to limit SO_2 and NO_x as precursor emissions to $PM_{2.5}$, and the third was an ozone season cap limiting NO_x as a precursor emission to ozone. The annual NO_x and seasonal NO_x caps were implemented as the "CAIR NO_x annual" and "CAIR ozone season NO_x" programs, respectively, in 2009. The SO_2 emissions cap was implemented as the "CAIR SO_2 annual" program in 2010.[117]

The scope of CAIR differed from prior NO_x trading programs. Whereas the NBP had included both electric generators and non-utility industrial sources (e.g., boilers and turbines), CAIR focused only on electric generators. As previously noted, OTAG's recommendations for the NO_x SIP Call included NO_x controls for medium and large non-utility stationary sources as well as electric generating units. While non-utility sources emit both NO_x and SO_2, EPA did not require NO_x and SO_2 reductions from these sources under CAIR. EPA concluded that it needed more reliable emissions data and better information about control costs to require reductions from non-utility sources in CAIR. Specifically, EPA stated that it lacked information about the costs to integrate NO_x and SO_2 controls at non-utility sources and therefore could not determine whether such controls would qualify as "highly cost-effective" under CAIR.[118]

Some stakeholders disagreed with this conclusion, noting that EPA had cost information from the NO_x SIP Call. EPA responded that the geographic scope of the NO_x SIP Call differed somewhat from CAIR, and therefore it had limited emissions data about non-utility sources in CAIR states that were outside of the NOx SIP Call. In addition, EPA expected that projected NO_x and SO_2 emissions from non-utility sources were "significantly lower than projected" emissions from

Transport of Fine Particulate Matter and Ozone for Minnesota," 74 *Federal Register* 56721, November 3, 2009.

[114] North Carolina v. EPA, 550 F.3d 1176 (D.C. Cir. 2008). See also CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[115] EPA, *2016 Program Progress*, p. 9.

[116] EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule)," 70 *Federal Register* 25162.

[117] EPA, *2016 Program Progress*, pp. 10-11.

[118] EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule)," 70 *Federal Register* 25214-25215.

electric generators.[119] EPA concluded that states would be better positioned to "make decisions regarding any additional control requirements for [non-utility] sources."[120]

CAIR was challenged in court. The U.S. Court of Appeals for the District of Columbia concluded that CAIR was flawed, finding among other things that the CAIR trading program did not assure some "measurable" emission reduction in each upwind state.[121] The court reasoned that the "[e]missions reduction by the upwind states *collectively* was not enough to satisfy Section 110(a)(2)(D)."[122] The court ultimately remanded CAIR to EPA in December 2008, allowing CAIR to remain in effect while EPA developed a replacement rule.[123] The CAIR programs for NO_x (annual and ozone season) began in 2009 and the CAIR SO_2 program began in 2010. The programs continued through the end of 2014.[124]

Cross State Air Pollution Rule

In 2011, EPA promulgated CSAPR to address the court's concerns regarding CAIR.[125] CSAPR implementation began in 2015—replacing CAIR—and it remains in effect today. Similar to CAIR, CSAPR aims to reduce ozone and $PM_{2.5}$ interstate transport. As shown in **Figure 2**, CSAPR requires 27 states to reduce SO_2 emissions, annual NO_X emissions, and/or ozone season NO_X emissions from the power sector.[126] Specifically, CSAPR sets annual SO_2, annual NO_x, and ozone-season NO_x budgets for the covered states and allows states to determine how they will achieve those budgets, including the option of emissions trading.

[119] EPA projected that in 2010, under base case conditions, electric generator emissions would contribute 70% of SO_2 (and 25% NO_x) in the CAIR region compared to 15% of SO_2 (and 16% NO_x) from non-electric generator boilers and turbines. EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule)," 70 *Federal Register* 25214.

[120] EPA, "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule)," 70 *Federal Register* 25215.

[121] North Carolina v. EPA, 531 F.3d 896, 908 (D.C. Cir. 2008). CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[122] CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

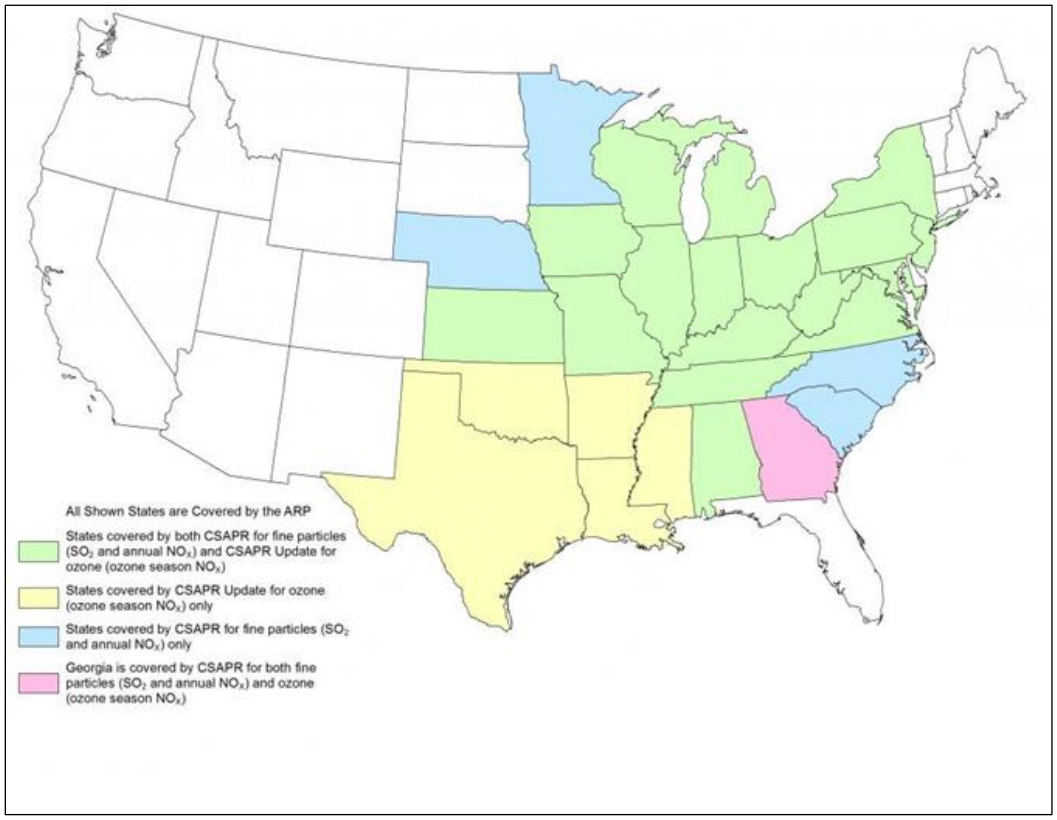
[123] Though initially vacating the CAIR rule, the D.C. Circuit revised its opinion some months later, leaving CAIR in effect "until it is replaced by a rule consistent with our opinion." North Carolina v. EPA, 550 F.3d 1176, 1178 (D.C. Cir. 2008). See also CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[124] EPA, *2016 Program Progress*, p. 11.

[125] EPA, "Federal Implementation Plans," 76 *Federal Register* 48207.

[126] CSAPR covers 27 states as of July 2018. Some changes have been made since EPA promulgated the 2011 CSAPR rulemaking. For list of CSAPR states, see EPA, "States That Are Affected by the Cross-State Air Pollution Rule (CSAPR)," https://www.epa.gov/csapr/states-are-affected-cross-state-air-pollution-rule-csapr.

Figure 2. States Covered by CSAPR



Source: EPA (2018), "Map of States Covered by CSAPR," https://www.epa.gov/airmarkets/map-states-covered-csapr.

Note: Alaska and Hawaii (not shown) are not covered under the Acid Rain Program (ARP), which applies to power plants in the contiguous United States, nor are they covered under the Cross State Air Pollution Rule (CSAPR).

CSAPR differs from CAIR in other ways, though, and introduced a new approach to measuring a significant contribution under Section 110(a)(2)(D). EPA had previously relied on a regional analysis of significant contributions (e.g., in CAIR and the NO_x SIP Call).[127] As previously noted, the D.C. Circuit found the regional approach flawed in a ruling on CAIR.[128] As a result, EPA used state-specific information under CSAPR to determine significant contributions at the state level. After various legal challenges, the approach used in CSAPR remains in effect today. EPA has determined that it can use this framework to assess the Good Neighbor provision each time it revises the relevant NAAQS.[129]

Framework to Assess Good Neighbor Provision

EPA developed a multi-step framework to assess states' Good Neighbor obligations and determine each state's significant contribution in CSAPR. First, EPA conducted air quality

[127] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248.

[128] North Carolina v. EPA, 550 F.3d 1176 (D.C. Cir. 2008). See also CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[129] EPA, "Cross-State Air Pollution Rule Update," 81 *Federal Register* 74507.

modeling to project "downwind air quality problems"—that is, it identified downwind monitoring receptors expected to have difficulty attaining or maintaining the NAAQS.[130] Next, EPA identified the links between upwind states and the downwind air quality monitoring sites with projected attainment or maintenance difficulties. EPA then identified which of these linked upwind states "contribute at least one percent of the relevant NAAQS" at the downwind sites.[131] The agency next assessed the cost-effectiveness of emission control measures and air quality factors to determine whether states exceeding this threshold made significant contributions or interfered with maintenance of a NAAQS in a downwind state. That is, EPA determined that an upwind state contributes significantly to a nonattainment or interference with maintenance of a NAAQS if it produced more than 1% of NAAQS concentration in at least one downwind state and if this pollution could be mitigated using cost-effective measures.

EPA modified the way it considered costs under CSAPR. Whereas EPA had previously based "significant contribution" on the emissions that "could be removed using 'highly cost effective' controls," the agency accounted for both cost and air quality improvement to measure significant contributions under CSAPR.[132] In CSAPR, EPA (1) quantified each state's emission reductions available at increasing costs per ton ("cost thresholds"), (2) evaluated the impact of upwind reductions on downwind air quality, and (3) identified the cost thresholds providing "effective emission reductions and downwind air quality improvement."[133]

The last step of the Good Neighbor assessment framework requires the adoption of "permanent and enforceable measures needed to achieve" the emission reductions.[134] EPA implemented this step through its promulgation of FIPs, giving states the option to replace the FIP with a SIP.[135] The FIPs specified the emission budgets for each state, reflecting the required SO_2 and NO_x reductions from power plants in the state, and established the trading programs as each state's remedy to meet the emissions budgets.[136]

Legal challenges, which eventually reached the Supreme Court, delayed CSAPR implementation.[137] The Court largely upheld EPA's approach, holding that EPA's consideration of cost in establishing states' emission budgets was a "permissible construction of the statute."[138]

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[130] For a summary of the process, see EPA, "Federal Implementation Plans," 76 *Federal Register* 48211. See also Tsirigotis, pp. 2-3.

[131] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248.

[132] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248.

[133] EPA, "Federal Implementation Plans," 76 *Federal Register* 48248.

[134] Tsirigotis, p. 3.

[135] EPA, "Federal Implementation Plans," 76 *Federal Register* 48209.

[136] See EPA, "Federal Implementation Plans," 76 Federal Register 48210, and EPA, Regulatory Impact Analysis of the Cross-State Air Pollution Rule (CSAPR) Update for the 2008 National Ambient Air Quality Standards for Ground-Level Ozone, September 2016, pp. ES-8, https://www3.epa.gov/ttn/ecas/docs/ria/transport_ria_final-csapr-update_2016-09.pdf.

[137] EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584 (2014). For summary of the CSAPR legal challenges and the Supreme Court's ruling, see CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[138] EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584, 1606–07 (2014).

CSAPR Emissions Trading Programs

In response to the CAIR litigation, EPA designed "air quality-assured interstate emission trading programs" to implement CSAPR.[139] The CSAPR trading programs allow for interstate trading but include provisions meant to ensure that all of the necessary reductions would occur in each individual state. Specifically, EPA stated that the CSAPR assurance provisions "ensure that no state's emissions … exceed that specific state's budget plus the variability limit (i.e., the state's assurance level)."[140]

EPA established four interstate trading programs for affected power plants under CSAPR: two for annual SO_2, one for annual NO_X, and one for ozone-season NO_X.[141] These trading programs aim to help downwind areas attain the 1997 and 2006 annual $PM_{2.5}$ NAAQS and the 1997 and 2008 ozone NAAQS. The first phase of CSAPR, which began in 2015, sought to address the 1997 and 2006 $PM_{2.5}$ NAAQS as well as the 1997 ozone NAAQS. The second phase of CSAPR, referred to as the CSAPR Update, began in 2017 and has sought to address the 2008 ozone NAAQS.[142]

The total emissions budget for each CSAPR trading program equals the sum of the individual state budgets covered by that program. Affected power plants receive an allocation of allowances based on the emission budget for that trading program in the state. Each affected power plant must have an allowance to emit each ton of the relevant pollutant. It may comply with its allowance allocation by using control technologies to reduce emissions—and sell or bank any surplus allowances—or buy more allowances on the market.[143]

EPA's "CSAPR Update" rulemaking updated the ozone season NO_x program with respect to the 2008 ozone NAAQS.[144] Specifically, the CSAPR Update promulgated new FIPs for 22 states; 21 of these states were covered in the original CSAPR ozone season NO_x trading program.[145] The updated ozone season NO_x trading began in 2017 and largely replaced the original CSAPR ozone season NO_x trading program.[146] EPA concluded based on its modeling analysis that emissions from 10 of the states covered in the original CSAPR ozone season NO_x trading program "no longer significantly contribute to downwind nonattainment or interference with maintenance" of

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[139] EPA, "Federal Implementation Plans," 76 *Federal Register* 48210.

[140] Each state's emissions budget accounts for the "inherent variability in power system operations." See EPA, "Federal Implementation Plans," 76 *Federal Register* 48212, 48265, 48303.

[141] One SO_2 trading program—SO_2 Group 1—covers sources in states that need to make larger reductions to eliminate their significant contribution, while the second—SO_2 Group 2—includes sources in states that need to make smaller reductions. EPA, *2016 Program Progress*, p. 9.

[142] EPA, *2016 Program Progress*, p. 9.

[143] EPA clarified that while allowance trading—buying, selling, and banking—is allowed without restriction, there is a limit on the surrender of SO_2 allowances. A power plant in a Group 1 state can use only SO_2 allowances allocated to Group 1 states. Likewise, a power plant in a Group 2 state can use only Group 2 SO_2 allowances to cover SO_2 emissions. EPA, "Federal Implementation Plans," 76 *Federal Register* 48263-42864, 48284. See also EPA, *2016 Program Progress*, p. 9.

[144] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74507.

[145] Kansas was not covered in the original CSAPR ozone season NO_x program but was included in the CSAPR Update. See EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74506.

[146] The original ozone season CSAPR program was renamed "CSAPR NO_x Ozone Season Group 1 Trading Program" and now includes just one state: Georgia. Georgia is not included in the CSAPR Update trading program, "CSAPR NO_x Ozone Season Group 2." See EPA, "Determination Regarding Good Neighbor Obligations for the 2008 Ozone National Ambient Air Quality Standard," 83 *Federal Register* 31922, July 10, 2018; EPA, *Overview of the Cross-State Air Pollution Rule (CSAPR)*, https://www.epa.gov/csapr/overview-cross-state-air-pollution-rule-csapr; and EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74504.

either the 1997 ozone NAAQS or the 2008 ozone NAAQS.[147] Various states and stakeholders have filed a petition for review of the CSPAR Update to the D.C. Circuit.[148]

CSAPR does not address the Good Neighbor provision with respect to either the 2012 revision to the $PM_{2.5}$ NAAQS[149] or the 2015 revision[150] to the ozone NAAQS.[151] As of July 2018, states and EPA are in the process of evaluating interstate ozone transport with respect to the 2015 ozone NAAQS (see discussion under "Good Neighbor Determinations and the 2015 Ozone Standard").

Regarding the 2012 $PM_{2.5}$ standard, a 2016 EPA analysis determined that "few areas in the United States" would "have problems attaining and maintaining the 2012 $PM_{2.5}$ NAAQS due to the relatively small number and limited geographic scope of projected nonattainment and maintenance receptors."[152] EPA concluded that "most states will be able to develop good neighbor SIPs that demonstrate that they do not contribute significantly to nonattainment or interfere with maintenance of the 2012 $PM_{2.5}$ NAAQS in any downwind state."[153] Currently, nine areas are designated nonattainment with the 2012 $PM_{2.5}$ standard, four of which are located in two CSAPR states (Ohio and Pennsylvania). No areas are currently designated as maintenance with that standard.[154]

Results of Regional SO_2 and NO_x Trading Programs

Power sector SO_2 and NO_x emissions have declined since 2005. EPA has attributed most of these reductions to CAIR, which was in effect through the end of 2014.[155] The agency noted that other programs, such as state NO_x emission control programs, also contributed to the reductions in annual and ozone season NO_x achieved by 2016.[156] **Figure 3** illustrates the trend of declining emissions, showing that annual SO_2, annual NO_x, and ozone season NO_x decreased between 2009 (the first year of CAIR) and 2016 (the latest year for which the EPA Air Markets Program Data website reports emissions for all three programs).

[147] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74507.

[148] Wisconsin v. EPA, No. 16-1406 (D.C. Cir. Nov. 23, 2016).

[149] Referred to as the "2012" PM2.5 NAAQS revision because EPA signed the rule in late 2012. The rule was published in the *Federal Register* in early 2013. EPA, "National Ambient Air Quality Standards for Particulate Matter," 78 *Federal Register* 3086, January 15, 2013.

[150] EPA, "National Ambient Air Quality Standards for Ozone," 80 *Federal Register* 65292, October 26, 2015.

[151] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74507. EPA stated it addressed the Good Neighbor provision for the 2012 PM2.5 NAAQS in a memorandum. See EPA, "Information on the Interstate Transport 'Good Neighbor' Provision for the 2012 Fine Particulate Matter National Ambient Air Quality Standards under Clean Air Act Section 110(a)(2)(D)(i)(I)," March 17, 2016, https://www.epa.gov/pm-pollution/information-interstate-transport-good-neighbor-provision-2012-fine-particulate-matter.

[152] Stephen D. Page, Director, EPA Office of Air Quality Planning and Standards, letter to EPA Regional Air Division Directors, Regions 1-10, March 17, 2016, p. 3, https://www.epa.gov/sites/production/files/2016-08/documents/good-neighbor-memo_implementation.pdf.

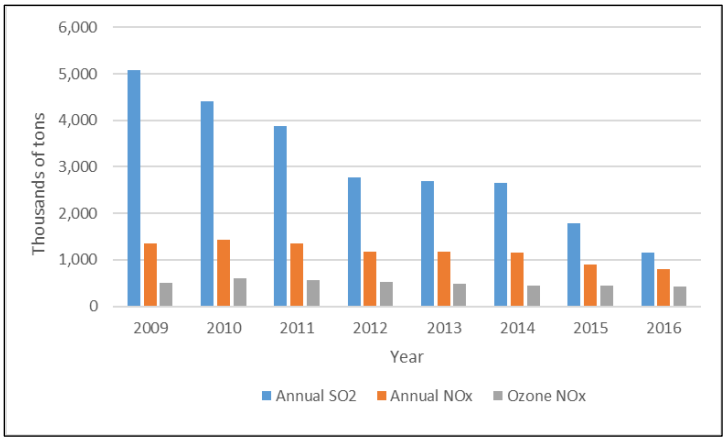
[153] Page, March 17, 2016, p. 7.

[154] As of June 30, 2018. The states with nonattainment areas for the 2012 $PM_{2.5}$ standard are California, Idaho, Ohio, and Pennsylvania. See EPA, *Green Book: PM-2.5 (2012) Designated Area/State Information*, June 30, 2018, https://www3.epa.gov/airquality/greenbook/kbtc.html.

[155] EPA, *2016 Program Progress*, p. 18.

[156] EPA, *2016 Program Progress*, pp. 24, 30.

Figure 3. CSAPR Sources Emission Trends, 2009-2016



Source: EPA Air Markets Program Data, https://ampd.epa.gov/ampd/.

Note: CAIR was in effect from 2009 through the end of 2014 and was replaced by CSAPR on January 1, 2015.

EPA attributed the SO_2 reductions under CAIR/CSAPR and the ARP largely to the greater use of pollution control technologies on coal-fired power plant units and "increased generation at natural gas-fired units that emit very little SO_2 emissions."[157] As noted by the U.S. Energy Information Administration (EIA), nearly all SO_2 emissions from the electricity sector are associated with coal-fired generation.[158] EPA reported that the average SO_2 emissions rate for units subject to either the CSAPR or ARP decreased 81% compared to 2005 rates. Most of the reductions were from coal-fired units.[159]

Analysis from EIA reveals a similar trend at the national level, suggesting that a combination of market and regulatory factors have contributed to SO_2 reductions. EIA reported a 73% reduction in national power sector SO_2 emissions from 2006 to 2015, which it described as "much larger" than the 32% reduction in coal-fired generation in that same period.[160] EIA attributed the national SO_2 reductions to (1) changes in the electricity generation mix (e.g., less coal-fired generation and more natural-gas-fired generation), (2) the installation of pollution control technologies at coal- and oil-fired plants (in particular, to comply with the Mercury and Air Toxics rule), and (3) lower use of the most-polluting power plants (e.g., retirements of coal-fired units).[161] Another EIA analysis reported that the eastern region of the United States—which includes all of the CSAPR states except Texas—had the largest share of capacity retirements between 2008 and 2017 compared to the rest of the continental United States.[162]

[157] EPA, *2016 Program Progress*, p. 19.

[158] EIA, "Sulfur Dioxide Emissions from U.S. Power Plants Have Fallen Faster Than Goal Generation," February 3, 2017, https://www.eia.gov/todayinenergy/detail.php?id=29812.

[159] EPA, *2016 Program Progress*, p. 19.

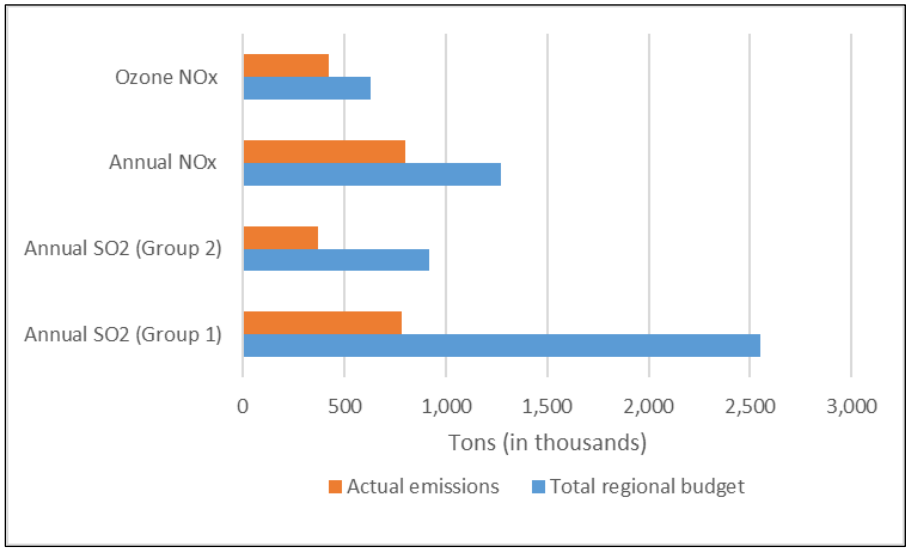
[160] EIA, "Sulfur Dioxide Emissions."

[161] EIA, "Sulfur Dioxide Emissions." EIA stated that various factors influence the decision to retire a power plant and analyzed retirements from the past decade in a separate report. See EIA, "Almost All Power Plants That Retired in the Past Decade Were Powered by Fossil Fuels," January 9, 2018, https://www.eia.gov/todayinenergy/detail.php?id=34452.

[162] EIA analyzed the lower 48 states of the United States and divided them into three regions: Western, Texas, and Eastern. See EIA, "Almost All Power Plants."

In addition, emissions in 2016 were below the total emission budgets for each CSAPR trading program (see **Figure 4**).[163] EPA observed that this resulted in CSAPR allowance prices at the end of 2016 that "were well below the marginal cost for reductions projected at the time of the final rule [and that such prices] are subject, in part, to downward pressure from the available banks of allowances."[164]

Figure 4. Comparison of CSAPR Emissions Budgets and Actual Emissions in 2016



Source: EPA 2016 Progress Report and EPA Air Markets Program Data, https://ampd.epa.gov/ampd/.

EPA reported that preliminary data from the 2017 ozone season—the first CSAPR Update compliance period—show that ozone season NO_x emissions were below the total emission budget.[165]

Emission allowance prices are generally affected by a number of factors, including supply and demand, program design elements that influence supply and demand, and legal and regulatory uncertainty.[166] Analyses of ozone season NO_x highlight summer weather as a key factor (e.g., higher than average temperatures could lead to greater demand for electricity). Power sector compliance strategies (e.g., use of installed control technologies, switching to lower emitting fuels, or retiring higher emitting units) are also relevant to ozone season allowance prices.[167]

Recent allowance prices in the CSAPR Update trading program appear to be lower than the marginal cost to reduce ozone season NO_x emission. One brokerage firm reported that by May

[163] EPA, *2016 Program Progress*, pp. 24, 30.

[164] EPA, *2016 Program Progress*, pp. 24, 30.

[165] In 2017, CSAPR Update sources emitted a total of 294,478 tons of ozone season NO_x, below the total budget of 316,464 tons. EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31927.

[166] Allowance banking—saving allowances for use in future years—is an example of a program design feature that may influence allowance supply. For discussion about how legal and regulatory uncertainty has affected allowance prices in regional SO_2 and NO_x markets, see Burtraw and Szambelan, *U.S. Emissions Trading Markets for SO_2 and NO_x*.

[167] For example, see Evolution Markets, *Market Update: Cross State Air Pollution Rule*, March 21, 2018, p. 2, http://www.evomarkets.com/content/news/reports_28_report_file.pdf; and Energy Ventures Analysis, "First Ozone Season Under the CSAPR Update Rule Begins Amid Uncertain Market Conditions," May 31, 2017, https://www.evainc.com/energy-blog/first-csapr-ozone-season-underway/.

2018—the start of the 2018 ozone season—NO_x allowance prices ranged from $150 to $175 per ton, suggesting that the availability of allowance prices at such low prices "could lead to some decisions not to run some pollution controls at maximum output. This would, in turn, lead to higher emissions."[168]

The brokerage firm reported the marginal cost of ozone season NO_x reductions to be about $300 per ton, though EPA considered higher marginal costs to develop the CSPAR Update emission budgets.[169] Specifically, EPA considered several cost thresholds—ranging from $800 per ton to $6,400 per ton—and based the CSAPR Update emission budgets on reductions that could be achieved at $1,400 per ton. EPA concluded that a $1,400 per ton threshold would maximize the incremental benefits—the emission reductions and corresponding downwind air quality improvements—compared to other marginal cost thresholds.[170] EPA identified NO_x control strategies at this cost threshold to include optimizing use of existing operational Selective Catalytic Reduction (SCR) controls, turning on existing but idled controls—for example, SCR that had not been used for several seasons—and installing advanced combustion controls, such as low-NO_x burners.[171]

EPA has reported improvements in air quality, attributing progress in part to the regional SO_2 and NO_x transport programs.[172] For example, 34 of the 36 areas in the eastern United States that were designated as nonattainment for the 1997 $PM_{2.5}$ NAAQS now show concentrations below that standard based on 2014-2016 data.[173] In terms of ozone, all 92 of the eastern areas originally identified as nonattainment under the 1997 ozone standard now show concentrations below that standard based on 2014-2016 data.[174] The 2014-2016 monitoring data also showed that 17 of the 22 areas in the eastern United States that were originally designated as nonattainment with the 2008 ozone standard now have concentrations below that standard.[175]

Status of Good Neighbor Determinations for Ozone Standards

As previously noted, revisions to the NAAQS trigger the SIPs review process, through which EPA determines whether states have met their Good Neighbor obligations. EPA has not yet finalized its Good Neighbor determinations for either the 2008 revision or the 2015 revision to the ozone standards. The remainder of this section summarizes the status of EPA's Good Neighbor determinations under each standard.

[168] Evolution Markets, *Market Update*, p. 2, http://www.evomarkets.com/content/news/reports_28_report_file.pdf.

[169] Evolution Markets, *Market Update*, p. 2.

[170] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74508, 74543.

[171] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74541, 74543. See also EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31927.

[172] EPA, *2016 Program Progress*, pp. 55-70.

[173] EPA had designated a total of 39 areas as nonattainment with respect to the 1997 $PM_{2.5}$ standard; 36 of these areas were located in the eastern United States. EPA, *2016 Program Progress*, p. 67.

[174] EPA, *2016 Program Progress*, p. 59.

[175] EPA, *2016 Program Progress*, p. 59.

Good Neighbor Determinations and the 2008 Ozone Standard

EPA first sought to address ozone transport with respect to the 2008 ozone standard in the 2016 CSAPR Update. Specifically, the CSAPR Update covered 22 states and promulgated FIPs with ozone season NO_x budgets for power plants.[176] EPA concluded at the time, however, that it could not determine whether the CSAPR Update fully addressed the Good Neighbor provision with respect to the 2008 ozone standard for 21 of the 22 covered states.[177] In other words, the 2016 CSAPR Update "did not fully satisfy the EPA's obligation to address the good neighbor provision requirements" for those 21 states.[178] EPA based its 2016 conclusion in part on the agency's projection of air quality problems at downwind monitors in 2017, even with implementation of the CSAPR Update. EPA found that 21 of the 22 CSAPR Update states would contribute "equal to or greater than 1 percent of the 2008 ozone NAAQS" to at least one nonattainment or maintenance monitor in 2017.[179]

Since then, EPA has updated its air quality modeling and, on June 29, 2018, proposed to determine that the CSAPR Update fully addresses 20 of the 21 remaining Good Neighbor obligations for the 2008 ozone standards.[180] As such, the agency has "proposed to determine that it has no outstanding, unfulfilled obligation under Clean Air Act Section 110(c)(1) to establish additional requirements for sources in these states to further reduce transported ozone pollution under" the CAA's Good Neighbor provision with respect to the 2008 ozone NAAQS.[181]

EPA based its proposed determination on the updated air quality modeling, which projected air quality in 2023—a longer analytical time frame than it used in the CSAPR Update.[182] The updated projections showed that in 2023, there would not be any nonattainment or maintenance monitors with respect to the 2008 ozone standard in the eastern United States.[183]

EPA's selection of a future analytic year is an important factor in the Good Neighbor determination.[184] The agency based its selection of 2023 on two primary factors: (1) the

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[176] EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74504, 74540.

[177] Tennessee was the only state for which EPA found the CSAPR Update FIP fully addressed the Good Neighbor provision with respect to the 2008 ozone standard. See EPA, "Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS," 81 *Federal Register* 74504, 74540; and EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31920.

[178] EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31920.

[179] EPA's analysis projected nonattainment monitors in Connecticut, Texas, and Wisconsin in 2017 and maintenance-only monitors in Connecticut, Maryland, Michigan, New York, and Texas in 2017. EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31922.

[180] Kentucky is the only one out of the group of 21 not covered by this proposed determination. EPA will address Kentucky in a separate rulemaking. EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31915, 31923.

[181] EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31916.

[182] In the CSAPR Update, EPA selected the year 2017 because it was the last full ozone season from which data could be used to determine attainment with the 2008 ozone standard by July 20, 2018, the attainment date for nonattainment areas classified as moderate. In addition, EPA did not analyze ozone season NO_x reductions available after 2017 due to time constraints. Stephen D. Page, Director, EPA Office of Air Quality Planning and Standards, memorandum to EPA Regional Air Division Directors, Regions 1-10, October 27, 2017, p. 3, https://www.epa.gov/airmarkets/october-2017-memo-and-supplemental-information-interstate-transport-sips-2008-ozone-naaqs.

[183] Page, October 27, 2017, p. 1, and EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31923.

[184] Stakeholders have disagreed with EPA's selection in other interstate air transport analyses, such as the 126(b) petitions regarding the 2008 and 2015 ozone NAAQS. See, for example, Delaware Department of Natural Resources and Environmental Control, *Testimony on EPA's Proposed Denial of Delaware's 126(b) Petitions*, p. 3.

downwind attainment deadlines[185] and (2) the time frame required to implement emission reductions as "expeditiously as possible."[186] As of August 2018, the next attainment dates for the 2008 ozone standard are July 20, 2021 (for areas classified as "Serious" nonattainment) and July 20, 2027 (for areas classified as "Severe" nonattainment).[187]

The potential to "over-control" emissions was another factor that EPA identified as relevant to the selection of the analytic year. EPA described it as relevant given the agency's expectation that future emissions will decline through implementation of existing local, state, and federal programs and in light of holdings from the U.S. Supreme Court.[188] EPA stated that it considered both downwind states' obligation to attain the ozone standards "as expeditiously as possible" and EPA's "obligation to avoid unnecessary over-control of upwind state emissions."[189] EPA did not specify whether it expected separate agency actions that may affect ozone precursor emissions—such as changes in the mobile source program—to affect its projections for 2023.

EPA acknowledged that the year it chose—2023—is later than the attainment date for areas classified as "Serious" nonattainment (2008 ozone standard) but concluded that "it is unlikely that emissions control requirements could be promulgated and implemented by the Serious area attainment date."[190]

The timing of EPA's proposed determination was driven in part by a court order. A federal district court in New York ordered EPA to propose determinations for five states by June 30, 2018, and finalize them by December 6, 2018.[191] EPA is under additional court-ordered and statutory deadlines to fully address the Good Neighbor provision with respect to the 2008 ozone standard. For example, another federal district court in California ordered EPA to address the Good Neighbor provision for Kentucky by June 30, 2018.[192] EPA is subject to statutory deadlines in 2018 and 2019 to address requirements for eight CSAPR Update states.[193]

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[185] The first factor stems from the D.C. Circuit's finding in *North Carolina v. EPA* that "emissions reductions required by the good neighbor provision should be evaluated considering the relevant attainment dates of downwind nonattainment areas impact by interstate transport." For the court case, see *North Carolina v. EPA*, 550 F.3d 896, 911-12 (D.C. Cir. 2008).

[186] For complete discussion about EPA's selection of the year 2023, see Page, October 27, 2017, pp. 4-7.

[187] Page, October 27, 2017, pp. 4-5. See also EPA, *Ozone NAAQS Timelines*, https://www.epa.gov/ozone-pollution/ozone-naaqs-timelines.

[188] EPA pointed to holdings from the U.S. Supreme Court and the D.C. Circuit Court "that the EPA may not require emissions reductions greater than necessary to achieve attainment and maintenance of the NAAQS in downwind areas." Page, October 27, 2017, pp. 4-6. See also *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1600-01 (2014); *EME Homer City Generation, L.P. v. EPA*, 795 F.3d 118, 127 (D.C. Cir. 2015).

[189] Page, October 27, 2017, pp. 4-6.

[190] Page, October 27, 2017, p. 6.

[191] The five states are Illinois, Michigan, Pennsylvania, Virginia, and West Virginia. Order, New York v. Pruitt, 1:18-cv-00406-JGK (S.D.N.Y. June 12, 2018).

[192] Order, Sierra Club v. Pruitt, No. 3:15-cv-04328 (N.D. Cal. May 23, 2017). EPA approved Kentucky's Good Neighbor SIP, concluding that Kentucky's SIP and Kentucky's CSAPR Update FIP "fully address the requirements of the good neighbor provision for the 2008 ozone NAAQS for Kentucky." EPA, "Air Plan Approval; Kentucky; 2008 Ozone NAAQS Interstate Transport SIP Requirements," 83 *Federal Register* 33730, July 17, 2018.

[193] The eight states are Indiana, Ohio, New Jersey, Maryland, Louisiana, Texas, Wisconsin, and New York. EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31931.

Good Neighbor Determinations and the 2015 Ozone Standard

Evaluation of interstate ozone transport with respect to the 2015 ozone NAAQS is underway. EPA has conducted air quality modeling to inform the development and review of the Good Neighbor SIPs and issued the results in a memorandum in March 2018.[194] States have the option to use these modeling results—for example, projections of potential nonattainment and maintenance monitoring sites with respect to the 2015 ozone NAAQS in the year 2023—to develop their Good Neighbor SIPs. States are required to submit Good Neighbor SIPs with respect to the 2015 ozone standard to EPA by October 1, 2018.[195] EPA will then evaluate the adequacy of the SIPs and determine whether additional steps are necessary to address ozone transport.

EPA's March 2018 memorandum also identified "potential flexibilities" or "concepts" for developing the Good Neighbor SIPs, describing considerations for each step of the transport framework.[196] One of these considerations centered on international ozone contributions. Specifically, EPA seeks feedback on the evaluation of international ozone contributions when determining whether a state significantly contributes to or interferes with maintenance of a NAAQS. This "potential flexibility" might involve developing a "consensus on evaluation of the magnitude of international ozone contributions relative to domestic, anthropogenic ozone contributions" to nonattainment or maintenance receptors and consider whether to weigh the "air quality, cost, or emission reduction factors" differently in areas with relatively high contributions from international sources.[197] EPA also invited stakeholders to suggest additional concepts—"including potential EPA actions that could serve as a model"—for the way Good Neighbor obligations are translated to enforceable emissions limits.[198]

Issues for Congressional Consideration

SO_2 and NO_x emissions have declined in recent decades, with SO_2, annual NO_x, and ozone season NO_x emissions well below the 2016 CSAPR budgets (see **Figure 3** and **Figure 4**). EPA's analysis suggests that its regional SO_2 and NO_x programs have reduced interstate transport of $PM_{2.5}$ and ozone in the eastern United States. EIA's national-scale analysis also points to a combination of broader market and regulatory factors contributing to emission reductions, in particular for SO_2.

Going forward, it is not clear whether emissions will remain well below CSAPR budgets given recent low allowance prices for ozone season NO_x and the supply of banked allowances that can be used in future years.[199] In addition, EPA has not yet issued a determination about whether ozone transport contributes to air quality problems with respect to the 2015 ozone standard.[200]

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[194] Memorandum from Peter Tsirigotis, Director, to Regional Air Division Directors, EPA Regions 1-10, March 27, 2018, https://www.epa.gov/sites/production/files/2018-03/documents/transport_memo_03_27_18_1.pdf.

[195] The CAA requires states to submit Good Neighbor SIPs to EPA within three years of a NAAQS revision. CAA §110(a)(1); 42 U.S.C. §7410(a)(1).

[196] EPA clarified that it is not recommending any changes and that any determinations about states' Good Neighbor obligations would undergo a notice-and-comment rulemaking. Tsirigotis, p. A-1.

[197] Tsirigotis, p. A-3.

[198] Under CSAPR, EPA has specified emissions budgets in a FIP to be implemented through an air-quality assured trading program. EPA's March 2018 memo does not indicate whether or how that approach might change. Tsirigotis, p. A-3.

[199] For details about the number of banked allowances, see EPA, *2016 Program Progress*, pp. 44-50.

[200] EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31923.

The agency has, therefore, not yet determined whether and how it will update the CSAPR budgets with respect to the 2015 ozone standard.

Stakeholder views on interstate air pollution transport vary, generally reflecting disagreements about the level of emissions that should be reduced and which sources—and states—bear responsibility for doing so. Some stakeholders have expressed concern that interstate transport continues to harm air quality.[201] For example, some stakeholders have expressed concern about transport of ozone and ozone precursor emissions to downwind states—and the health impacts associated with ozone exposure—and stated that some coal-fired power plants do not make full use of "already-installed pollution controls" to reduce ozone precursor emissions.[202] As discussed earlier in this report, EPA has recently denied a 126(b) petition and proposed to deny others from states seeking additional upwind reductions in ozone precursors, in part because the agency disagreed with each state's technical analysis (see "Section 126(b) Petitions").[203] Among the stakeholders disagreeing with the agency's rejection of Connecticut's 126(b) petition was a regional organization that raised concern that EPA has not used existing CAA tools to "adequately address interstate ozone transport in a timely manner."[204] On the other hand, emissions are below CSAPR budgets, and other stakeholders have questioned the feasibility of additional reductions in ozone precursors. These stakeholders have raised concerns about the extent to which international or natural sources contribute to ambient ozone concentrations.[205] The following issues may inform deliberations about interstate air transport, particularly as EPA continues its assessment of Good Neighbor obligations with respect to the 2015 ozone standard.

NO_x Emission Trends

Major sources of NO_x emissions include power plants, industrial facilities, and mobile sources such as cars and trucks.[206] EPA reported that NO_x emissions are expected to decline in the future

[201] In their recommendations to EPA regarding designation of nonattainment areas, Delaware, New Jersey, and Wisconsin attributed ozone violations in their jurisdictions to emissions transport from other states. See state recommendation letters to EPA, https://www.epa.gov/ozone-designations/2015-ozone-standards-state-recommendations-epa-responses-and-technical-support.

[202] U.S. Congress, House Committee on Science, Space, and Technology, Subcommittee on Environment, *State Perspectives on Regulating Background Ozone*, 115th Cong., 2nd sess., June 21, 2018. Testimony of Elena Craft, Environmental Defense Fund, pp. 1-5, 9, https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG%E2%80%93115%E2%80%93SY18%E2%80%93WState-ECraft-20180621_0.pdf.

[203] For example, Connecticut, Delaware, Maryland, and New York submitted 126(b) petitions related to compliance with the 2008 and/or 2015 ozone NAAQS. EPA, *Ozone National Ambient Air Quality Standards (NAAQS) Section 126 Petitions*, June 2018, https://www.epa.gov/ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs-section-126-petitions.

[204] Arthur N. Marin, Executive Director, Northeast States for Coordinated Air Use Management, letter to William Wehrum, Assistant Administrator, EPA Office of Air and Radiation, March 26, 2018, http://www.nescaum.org/documents/nescaum-comments-ct-126-petition-20180326.pdf/.

[205] U.S. Congress, House Committee on Science, Space, and Technology, Subcommittee on Environment, *State Perspectives on Regulating Background Ozone*, 115th Cong., 2nd sess., June 21, 2018. See testimony of Diane D. Rath, Alamo Area Council of Governments, pp. 5-7, https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG%E2%80%93115%E2%80%93SY18%E2%80%93WState-DRath-20180621_0.pdf; and testimony of Timothy Franquist, Arizona Department of Air Quality, pp. 1-3, https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG%E2%80%93115%E2%80%93SY18%E2%80%93WState-TFranquist-20180621_0.pdf. See also EPA, *Final Report on Review of Agency Actions that Potentially Burden the Safe, Efficient Development of Domestic Energy Resources Under Executive Order 13783*, October 25, 2017, p. 5, https://www.epa.gov/laws-regulations/final-report-review-agency-actions-potentially-burden-safe-efficient-development.

[206] EPA estimated that mobile sources accounted for over 50% of continental U.S. NO_x emissions. EPA implements

through a "combination of the implementation of existing local, state, and federal emissions reduction programs and changing market conditions for [power] generation technologies and fuels."[207] EIA's projections, however, suggest that while coal-fired power generation declines in the reference scenario, power sector NO_x emissions remain relatively flat between 2017 and 2050, showing a total decline of 0.2%.[208] EPA noted that non-power-sector sources may be "well-positioned to cost-effectively reduce NO_x" emissions compared to the power sector, but the agency also concluded that it has less certainty about non-power-sector NO_x control strategies.[209]

The extent to which the current collection of federal and state programs—such as CSAPR and EPA mobile source programs that set tailpipe emission standards—improve air quality in areas not meeting the 2015 ozone standard is to be determined.[210] In 2015, EPA projected that existing rules (e.g., those addressing automobile emission and fuel economy standards and rules affecting power plants) would reduce ozone precursor emissions, regardless of whether EPA revised the ozone NAAQS.[211] EPA has subsequently proposed changes to some of these existing rules—specifically, greenhouse gas emission (GHG) standards for passenger cars and light trucks and existing coal-fired power plants.[212] In particular, the proposal for passenger cars and light trucks would freeze fuel economy and GHG standards at model year 2020 levels through model year 2026. The current GHG standards would decrease between model years 2020 and 2025 and were projected to decrease carbon dioxide as well as ozone precursor emissions.[213] In terms of power

separate programs to address mobile source emissions. EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31918.

[207] EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31926.

[208] EIA, *Annual Energy Outlook 2018*, Electricity Supply, Disposition, Prices, and Emissions, https://www.eia.gov/outlooks/aeo/data/browser/#/?id=8-AEO2018&region=0-.

[209] EPA, "Determination Regarding Good Neighbor Obligations," 83 *Federal Register* 31927.

[210] For more information about EPA's "Tier 3" requirements for tailpipe emissions, see CRS Report R43497, *Tier 3 Motor Vehicle Emission and Fuel Standards*, by Richard K. Lattanzio and James E. McCarthy.

[211] Specifically, EPA's 2015 analysis projected that the existing rules would bring monitored ozone levels to 70 ppb or lower in all but 14 counties (excluding California) of the 241 counties showing nonattainment with the 70 ppb level, based on 2012-2014 monitoring data. EPA's 2015 analysis also projected that the 2015 ozone revision would lead to further emission reductions. For discussion, see CRS Report R43092, *Implementing EPA's 2015 Ozone Air Quality Standards*, by James E. McCarthy and Kate C. Shouse. See also EPA, *Regulatory Impact Analysis of the Final Revisions to the National Ambient Air Quality Standards for Ground-Level Ozone*, September 2015, p. 26, https://www.regulations.gov/document?D=EPA-HQ-OAR-2013-0169-0057.

[212] On August 1, 2018, the National Highway Traffic Safety Administration and EPA proposed to amend certain existing Corporate Average Fuel Economy and GHG emission standards for passenger cars and light trucks. The proposal has not yet been published in the *Federal Register*. A pre-publication version can be viewed at https://www.epa.gov/sites/production/files/2018-08/documents/safe-my-2021-2026-cafe-ld-ghg-nhtsa-epa-nprm-2018-08-02.pdf. On August 20, 2018, EPA proposed, among other things, to replace the Clean Power Plan, an Obama Administration rule that would limit carbon dioxide, SO_2, and NO_x emissions from existing fossil-fuel-fired power plants. The proposed rule has not yet been published in the *Federal Register* but can be viewed on EPA's website. See EPA, "Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guideline Implementing Regulations; Revisions to New Source Review Program," https://www.epa.gov/stationary-sources-air-pollution/proposal-affordable-clean-energy-ace-rule.

[213] For summary of the current GHG standards for cars and light trucks (model years 2017 to 2025) and projected emission impacts, see EPA, *EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks*, August 2012, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockey=P100EZ7C.PDF. For additional discussion about these standards, see EPA, *Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, August 2012, https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZI1.PDF?Dockey=P100EZI1.PDF. See also CRS Report R45204, *Vehicle Fuel Economy and Greenhouse Gas Standards: Frequently Asked Questions*, by Richard K. Lattanzio, Linda Tsang, and Bill Canis.

plants, EPA concluded that its Affordable Clean Energy proposal to replace the Clean Power Plan would increase carbon dioxide, SO_2, and NO_x emissions from the power sector relative to a scenario with implementation of the Clean Power Plan.[214] While the agency has not yet finalized these changes, they may have implications for levels of ozone precursor emissions. That is, regulatory changes affecting emissions in one sector—such as automobiles—may affect ozone NAAQS implementation as states seek to ensure the necessary emission reductions are achieved across all sources—mobile and stationary—in the state.

Incentives for NO_x Reductions

A recent market report concluded that current NO_x allowance prices—which are lower than the marginal cost of NO_x reductions—may ultimately lead to higher emissions.[215] While EPA has set state-specific emission budgets for CSAPR states intended to address interstate ozone transport with respect to the 2008 ozone standard, it is not clear whether these budgets will be sufficient to address Good Neighbor obligations under the more stringent 2015 ozone standard.

In light of this trend in NO_x allowance prices, some have questioned whether additional regulatory incentives may be necessary for states to fulfill Good Neighbor obligations.[216] Some states have urged EPA to implement additional regulatory requirements through 126(b) petitions.[217] For example, Delaware's 126(b) submission to EPA concluded that "[a]dditional regulatory incentive is required to ensure that the existing [Electric Generating Unit] NO_x controls are consistently operated in accordance with good pollution control practices."[218]

Related EPA Air Quality Initiatives

Current Trump Administration air quality initiatives may indirectly affect consideration of states' Good Neighbor obligations. The Administration has established a "NAAQS Reform" initiative that, among other things, seeks to streamline the NAAQS review process and obtain Clean Air Scientific Advisory Committee advice regarding background pollution and potential adverse effects from NAAQS compliance strategies.[219] EPA has also created an Ozone Cooperative Compliance Task Force in response to some stakeholders' concerns about international and long-

[214] EPA, Regulatory Impact Analysis for the Proposed Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guideline Implementing Regulations; Revisions to New Source Review Program, August 2018, pp. ES-8 to ES-9, https://www.epa.gov/sites/production/files/2018-08/documents/utilities_ria_proposed_ace_2018-08.pdf.

[215] Evolution Markets, *Market Update*, p. 2.

[216] Thomas F. McNevin, "Recent Increases in Nitrogen Oxide (NO_x) Emissions from Coal-Fired Electric Generating Units Equipped with Selective Catalytic Reduction," *Journal of the Air and Waste Management Association*, vol. 66, no. 1 (2016), pp. 66-75.

[217] EPA, *Ozone National Ambient Air Quality Standards (NAAQS) Section 126 Petitions*, June 2018, https://www.epa.gov/ozone-pollution/ozone-national-ambient-air-quality-standards-naaqs-section-126-petitions.

[218] David Small, Secretary, Delaware Department of Natural Resources and Environmental Control, letter to Gina McCarthy, EPA Administrator, November 28, 2016, p.29, http://www.dnrec.delaware.gov/Air/Documents/126b%20Petitions/Conemaugh%20126%20Petition.pdf.

[219] E. Scott Pruitt, EPA Administrator, letter to EPA Assistant Administrators, May 9, 2018, https://www.epa.gov/sites/production/files/2018-05/documents/image2018-05-09-173219.pdf. See also EPA, *Final Report on Review of Agency Actions That Potentially Burden the Safe, Efficient Development of Domestic Energy Resources Under Executive Order 13783*, October 25, 2017, p. 3, https://www.epa.gov/laws-regulations/final-report-review-agency-actions-potentially-burden-safe-efficient-development.

range ozone transport as well as monitoring and modeling issues.[220] Limited information is available about the Ozone Cooperative Compliance Task Force and what actions it may undertake.

In March 2018, EPA reiterated its interest in these particular ozone issues when it published air quality projections meant to inform Good Neighbor evaluations with respect to the 2015 ozone standard. Specifically, EPA's memorandum sought comment on "potential flexibilities" for developing the Good Neighbor SIPs, describing considerations for each step of the transport framework, including assessment of international ozone transport.[221]

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[220] EPA, *Final Report*, p. 3..

[221] EPA clarified that it is not recommending any changes and that any determinations about states' Good Neighbor obligations would undergo a notice-and-comment rulemaking. Tsirigotis, p. A-1.