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EPA's Affordable Clean Energy Rule and Related Issues: Frequently Asked Questions

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SUMMARY

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EPA's Affordable Clean Energy Rule and Related Issues: Frequently Asked Questions

In 2019, the U.S. Environmental Protection Agency (EPA) completed its reconsideration of a Clean Air Act (CAA) rulemaking for greenhouse gas (GHG) emissions from existing fossil-fuel-fired power plants. Specifically, the agency repealed the Clean Power Plan (CPP) and promulgated new guidelines for coal-fired power plants in the Affordable Clean Energy (ACE) rule. EPA based these actions on its conclusion that the CPP exceeded CAA authority by using measures that applied to the power sector as a whole rather than measures implemented at an individual facility. EPA also promulgated new general regulations to implement the ACE rule and any future emission guidelines issued under CAA Section 111(d).

EPA promulgated the CPP in 2015 to limit GHG emissions—specifically, carbon dioxide (CO_2)—from existing fossil-fuel-fired power plants. The CPP was the subject of ongoing litigation and never went into effect. In 2017, EPA reviewed the CPP in response to Executive Order (E.O.) 13783, which directed federal agencies to "review existing regulations and policies that potentially burden the development or use of domestically produced energy resources." EPA's review concluded that the CPP exceeded EPA's statutory authority. The agency therefore proposed repeal of the CPP in 2017 and a rule to replace it in 2018.

The structure and major provisions of the final ACE rule largely resemble those EPA proposed in August 2018. For example, the ACE rule defines the best system of emission reduction (BSER) for existing, coal-fired power plant CO_2 emissions as "heat rate improvement" measures, also known as efficiency improvements. EPA stated that it lacked adequate information to establish a BSER for other types of existing fossil-fuel-fired units, particularly natural-gas-fired units. Similar to the proposal, the ACE rule does not establish a binding, numeric performance standard for CO_2 emissions from existing coal-fired units. Rather, EPA identified six candidate technologies, which it characterized as the "most impactful" in the 2018 proposal, along with operating and maintenance practices that states must evaluate in establishing a standard of performance for each source in their state plans under CAA Section 111(d). Noting that many state and industry commenters requested a presumptive standard or additional clarity, EPA specified the level of emissions reductions achievable using the candidate technologies. States, however, must ultimately establish a rate-based standard and have the option to establish performance standards reflecting a heat rate improvement that falls outside of these ranges.

EPA analyzed the ACE rule and the CPP repeal impacts separately, projecting emission changes under each rule in 2025, 2030, and 2035. The agency projected "modest" CO_2 reductions (less than 1%) under the final ACE rule compared to a baseline, which excludes the CPP. In its separate CPP repeal analysis, EPA projected CO_2 reductions ranging from zero to 3.5% under several CPP implementation scenarios compared to a baseline without the CPP. EPA considered these projections as well as power sector trends and concluded that "the most likely result" of implementing the CPP would be "no change in emissions." Others have modeled different assumptions than EPA to assess the CPP repeal and reached different conclusions about projected emission changes.

EPA also finalized revisions to the general implementing regulations under CAA Section 111. The revisions codify EPA's current interpretation that states have "broad discretion" to establish and apply emission standards consistent with the BSER. Among other things, EPA lengthened the timeline specified in federal regulations for development and review of state plans.

EPA did not finalize the proposed revision to the applicability test for certain power plants under New Source Review (NSR). The NSR program generally requires emission limits based on the best available control technology when new facilities are built or when an existing facility makes a change that increases emissions above specified thresholds. Historically, NSR applicability determinations have been contentious and extensively litigated. According to EPA, the NSR changes that were included in the ACE proposal would prevent NSR from discouraging the installation of energy-efficiency measures. EPA stated that it intends to take final action on the proposed NSR changes at a later date.

Twenty-three states, the District of Columbia, and seven municipalities are challenging the CPP repeal and ACE rule in the U.S. Court of Appeals for the D.C. Circuit. A coalition of 21 states has intervened in the litigation in support of EPA. Various other public interest organizations, industry groups, and Members of Congress are also participating in the litigation.

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Introduction

In 2019, the U.S. Environmental Protection Agency (EPA) finalized its repeal of the Clean Power Plan (CPP) rulemaking and promulgated new emissions guidelines for existing coal-fired electric utility generating units (EGUs), more commonly referred to as power plants,[1] in the Affordable Clean Energy (ACE) rule.[2] These actions stem from a legal interpretation of Section 111 of the Clean Air Act (CAA). EPA also finalized new general regulations to implement the ACE rule and any future emission guidelines issued under CAA Section 111(d).

EPA promulgated the CPP in 2015 to limit greenhouse gas (GHG) emissions—specifically, carbon dioxide (CO_2)[3]—resulting from the combustion of fossil fuels at existing fossil-fuel-fired EGUs. CO_2 emissions account for about 82% of U.S. GHG emissions and over 98% of the GHG emissions in the electric power sector.[4] The CPP was litigated and never went into effect due to a stay issued by the Supreme Court in February 2016. Challenges to the CPP centered on the rule's legal justification and EPA's methodology to establish national CO_2 emission performance rates.

In 2017, EPA reviewed the CPP under Executive Order (E.O.) 13783, which directed federal agencies to "review existing regulations and policies that potentially burden the development or use of domestically produced energy resources."[5] EPA's review concluded that the CPP exceeded EPA's statutory authority by using measures that applied to the power sector as a whole rather than measures carried out within an individual facility. The agency therefore proposed repeal of the CPP in 2017.

In 2018, the EPA proposed three actions in the ACE rule.[6] First, EPA proposed to replace the CPP with new emission guidelines for existing coal-fired EGUs. Second, EPA proposed revised regulations to implement emission guidelines under CAA Section 111(d). Third, EPA proposed to modify an applicability determination for New Source Review (NSR), a CAA preconstruction permitting program for new and modified stationary sources.[7]

Debate surrounding CO_2 performance standards and EPA's interpretation of its CAA authority continues with the repeal of the CPP and issuance of the ACE rule. Stakeholders have expressed divergent views regarding EPA's interpretation of its CAA authority and its best system of emission reduction (BSER) determination under Section 111(d). Twenty-three states, the District of Columbia, seven municipalities, and various stakeholders are challenging the CPP repeal and

[1] The term *power plant* is a general term referring to a facility that has at least one electric utility generating unit to generate electricity. This report uses the terms *power plant* and *electric utility generating unit* (EGU) interchangeably.

[2] EPA, "Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations," 84 *Federal Register* 32534, July 8, 2019 (hereinafter "ACE Final Rule").

[3] Under the CAA, the pollutants regulated in the CPP and the ACE rule are GHGs with standards expressed in the form of CO_2 limits. See 40 C.F.R. §60.5705a (for the ACE rule); 40 C.F.R. §60.5705(a) (for the repealed CPP).

[4] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017*, April 2019.

[5] Executive Order 13783, 82 *Federal Register* 16093 §7 (March 31, 2017). For more information on this executive order, see CRS Legal Sidebar WSLG1789, *New Executive Order Directs Agencies to Revise or Rescind Climate Change Rules and Policies*, by Linda Tsang.

[6] 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," 83 *Federal Register* 44761, August 31, 2018 (hereinafter "ACE Proposal").

[7] For more information see CRS Report R45393, *EPA's Affordable Clean Energy Proposal*, by Kate C. Shouse, Jonathan L. Ramseur, and Linda Tsang.

ACE rule.[8] Twenty-one states and other stakeholders have intervened in the litigation in support of the CPP repeal and ACE rule.[9]

In order to provide information about the repeal of the CPP, promulgation of the ACE rule and related actions, and litigation, this report presents a series of questions and responses and concludes with a discussion of issues for congressional consideration.

For a detailed discussion of EPA's 2018 ACE proposal, see CRS Report R45393, *EPA's Affordable Clean Energy Proposal*, by Kate C. Shouse, Jonathan L. Ramseur, and Linda Tsang. For a detailed discussion of the legal issues, see CRS Legal Sidebar LSB10325, *EPA Replaces the Clean Power Plan with the Affordable Clean Energy Rule*, by Linda Tsang; and CRS Legal Sidebar LSB10199, *EPA Proposes New Permitting Test for Power Plant Modifications*, by Linda Tsang.

Background

Q: How much does the generation of electricity contribute to total U.S. GHG emissions?

A: Anthropogenic (i.e., man-made) GHG emissions are generated throughout the United States from millions of discrete sources: vehicles, power plants, industrial facilities, households, commercial buildings, and agricultural activities (e.g., soils and livestock).[10] According to EPA, since 1990, GHG emissions from fossil fuel combustion—coal, natural gas, and petroleum—have accounted for 74%-78% of total U.S. GHG emissions.[11] As illustrated by **Figure 1**, the electricity sector historically accounted for the largest percentage of U.S. GHG emissions from fossil fuel combustion. However, due to declines in the electricity sector emissions over the past decade, the transportation sector surpassed electricity in 2016. In 2018, the transportation sector accounted for 28% and the electricity sector accounted for 27% of total U.S. GHG emissions.

[8] See Docket, Am. Lung Assoc. v. EPA, No. 19-1140 (D.C. Cir.).

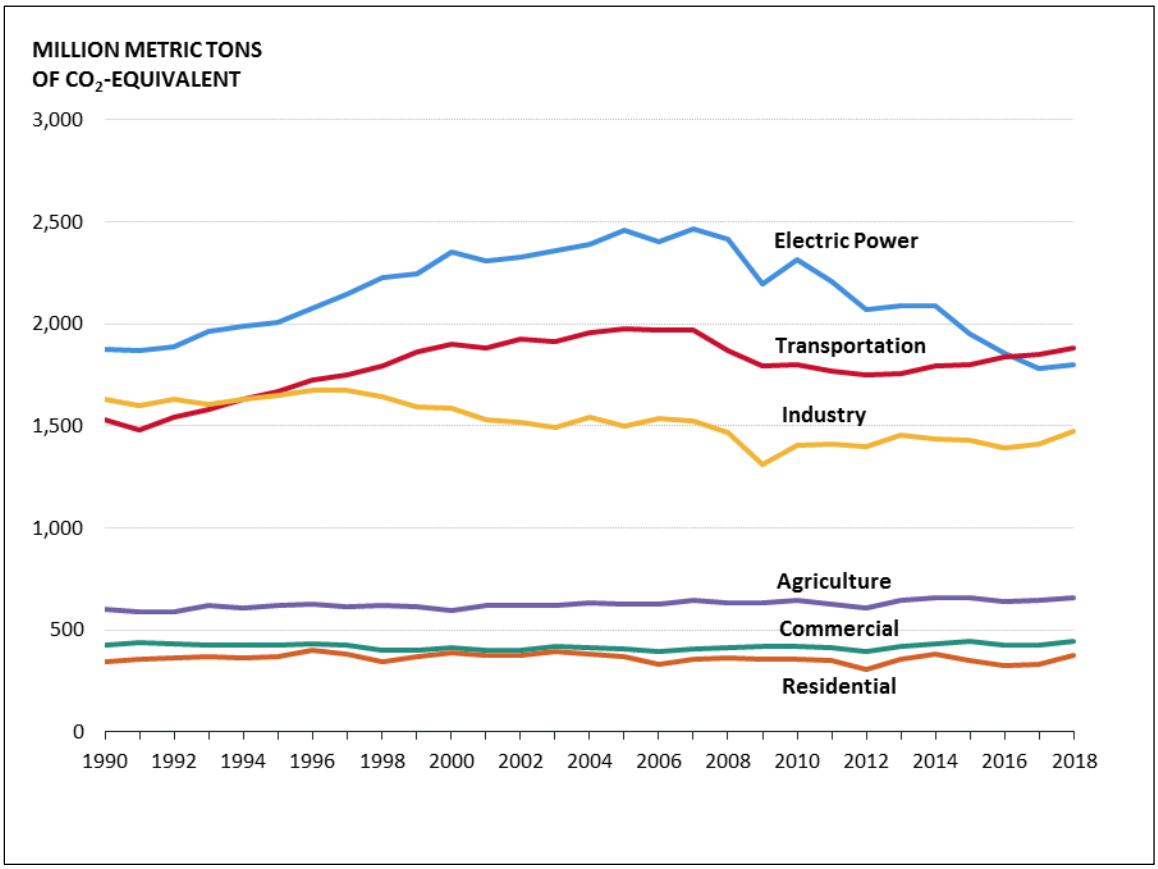
[9] See Docket, Am. Lung Assoc. v. EPA, No. 19-1140 (D.C. Cir.).

[10] GHGs in the atmosphere trap radiation as heat, warming the earth's surface and oceans. The primary GHGs emitted by humans (and estimated by EPA in its annual inventories) include CO_2, methane, nitrous oxide, sulfur hexafluoride, chlorofluorocarbons, hydrofluorocarbons, and perfluorocarbons. While both natural and human-related sources release GHGs and influence climate, "current climate scientific assessment states high confidence (extremely likely) that human influence is the dominant cause of the observed warming over the past half-century." For additional discussion, see CRS Report R45086, *Evolving Assessments of Human and Natural Contributions to Climate Change*, by Jane A. Leggett.

[11] In 2018 (the most recent year of available data), these emissions accounted for 75% of total U.S. GHG emissions. See Table ES-2 in EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*, April 2020.

Figure 1. GHG Emissions by Economic Sector

1990-2018



Source: Prepared by CRS; data from EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*, April 2020, Table 2-10, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2018.

Notes: Million metric tons of CO_2 equivalent is used because GHGs vary by global warming potential (GWP). GWP is an index developed by the Intergovernmental Panel on Climate Change (IPCC) that allows comparisons of the heat-trapping ability of different gases over a period of time, typically 100 years. Consistent with international GHG reporting requirements, EPA's most recent GHG inventory (April 2020) uses the GWP values presented in the IPCC's 2007 Fourth Assessment Report. The IPCC has since updated the 100-year GWP estimates, with some increasing and some decreasing.

CO_2 emissions from fossil fuel combustion account for over 98% of the GHG emissions in the electric power sector.[12] Multiple factors have played a role in the CO_2 emission decrease in the electricity sector. One key factor is the electricity generation portfolio. Electricity is generated from a variety of fuels and sources in the United States. Some fuels and sources—nuclear, hydropower, and some renewables—directly produce no CO_2 emissions with their electricity generation. Fossil fuels, on the other hand, generate different amounts of CO_2 emissions per unit of generated electricity. The amount of CO_2 emitted during fossil-fuel-fired electricity generation is dependent upon the carbon content of the fuel and the efficiency of the generating unit in which it is combusted, among other variables. For example, natural-gas-fired electricity from a combined cycle unit typically yields approximately 43% of the CO_2 emissions of coal-fired

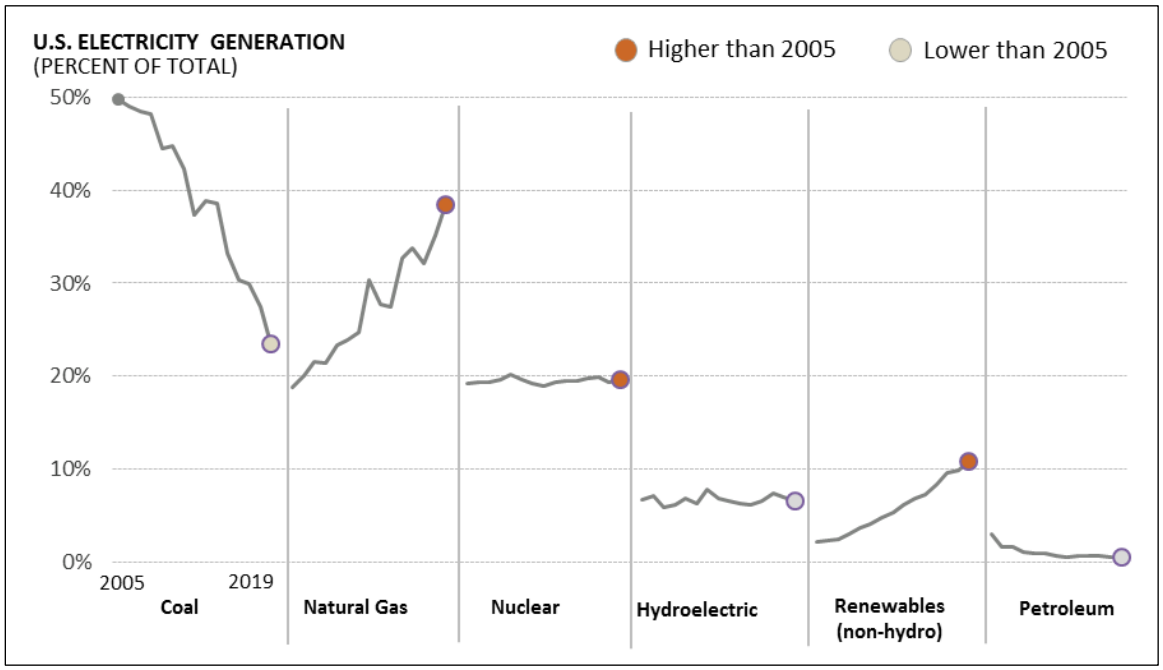
[12] See Table 2-11 in EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*, April 2020.

electricity from a steam unit per kilowatt-hour of electricity.[13] Therefore, shifting the U.S. electricity generation portfolio to lower-emissions fuel sources and more efficient technologies would likely (all else being equal) reduce CO_2 emissions from the electricity sector, which in turn, would likely reduce total U.S. GHG emissions. **Figure 2** illustrates the changes in the electricity portfolio from 2005 to 2019. Highlighted changes include the following:

- Coal's contribution to total electricity generation decreased from 50% to 23%.
- Natural gas's contribution to total electricity generation increased from 19% to 38%.
- Non-hydro renewable energy (wind and solar) generation increased from 2% to 11%.

Figure 2. Percentage of Total Electricity Generation by Energy Source

2005-2019



Source: Prepared by CRS; data from EIA, Electric Power Monthly, Table 1.1, http://www.eia.gov/beta/epm/.

Notes: Renewable sources include wind, utility scale solar, wood fuels, landfill gas, biogenic municipal solid waste, other biomass, and geothermal. Petroleum includes petroleum liquids and petroleum coke. Estimates of small-scale solar generation are not included in the above figure. EIA started estimating this generation in 2014. If estimated small-scale solar generation were included in the renewables generation for 2019, the percentage of total generation for renewables (non-hydro) would increase from 11% to 12%.

Several factors likely played a role in these recent changes, including technological advances in energy production (e.g., hydraulic fracturing) and federal and state policies, including federal tax policies[14] and states' renewable portfolio standards.[15] These factors have influenced the

[13] For further discussion, see CRS Report R44090, *Life-Cycle Greenhouse Gas Assessment of Coal and Natural Gas in the Power Sector*, by Richard K. Lattanzio.

[14] See CRS Report R44852, *The Value of Energy Tax Incentives for Different Types of Energy Resources*, by Molly F. Sherlock.

[15] See, for example, Database of State Incentives for Renewables and Efficiency, Map of Renewable Portfolio Standard

deployment of these technologies and resources and impacted the relative price differences between energy sources, particularly coal, natural gas, and renewable sources. These market forces have played a role in the retirement of coal-fired power plants: Between 2007 and 2018, the number of coal-fired power plants decreased from 351 to 206, and according to the Energy Information Administration (EIA), more retirements are planned in coming years.[16]

Q: How much progress has the United States made in reducing GHG emissions and meeting emission targets?

A: **Figure 3** illustrates total U.S. GHG emissions between 1990 and 2018. As the figure indicates, U.S. GHG emissions increased 20% between 1990 and 2007. The economic downturn in 2008 and 2009 resulted in a decrease of energy consumption (including electricity) across all economic sectors. This decline played a key role in the 10% decrease in emission levels during that time. Between 2010 and 2017, emissions continued to decrease by 8%. Between 2017 and 2018, emissions increased by 3% and were roughly equivalent to emission levels in 1995. As discussed above, changes in the nation's electricity generation portfolio played a key role in this more recent decline.

In addition, **Figure 3** compares recent U.S. GHG emission levels to the 2020 and 2025 emissions goals previously made by the United States pursuant to the United Nations Framework Convention on Climate Change's 2009 Copenhagen Accord and 2015 Paris Agreement, respectively.[17] As the figure indicates, 2018 U.S. GHG emission levels were 10% less than 2005 emissions levels. For more information about trends in CO_2 emissions from electricity generation and the factors that impact emission levels in that sector, see CRS Report R45453, U.S. Carbon Dioxide Emissions in the Electricity Sector: Factors, Trends, and Projections, by Jonathan L. Ramseur. For an overview of U.S. energy issues, including U.S. energy consumption and changes in the fuels used to generate electricity, see CRS Report R44854, 21st Century U.S. Energy Sources: A Primer, coordinated by Michael Ratner.

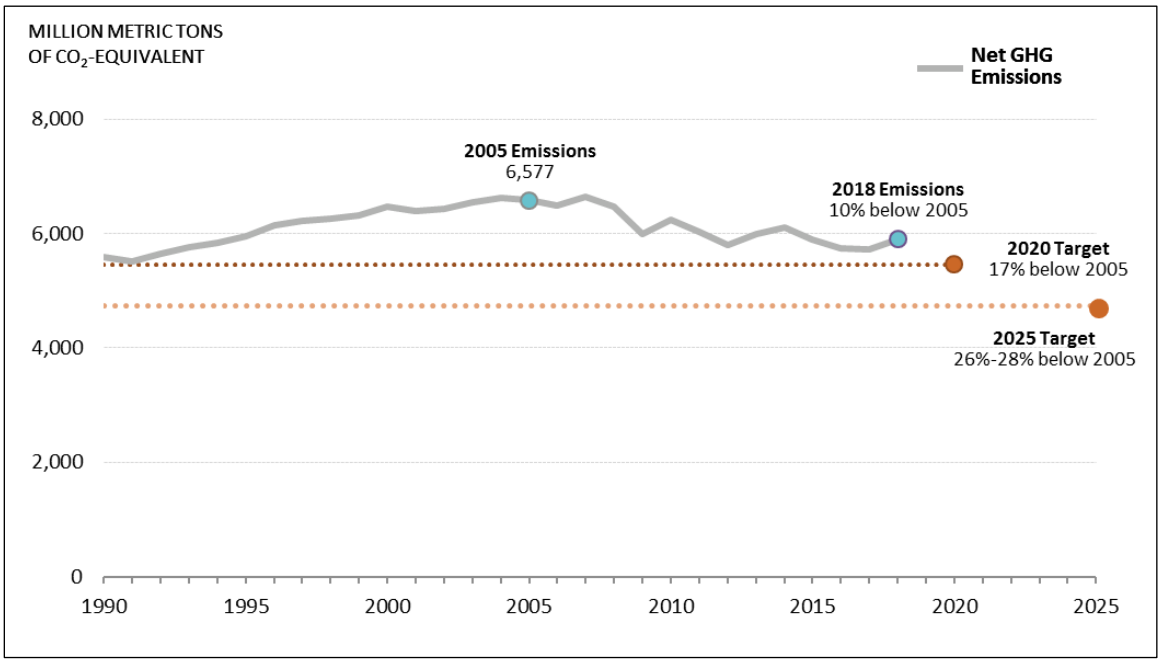
Policies, as of June 2019, https://www.dsireusa.org/resources/detailed-summary-maps/.

[16] EIA, *Electric Power Annual*, Table 4.1, https://www.eia.gov/electricity/annual/; and EIA, "More U.S. Coal-Fired Power Plants Are Decommissioning as Retirements Continue," July 26, 2019, https://www.eia.gov/todayinenergy/detail.php?id=40212.

[17] For more on U.S. commitments and pledges under the UNFCCC (U.S. Treaty Document 102-38), see CRS Report R44092, *Greenhouse Gas Pledges by Parties to the United Nations Framework Convention on Climate Change* and CRS Report R44609, *Climate Change: Frequently Asked Questions About the 2015 Paris Agreement*.

Figure 3. U.S. GHG Emissions (Net)

Compared to 2020 and 2025 Emissions Targets



Source: Prepared by CRS; data from EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018, 2020, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Notes: Net GHG emissions includes net carbon sequestration from land use, land use change, and forestry. This involves carbon removals from the atmosphere by photosynthesis and storage in vegetation. See the note in **Figure 1** regarding "Million metric tons of CO_2-equivalent."

Q: What are the Clean Air Act (CAA) Section 111 requirements?

A: CAA Section 111 requires EPA to establish nationally uniform, technology-based standards for categories of industrial facilities, also referred to as stationary sources of air pollution.[18] These standards were intended to help prevent new pollution problems and to "level the playing field for states competing for industrial growth," for example, by removing incentives for states or communities to weaken air pollution standards in order to attract industry.[19]

CAA Section 111(b) directs EPA to establish maximum emission levels (called New Source Performance Standards, or NSPS) for new and modified major stationary sources—power plants, steel mills, and smelters, for example. To set the emission levels, EPA determines the BSER that has been "adequately demonstrated," taking costs and any non-air-quality health and environmental impacts and energy requirements impacts into account.[20]

Section 111 also addresses existing stationary sources of pollution. Section 111(d) requires EPA to promulgate regulations, which EPA has historically referred to as "emission guidelines."[21] These

[18] 42 U.S.C. §7411(b).

[19] Robert J. Martineau Jr. and Michael K. Stagg, "New Source Performance Standards," in *The Clean Air Act Handbook*, ed. Julie R. Domike and Alec C. Zacaroli, 4th ed. (Chicago: American Bar Association, 2016).

[20] 42 U.S.C. §7411(a)(1).

[21] For emission guidelines promulgated prior to ACE, EPA defines *emission guideline* at Title 40, Section 60.21(e), of the *Code of Federal Regulations*. For ACE and any future emission guidelines, EPA defines *emission guideline* at Title

emission guidelines establish binding requirements that states must address when they develop plans to regulate the existing sources, which EPA refers to as "designated facilities."[22] In particular, states must establish performance standards reflecting the BSER for existing sources, which is determined by EPA. States, in their plans, provide for implementation and enforcement of the standards. EPA cannot compel a state to submit a state plan pursuant to CAA Section 111(d). However, if a state does not submit a satisfactory plan by EPA's regulatory deadline, CAA Section 111(d) directs EPA to prescribe a plan for the state, often described as a federal plan (42 U.S.C. §7411(d)(2)).

Q: How does the CAA Section 111 define *standards of performance* and *best system of emission reduction*?

A: The term *standards of performance* appears multiple times in CAA Section 111, including in both the Section 111(b) provisions relating to new sources and the Section 111(d) provisions relating to existing sources in a source category. Section 111(a) defines *standard of performance* as

> [A] standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.[23]

Under this definition, EPA must determine the BSER that is "adequately demonstrated," considering certain factors. Then, EPA or states, as applicable, must base the emissions standard on the degree of emission limitation that is "achievable" through the BSER. The CAA does not define these component terms within the definition of *standard of performance*.

Courts have expanded on the CAA Section 111 definition of the term *standards of performance* and EPA's interpretation of its component terms, but they have done so generally with respect to NSPSs under Section 111(b) rather than emission guidelines for existing sources under Section 111(d).[24] For detailed discussion about EPA's current interpretation of its authority to determine the BSER under Section 111, see the questions and answers in the "Repeal of the Clean Power Plan" section.

Q: What is a "state plan"?

A: A "state plan" refers to a plan that provides for the implementation and enforcement of CAA Section 111(d) performance standards.[25] For example, under the ACE rule, states are to develop plans detailing the implementation and enforcement of performance standards for CO_2 emissions

40, Section 60.21a(e).

[22] 42 U.S.C. §7411(d)(1). For EPA's definition of *designated facility* for emission guidelines promulgated prior to ACE, see 40 C.F.R. §60.21(b). For EPA's definition of *designated facility* for ACE and any future emission guidelines established after July 8, 2019, see 40 C.F.R. §60.21a(b).

[23] CAA §111(a)(1), 42 U.S.C. §7411(a)(1).

[24] See, for example, Lignite Energy Council v. EPA, 198 F.3d 930, 933 (D.C. Cir. 1999); Sierra Club v. Costle, 657 F.2d 298 (D.C. Cir. 1981); ASARCO Inc. v. EPA, 578 F.2d 319 (D.C. Cir. 1978); Essex Chemical Corp. v. Ruckelshaus, 486 F.2d 427 (D.C. Cir. 1973); Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 391 (D.C. Cir. 1973).

[25] 42 U.S.C. §7411(d)(1). States also prepare "state plans" under CAA Section 129, which authorizes air emission limits for solid waste incineration units. See 42 U.S.C. §7429(b)(2).

from coal-fired EGUs. In general, states develop Section 111 plans based on the emission guidelines, which include the BSER determination, issued by EPA and in accordance with federal procedural requirements and then submit them to EPA for review.[26] The state plans approved by EPA are published in federal regulatory code (40 C.F.R. Part 62).[27] If a state does not submit a satisfactory plan by EPA's regulatory deadline, CAA Section 111(d) directs EPA to prescribe a plan for the state, described as a federal plan in the ACE rule.[28]

Q: What is the difference between a "state plan" and a "state implementation plan"?

A: These terms refer to plans developed by states under different sections of the CAA. A "state plan" is a plan that provides for the implementation and enforcement of CAA Section 111(d) performance standards.[29] A "state implementation plan" (SIP) is the collection of regulations and documents developed under CAA Section 110 to ensure compliance with federal air quality standards, known as National Ambient Air Quality Standards (NAAQS).[30]

State plans and SIPs establish limits for different kinds of air pollutants and differ in scope of sources covered.[31] A SIP sets forth procedures for compliance with NAAQS for six pollutants, known as "criteria pollutants" (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide [SO_2]).[32] A SIP establishes an emissions budget for diverse emission sources in the state, including power plants, industrial plants, incinerators, and motor vehicles. The scope of a state plan is relatively narrower than a SIP, given that EPA has historically issued Section 111(d) performance standards for "specialized types of emission sources that emit discrete types of pollutants."[33] State plans apply to "designated pollutants," which EPA has defined to include performance standards for new sources under Section 111(b) and to exclude criteria pollutants and hazardous air pollutants (HAPs).[34] Examples of designated pollutants

[26] EPA cannot compel a state to submit a state plan pursuant to CAA Section 111(d). If a state does not submit a satisfactory plan by EPA's regulatory deadline, CAA Section 111(d) directs EPA to prescribe a plan for the state (42 U.S.C. §7411(d)).

[27] This part also contains federal plans issued for states that did not submit adequate plans.

[28] 42 U.S.C. §7411(d)(2).

[29] 42 U.S.C. §7411(d)(1). States also prepare "state plans" under CAA Section 129, which authorizes air emission limits for solid waste incineration units (42 U.S.C. §7429(b)(2)).

[30] 42 U.S.C. §7410. See also EPA, *Basic Information about Air Quality SIPs*, https://www.epa.gov/sips/basic-information-air-quality-sips.

[31] EPA guidance explains that because "emissions standards applicable to industries on a nationwide basis" (such as Section 111 performance standards and Section 112 National Emission Standards for Hazardous Air Pollutants) are codified in the *Code of Federal Regulations*, they are not included in federally approved SIPs. EPA observed that while states "typically adopt" federal emission standards into their SIPs, EPA does not adopt those provisions into the federally approved SIP because such provisions are already enforceable through the federal *Code of Federal Regulations*. See EPA, *SIP Processing Manual, "What's Not in a SIP,"* https://cfpub.epa.gov/oarwebadmin/sipman/sipman/mContent.cfm?chap=1&filePos=8.

[32] 42 U.S.C. §§ 7408(a)(1), 7410. For more information about NAAQS requirements, see CRS Report RL30853, *Clean Air Act: A Summary of the Act and Its Major Requirements*, by Kate C. Shouse and Richard K. Lattanzio. 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," https://www.epa.gov/criteria-air-pollutants/naaqs-table.

[33] See generally 40 C.F.R. Part 62. See also Martineau and Stagg, "New Source Performance Standards," pp. 342-343.

[34] 40 C.F.R. §60.21(e).

include sulfuric acid mist from sulfuric acid plants, fluoride emissions from phosphate fertilizer plants, and nonmethane organic emissions from landfills.[35]

Q: What was the Clean Power Plan (CPP)?

A: EPA promulgated the CPP in 2015 to limit CO_2 emissions from existing fossil-fuel-fired power plants.[36] EPA set national performance standards for CO_2 emissions from existing fossil-fuel-fired power plants under the authority of CAA Section 111(d). One national performance standard would have applied to existing electric steam generating units (which are mostly coal), and the other applied to existing stationary combustion turbines—for example, natural gas combined cycle (NGCC) units. EPA based these standards on the BSER, a statutory term used to define a performance standard under CAA Section 111. EPA determined the BSER for the CPP based on a collection of measures that it referred to as three "building blocks": (1) improving the heat rate at coal-fired units, (2) shifting generation from coal-fired units to lower-emitting natural gas units, and (3) shifting generation from fossil fuel units to renewable energy generation. The CPP also set individual state targets for average emissions from existing power plants based on the CO_2 performance standards. Although EPA set state-specific targets, states were to determine how to reach these goals. For additional details about the CPP as EPA promulgated it in 2015, see CRS Report R44341, *EPA's Clean Power Plan for Existing Power Plants: Frequently Asked Questions*, by James E. McCarthy et al.

Q: Did the CPP ever take effect?

A: No. The CPP was the subject of ongoing litigation and was never implemented due to a stay from the Supreme Court.[37] The Court dismissed the litigation challenging the CPP as moot after EPA finalized its repeal of the CPP and the ACE rule.[38]

Q: Did EPA promulgate GHG performance standards for new and modified power plants under the CAA?

A: Yes. In 2015, EPA promulgated GHG performance standards for new and modified power plants under CAA Section 111(b) concurrent to the 111(d) standards for existing plants in the CPP.[39] Once EPA lists a source category, such as fossil-fuel-fired EGUs, Section 111(b) requires EPA to establish NSPS for new and modified sources within a listed source category.[40] Once EPA promulgates NSPS under Section 111(b) for new or modified sources in that category, Section 111(d) then directs EPA to establish procedures for the states to submit plans establishing

[35] See generally 40 C.F.R. Part 62. See also Martineau and Stagg, "New Source Performance Standards," pp. 342-343.

[36] The pollutants regulated in the CPP and the ACE rule are GHGs with standards expressed in the form of CO_2 limits. 40 C.F.R. §60.5705a (for the ACE rule); 40 C.F.R. §60.5705(a) (for the repealed CPP). EPA, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Final Rule," 80 *Federal Register* 64661, October 23, 2015 (hereinafter CPP Final Rule).

[37] The Supreme Court in 2016 stayed the implementation of the CPP pending resolution of the lawsuit challenging its legality. Order in Pending Case, West Virginia v. EPA (S. Ct. No. 15A773, Feb. 9, 2016), https://www.supremecourt.gov/orders/courtorders/020916zr_21p3.pdf.

[38] Order, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Sept. 17, 2019).

[39] EPA, "Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Generating Units; Final Rule," 80 *Federal Register* 64510, October 23, 2015.

[40] 42 U.S.C. §7411(b)(1).

standards of performance for existing sources that would be subject to NSPS if they were new, unless they are subject to an exclusion under Section 111(d).[41]

As promulgated in 2015, the NSPS for new and modified power plants would have relied in part on carbon capture and sequestration (CCS) technology to reduce emissions by about 20% compared to the emissions of what was then considered a state-of-the-art coal-fired plant without CCS. Stakeholders challenged the 2015 GHG performance standards for new and modified power plants in court, but the court paused the litigation pending completion of EPA's review and any resulting rulemaking.[42]

Q: What is the status of GHG performance standards for new and modified power plants?

A: The GHG performance standards for new and modified power plants remain in effect, though EPA proposed to revise them on December 6, 2018.[43] The December 2018 proposal is a separate rulemaking from the CPP repeal and ACE rulemakings.

In the December 2018 proposal for new and modified power plants, EPA determined that the BSER for newly constructed coal-fired units would be the most efficient demonstrated steam cycle in combination with the best operating practices from exiting units. This proposed BSER would replace the determination from the 2015 rule, which identified the BSER as partial CCS. According to the agency, "the primary reason for this proposed revision is the high costs and limited geographic availability of CCS."[44] The semiannual regulatory agenda estimated a final decision by December 2020.[45] As of July 2020, EPA has not yet finalized this proposal. According to EPA's status report in the paused litigation challenging the 2015 GHG performance standards for new and modified power plants, the agency continues to review the comments submitted on the proposed rule and plans to send the final rule package to the Office of Management and Budget (OMB) for interagency review in the early summer of 2020.[46]

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[41] 42 U.S.C. §7411(d)(1). One of the legal issues raised in the CPP and ACE rule litigation challenges EPA's interpretation of CAA Section 111(d)(1)(A). This provision excludes, among other things, from Section 111(d) regulation "any existing source for any air pollutant (i) for which air quality criteria have not been issued or which is not included on a list published under section 108(a) or emitted from a source category which is regulated under [CAA] section 112." *Id.* The Section 108(a) exclusion refers to "criteria" air pollutants under the NAAQS program. *Id.* §§7408-7410. The Section 108(s) exclusion does not apply because EPA has not listed GHGs as criteria pollutants. Under the CPP, EPA explained that the Section 112 exclusion "does not bar the regulation under CAA section 111(d) of non-HAP [hazardous air pollutants] from a source category, regardless of whether that source category is subject to standards for HAP under CAA section 112." CPP Final Rule at 64711-15. See also Section 112 Exclusion discussion in CRS Report R44480, *Clean Power Plan: Legal Background and Pending Litigation in West Virginia v. EPA*, by Linda Tsang. Petitioners that challenged the CPP and are challenging the ACE rule argue that sources, and not air pollutants, regulated under other CAA Section 112 to limit HAPs, such as existing fossil-fuel-fired EGUs, are excluded from EPA's scope of Section 111(d) authority. *Id.* See also "Q: What are the main legal issues in the litigation?"

[42] EPA Status Report, North Dakota v. EPA at 3-4, No. 15-1381 (D.C. Cir. Apr. 24, 2020). In 2017, the court ordered the petitions for review of the 2015 GHG performance standards for new and modified power plants to be held in abeyance (paused) pending further order of the court.

[43] EPA, "Review of Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units," 83 *Federal Register* 65424, December 20, 2018.

[44] Additional information, including a link to the proposed rule, a fact sheet, and an economic impact analysis, can be found at https://www.epa.gov/stationary-sources-air-pollution/proposal-nsps-ghg-emissions-new-modified-and-reconstructed-egus.

[45] Office of Management and Budget (OMB), Semiannual Regulatory Agenda, EPA, RIN 2060-AU58, Spring 2020, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202004&RIN=2060-AU58.

[46] EPA Status Report, North Dakota v. EPA at 4, No. 15-1381 (D.C. Cir. Apr. 24, 2020). In 2017, the court ordered the

Q: Do the CPP repeal and ACE rules have implications for EPA's other GHG rulemakings or the endangerment finding?

A: In 2009, EPA issued two findings under CAA Section 202, referred to collectively as the "GHG endangerment finding." EPA found (1) that GHGs currently in the atmosphere potentially endanger public health and welfare and (2) that new motor vehicle emissions cause or contribute to that pollution.[47] EPA subsequently promulgated regulations under CAA authority to limit GHG emissions from motor vehicles, the power sector, the oil and gas industry, and other sources.

Neither the CPP repeal nor the promulgation of the ACE rule reconsiders EPA's 2009 GHG endangerment finding.[48] Without reconsidering the GHG endangerment finding, EPA appears to have a continuing obligation to limit GHG emissions under the CAA.[49] Separate from the CPP repeal and ACE rulemaking, EPA has proposed specific changes to other GHG regulations, including those for motor vehicles and for the oil and gas sector. For a brief overview of these proposed changes, see CRS Report R45451, *Clean Air Act Issues in the 116th Congress*, by James E. McCarthy, Kate C. Shouse, and Richard K. Lattanzio.

Repeal of the Clean Power Plan

Q: Why did EPA repeal the CPP?

A: EPA bases the CPP repeal on a change in its legal interpretation of its authority under CAA Section 111 from its interpretation in the CPP. EPA concluded that the CPP exceeded CAA statutory authority in setting the BSER as a combination of *on- and off-site* emission reduction measures that applied to the entire existing source category.[50] Because the CPP BSER was based, in part, on "beyond-the-source" measures (i.e., measures that apply to the source category as a whole or to entities entirely outside the regulated source category), EPA, after reconsidering the relevant statutory text, structure, and purpose of CAA Section 111, asserts that the CPP

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petitions for review of the 2015 GHG performance standards for new and modified power plants to be held in abeyance (paused) pending further order of the court. Id. at 3-4.

[47] Specifically, EPA's first finding was that "elevated concentrations of greenhouse gases in the atmosphere may reasonably be anticipated to endanger the public health and to endanger the public welfare of current and future generations." See EPA, "Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act," Final Rule, 74 *Federal Register* 66496 and 66516, December 15, 2009. The Supreme Court upheld EPA's "endangerment finding" in *Util. Air Regulatory Group v. EPA*, 134 S. Ct. 2427 (2014).

[48] In the lawsuits challenging the CPP and the ACE rule, petitioners claimed that EPA failed to make the required endangerment finding under CAA Section 111 and that EPA could not rely on the endangerment finding that it made in 2009 in the context of CAA Section 202 for motor vehicles. See, for example, Brief of Pac. Legal Found., Tex. Pub. Policy Found., Morning Star Packing Co., Merit Oil Co., Loggers Ass'n of N. Cal., and Norman Brown in Supp. of Pet'rs 20-24, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Feb. 23, 2016) (challenging the CPP); Statement of Issues to be Raised by Petitioner Texas Public Policy Foundation, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Oct, 7, 2019) (challenging the ACE rule).

[49] See Massachusetts v. EPA, 549 U.S. 497, 533 (2007) ("Under the clear terms of the Clean Air Act, EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do.").

[50] The CPP repeal is one of three separate and distinct rulemakings published in the same Federal Register notice. The CPP repeal is published at pp. 32522-32 in EPA, "Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations," 84 *Federal Register* 32534, July 8, 2019. Hereinafter, "CPP repeal" refers to pp. 32522-32 of this Federal Register notice.

"significantly exceeded" its authority.[51] Based on this revised interpretation, EPA repealed the CPP and limited the BSER in the ACE rule to emission reduction measures that owners and operators can apply directly on site at individual existing EGUs.

In the CPP repeal and ACE rule, EPA contends that it has discretion to change its interpretation of its legal authority so long as it provides a "reasonable explanation" for the change.[52] The Supreme Court has explained that "[a]gencies are free to change their existing policies as long as they provide a reasoned explanation for the change…. But the agency must at least 'display awareness that it is changing position' and 'show that there are good reasons for the new policy.' … [A]n '[u]nexplained inconsistency' in agency policy is 'a reason for holding an interpretation to be an arbitrary and capricious change from agency practice.'"[53]

Q: How has EPA's interpretation of Section 111 authority changed from its interpretation in the CPP?

A: EPA's interpretation of its CAA Section 111 authority in the ACE rule is narrower than its previous interpretation in the CPP. As discussed above, CAA Section 111(a) requires standards of performance to reflect the emissions reductions achievable through "application" of the BSER. In the CPP, EPA reasoned that the "system" in the BSER reflected the "overall source category," taking into account the "unique characteristics of CO_2 pollution and the unique, interconnected and interdependent manner in which affected EGUs and other generating sources operate within the electricity sector."[54] Under this interpretation, EPA based the CPP BSER for existing fossil-fuel-fired EGUs on three "building blocks": (1) improving the heat rate at coal-fired units, (2) shifting generation to lower-emitting natural gas units, and (3) shifting generation from fossil fuel units to renewable energy generation.[55]

In the CPP repeal, EPA presents a different view of its authority to determine the BSER under Section 111. EPA asserts that the "application" of the BSER referenced in CAA Section 111(a) "unambiguously limits the BSER to those systems" that can be "applied" or "put into operation at a building, structure, facility, or installation."[56] In other words, EPA contends that the CAA does not authorize the agency to select as the BSER measures that apply to the source category as a whole or to entities entirely outside the regulated source category. EPA states that the CPP "beyond-the-source" approach "ignored or misinterpreted" the plain text of the CAA that "clearly precluded the unsupportable reading" of Section 111 used in the CPP to choose emission reduction measures that are not directly applied to the regulated EGU.[57]

To support its interpretation that the BSER must be source-specific, EPA points to an "explicit statutory link" between the CAA's Section 165 Prevention of Significant Deterioration (PSD) permitting program and Section 111 standards.[58] Section 111 emission standards (as derived from

[51] CPP Repeal, p 32523.

[52] ACE Final Rule, p. 32523.

[53] Encino Motorcars, LLC v. Navarro, 136 S. Ct. 2117, 2125-26 (2016), quoting FCC v. Fox Television Stations, Inc., 556 U.S. 502, 515 (2009) and National Cable & Telecommunications Assn. v. Brand X Internet Services, 545 U.S. 967, 981 (2005) (internal citations omitted).

[54] CPP Final Rule, p. 64726.

[55] See "Q: What was the Clean Power Plan (CPP)?" for a discussion of the CPP "building blocks."

[56] CPP Repeal, p. 32524.

[57] CPP Repeal, p. 32527.

[58] CPP Repeal, p. 32525.

the BSER) act as a "floor" (minimum) for emission limits in PSD permits.[59] The permitting authority bases the PSD emission limits only on source- or facility-specific best available emission control technologies. EPA contends that if Section 111 emission standards are the "floor" for source-specific emission limits in PSD permits, EPA must base the BSER (and the emission standards established by applying the BSER) only on what is achievable at an individual source.[60] In comparison, in the CPP, EPA did not apply PSD program policies or interpretations to its BSER determination because it interpreted the PSD permitting program as distinct from Section 111(d) emission guidelines.[61] In the CPP, EPA observed that the PSD permitting program applies to individual modified or new sources in contrast to Section 111(d) guidelines that apply to an entire source category.[62]

The ACE rule and the CPP also diverge in their interpretation of the Section 111(d) provision that allows states to consider the "remaining useful life of an existing source" and "other factors" when "applying" a standard of performance to a particular source. In the ACE rule, EPA interprets this provision to allow states to consider these factors when "establishing" emission standards, including the costs of implementing heat rate improvement (HRI) and technical feasibility.[63] EPA acknowledges that consideration of such factors could result in source-specific emission standards "that reflect a value of HRI that falls outside" the emission reduction ranges that EPA identified for each technology.[64] The CPP, in contrast, allowed states to consider these factors only when determining how to apply the national emission standards to existing EGUs and prohibited states from making "adjustments" to the mandatory statewide emission reduction goals based on these source-specific factors.[65]

Q: Has anyone challenged the CPP repeal in court?

A: Yes. Parties have filed petitions in the U.S. Court of Appeals for the D.C. Circuit challenging CPP repeal and the ACE rule as of July 8, 2019.[66] See "Litigation Challenging the CPP Repeal and the ACE Rule" below for questions related to the litigation.

Affordable Clean Energy (ACE) Final Rule

Q: What is the ACE rule?

A: The final ACE rule establishes emission guidelines for states to use when they develop and submit plans to EPA that establish standards to reduce CO_2 emissions[67] from existing coal-fired

[59] 42 U.S.C. §7479(3).

[60] CPP Repeal, p. 32525.

[61] EPA, Response to Comments, CPP Final Rule, chap. 1.2, pp. 100-01.

[62] EPA, Response to Comments, CPP Final Rule, chap. 1.2, pp. 100-01.

[63] ACE Final Rule, p. 32549.

[64] ACE Final Rule, p. 32549.

[65] CPP Final Rule, p. 64870.

[66] *See* Petition for Review, Am. Lung Assoc. v. EPA, No. 19-1140 (D.C. Cir. July 8, 2019).

[67] In the ACE rule, EPA states that the "air pollutant regulated in this final action is GHGs. However, the standards in this rule are expressed in the form of limits solely on emissions of CO_2, and not the other constituent gases of the air pollutant GHGs." CPP Repeal, p. 32534. See 40 C.F.R. §60.5705a.

units. The ACE rule's emission guidelines present EPA's BSER determination for CO_2 emissions from existing coal-fired EGUs.[68]

Q: Why did EPA promulgate the ACE rule?

A: EPA's promulgation of NSPS GHG standards for new and modified EGUs under CAA Section 111(b) triggered the requirements for existing sources under CAA Section 111(d).[69] Repeal of the CPP—the 111(d) rulemaking that EPA promulgated concurrent to the GHG NSPS in 2015—meant that EPA had to promulgate a new rule to fulfill its obligation under CAA Section 111(d) for existing sources.

Q: To whom does the ACE rule directly apply?

A: The final ACE rule directs the governor (or the governor's designee) of each state in the contiguous United States to submit a state plan to EPA by July 8, 2022.[70] A state plan should establish standards of performance based on the BSER for designated facilities in that state's jurisdiction and provide for the implementation and enforcement of those standards. The final rule also requires states in the contiguous United States without any designated facilities (i.e., coal-fired EGUs) to submit a "negative declaration letter" to EPA in lieu of a state plan. EPA expects state plan submissions from 43 of the 48 contiguous states and negative declarations from the remaining five (California, Idaho, Maine, Rhode Island, and Vermont).[71]

The final ACE rule does not explain why its emission guidelines do not apply to non-contiguous states.[72] The 2015 CPP final rule likewise did not apply to non-contiguous states. The final CPP rule stated that EPA did not have the information or tools required to establish the BSER in non-contiguous states and U.S. territories, concluding that it would determine how to address CAA Section 111(d) requirements in those areas at a later date.[73]

Q: What types of facilities are affected by the final rule?

A: Under the ACE rule, state plans will establish CO_2 performance standards for each "affected steam generating unit," which EPA refers to as a "designated facility."[74] EPA defined *designated facility* as a coal-fired electric utility steam generating unit (coal-fired EGU) that was in operation or had commenced construction on or before January 8, 2014, exceeds a specified nameplate capacity and base load rating, and burns coal for more than 10% of the average annual heat input during the three previous calendar years.[75]

EPA did not establish the BSER for integrated gasification combined cycle (IGCC) units, oil- or natural-gas-fired utility boilers, or fossil-fuel-fired stationary combustion turbines and therefore

[68] ACE Final Rule, p. 32521.

[69] EPA described the existing Section 111(b) requirements as the "requisite predicate for applicability of CAA section 111(d)." ACE Final Rule, p. 32533.

[70] 40 C.F.R. §60.5710a and §60.5800a.

[71] ACE Final Rule, p. 32573.

[72] Similarly, the preamble to the 2018 ACE proposal does not discuss why it excludes non-contiguous states.

[73] For additional discussion, see CRS Report R44341, *EPA's Clean Power Plan for Existing Power Plants: Frequently Asked Questions*, by James E. McCarthy et al.

[74] 40 C.F.R. §60.5700a.

[75] ACE Final Rule, p. 32533. See also 40 C.F.R. §60.5805a.

excluded these EGUs from the definition of *designated facility*.[76] For more information, see "Q: Why didn't EPA establish a BSER for other fossil-fuel-fired units?"

Q: What is the BSER under the ACE rule?

A: EPA determined that efficiency improvements, also known as "heat rate improvements" or HRI, are the BSER to reduce CO_2 emissions from existing coal-fired EGUs.[77]

The "heat rate" measures the amount of energy that a power plant uses to generate one kilowatt-hour of electricity.[78] A power plant with a lower, more efficient heat rate uses less fuel to generate the same amount of electricity as a power plant with a higher heat rate. Using less fuel per kilowatt-hour may result in lower emissions of CO_2 as well as lower levels of SO_2 and nitrogen oxides (NO_x).[79]

HRI is affected by a number of factors, such as the age and type of EGU. For more information, see CRS Report R43343, *Increasing the Efficiency of Existing Coal-Fired Power Plants*, by Richard J. Campbell. For more information about HRI and potential emission impacts, see "Q: Would the ACE rule's HRI lead to potential "rebound effects"?"

EPA identified other "systems of GHG emission reduction"—such as natural gas co-firing, use of biomass, and CCS—that the agency concluded did not meet the criteria for the BSER.[80] For information about EPA's consideration of natural gas co-firing, see "Q. Why did EPA exclude natural gas co-firing from the BSER?" For information about EPA's consideration of biomass, CCS, and other systems of GHG emission reduction, see "Q: Can states use emission reduction measures outside the "candidate technologies" list to establish the ACE rule's performance standards?"

Q: What are the ACE rule's performance standards for CO_2 emissions?

A: Similar to the ACE proposal, the final ACE rule does not establish a binding, numeric performance standard for CO_2 emissions from existing coal-fired units. Rather, EPA established a list of candidate technologies, comprising six HRI measures and improved operation and maintenance practices, which states "must evaluate in establishing a standard of performance for that source in their state plans under CAA section 111(d)."[81] As in the proposal, the final ACE rule presents ranges of expected HRI improvements for the candidate technologies, expressed as a percentage improvement, for three size-based categories of coal-fired EGUs.[82] The estimated potential HRI improvements for the six candidate technologies at existing coal-fired EGUs ranges

[76] ACE Final Rule, p. 32533. See also 40 C.F.R. §60.5780a

[77] ACE Final Rule, p. 32532.

[78] EIA, *Analysis of Heat Rate Improvement Potential at Coal-Fired Power Plants*, May 19, 2015, https://www.eia.gov/analysis/studies/powerplants/heatrate/.

[79] EIA, *Analysis of Heat Rate Improvement Potential at Coal-Fired Power Plants*.

[80] ACE Final Rule, pp. 32543-32549. EPA clarified that states can use natural gas co-firing as a compliance measure, however. See ACE Final Rule, p. 32555.

[81] ACE Final Rule, p. 32536.

[82] For final rule, see ACE Final Rule, Table 1, p. 32537. For proposal, see ACE Proposal Table 1, p. 44757.

from 0.1% to 2.9%.[83] States must ultimately establish a rate-based standard. They also have the option to establish performance standards reflecting an HRI "that falls outside of these ranges."[84]

Q: Why did EPA not establish a numeric or presumptively approvable CO_2 performance standard in the ACE rule?

A: EPA discussed several reasons why it did not establish a numeric CO_2 performance standard or specify a standard that, while not required, would meet the requirements for EPA approval (i.e., "presumptively approvable"). First, EPA asserted that "CAA Section 111(d)(1) squarely places the responsibility of establishing a standard of performance for an existing designated facility on the state as part of developing a state plan."[85] Second, EPA determined that it could not establish national performance standards due to variation among existing coal-fired units.[86] Factors that may affect HRI potential for a particular unit include, but are not limited to, the EGU's "past and projected utilization rate, maintenance history, and remaining useful life."[87] Third, EPA concluded that states are best positioned to account for site-specific considerations that influence HRI potential.[88]

According to EPA, many commenters supported this "unit-specific, state-led" approach because "it is not possible to adopt uniform, nationally applicable standards of performance based on implementation of particular HRI technologies because each individual unit is subject to a unique combination of factors that can affect the unit's heat rate and HRI potential, many of which are geographically driven and outside the control of a source."[89] EPA noted that Section 111(d) of the CAA directs the agency "to permit states to take such factors into consideration as they develop plans to establish performance standards for existing sources within their jurisdiction."[90]

Other commenters disagreed with this "unit-specific, state-led" approach and viewed it as inconsistent with the CAA legislative history as well as past practice to determine BSER based on a specific emission reduction technology. These commenters concluded that the unit-specific, state-led approach would not result in significant emission reductions. EPA disagreed, responding that designating a "specific set of emission reduction technologies" and operational practices as the BSER are consistent with the statute. EPA responded further that this approach "recognizes the challenges of applying a single specific emission reduction technology within such a diverse population of designated facilities."[91]

Some commenters maintained that EPA has a statutory responsibility to establish the level of stringency for the performance standards. According to EPA, these commenters stated that "EPA is legally obligated to identify 'the degree of emission limitation achievable through the application of the [BSER]' (i.e., a level of stringency) because such degree of emission limitation is inextricably linked with the determination of the BSER, which is the EPA's statutory role and

[83] ACE Final Rule, p. 32537.

[84] ACE Final Rule, p. 32538.

[85] ACE Final Rule, p. 32550.

[86] ACE Final Rule, p. 32536.

[87] ACE Final Rule, p. 32536.

[88] ACE Final Rule, pp. 32535-6.

[89] ACE Final Rule, pp. 32535-6.

[90] ACE Final Rule, p. 32536.

[91] ACE Final Rule, p. 32536.

responsibility."[92] EPA responded that the ACE rule's presentation of ranges of expected HRI improvements fulfills the agency's statutory obligation to specify the "level of emissions reductions achievable using the candidate technologies."[93]

The lack of a numeric performance standard introduces uncertainty about the level of stringency expected from implementation of HRI measures under the ACE rule. EPA reported that "numerous" state and industry commenters requested a presumptive standard or additional clarity about the CO_2 performance standards. Other states commented that they "heartily approve" of the CPP repeal and of aspects of the proposed ACE rule, in particular that, in their view, the proposal affords "the States sufficient flexibility to comply with federal environmental mandates without disrupting the flow of affordable, reliable electricity to their citizens and the nation as a whole."[94] The National Association of Clean Air Agencies (NACAA), which represents air pollution control agencies in 35 states, the District of Columbia, four territories and 116 metropolitan areas,[95] recommended that EPA provide states "presumptively approvable" language for state plans as well as "presumptively approvable standards."[96] NACAA commented that such presumptively approvable language or standards "need not restrict state flexibilities" and that "EPA could present these as options in the rule and specify in all cases that states remain free to craft alternative compliance approaches consistent with the emission guidelines."[97]

EPA did not identify "presumptively approvable" standards in the final ACE rule. EPA concluded that it was "reasonable" for the agency to present "the 'degree of emission limitation achievable through application of the BSER' as a set of ranges of values, rather than a single number, that reflects application of the candidate technologies as a whole," given that source-specific factors may result in "varying degrees of reductions" when implementing the BSER at a particular unit.[98]

Q: What are the candidate technologies under the ACE rule?

A: EPA finalized a list of "candidate technologies"—six HRI measures and improved operating and maintenance (O&M) procedures—that constitute the BSER.[99] Under the ACE rule, states "will consider" the candidate technologies and "other factors when establishing unit-level standards of performance."[100]

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[92] ACE Final Rule, p. 32537.

[93] ACE Final Rule, p. 32537. See ACE Final Rule, Table 1, p. 32537, for ranges of the percentage of potential HRI improvement.

[94] CRS did not identify comments from these states regarding their views on presumptively approvable standards. See letter from the States of West Virginia, Alabama, Arkansas, Georgia, Indiana, Kansas, Kentucky, Louisiana, Michigan, Missouri, Montana, Nebraska, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Utah, Wisconsin, and Wyoming and the Mississippi Department of Environmental Quality and the Mississippi Public Service Commission to EPA, ACE rulemaking docket, EPA-HQ-OAR-2017-0355-24627, October 31, 2018, pp. 6-9, https://www.regulations.gov/.

[95] As of March 2020. See NACAA, "About NACAA," http://www.4cleanair.org/about.

[96] NACAA recommends that "[a]t a minimum" EPA "provide example calculations that convert sample HRI percentages drawn from EPA's candidate technologies, both individually and in combination, across a representative inventory of sources into the rate-based CO_2/MWh emission rate standard EPA is requiring for the performance standards." Letter from NACAA to EPA, ACE rulemaking docket, EPA-HQ-OAR-2017-0355-23788, October 31, 2018, p. 4, https://www.regulations.gov/.

[97] Letter from NACAA to EPA, p. 4.

[98] ACE Final Rule, p. 32538.

[99] ACE Final Rule, pp. 32536-37.

[100] ACE Proposal, p. 44757.

The candidate technologies list has not changed from the ACE proposal.[101] It includes the following:

- Neural Network/Intelligent Sootblowers
- Boiler Feed Pumps
- Air Heater and Duct Leakage Control
- Variable Frequency Drives
- Blade Path Upgrade (Steam Turbine)
- Redesign/Replace Economizer
- Improved O&M Practices.

According to EPA, these are the "most impactful" candidate technologies "because they can be applied broadly and are expected to provide significant HRI without limitations due to geography, fuel type, *etc*."[102] EPA estimated that HRI potential from the six HRI measures on the candidate technologies list ranges from 0.1% to 2.9%, and that HRI potential from O&M practices may range from zero to less than 2.0% depending on the unit's historical O&M practices.[103]

The two candidate technologies reported in the EPA analysis showing highest HRI potential are steam turbine blade upgrades and the redesign/replacement of the economizer for cooling system heat recovery. These two technologies also have, according to EPA, the greatest potential of the candidate technologies to trigger preconstruction permitting requirements under the NSR program.[104] EPA has asserted, based on stakeholder comments, that "if such HRI trigger NSR, the resulting requirements for analysis, permitting, and capital investments will greatly increase the cost of implementing those HRI technologies and, in the absence of NSR reforms, states will be more likely to determine that those technologies are not cost-effective when analyzing 'other factors' in determining a standard of performance for an individual facility."[105]

EPA has proposed, but not yet finalized, a revision to the applicability test for certain power plants under NSR. EPA stated in the final ACE rule that it intends to take final action on the proposed NSR changes at a later date.[106] EPA decided to retain the two candidate technologies—steam turbine blade upgrades and redesign/replace economizer—on the final list of candidate technologies because the agency "still expects these technologies to be generally applicable across the fleet of existing EGUs, and because the costs of the technologies are generally economical and reasonable."[107] EPA estimated the potential impact of applying the candidate technologies and projected "modest" emission changes under the ACE rule policy scenario compared to the reference scenario. See "Q: What CO2 emission effects did EPA estimate from the CPP repeal and from the ACE rulemakings?" For more information about EPA's determination that HRI is the best system of emission reduction to reduce CO_2 emissions from

[101] ACE Proposal, p. 44757.

[102] ACE Final Rule, p. 32536.

[103] ACE Final Rule, p. 32537.

[104] The NSR program generally requires emission limits based on the best available control technology when new facilities are built or when existing facilities make a change that increases emissions above specified thresholds. Historically, NSR applicability determinations have been contentious and extensively litigated.

[105] ACE Final Rule, p. 32537.

[106] ACE Final Rule, p. 32521.

[107] ACE Final Rule, p. 32537.

existing coal-fired EGUs. For the agency's consideration of other systems of GHG emission reduction, see "Q: What is the BSER under the ACE rule?"

The final ACE rule does not limit states' consideration of performance standards to the candidate technologies list, though EPA clarified that certain measures, such as biomass co-firing, cannot be used for compliance. See "Q: Can states use emission reduction measures outside the "candidate technologies" list to establish the ACE rule's performance standards?" for additional discussion.

Q: How will states establish CO_2 emission performance standards?

A: Although the ACE rule does not require a specific method for states to develop performance standards, EPA described two steps that it views as a "reasonable" approach for states to follow and document in their state plans.[108] First, EPA expects states to establish unit-specific CO_2 performance standards by calculating an emissions rate reflecting application of the BSER—that is, the candidate technologies—at each unit.[109] For example, a state might apply the BSER to a designated facility's average emission rate from the previous three years or to a projected emission rate under specific conditions.[110] Second, states have discretion to tailor the emission rates based on site-specific considerations, such as remaining useful life and cost.[111] That is, states are to consider the candidate technologies listed as the BSER—including EPA's estimated ranges of HRI potential—but states may calculate a performance standard for a particular unit that falls outside of the range of EPA's estimated HRI potential due to site-specific factors.[112] Under EPA's current interpretation of CAA Section 111(d), states may establish performance standards that are less stringent than the "standard that would result from a direct application of the BSER identified by the EPA."[113]

EPA also clarified that a state may determine that one or more of the six candidate technologies "should not be part of the methodology to calculate the EGU's standard of performance because of remaining useful life or other factors."[114]

Finally, the ACE final rule requires states to set a rate-based standard in the form of an allowable emission rate.[115]

Q: Can states establish CAA Section 111(d) performance standards less stringent than otherwise expected from implementing the BSER?

A: EPA interprets the CAA as requiring the agency to allow states to establish Section 111(d) performance standards that, based on site-specific considerations, are less stringent than the "standard that that would result from a direct application of the BSER identified by the EPA."[116] The agency based this interpretation on CAA Section 111(d)(1)(B), which directs EPA to

[108] EPA clarified that states may conduct these steps sequentially or concurrently. ACE Final Rule, p. 32550.

[109] ACE Final Rule, pp. 32549-50.

[110] ACE Final Rule, p. 32550.

[111] ACE Final Rule, pp. 32550, 32551.

[112] ACE Final Rule, p. 32551.

[113] ACE Final Rule, p. 32553.

[114] EPA noted that the state should document its rationale and analysis, for example, "by explaining that such technology has already been implemented by a particular source." ACE Final Rule, p. 32550.

[115] ACE Final Rule, p. 32555.

[116] ACE Final Rule, pp. 32553, 32570.

promulgate federal regulations that "shall permit the State in applying a standard of performance to any particular source under a plan submitted under this paragraph to take into consideration, among other factors, the remaining useful life of the existing source to which such standard applies."[117] EPA concluded that "Congress explicitly envisioned under CAA section 111(d)(1)(B) that states could implement standards of performance that vary from the EPA's emission guidelines under appropriate circumstances."[118]

Prior to the ACE rule, the general regulations implementing CAA Section 111(d) specified that state plans for health-based pollutants must be as stringent as the emission guideline established by EPA unless the state demonstrates, on a case-by-case basis, that a source meets certain factors.[119] Previously referred to as the "variance provision,"[120] it allowed a state to apply less stringent standards for health-based pollutants if the state demonstrated any of the following factors applied to a particular emission source:

- unreasonable cost of control resulting from plant age, location, or basic process design;
- physical impossibility of installing necessary control equipment; or
- other factors specific to the facility (or class of facilities) that make application of a less stringent standard or final compliance time significantly more reasonable.[121]

EPA noted that promulgation of this provision predated the statutory language in CAA Section 111(d)(1)(B) that "the EPA permit states to take into account remaining useful life and other factors."[122] As part of the new implementing regulations for Section 111(d) that EPA promulgated with the ACE rule, the agency included a provision intended to reflect CAA Section 111(d)(1)(B). The new provision, codified at Title 40, Section 60.24a(e), of the *Code of Federal Regulations*, incorporates the statutory phrase *remaining useful life* but otherwise presents the same source-specific factors that were previously codified at Section 60.24(f). The new provision reads as follows:

> (e) In applying a standard of performance to a particular source, the State may take into consideration factors, such as the remaining useful life of such source, provided that the State demonstrates with respect to each such facility (or class of such facilities):
>
> (1) Unreasonable cost of control resulting from plant age, location, or basic process design;
>
> (2) Physical impossibility of installing necessary control equipment; or
>
> (3) Other factors specific to the facility (or class of facilities) that make application of a less stringent standard or final compliance time significantly more reasonable.[123]

[117] 42 U.S.C. §7411(d)(1)(B).

[118] ACE Final Rule, p. 32570.

[119] 40 C.F.R. §60.24(f).

[120] EPA referred to the provision at Title 40, Section 60.24(f), of the *Code of Federal Regulations* as the "variance provision" prior to promulgation of ACE. EPA stated that it will no longer refer to this section or its corollary under the new implementing regulations as the "variance provision." Instead, EPA will refer to these provisions as "remaining useful life and other factors." ACE Final Rule, p. 32570.

[121] 40 C.F.R. §60.24(f). Paragraph c specifies that state plans for health-based pollutants must be as stringent as the emission guideline established by EPA.

[122] ACE Final Rule, p. 32570.

[123] 40 C.F.R. §60.24a(e).

The final rule requires a state that factors remaining useful life or other site-specific considerations into their determination of performance standards to "describe, justify, and quantify how the considerations were made in its plan."[124]

States may also consider factors not listed in Section 60.24a(e), provided the state "adopts a reasonable approach and adequately explains that approach in its submission to the EPA."[125] In describing the codified list of site-specific factors as "nonexclusive," EPA concluded that it is not possible to define "each and every circumstance that states may consider when applying a standard of performance under CAA section 111(d)."[126] EPA provided examples of other site-specific factors that may "influence decisions to invest in technologies to meet a potential performance standard," including "timing considerations like expected life of the source, payback period for investments, the timing of regulatory requirements, and … space or other physical barriers to implementing certain HRIs at specific units."[127] EPA concluded that ultimately "many of these 'other factors' that can affect the application of the BSER candidate technologies distill down to a consideration of cost."[128]

Q: What are the next steps to implement the ACE rule and what is the timeline?

A: States are to develop performance standards for designated facilities—that is, existing, coal-fired EGUs[129]—in their jurisdictions and establish these performance standards through state plans.[130] States will also provide for the implementation and enforcement of the performance standards in the state plans. State plans are due to EPA by July 8, 2022.[131]

EPA is to determine whether a state plan is complete within 60 days of receiving the plan but no later than six months of receipt.[132] Within 12 months of the completeness determination, EPA is to determine whether the plans are "satisfactory" under CAA Section 111(d)(2)(A) and either approve or disapprove the plan or portion of the plan through a notice-and-comment rulemaking.[133] EPA is to promulgate a federal plan if (1) the state fails to submit a plan, (2) EPA determines that the state plan is incomplete, or (3) EPA disapproves the state plan.[134] After determining that any of these circumstances applies, EPA has two years to issue the federal plan.

This schedule for state and federal plans is specified in the implementing regulations for CAA Section 111(d). For discussion about changes to this schedule promulgated in the ACE rule, see

[124] ACE Final Rule, p. 32554.

[125] ACE Final Rule, p. 32571.

[126] 40 C.F.R. §60.24a(e). See also ACE Final Rule, pp. 32553, 32571.

[127] ACE Final Rule, p. 32553.

[128] ACE Final Rule, p. 32553.

[129] For purposes of ACE, EPA defined *designated facility* as a coal-fired electric utility steam generating unit (coal-fired EGU) that commenced construction as of January 8, 2014, exceeds a specified nameplate capacity and base load rating, and burns coal for more than 10% of the average annual heat input during the three previous calendar years. EPA clarified that a "designated facility refers to a single EGU that is affected" by the ACE emission guidelines. ACE Final Rule, p. 32533.

[130] The final rule also requires states in the contiguous United States without any designated facilities to submit a "negative declaration letter" to EPA in lieu of a state plan. 40 C.F.R. §§60.5710a, 60.5800a.

[131] 40 C.F.R. §§60.5710a, 60.5800a.

[132] 40 C.F.R. §60.27a(g).

[133] 40 C.F.R. §60.27a(b). See also ACE Final Rule, p. 32568.

[134] 40 C.F.R. §60.27a(c). See also ACE Final Rule, p. 32568.

"Q: What changes did EPA make to the schedules for submission and review of state plans and federal plans?"

Q: When do existing coal-fired EGUs have to comply with performance standards established by states under the ACE rule?

A: The date that the performance standards go into effect will be determined by each state's plan. As previously noted, states will first need to develop performance standards for each affected unit in their jurisdictions and provide for implementation and enforcement through the state plans. State plans that contain compliance schedules longer than two years from the date of state plan submission to EPA must also include provisions for increments of progress.[135] Prior to the ACE rule, the requirement to include provisions for "increments of progress" applied to plans with compliance schedules longer than 12 months from the date of submission to EPA.[136] EPA updated timing criteria for this requirement to align with the changes it finalized to the schedule of state plan submission and EPA review. For information about these schedule changes, see "Q: What changes did EPA make to the schedules for submission and review of state plans and federal plans?"

Q: What information must a state include in the state plan submission for existing coal-fired units?

A: State plans must establish Section 111(d) performance standards for designated units and provide for their implementation and enforcement.[137] First, to document establishment of performance standards, state plans are to explain how the state applied the BSER to each source and how the state considered other factors, such as remaining useful life, into the determination of the unit-specific standard.[138] State plans "must adequately document and demonstrate the process and underlying data used to establish standards of performance" under the ACE rule so that EPA can "understand and replicate" the state's calculations.[139] In particular, a state plan must identify each EGU within the state's jurisdiction that is subject to the ACE rule along with the emissions and operational data used to establish the performance standard for each unit. A state that considers the remaining useful life of a unit must "specify the exact date by which" the unit will no longer supply electricity to the grid.[140] States that determine that HRI are not feasible at any particular unit must present the basis for that conclusion, including supporting data or metrics.

Second, each state plan must specify how the state will implement and enforce the performance standards so that "EPA can review and identify measures that assure transparent and verifiable implementation."[141] According to EPA, state plans should demonstrate that the performance standards will be "quantifiable, permanent, verifiable, and enforceable."[142]

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[135] EPA regulations define *increments of progress* as "steps to achieve compliance which must be taken by an owner or operator of a designated facility." 40 C.F.R. §60.21a(h). See also ACE Final Rule, p. 32568.

[136] 40 C.F.R. §§60.24(e)(1), 60.21(h).

[137] ACE Final Rule, p. 32558.

[138] EPA, *Fact Sheet: The Affordable Clean Energy Rule*, 2019, https://www.epa.gov/sites/production/files/2019-06/documents/bser_and_eg_fact_sheet_6.18.19_final.pdf.

[139] ACE Final Rule, p. 32558.

[140] A state may revise the state plan if the retirement date changes. ACE Final Rule, p. 32558.

[141] ACE Final Rule, p. 32558.

[142] ACE Final Rule, p. 32559.

Q: How does the ACE rule interact with existing GHG emission reduction programs in the states, such as the Regional Greenhouse Gas Initiative and California's climate policies?

A: Various U.S. states have already required power sector GHG emission reductions. California established a cap-and-trade program that took effect in 2013. California's cap covers multiple GHGs, which account for approximately 85% of California's GHG emissions.[143] In addition to its emissions cap, California has adopted a range of other climate change mitigation policies (e.g., renewable energy portfolio standards).[144]

A coalition of states from the Northeast and Mid-Atlantic regions established the Regional Greenhouse Gas Initiative (RGGI).[145] RGGI is a cap-and-trade system that took effect in 2009 and currently involves 10 states.[146] RGGI applies to CO_2 emissions from electric power plants with capacities to generate 25 megawatts or more. While each state adopts its own regulations implementing RGGI, most have promulgated regulations similar to a model rule.

In addition, Massachusetts has adopted GHG emission requirements beyond its commitment to RGGI.[147] Pursuant to the 2008 Massachusetts Global Warming Solutions Act, the state's Department of Environmental Protection promulgated regulations in 2017 requiring GHG emission reductions from several specific source categories.

Some states raised concerns about how the ACE rule will interact with existing state and local programs. The interaction of the ACE rule and state and local GHG reduction programs has implications for state planning efforts. For example, it may be more efficient for states to rely on existing, non-federal GHG emission reduction programs to fulfill the ACE rule requirements rather than implementing separate state and federal standards for the same emission sources. NACAA observed that the ACE proposal was "silent on this topic" and described it as a "critical and complex issue for many air agencies."[148] NACAA requested EPA to ensure the final ACE rule "does not interfere with existing state and local programs including cap-and-trade programs and state-level GHG reduction goals" and that the ACE rule does not "prevent states from choosing to go further in stringency than the federal standard."[149]

Additional state coalitions provided perspectives on federal-state interactions under the ACE rule. For example, the National Conference of State Legislatures commented that the proposed ACE rule would provide "significant authority and flexibility to states, allowing them to work within an overall framework while taking into account state and regional differences, ensuring sufficient flexibility for each state to determine how to best achieve nationally set goals."[150] Similarly, a

[143] For more details, see the California Air Resources Board, "Cap-and-Trade Program," https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

[144] See California Air Resources Board, "Cap-and-Trade Program."

[145] See CRS Report R41836, *The Regional Greenhouse Gas Initiative: Background, Impacts, and Selected Issues*, by Jonathan L. Ramseur.

[146] Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey (rejoined in 2020), New York, Rhode Island, and Vermont.

[147] For more information, see Massachusetts Department of Environmental Protection, Background Document on Proposed, New and Amended Regulation, 2016, https://www.mass.gov/guides/reducing-ghg-emissions-under-section-3d-of-the-global-warming-solutions-act.

[148] Letter from NACAA to EPA, pp. 4-5.

[149] Letter from NACAA to EPA, pp. 4-5.

[150] The National Conference of State Legislatures (NCSL) represents the legislatures of states, territories, and commonwealths in the United States. Letter from NCSL to EPA, ACE rulemaking docket, EPA-HQ-OAR-2017-0355-

coalition of states commented that the proposed ACE rule affords "the States sufficient flexibility to comply with federal environmental mandates without disrupting the flow of affordable, reliable electricity to their citizens and the nation as a whole."[151]

The final ACE rule does not prohibit states from implementing GHG programs under state authority. It is unclear, though, whether state plans that incorporate RGGI or other non-federal GHG emission reduction programs will meet the ACE rule requirements. First, EPA stated that it does not "prejudge the approvability of a state plan."[152] Second, the agency questioned whether it has statutory authority to approve state plans that include standards more stringent than those that would result from application of the BSER. While EPA found "merit" in some commenters' view that the agency lacks authority to approve state plans establishing more stringent standards, the agency did not specify whether it agrees with this view.[153] Instead, EPA concluded it would consider this question as it evaluates an individual state plan.[154]

EPA asserted that regardless of stringency, the agency lacks statutory authority to approve state plan requirements on entities other than existing, coal-fired EGUs—that is, those units qualifying as designated facilities under the ACE rule. According to EPA, CAA Section 111(d)(1) "clearly contemplates that state plans may only contain requirements for existing sources, and not other entities."[155]

Q: Can states use emission reduction measures outside the "candidate technologies" list to establish the ACE rule's performance standards?

A: States may rely on measures that are not on the candidate technologies list to establish performance standards in their state plans provided that the measures meet EPA's criteria.[156] EPA's criteria are as follows:

> (1) The compliance measures must be capable of being applied to and at the source and (2) compliance measure must be measurable at the source using data, emissions monitoring equipment or other methods to demonstrate compliance, such that they can be easily monitored, reported, and verified at the unit.[157]

CCS is one example of an emission reduction measure excluded from the candidate technologies list that states may use as a compliance measure in state plans. EPA concluded that although CCS is not "broadly applicable to the entire existing coal-fired power plant fleet," it may be a "technically feasible and an economically viable control option … under very specific circumstances."[158] Natural gas co-firing is another example.[159] (For more information about why

23602, October 31, 2018, pp. 1-2, https://www.regulations.gov/.

[151] Letter from the States of West Virginia, Alabama, Arkansas, Georgia, Indiana, Kansas, Kentucky, Louisiana, Michigan, Missouri, Montana, Nebraska, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Utah, Wisconsin, and Wyoming; the Mississippi Department of Environmental Quality; and the Mississippi Public Service Commission to EPA, ACE rulemaking docket, October 31, 2018, EPA-HQ-OAR-2017-0355-24627, pp. 6-9 https://www.regulations.gov/.

[152] ACE Final Rule, p. 32560.

[153] ACE Final Rule, p. 32560.

[154] ACE Final Rule, p. 32560.

[155] ACE Final Rule, p. 32560.

[156] ACE Final Rule, p. 32555.

[157] ACE Final Rule, p. 32555.

[158] ACE Final Rule, pp. 32547-48.

[159] ACE Final Rule, p. 32555.

EPA excluded natural gas co-firing from the BSER, see "Q. Why did EPA exclude natural gas co-firing from the BSER?").

EPA prohibited certain measures from use in state plans as compliance measures based on its conclusion that they do not meet the compliance measure criteria. These measures are biomass co-firing and averaging-and-trading.[160] EPA concluded that biomass co-firing did not meet the criteria because the "biomass firing in and of itself does not reduce emissions of CO_2 emitted from that source. Specifically, when measuring stack emissions, biomass emits more CO_2 per Btu than fossil fuels, thereby increasing the CO_2 emission rate at the source."[161]

The prohibition of averaging-and-trading—either across units at the same plant or between units located at different plants—as a compliance measure in the final rule marks a partial change from proposal. EPA had proposed to allow states to include in their plans "emissions averaging among [affected] EGUs across a single facility" but not between affected and non-affected units or between units at separate facilities.[162] EPA's definition of an individual EGU as a "designated facility" in the final rule led the agency to conclude that it could not allow emissions averaging across EGUs at the same plant. EPA concluded that it lacks authority to allow states to average emissions across multiple "designated facilities," even if such units are located at the same plant.[163] That is, EPA's "determination that individual EGUs are subject to regulation under the ACE rule precludes the Agency from attempting to change the basic unit from an EGU to a combination of EGUs for purposes of the ACE rule implementation."[164]

EPA stated more broadly that "trading is not permissible under CAA section 111." EPA concluded that trading is not consistent with its current interpretation that CAA Section 111 requires a system of emission reduction to "be applied to and at an individual source and would lead to emission reductions from that source." EPA observed that "the nature of trading as a compliance mechanism is such that some sources would not need to apply any pollution control techniques at all in order to comply with a cap-and-trade scheme."[165]

Q. Why did EPA exclude natural gas co-firing from the BSER?

A. EPA excluded natural gas co-firing[166] from the ACE rule BSER based on its conclusion that a BSER based on natural gas co-firing would: (1) cost more than applying the HRI candidate technologies, (2) encourage inefficient use of natural gas, and (3) pose greater costs and

[160] ACE Final Rule, p. 32555.

[161] ACE Final Rule, pp. 32547, 32557-58. Stakeholders disagree about whether particular types of biomass are carbon neutral. EPA is developing a proposed action to establish the treatment of biogenic CO_2 emissions from the use of certain biomass feedstocks at stationary sources under various CAA programs. See OMB, Semiannual Regulatory Agenda, EPA, RIN 2060-AU03, Fall 2019, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201910&RIN=2060-AU03; OMB, Semiannual Regulatory Agenda, EPA, RIN 2060-AU03, Spring 2020, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202004&RIN=2060-AU03. A discussion of this topic is beyond the scope of this report. For more information about biomass, see CRS Report R41603, *Is Biopower Carbon Neutral?*, by Kelsi Bracmort.

[162] ACE Proposal, p. 44767.

[163] ACE Final Rule, pp. 32556-7.

[164] ACE Final Rule, p. 32556.

[165] ACE Final Rule, p. 32557.

[166] According to EPA in the ACE rule, natural gas co-firing refers to the period when coal-fired utility boilers use natural gas for startup operations, for maintaining the unit in "warm standby," or for nitrogen oxide control (either directly as a combustion fuel or in configuration referred to as natural gas reburn). ACE Final Rule, p. 32544.

challenges for units that currently have limited or no access to natural gas.[167] Among other things, EPA analyzed fuel use data from the EIA. EPA concluded that while "nearly 35 percent of coal-fired units" co-fired with natural gas in 2017, few of the units co-fired natural gas in an amount greater than 5% of the total annual heat input, suggesting to EPA that most of the natural gas was used as a secondary fuel for unit startup or to maintain the unit in "warm standby" rather than as a primary fuel to generate electricity.[168] While EPA excluded natural gas co-firing from the BSER, the agency also noted that states may use natural gas co-firing as a compliance measure in state plans.[169] For more information about use of non-BSER measures for compliance, see "Q: Can states use emission reduction measures outside the "candidate technologies" list to establish the ACE rule's performance standards?"

Stakeholder views regarding BSER and natural gas co-firing varied. Some stakeholders commented that natural gas co-firing should not be part of the BSER under the ACE rule because, for example, natural gas co-firing is not sufficiently cost-effective, there may not be a reliable supply of gas to co-fire, or it could negatively affect the unit's heat rate.[170] Other stakeholders disagreed and recommended natural gas co-firing as the BSER, based partly on analysis of the same fuel use data from EIA. According to EPA, these stakeholders concluded that natural gas co-firing at coal plants is "technically feasible, readily available, achieves significant emission reductions, and may be the most cost-effective option for some facilities."[171] One stakeholder estimated that "a highly cautious approach to increasing natural gas co-firing would more than double the emissions reductions under ACE" and observed that the costs of co-firing are comparable to the costs of heat rate improvements.[172]

Q: Why didn't EPA establish a BSER for other fossil-fuel-fired units?

A: EPA determined that it lacks "adequate information" to establish a BSER for other types of existing fossil-fuel-fired units, such as IGCC units and natural-gas-fired power plants.[173] (Natural-gas-fired power plants, such as NGCC units, are also referred to as stationary combustion turbines.[174]) EPA reported that it "is still evaluating the data for EGUs not covered by the ACE

[167] ACE Final Rule, p. 32545.

[168] ACE Final Rule, p. 32543.

[169] ACE Final Rule, p. 32555.

[170] EPA, *EPA's Responses to Public Comments on the EPA's Proposed Emission Guidelines for Greenhouse Gas Emissions From Existing Electric Utility Generating Units*, June 2019, https://www.regulations.gov (Document ID EPA-HQ-OAR-2017-0355-26741, hereinafter "ACE RTC"). See chap. 4, p. 7.

[171] Some stakeholders also recommended that EPA include natural gas co-firing on the list of HRI candidate technologies. ACE Final Rule, p. 32544.

[172] See Resources for the Future, *10 Big Little Flaws in EPA's Affordable Clean Energy Rule*, July 2019, pp. 4-5, https://www.rff.org/documents/2138/IB_19-05_Burtraw_Keyes_4.pdf; and Resources for the Future, *Letter to EPA Docket*, EPA-HQ-OAR-2017-0355-25898, October 31, 2018, p. 24, https://www.regulations.gov.

[173] ACE Final Rule, p. 32533. IGCC technology uses a gasifier to turn a feedstock—for example, coal or other carbon-based feedstock—into pressurized gas, which then fuels a combined cycle turbine to generate electricity. According to the National Energy Technology Laboratory, coal is the most commonly used feedstock in IGCC operations. See National Energy Technology Laboratory, "Commercial Power Production Based on Gasification," https://www.netl.doe.gov/research/Coal/energy-systems/gasification/gasifipedia/igcc. The ACE final rule defines *IGCC* as "a combined cycle facility that it designed to burn fuels containing 50 percent (by heat input) or more solid-derived fuel not meeting the definition of natural gas plus any integrated equipment that provides electricity or useful thermal output to either the affected facility or auxiliary equipment." 40 C.F.R. §60.5805a.

[174] Stationary combustion turbines that are used to generate electricity are generally fueled by natural gas. The ACE final rule defines *simple cycle* and *combined cycle units* as stationary combustion turbines. It defines *stationary combustion turbine* as the equipment "that provides electricity or useful thermal output to the combustion turbine

rule," noting that "only a handful" of IGCC units are in operation.[175] EPA stated that it "may issue emission guidelines" for stationary combustion turbines at a later date.[176]

Comment letters revealed support for and opposition to EPA's decision not to identify a BSER for stationary combustion turbines in the ACE rule. According to EPA, some commenters observed that "natural gas-fired stationary combustion turbines are already highly efficient" and concluded, among other things, that "available emission reductions at natural gas-fired stationary combustion turbines would likely be expensive or would likely provide only small overall reductions."[177] Other commenters disagreed with EPA's decision and, according to EPA, these commenters stated that because EPA issued regulations under Section 111(b) for new natural-gas-fired turbines (including both simple cycle and combined cycle natural gas units), EPA is required under Section 111(d) to issue emission guidelines for the same category of existing natural gas units.[178] Commenters that favored setting a BSER for stationary combustion turbines further recommended that EPA consider various technology options, including HRI, natural gas co-firing, CCS, and generation shifting.[179]

Commenters likewise expressed varying opinions regarding EPA's conclusion that it lacks "adequate information" to determine the BSER for existing stationary combustion turbines. According to EPA, some commenters who supported EPA's determination cited a "lack of information currently in the record."[180] For example, commenters stated that the cost is rarely reported for "hot gas path upgrades," which they described as a "key action to improve gas turbine performance" but with "limited applicability."[181] Other commenters, though, pointed to information contained in rulemaking records—for example, public comments and analyses developed through the 2015 rulemakings for new and modified EGUs and the CPP—and asserted that EPA has not explained why the available information is "insufficient for the EPA to include HRI technologies at gas-fired plants in the BSER."[182] Commenters noted, according to EPA, that the agency's decision not to establish a BSER in the ACE rule "is not based on a reasoned rejection of the evidence or any thoughtful conclusion that the described emission reduction opportunities are not adequately demonstrated."[183]

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engine, heat recovery system or auxiliary equipment." For the complete definitions, including the types of equipment specified, see 40 C.F.R. §60. 5805a.

[175] ACE RTC, see chap. 2, p. 12.

[176] ACE RTC, see chap. 2, p. 27.

[177] ACE RTC, see chap. 2, p. 23. Others suggest that older combustion turbines may not be as efficient as NGCC units. See, for example, Darrell Proctor, "Efficiency Improvements Mark Advances in Gas Turbines," *Power Magazine*, January 3, 2018, https://www.powermag.com/efficiency-improvements-mark-advances-in-gas-turbines/; and S. C. Bhatia, "Cogeneration," in *Advanced Renewable Energy Systems* (New Delhi, India: Woodhead Publishing India, 2014), pp. 490-508.

[178] Commenters stated that the GHG endangerment finding and the 2015 promulgation of CO_2 performance standards under CAA Section 111(b) for new and modified fossil-fuel-fired EGUs requires EPA to issue emission standards for existing stationary combustion turbines and IGCC units. ACE RTC, see chap. 2, p. 12.

[179] ACE RTC, see chap. 2, pp. 13-21. EPA stated that "because basing BSER on generation shifting is precluded by CAA section 111, the Agency is repealing the CPP and cannot consider generation shifting as part of the BSER in any future action" (ACE RTC, chap. 2, p. 20). For more information about EPA's interpretation of CAA Section 111, see "Repeal of the Clean Power Plan."

[180] According to EPA, "Commenters stated that the Agency should not set a BSER for NGCCs given the lack of information currently in the record." ACE RTC, see chap. 2, p. 13.

[181] ACE RTC, see chap. 2, p. 12.

[182] ACE RTC, see chap. 2, p. 14.

[183] ACE RTC, see chap. 2, p. 14.

Litigation Challenging the CPP Repeal and the ACE Rule

Q: Who is challenging the CPP Repeal, the ACE rule, and the revised implementing regulations?

A: The American Lung Association and the American Public Health Association were the first parties to file a petition for review of the CPP repeal, ACE rule, and revised implementing regulations (the "rules") in the D.C. Circuit on the day the rules were published in the *Federal Register*, July 8, 2019.[184] Soon after, 22 states, the District of Columbia, and seven municipalities filed petitions for review.[185] The State of Nevada has intervened in support of the petitioning states and municipalities, raising the number of states challenging the rules to 23 states.[186] See **Figure 4** for states involved in the litigation. As identified in litigation documents,[187] other petitioners challenging the rules include 11 environmental organizations,[188] several energy trade associations,[189] six power companies, and an association of power companies.[190] Many of the petitioners challenging the rules intervened in support of EPA in the litigation challenging the CPP.[191] Collectively, the court refers to this group of petitioners as the "Coordinating Petitioners."[192] Various stakeholders have submitted briefs as amici curiae in support of these petitioners.[193] Several Members of Congress filed amici curiae briefs opposing the CPP repeal and ACE rule.[194]

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[184] *See* Petition for Review, Am. Lung Ass'n v. EPA, No. 19-1140 (D.C. Cir. July 8, 2019).

[185] *See* Petition for Review, New York v. EPA, No. 19-1165 (D.C. Cir. Aug. 13, 2019) (California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, Washington, Wisconsin, the District of Columbia, City of Boulder, City of Chicago, City of Los Angeles, City of New York, City of Philadelphia, and City of South Miami). The City and County of Denver filed a separate petition for review. City and County of Denver, Colorado v. EPA, No. 19-1777 (D.C. Cir. Sept. 4, 2019).

[186] The State of Nevada voluntarily withdrew its petition for review and intervened in support of the other petitioning states and municipalities. *See* Orders, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Nov. 18-19, 2019) (granting motion to voluntarily dismiss Nevada's petition for review, No. 19-1189; granting motion to intervene in support of the state and municipalities petitioners).

[187] Unopposed Motion of Coordinating Petitioners for Extension and Modification of Briefing Schedule, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Mar. 19, 2020).

[188] *See* Petition for Review, Appalachian Mountain Club v. EPA, No. 19-1166 (D.C. Cir. Aug. 14, 2019); Chesapeake Bay Foundation, Inc. v. EPA, No. 19-1173 (D.C. Cir. Aug. 29, 2019);

[189] *See* Petition for Review, Am. Wind Energy Ass'n, and Solar Energy Industries Ass'n v. EPA, No. 19-1173 (D.C. Cir. Sept. 6, 2019); Petition for Review, Biogenic CO2 Coalition v. EPA, No. 19-1185 (D.C. Cir. Sept. 5, 2019); Advanced Energy Economy v. EPA, No. 19-1186 (D.C. Cir. Sept. 6, 2019).

[190] Consolidated Edison, Inc. v. EPA, No. 19-1188 (D.C. Cir. Sept. 6, 2019).

[191] See CRS Report R44480, *Clean Power Plan: Legal Background and Pending Litigation in West Virginia v. EPA*, by Linda Tsang for discussion of parties involved in the CPP litigation.

[192] Order, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Mar. 23, 2020).

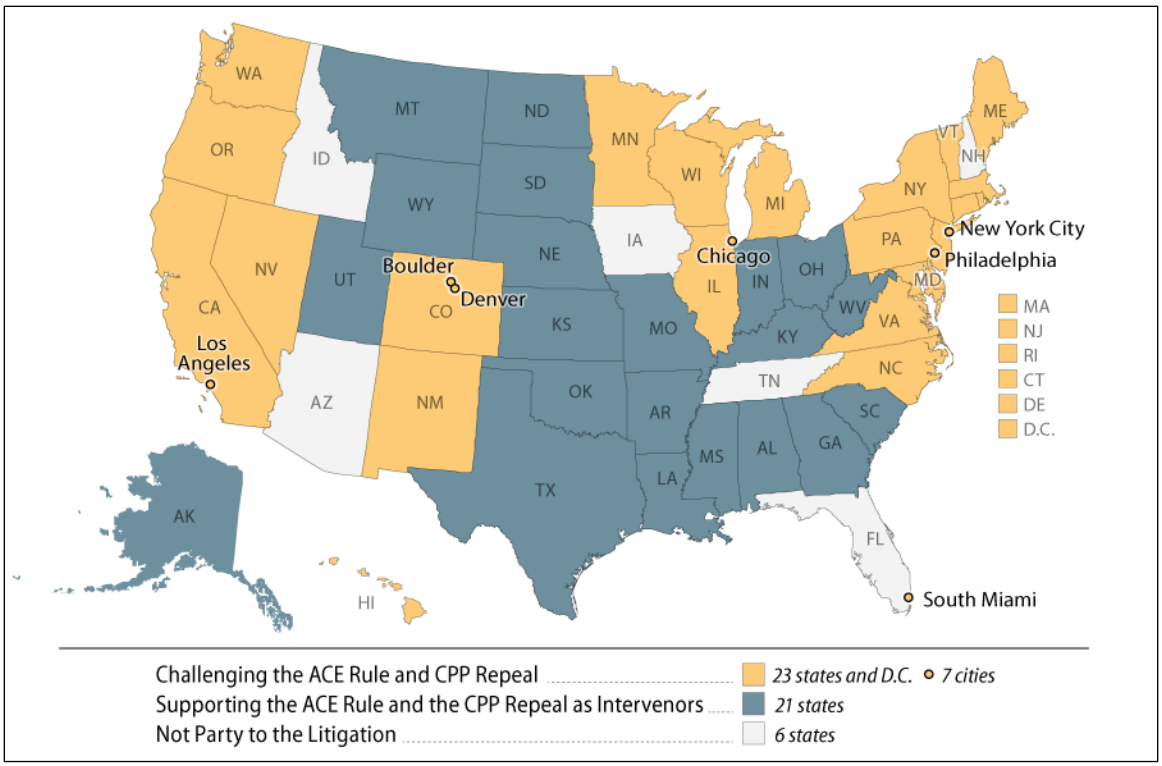
[193] *See*, *e.g.*, State and Muni. Petitioners' Opening Brief at v-vi, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (listing amici curiae that notified the court that they would submit briefs in support of the Coordinating Petitioners).

[194] *See* Brief for Members of Congress as *Amici Curiae* in Support of Petitioners, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 24, 2020) (opposing the CPP repeal); Brief for U.S. Senators Sheldon Whitehouse, Jeff Merkley, Kirsten Gillibrand, Brian Schatz, and Edward J. Markey as *Amici Curiae* in Supporting the State and Muni. Petitioners,

Several coal and mining companies and industry groups are challenging EPA's underlying authority to issue the ACE rule under CAA Section 111(d).[195] And the Biogenic CO_2 Coalition is petitioning EPA's refusal to recognize biogenic CO_2 emission from biomass fuel as carbon neutral or exempt from regulation under the ACE rule.[196] Under CAA Section 307(b), the deadline for filing a petition for review of the rules with the D.C. Circuit was September 6, 2019.[197] The court has consolidated all the petitions into one lead case, *American Lung Association v. EPA*.[198]

Figure 4. States and Municipalities Participating in the ACE Rule and CPP Repeal Litigation

Consolidated Petitions: American Lung Ass'n v. EPA, No. 19-1140 (D.C. Circuit)



Source: Prepared by CRS from litigation filing in *American Lung Ass'n v. EPA*, No. 19-1140 (D.C. Cir.).

Note: The map also includes the petitioner, District of Columbia.

Pub. Health and Envtl. Petitioners, Power Co. Petitioners, and Clean Energy Trade Ass'n. Petitioners, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 24, 2020) (opposing the ACE rule).

[195] *See* Petition for Review, Westmoreland Mining Holdings LLC v. EPA, No. 1176 (D.C. Cir. Sept. 5, 2019); Petition for Review, North Am. Coal Corp. v. EPA, No. 19-1179 (D.C. Cir. Sept. 5, 2019); Robinson Enterprises, Inc. v. EPA, No. 19-1175 (D.C. Cir. Sept. 6, 2019).

[196] *See* Petition for Review, Biogenic CO2 Coalition v. EPA, No. 19-1185 (D.C. Cir. Sept. 5, 2019).

[197] 42 U.S.C. §7607(b).

[198] Clerk's Order, Am. Lung Ass'n v. EPA, No. 19-1140 (D.C. Cir. Sept. 2019) (issuing various orders consolidating petitions through September 11, 2019).

Q: Who are the respondents and intervenors in support of the rules?

A: Respondents in the litigation are EPA and its Administrator (as of July 2020), Andrew Wheeler, in his official capacity.[199] Parties that have intervened in support of respondents include 21states.[200] See **Figure 4**. In total, 44 states, seven cities, and the District of Columbia are participating in the litigation.[201]

Other parties intervening in support of the EPA include three labor unions, a public utility commission, a number of rural electric cooperatives and an association representing them, several industry and trade groups, and more than a dozen fossil-fuel-related companies and local electric utilities.[202] The National Association of Home Builders has submitted an amicus curiae brief in support of the respondents.[203]

Petitioning states, municipalities, and public health and environmental organizations have intervened on behalf of EPA to defend the agency's underlying CAA authority to issue the ACE rule and oppose a regulatory exemption or relaxation of emission standards for biogenic CO_2 emissions.[204]

Q: What are the main legal issues in the litigation?

A: Petitioners challenge various aspects of the CPP repeal and the ACE rule as "arbitrary, capricious and not in accordance with law."[205] Under CAA Section 307(d), a court may reverse an

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[199] *See* Joint Proposal on Briefing Schedule and Format by EPA and Other Parties, No. 19-1140 (D.C. Cir. Dec. 18, 2019). The Department of Justice represents the respondents.

[200] *See* Order, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Nov. 18, 2019) (granting motions to intervene by Alabama, Alaska, Arkansas, Georgia, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Utah, West Virginia, Wyoming). The State of West Virginia led a coalition of 20 states, not including North Dakota, to intervene in support of the ACE rule and CPP repeal. Motion of West Virginia and 20 States, State Officers, and State Agencies to Intervene as Respondents, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Sept. 12, 2019). The State of North Dakota intervened separately. North Dakota's Motion to Intervene, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Sept. 6, 2019).

[201] The six states not participating in the litigation at this time are Arizona, Florida, Idaho, Iowa, New Hampshire, and Tennessee. Of these six states, Idaho is the only state that does not have any affected EGUs under the ACE rule. ACE Final Rule, p. 32573.

[202] Orders, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Sept. 11, 2019, Nov. 18, 2019) (granting motions to intervene by various industry groups and associations and power companies).

[203] Brief of Amicus Curiae National Association of Home Builders in Support of Respondents, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. June 23, 2020).

[204] Order, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Nov. 18, 2019) (granting motions to intervene by various industry groups and associations and power companies). *See* Initial Brief for Pub. Health and Envtl. Respondent-Interverors at 20, Am. Lung Ass'n. v. EPA, No. 19-1140 (July 16, 2020) (arguing that "neither science nor law supports Biogenic Petitioner's claims that biomass combustion is categorically carbon neutral, or that EPA lacks authority to regulate biogenic emissions.") (hereinafter *Public Health and Env'tl Intervernors' Br.*).

[205] *See, e.g.*, State and Muni. Petitioners' Opening Brief at 22, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *States and Muni. Pet'rs Br.*) Although several petitioners also challenged EPA's revised Section 111 implementing regulations in their petitions for review and statement of the issues, these petitioners did not set forth their legal arguments related to the revised implementing regulations in their briefs. *See, e.g.*, State and Muni. Nonbinding Statement of Issues at 6, New York v. EPA, No. 19-1165 (consolidated with No. 19-1140) (D.C. Cir Oct. 7, 2019); Public Health and Env'tl Petitioners' Joint Nonbinding Statement of Issues at 8, Am. Lung Ass'n. v. EPA, Nos. 1140, 1166 (D.C. Cir. Oct. 7, 2019); Petitioner's Nonbinding Statement of Issues at 8, Chesapeake Bay Found., Inc. v. EPA, (D.C. Cir. Oct. 7, 2019). In general, petitioners forfeit a legal argument if they fail to raise that argument in their brief. *See* Petit v. Dep't of Educ., 675 F.3d 769, 779 (D.C. Cir. 2012) (ruling appellants waived a legal claim that was not raised in their opening brief); New York v. EPA, 413 F.3d 3, 20 (2005) ("That [legal] argument was not made by industry petitioners in their opening brief and is therefore waived.").

agency action that the court finds to be, among other things, "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law" or "without observance of procedure required by law."[206] This section highlights some of the petitioners' legal arguments presented in their opening briefs but does not provide a comprehensive preview of the petitioners' legal issues presented to the court for or against the rules.[207]

Various legal issues raised in the litigation challenging the CPP repeal and the ACE rule, including the scope of EPA's authority and its interpretation of the BSER under CAA Section 111, were central to the legal challenges to the CPP. For example, Coordinating Petitioners argue that the CPP repeal and ACE rule are unlawful because EPA interpreted CAA Section 111 as unambiguously limiting the BSER to measures that can be installed and implemented at each individual existing coal-fired EGU.[208] In the CPP, EPA asserted that the "system" in the BSER reflected the "overall source category" of fossil-fuel-fired EGUs, taking into account the "unique characteristics of CO_2 pollution and the unique, interconnected and interdependent manner in which affected EGUs and other generating sources operate within the electricity sector."[209]

In contrast, in the CPP repeal and the ACE rule, EPA reasons that the CPP "beyond-the-source" approach "ignored or misinterpreted" the plain text of the CAA that "clearly precluded the unsupportable reading" of Section 111 used in the CPP to choose emission reduction measures that are not directly applied to the regulated EGU.[210] In its brief, EPA further argues that the CPP adopted an "impermissibly broad view of EPA's authority" that "cannot be correct" because, among other reasons, Congress provided no "clear statement" delegating such broad authority to EPA.[211] Intervening state and industry groups support EPA's arguments and further assert that the CPP repeal must be upheld to avoid "displac[ing] traditional state authority over energy generation" and "the serious constitutional question of whether Congress can delegate those fundamental policy decisions to EPA."[212]

EPA's interpretation of the scope of its authority to consider various emission reduction measures in determining the BSER was a divisive issue among the parties in the CPP litigation.[213]

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[206] 42 U.S.C. §7607(d)(9).

[207] *See States and Muni. Pet'rs Br.*; Initial Opening Brief of Public Health & Envtl. Petitioners, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *Public Health and Env'tl Pet'rs Br.*); Opening Brief of Petitioners American Wind Energy Ass'n, Advanced Energy Economy, & Solar Energy Ind. Ass'n, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *AWEA Br.*); Opening Brief of Petitioners Consolidated Edison, Inc., Exelon Corp., Nat'l Grid USA, N.Y. Power Auth., Power Cos. Climate Coal., Pub. Serv. Enterprise Grp. Inc., & Sacramento Muni. Util. Dist., Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *Consol. Edison Br.*); Initial Brief for Petitioner Biogenic CO2 Coalition, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *Biogenic CO2 Br.*); Brief of Petitioner Robinson Enter., Inc. et al., Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 17, 2020) (hereinafter *Robinson Br.*); Coal Industry Petitioners Opening Brief, Westmoreland Mining Holdings LLC & N. Am. Coal Corp. v. EPA, Nos. 19-1176 & No. 1179, (and consolidated cases) (D.C. Cir. Apr. 17, 2020) (hereinafter *Coal Indus. Br.*). This report does not address the legal issues that amici curiae have raised in their briefs in support of the Coordinating Petitioners.

[208] *See, e.g., States and Muni. Pet'rs Br. at 23-26; Public Health and Env'tl Pet'rs Br. at* 15-19*; AWEA Br. at* 5-14*; Consol. Edison Br. at* 8-17.

[209] CPP Rule, p. 64726.

[210] CPP Repeal, p. 32527.

[211] Proof Brief for the U.S. EPA, and EPA Admin. Andrew Wheeler at 50, 97-108, Am. Lung Ass'n. v. EPA, No. 19-1140 (June 16, 2020) (hereinafter *EPA Brief*).

[212] Proof Brief for State and Industry Intervenors for Respondent in Support of the Clean Power Plan Repeal at 3-4, Am. Lung Ass'n. v. EPA, No. 19-1140 (July 16, 2020).

[213] *See* CRS Report R44480, *Clean Power Plan: Legal Background and Pending Litigation in West Virginia v. EPA*, by

Coordinating Petitioners are also challenging EPA's selection of HRI as the BSER in the ACE rule. Coordinating Petitioners argue that EPA (1) unreasonably limited the BSER to heat rate improvements and (2) "arbitrarily dismissed" measures such as generation-shifting from fossil resources to lower- or zero emission resources, using carbon capture, and reducing use of high-emitting sources when determining the BSER.[214] Because EPA rejected these measures from the BSER determination, Coordinating Petitioners allege that the BSER fails to reduce adequately CO_2 emissions from existing EGUs.[215] In its brief, EPA maintains that the "only systems available across the fleet, at reasonable cost, were the suite of heat rate improvement methods EPA selected as the BSER" and that its BSER determination is "rational and supported by the record."[216] Intervening state and industry groups support EPA's BSER determination and further argue that the ACE rule "correctly reflects that BSER targets improvements to a source's emissions *performance*, not a reduction in total emissions from a source or source category."[217]

Coordinating Petitioners also challenge the limits and responsibilities the ACE rule places on the states. For example, they argue that EPA erroneously limited (1) the compliance measures that states may include in their state plans and (2) the state's ability to include emission standards that are more stringent than the BSER.[218] Certain petitioners assert that restricting the states' ability to adopt standards more stringent than the BSER is inconsistent with CAA Section 116,[219] which provides that nothing in the CAA denies the states the right "to adopt or enforce (1) any standard or limitation respecting emissions of air pollutants or (2) any requirement respecting control or abatement of air pollution" so long as such standard, limitation, or control is at least as stringent as one "in effect under an applicable implementation plan or under section 7411" of the act.[220] In response, EPA argues that the petitioners' claims that the ACE rule restricts state implementation options are unripe for judicial review because EPA has not taken final agency action on a state plan (i.e., approve or disapprove a state plan).[221]

Further, petitioners allege that EPA failed to set CO_2 emission limits for existing gas-fired power plants in the ACE rule as required by CAA Section 111(d).[222] The scope of sources covered under Section 111(d) includes "any existing source" that would be subject to NSPSs under Section 111(b) if it was newly constructed.[223] Because EPA has issued NSPSs under CAA Section 111(b) for new natural-gas-fired turbines (including both simple cycle and combined cycle natural gas units), petitioners assert that EPA is required under Section 111(d) to issue emission guidelines for

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Linda Tsang.

[214] *See, e.g., AWEA Br. at* 5-9*; Consol. Edison Br. at* 17-23; *Consol. Edison Br. at* 17-23*; Public Health and Env'tl Pet'rs Br. at* 31-40.

[215] *See, e.g., States and Muni. Pet'rs Br*. at 58-61; *Public Health and Env'tl Pet'rs Br.* at 27-41; *AWEA Br*. at 10-14*; Consol. Edison Br.* at 17-23. Petitioners also allege that EPA has not reasonably explained its change in position that the "rebound effect," in which emission reductions from improved efficiency at coal-fired plants are offset by emission increases if those plants increase their operations. *Public Health and Env'tl Pet'rs Br.* at 28-31.

[216] *EPA Brief* at 51-52.

[217] Proof Brief for State and Industry Intervenors for Respondent Regarding ACE Rule at 3, Am. Lung Ass'n. v. EPA, No. 19-1140 (July 16, 2020).

[218] *See, e.g., States and Muni. Pet'rs Br*. at 66-67*; Consol. Edison Br.* at 23-31. In addition, the Biogenic CO2 Coalition claims that EPA erred in disqualifying biomass co-firing as a compliance measure for regulated facilities to meet emissions limits under the ACE rule. *See Biogenic CO2 Br.* at 7-33.

[219] *See id*.

[220] 42 U.S.C. § 7416.

[221] *EPA Brief* at 243-44.

[222] *See, e.g., States and Muni. Pet'rs Br.* at 27-28, 69-70; *Public Health and Env'tl Pet'rs Br.* at 40-44.

[223] 42 U.S.C. §b7411(d)(1).

the same category of existing natural gas units.[224] In its brief, EPA asserts that Section 111(d) does not impose a mandatory duty or deadline to promulgate regulations for "any existing source."[225] For further discussion of this issue, see "Q: Why didn't EPA establish a BSER for other fossil-fuel-fired units?"

Petitioning coal and mining companies and industry groups are challenging EPA's underlying authority to issue the ACE rule under CAA Section 111(d), echoing issues raised in the CPP litigation.[226] These petitioners claim that EPA failed to make the required endangerment finding under CAA Section 111 and that EPA can rely on neither previous endangerment findings made in the 1970s related to SO_2, nitrogen dioxide, and particulate matter emissions from steam generators and combustion turbines nor the endangerment finding made in 2009 in the context of GHG emission from motor vehicles.[227] They also argue that Section 111(d) bars EPA from regulating CO_2 emissions from power plants in any manner because power plants are a source category regulated under Section 112 for mercury and other HAPs.[228]

In its response, EPA argues that an endangerment finding is required only when EPA seeks to regulate *new* sources under Section 111(b) and that Section 111(d) does not require EPA to make a separate endangerment finding when regulating *existing* sources.[229] Intervening states, municipalities, and public health and environmental organizations reiterate the agency's argument.[230] These groups further assert that EPA made an endangerment finding in its 2015 GHG performance standards for new and modified power plants, which concluded that power plant CO_2 emissions harm public health and welfare and that power plants significantly contribute to atmospheric CO_2.[231]

Similar to the CPP litigation, the coal and mining industry petitioners are challenging EPA's interpretations of the different House and Senate versions of Section 111's reference to Section 112 exclusion in the 1990 CAA amendments.[232] In 1990, Congress replaced and removed the former HAP listing process in Section 112(b)(1)(A) with a list of nearly 200 HAPs set forth in Section 112(b).[233] In doing so, Section 111(d)'s cross-reference to the deleted Section 112(b)(1)(A) became obsolete. Both the House and the Senate offered different amendments to address the Section 112 cross-reference that were both passed and signed into law.[234] The provisions amended Section 111(d)(1)(A)(i), which excludes from regulation any air pollutant that is included on:

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[224] *See, e.g., Public Health and Env'tl Pet'rs Br.* at 40-43.

[225] *EPA Brief* at 158-61.

[226] *See generally Robinson Br.; Coal Indus. Br.*

[227] *See, e.g., Robinson Br.* at 20*; Coal Indus. Br.* at 7-19.

[228] *See, e.g., Coal Indus. Br*. at 20-35.

[229] *EPA Brief* at 163-68.

[230] Page-proof Brief for State and Municipal Respondent-Intervenors at 12-24, Am. Lung Ass'n. v. EPA, No. 19-1140 (July 16, 2020); (hereinafter *State and Muni. Intervenors' Br.*); *Public Health and Env'tl Intervenors' Br* at 19.

[231] *See Public Health and Env'tl Intervenors' Br.* at 18-19 (citing 80 *Federal Register* 64,510, 64,517-24 (Oct. 23, 2015)); *State and Muni. Intervenors' Br.* at 19-24.

[232] *See* Section 112 Exclusion discussion in CRS Report R44480, *Clean Power Plan: Legal Background and Pending Litigation in West Virginia v. EPA*, by Linda Tsang. *See also Coal Indus. Br*. at 20-35.

[233] 42 U.S.C. §7412(b).

[234] P.L. 101-549, §§108(g), 302(a) (1990).

House-originated amendment	"a list published under section [1]08(a) or *emitted from a source category which is regulated under section [1]12 of this title*"[235]
Senate-originated amendment	"a list published under section [1]08(a) *or [1]12(b)*"[236]

Industry petitioners assert that the House-originated amendment as published in the *U.S. Code* superseded the Senate's "superfluous scrivener's amendment."[237] Based on the House-originated provision, they argue that EPA is barred from regulating power plants under Section 111(d) for CO_2 because power plants are a source category regulated under Section 112 for mercury and other HAPs.[238] In both the CPP and the ACE rule, EPA maintains that the Section 112 exclusion in Section 111(d) "does not bar the regulation of GHGs from power plants notwithstanding that power plants are regulated for HAP under section 112."[239] The court did not resolve this issue in the CPP litigation because it dismissed the case as moot after EPA finalized the CPP repeal and ACE rule.[240]

Other petitioners representing some industries, trade associations, and think tanks claim that EPA cannot use its authority under CAA Section 111 to regulate GHGs.[241] These petitioners assert that EPA must establish NAAQS under CAA Sections 108-110 for air pollutants in the "ambient air" emitted from "numerous or diverse" sources that "endanger" human health or welfare.[242] Because CO_2 in the ambient air is emitted by numerous or diverse sources, petitioners claim that EPA "impermissibly circumvented" the NAAQS procedures by regulating CO_2 emissions under Section 111 without first establishing a NAAQS for CO_2.[243] In the petitioners' view, EPA may establish emission standards under Section 111 only to supplement an established NAAQS.[244] In its brief, EPA contends that it does not have a mandatory obligation to regulate GHGs under the NAAQS program and is not "bound" to regulate CO_2 emissions in a particular manner or order that the petitioners prefer.[245]

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[235] P.L. 101-549, §108(g), 104 Stat. 2399, 2467 (1990), codified at 42 U.S.C. §7411(d)(1)(A)(i) (emphasis added). The House-originated provision appears in both the U.S. Code and the Statutes at Large. Note that CO_2 also is not listed as a criteria pollutant under CAA Section 108(a).

[236] P.L. 101-549, §302(a), 104 Stat. 2399, 2574 (1990) (emphasis added). The Senate-originated provision is included in the Statutes at Large but not the *U.S. Code*. EPA has regulated HAPs from power plants under CAA Section 112 as part of its mercury and air toxics standards. For the status of these standards, see CRS In Focus IF11078, *EPA Reconsiders Benefits of Mercury and Air Toxics Limits*, by Kate C. Shouse.

[237] *See, e.g., Coal Indus. Br*. at 20-35.

[238] *See Coal Indus. Br*. at 20-35 (challenging the ACE rule). *See also* Opening Br. of Petitioners' on Core Legal Issues Pet'rs Br. Core Legal Issues at 61-74, West Virginia v. EPA, No. 15-1363 (D.C. Cir. February 19, 2016). Note that CO_2 is not listed as a criteria pollutant under a NAAQS under CAA Section 108(a).

[239] *See* EPA, Response to Comments, ACE rule, Chapter 1, Legal Authority, at 10-19 (referencing the preamble to the CPP for the basis of EPA's position on this issue, 80 *Federal Register* 64662, 64710-64715 (Oct. 23, 2015)). *See also EPA Brief* at 50-51, 172-90.

[240] Order, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Sept. 17, 2019).

[241] *Robinson Br*. at 8-20.

[242] 42 U.S.C. §§7408-7410.

[243] *Robinson Br*. at 11.

[244] *Id.* at 8-20.

[245] *EPA Brief* at 193-97.

Q: What is the status of the litigation?

A: On March 23, 2020, the D.C. Circuit issued a revised briefing schedule for the parties.[246] All parties must submit their final briefs by August 13, 2020.[247] The court has scheduled the oral argument for October 8, 2020.

EPA's Updated Analysis of the CPP Repeal and the ACE Rule: Emission Impacts, Benefits, and Costs

Q: How did EPA estimate the emission impacts of the final rules repealing the CPP and promulgating the ACE rule?

A: EPA conducted power sector modeling to estimate emission changes under different scenarios. Given EPA's treatment of the CPP repeal and the ACE rule as "separate and distinct" final actions,[248] the agency analyzed the emission impacts from each rulemaking separately. The sequence of these two final rulemakings had implications for the baseline scenario used to estimate each policy scenario's incremental emission impacts.

To analyze the first final rule—the repeal of the CPP—EPA modeled three scenarios of CPP implementation and compared those emissions projections to a baseline or "reference" scenario that excluded standards of performance under CAA Section 111(d) for CO_2 emissions. The reference scenario represents "business-as-usual" conditions that "would be expected under the market and regulatory conditions in the electricity and related sectors in the absence" of the rule.[249] This comparison allowed EPA to estimate the impacts from repealing, and not replacing, the CPP. The reference and CPP implementation scenarios are as follows:

- **Reference case:** This is a baseline scenario. EPA assumes business-as-usual market and regulatory conditions in the power sector based on, among other things, projections from the EIA's *Annual Energy Outlook 2019*.
- **CPP with intrastate trading:**[250] This scenario assumes that states begin to implement the 2015 CPP final rule in 2022 by utilizing a mass-based approach with intrastate trading only. This and the two other CPP scenarios below assume no incremental demand-side energy efficiency investments and no requirements for states to address emissions from new sources.
- **CPP with regional trading and three-year delay:** This scenario assumes that states begin to implement the CPP in 2025 by utilizing a mass-based approach and regional trading. EPA assumes a three-year CPP compliance delay due to the rule's uncertain legal status in the court system, with final goals in 2033 instead

[246] Order, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Mar. 23, 2020).

[247] *Id.*

[248] EPA, *Regulatory Impact Analysis for the Repeal of the Clean Power Plan, and the Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units*, June 2019, pp. 1-2, 2-1, https://www.epa.gov/stationary-sources-air-pollution/regulatory-impact-analysis-repeal-clean-power-plan-and-emission (hereinafter "Final RIA").

[249] Final RIA, p. 3-4.

[250] EPA refers to this scenario as "CPP with Limited Trading" in the Final RIA. See p. 2-36.

of 2030. Regional trading involves six regions based on existing electricity interconnections and regional trading systems (e.g., RGGI).

- **CPP with national trading and three-year delay**: This scenario is the same as the "CPP with regional trading and three-year delay" scenario except that (1) it assumes national trading instead of regional trading, and (2) EPA excludes California and the RGGI states from the national trading in this scenario, as these states have more stringent reduction requirements.

To analyze implementation of the second final rule—the ACE rule—EPA compared projected emissions from an illustrative ACE rule implementation scenario to a reference scenario that excluded standards of performance under CAA Section 111(d) for CO_2 emissions.[251] That is, EPA analyzed the ACE rule as "a separate action that occurs only after repeal of the CPP."[252] EPA analyzed a second reference scenario that included changes made by the Bipartisan Budget Act of 2018 (P.L. 115-123) to Internal Revenue Code Section 45Q, which provides a tax credit for specific CCS activities.[253] The illustrative ACE rule implementation scenario modeled application of HRI at coal-fired EGUs beginning in 2025.[254] This scenario assumed that HRI potential and costs differ based on unit size and efficiency. EPA characterized the analysis as "illustrative," because "HRI potential can vary significantly from unit to unit," and states may consider various factors when applying the performance standards.[255]

This ACE rule implementation scenario differed from those analyzed at proposal because EPA did not finalize the proposed revision to the applicability test for certain power plants under NSR.[256] At proposal, two of the three ACE rule scenarios in EPA's analysis accounted for "benefits from the proposed revisions to NSR."[257] Details about the scenarios analyzed for the final ACE rule are presented below.

- **Reference case:** This is a baseline scenario. EPA assumes business-as-usual market and regulatory conditions in the power sector based on, among other things, projections from the EIA's *Annual Energy Outlook 2019*. In particular, this scenario does not include implementation of the 2015 CPP final rule.
- **Reference case with 45Q:** This baseline scenario is identical to the above scenario, but it also includes changes made by the Bipartisan Budget Act of 2018 (P.L. 115-123) to Internal Revenue Code Section 45Q, which provides a tax credit for specific CCS activities.[258] The 2018 act increased the 45Q tax credit linearly from $22.66 to $50 per ton from 2017 to 2026 for CO_2 captured and

[251] EPA used the same reference scenario to analyze the final CPP repeal rule and the final ACE rule.

[252] Final RIA, p. 1-5.

[253] 26 U.S.C. §45Q.

[254] EPA selected 2025 as "an approximation for when the standards for performance under the final rule might be implemented." Final RIA, p. 3-6.

[255] Final RIA, p. 1-7.

[256] ACE Final Rule, p. 32521.

[257] In the two ACE scenarios that accounted for the proposed NSR change, EPA assumed that two additional HRI technologies—steam turbine upgrade and redesign/replacement of the economizer—would be available to facilities. For details, see 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*, 2018, pp. 1-13 to 1-19, https://www.epa.gov/sites/production/files/2018-08/documents/utilities_ria_proposed_ace_2018-08.pdf.

[258] 26 U.S.C. §45Q.

permanently stored and from $12.83 to $35 per ton over the same period for CO_2 captured and used as a tertiary injectant (typically for enhanced oil recovery).[259]

- **ACE rule policy scenario:** This scenario assumes HRI at coal-fired EGUs. EPA divided the affected EGUs into 12 groups based on their current generation capacity (megawatts) and heat rate (British Thermal Units per kilowatt-hour). EPA assumed that each group would be able to achieve different HRIs: The least efficient EGUs would make larger HRIs, ranging from 2.8% to 3.2%, the most efficient EGUs would not make any improvements, and the middle groups would make HRIs ranging from 0.8% to 2.1%. Based on these ranges, EPA determined that the average capacity-weighted HRI was 1.5%.[260] EPA assumed that the HRI changes would be made in 2025 and would not change over time.

EPA incorporated "routine data updates" and more current projections into the power sector modeling for both of the final rules. Among other things, EPA included more current energy demand projections from the EIA's *Annual Energy Outlook* as well as an updated inventory of state and federal power sector regulations.[261]

Q: What CO_2 emission effects did EPA estimate from the CPP repeal and from the ACE rulemakings?

A: EPA's power sector modeling projected modest CO_2 emission changes—and in some cases, no changes in CO_2 emissions—under each rulemaking.[262] **Table 1** presents EPA's projected emission levels between 2030 and 2050 for the reference scenario, the three CPP scenarios, and the ACE rule policy scenario.

EPA modeled three CPP policy scenarios and compared them to a reference scenario. One of the three CPP scenarios—"CPP with national trading and three-year delay"—projected zero or close to zero changes in CO_2 emissions compared to the reference scenario.[263] The other two CPP scenarios projected some CO_2 emissions changes compared to the reference scenario in various years, ranging from less than one-half percent to about 4% decrease. The "CPP with intrastate trading" scenario, which assumed that CPP implementation would begin in 2022, projected greater CO_2 reductions compared to the "CPP with regional trading and three-year delay" scenario. EPA concluded, based on its modeling analysis and its consideration of power sector trends,[264] that repealing the CPP "under current and reasonably projected market conditions and

[259] For more details, see CRS In Focus IF11578, *CO2 Underground Injection Regulations: Selected Differences for Enhanced Oil Recovery and Geologic Sequestration*, by Angela C. Jones; and CRS Report R44902, *Carbon Capture and Sequestration (CCS) in the United States*, by Peter Folger.

[260] In the ACE proposed rule, EPA applied uniform HRI percentages to each affected EGU. In the proposed rule, EPA's modeling scenarios assumed a fleet-wide HRI of 2% and 4.5% under NSR implementation conditions.

[261] EPA's power sector modeling included AEO 2018. See Final RIA, pp. 3-4 to 3-5.

[262] The electric power sector analysis (i.e., modeling results) is available at https://www.epa.gov/airmarkets/analysis-final-ace-rule.

[263] Unrounded estimates range from zero percent change to less than one-half percent change compared to the baseline in various years.

[264] EPA reported that it considered power sector changes, including fuel prices, technology changes and the age of different portions of the generating fleet, and "recent commitments by many utilities that include long-term CO_2 reductions across the EGU fleet." Final RIA, pp. ES-2, 2-1.

regulatory implementation is not anticipated to have a meaningful effect on emissions of CO_2 or other pollutants or regulatory compliance costs."[265]

EPA's power sector modeling projected modest emission changes under the ACE rule policy scenario compared to the reference scenario. As shown in **Table 1**, the modeling projected that CO_2 emissions would decrease about 1% compared to the reference scenario in 2030 and 2035, and it projected zero or close to zero change in 2040, 2045, and 2050.[266] EPA characterized the projected CO_2 reductions under the ACE rule as "small compared to the recent market-driven changes that have occurred in the electric sector."[267]

Table 1. EPA Projections of CO_2 Emissions in the Electric Power Sector

Comparison of EPA Reference and Policy Modeling Scenarios (2030-2050)

EPA Scenario	Projected CO_2 Emission Levels ($MMTCO_2$)					Percentage Change in CO_2 Emissions Compared to Reference Case				
	2030	2035	2040	2045	2050	2030	2035	2040	2045	2050
Reference case	*1,581*	*1,559*	*1,604*	*1,595*	*1,585*	—	—	—	—	—
CPP with intrastate trading	1,525	1,512	1,553	1,555	1,550	-4%	-3%	-3%	-2%	-2%
CPP with regional trading and 3-year delay	1,572	1,550	1,593	1,594	1,585	-1%	-1%	-1%	0%	0%
CPP with national trading and 3-year delay	1,581	1,559	1,604	1,595	1,586	0%	0%	0%	0%	0%
ACE policy scenario	1,571	1,551	1,599	1,596	1,585	-1%	-1%	0%	0%	0%

Source: Prepared by CRS with data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule.

Figure 5 illustrates EPA CO_2 emission projections in the electric power sector from 2021 to 2050 for each of these scenarios. The top portion of the figure compares the CO_2 emission projections to actual CO_2 emissions in the electric power sector between 1990 and 2017. The lower portion provides a closer look at the differences between the scenarios EPA modeled.

The table and the figure indicate that the emission estimates for the ACE rule policy scenario closely track the reference case estimates. In 2045, the ACE rule policy emissions are one metric ton higher than the reference case, which some might argue is evidence of a rebound effect, as discussed below. See "Q: Would the ACE rule's HRI lead to potential "rebound effects"?"

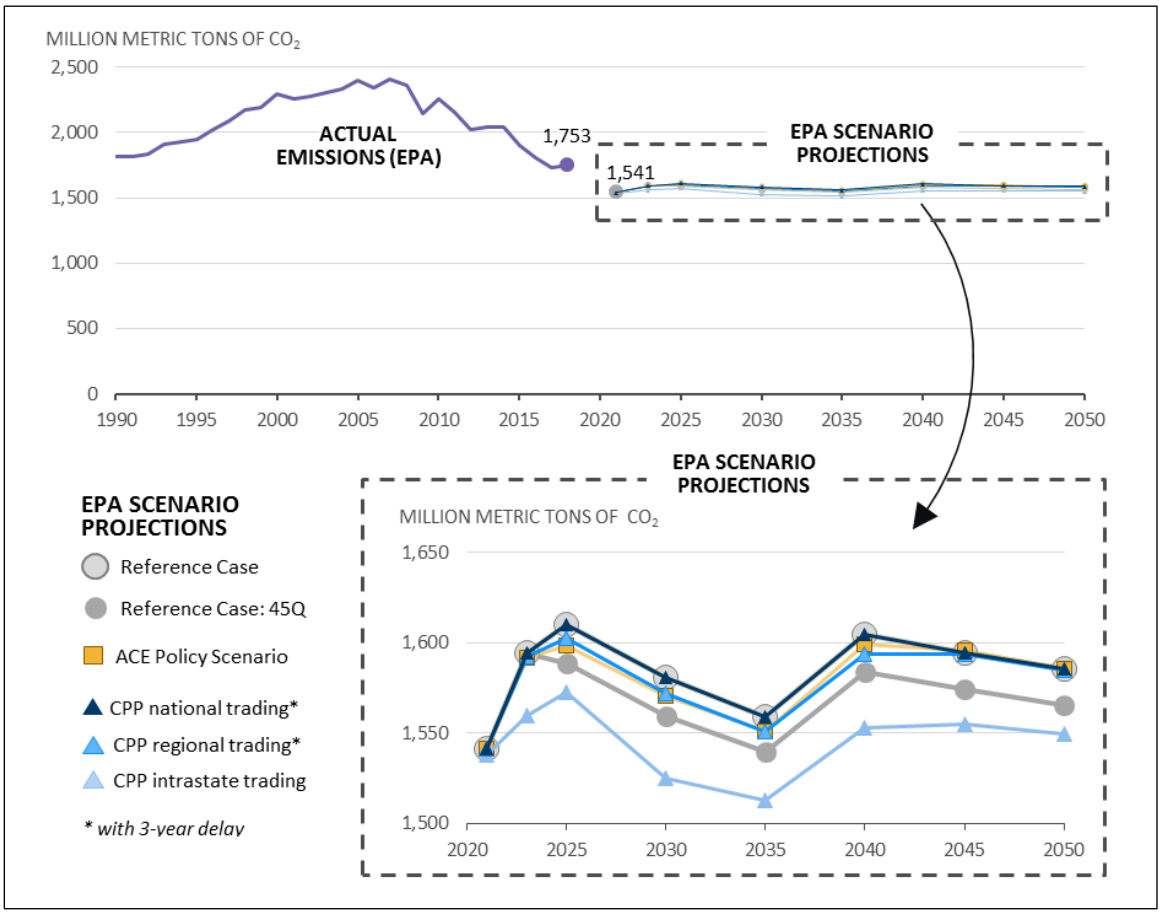
[265] Final RIA, p. 2-5.

[266] Unrounded estimates range from zero percent change to less than one-half percent change compared to the baseline in various years.

[267] EPA, *Fact Sheet: Regulatory Impact Analysis for the Affordable Clean Energy Rule (ACE) and Clean Power Plan Repeal*, June 2019, p. 1, https://www.epa.gov/sites/production/files/2019-06/documents/ ace_ria_fact_sheet_6.18.19_final.pdf.

Figure 5. EPA Projections of CO_2 Emissions in the Electric Power Sector

Actual CO_2 Emissions and EPA Scenarios



Source: Prepared by CRS with data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule. Actual emissions from EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*, April 2020, https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

Note: The same EPA scenarios for references cases and CPP and ACE policy scenarios between 2020 and 2050 that are plotted in the top graph are plotted on an expanded scale in the bottom graph to provide a more detailed view.

EPA points out that its emission projections contain uncertainty. In addition to the factors identified by EPA that provide uncertainty for all the scenarios—electricity demand, natural gas supply and demand, and long-term planning by utilities—the agency describes "considerable uncertainty" that is particular to its ACE rule policy scenario. In its Regulatory Impact Analysis of the final rule, EPA states that "there is inadequate and incomplete information regarding how states might specifically implement this rule, and the estimated range of costs and impacts presented in this chapter is based on the assumptions."[268]

[268] Final RIA, pp. 3-29.

Q: How do the CO_2 emission projections in the final ACE rule compare with prior EPA CO_2 emission projections?

A: Comparing EPA's emission projections in the 2019 final ACE rule with projections from the 2015 final CPP rule is challenging for several reasons. First, the CO_2 emission baseline conditions in the electric power sector changed between 2015 and 2019 (e.g., see the changes in the electricity generation profile in **Figure 2** above). These changes impact the stringency of emission reduction programs. For example, in 2015, EPA estimated that the CPP would reduce CO_2 emissions from the electric power sector by 32% in 2030 from 2005 levels compared to a reference case scenario prepared for the CPP rule. In its 2019 final ACE rule, EPA estimated that its reference case scenario (without the CPP) would reduce CO_2 emissions from the electric power sector by 34% in 2030 from 2005 levels.[269]

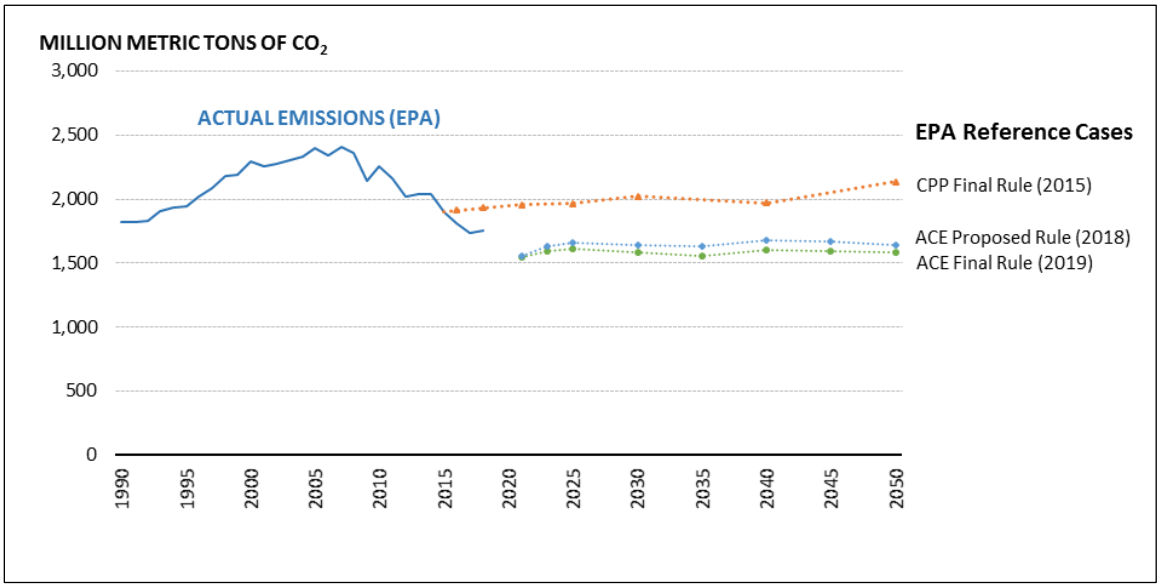
As illustrated in **Figure 6**, EPA's reference case scenarios have changed over the past four years. The different reference case scenarios are a result of the recent decreases in CO_2 emissions in the electric power sector (as discussed above). As the figure indicates, emissions decreased by 15% between 2014 and 2017. Therefore, when EPA promulgated the CPP in 2015, the rule appeared more stringent (compared to its 2015 baseline) than it does today, because many of the emission reductions that would have been required by the CPP have already occurred. As previously noted, several factors likely played a role in recent power sector emission changes, including technological advances in energy production (e.g., hydraulic fracturing) and federal and state policies, including federal tax policies[270] and states' renewable portfolio standards.[271] For more information, see "Q: How much does the generation of electricity contribute to total U.S. GHG emissions?"

[269] CRS identified one study that used EPA's modeling framework to estimate emissions under the CPP repeal and ACE final rule. The authors estimated emissions reductions using an "updated version of the CPP," which included revised assumptions regarding renewable energy use, national trading, energy efficiency improvements, and mechanisms to address emissions from new sources. See Kathy Fallon Lambert et al., *Carbon Standards Re-Examined: An Analysis of Potential Emissions Outcomes for the Affordable Clean Energy Rule and the Clean Power Plan*, July 17, 2019, https://cdn1.sph.harvard.edu/wp-content/uploads/sites/2343/2019/07/Carbon-Standards-Re-Examined_Final1.pdf.

[270] See CRS Report R44852, *The Value of Energy Tax Incentives for Different Types of Energy Resources*, by Molly F. Sherlock.

[271] See, for example, Database of State Incentives for Renewables and Efficiency, Map of Renewable Portfolio Standard Policies, as of October 2018, http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2018/10/Renewable-Portfolio-Standards-2018.pdf.

Figure 6. Comparison of EPA Reference Case Scenarios



Sources: Prepared by CRS with data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule; and data from analysis for the CPP final rule.

Some observers have noted that the underlying assumptions in the CPP scenarios modeled by EPA in 2015 differ from the assumptions in the CPP scenarios the agency modeled in 2019.[272] For example, in its 2015 CPP final rule analysis, EPA assumed that CPP implementation would result in energy efficiency improvements.[273] This assumption effectively lowered the demand for electricity generation and therefore emissions from electricity.[274] EPA does not include energy efficiency assumptions in its 2019 analysis. In addition, in EPA's 2015 final rule analysis, the relevant CPP scenario included a mechanism to account for potential emissions from new generation sources.[275] The CPP scenarios considered in the 2019 analysis do not have this requirement. As highlighted above, in its 2019 analysis EPA assumed a three-year implementation in two of the CPP scenarios compared to the assumed start date considered in the 2015 CPP

[272] Lambert et al., *Carbon Standards Re-Examined*; and Arjun Krishnaswami, "EPA's Monkey Business Hides ACE Rule Emissions Increase," Natural Resources Defense Council, June 2019, https://www.nrdc.org/experts/arjun-krishnaswami/epas-monkey-business-hides-ace-rule-emissions-increases.

[273] EPA defined *demand-side energy efficiency measures* as an "extensive array of technologies, practices and measures that are applied throughout all sectors of the economy to reduce energy demand while providing the same, or better, level and quality of service" (EPA, *Demand-Side Energy Efficiency Technical Support*, August 2015, https://www.regulations.gov/document?D=EPA-HQ-OAR-2017-0355-0048). Examples include utilities offering technical services such as audits and retrofit, installation of more efficient products and equipment in residential or commercial buildings, or undertaking home energy audits leading to customized whole home retrofits.

[274] EPA did not model specific energy efficiency measures in the 2015 CPP Regulatory Impact Analysis (RIA) but rather assumed that demand-side energy efficiency efforts would reduce electricity demand by approximately 8% compared to a business-as-usual scenario. EPA based this estimate on its review of historical state programs and the literature. See EPA, *Regulatory Impact Analysis for the Clean Power Plan Final Rule*, Table 3-2, October 23, 2015, https://www.regulations.gov/document?D=EPA-HQ-OAR-2013-0602-37105 (hereinafter "2015 CPP RIA"); and EPA, *Demand-Side Energy Efficiency Technical Support*.

[275] EPA included this mechanism (described as a "new source complement") to account for the requirement that states using a mass-based target approach must address the potential for emissions leakage in their state plans. For more details see CRS Report R44341, *EPA's Clean Power Plan for Existing Power Plants: Frequently Asked Questions*, by James E. McCarthy et al.

analysis. All else being equal, the impacts of these different assumptions in the 2019 modeled CPP scenarios likely diminish the potential emission reductions of the 2015 CPP.

Q: What non-CO_2 emission effects did EPA estimate from the CPP repeal and ACE rulemakings?

A: EPA's power sector modeling also projected changes in non-CO_2 emissions under each rulemaking. Specifically, the modeling analysis projected changes in emissions of SO_2, NO_x, and HAPs, including mercury. While these pollutants have implications for air quality and public health,[276] they are not directly targeted by the CPP (or CPP repeal) or the ACE rule. **Table 2** presents EPA's projected non-CO_2 emission levels for 2030, 2035, and 2040 for the reference scenario; the three CPP scenarios; and the ACE rule policy scenario. **Table 3** presents the emission changes as a percentage.

EPA's power sector modeling projected modest changes nationally in non-CO_2 pollutants under most scenarios compared to the reference scenario. Across the CPP policy scenarios and the ACE rule policy scenario, the "CPP with intrastate trading" scenario showed the highest emission changes compared to the reference scenario. The remaining two CPP scenarios and the ACE rule scenario generally projected emission changes less than 1% from the baseline at the national level.

EPA's modeling analysis of the ACE rule "projects both decreased and increased levels of [fine particulate matter] and ozone, depending on the location," compared to the reference scenario.[277] Some stakeholders raised concerns that regional increases in non-CO_2 pollutants would "make it harder for some areas" to meet existing federal air quality standards.[278] EPA responded that the updated modeling for the final ACE rule projected nationwide decreases compared to the reference scenario. EPA also discussed its consideration of rebound effects. For more details about projected changes in non-CO_2 emissions at a sub-national level, see "Q: Would the ACE rule's HRI lead to potential "rebound effects"?"

Table 2. EPA Projected Non-CO_2 Emissions in the Electric Power Sector

Comparison of EPA Reference and Modeling Scenarios (2030-2040)

EPA Scenario	Projected SO_2 Emission Levels (thousand metric tons SO_2)			Projected NO_x Emission Levels (thousand metric tons NO_x)			Projected Hg Emission Levels (metric tons Hg)		
	2030	2035	2040	2030	2035	2040	2030	2035	2040
Reference case	803	741	736	735	683	673	4.0	3.7	3.7
CPP with intrastate trading	774	698	707	691	646	633	3.9	3.5	3.6

[276] For example, SO_2 and NO_x are criteria pollutants regulated under the CAA that directly affect air quality. SO_2 and NO_x are also "precursor emissions" that contribute to the formation of particulate matter and ozone, which are likewise regulated under the CAA.

[277] Final RIA, p. 4-8.

[278] ACE RTC, see chap. 7, p. 6.

EPA Scenario	Projected SO_2 Emission Levels (thousand metric tons SO_2)			Projected NO_x Emission Levels (thousand metric tons NO_x)			Projected Hg Emission Levels (metric tons Hg)		
	2030	2035	2040	2030	2035	2040	2030	2035	2040
CPP with regional trading and 3-year delay	797	733	725	729	678	667	4.0	3.6	3.7
CPP with national trading and 3-year delay	805	740	737	735	683	673	4.0	3.7	3.7
ACE policy scenario	798	735	733	728	678	670	4.0	3.6	3.7

Source: Prepared by CRS with data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule.

Note: NO_x based on estimated annual NO_x emissions.

Table 3. EPA Projected Changes in Non-CO_2 Emissions in the Electric Power Sector

Comparison of EPA Reference and Modeling Scenarios (2030-2040)

EPA Scenario	Projected SO_2 Emission Levels (thousand metric tons SO_2)			Projected NO_x Emission Levels (thousand metric tons NO_x)			Projected Hg Emission Levels (metric tons Hg)		
	2030	2035	2040	2030	2035	2040	2030	2035	2040
Reference case	—	—	—	—	—	—	—	—	—
CPP with intrastate trading	-3.6%	-5.8%	-3.9%	-6.0%	-5.3%	-6.0%	-4.5%	-3.4%	-3.8%
CPP with regional trading and 3-year delay	-0.8%	-1.2%	-1.5%	-0.8%	-0.8%	-0.9%	-0.7%	-1.0%	-1.0%
CPP with national trading and 3-year delay	0.2%	-0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ACE policy scenario	-0.6%	-0.8%	-0.4%	-0.9%	-0.8%	-0.5%	-0.7%	-0.6%	-0.3%

Source: Prepared by CRS with data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule.

Notes: NO_x based on estimated annual NO_x emissions. Positive values signify an estimated increase in emissions relative to the baseline. Negative values signify an estimated decrease in emissions relative to the baseline.

Q: Would the ACE rule's HRI lead to potential "rebound effects"?

A: The "heat rate" measures the amount of energy that a power plant uses to generate one kilowatt-hour of electricity.[279] A power plant with a lower, more efficient heat rate uses less fuel to generate the same amount of electricity as a power plant with a higher heat rate. Using less fuel per kilowatt-hour may result in lower emissions of CO_2 as well as SO_2 and NO_x. HRI can also lead to greater use of the more efficient fossil-fuel-fired power plants, which contributes to a "rebound effect." That is, coal-fired power plant efficiency gains achieved from HRI may lead to increased electricity generation from these units, thereby increasing absolute emissions and, to some extent, offsetting the emission reductions from the HRI.

In its 2015 CPP final rule, EPA stated that

> applying building block 1 [HRI at coal-fired EGUs] in isolation can result in a "rebound effect" that undermines the emissions reductions otherwise achieved by heat rate improvements.[280]

However, in its 2018 proposed ACE rule, EPA stated that its

> analysis indicates that the system-wide emission decreases due to reduced heat rate are likely to be larger than any system-wide increases due to increased operation.[281]

EPA reached a similar conclusion in its 2019 final ACE rule:

> The EPA conducted updated modeling and analysis for the final ACE rule … and confirmed that aggregate CO_2 emissions from the group of designated facilities are anticipated to decrease (outweighing any potential CO_2 increases related to increased generation by certain units).[282]

Although EPA estimated that in 2030 the aggregate (i.e., nationwide) power sector CO_2 emissions would decrease under the ACE rule scenario, EPA estimated some state-level increases in emissions. EPA projected that CO_2 emissions would increase in 15 states (and the District of Columbia) in 2030 compared to the agency's reference case. **Figure 7** illustrates the results from EPA's modeling. The figure compares the ACE rule policy scenario with EPA's reference case scenario in 2030. The results ranged from a decrease of 11.0% (Tennessee) to an increase of 1.6% (Minnesota).

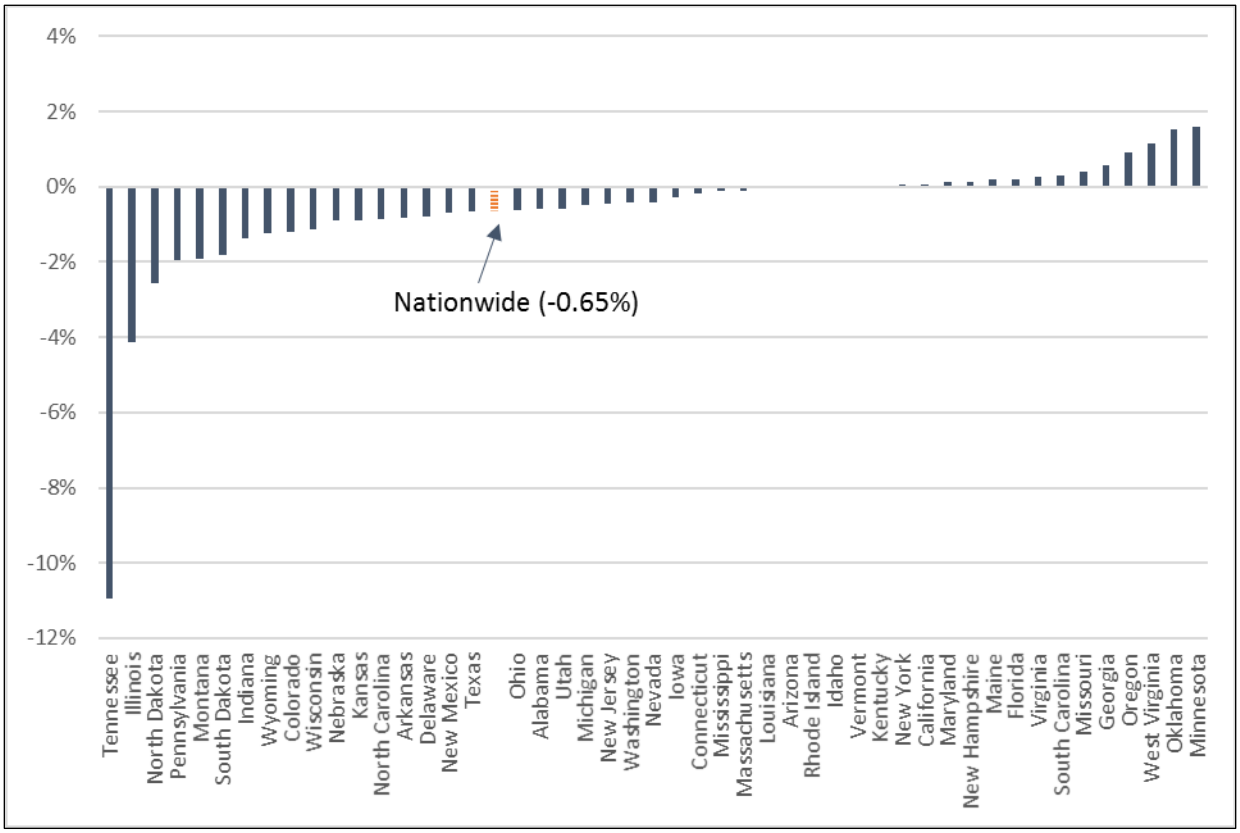
[279] EIA, *Analysis of Heat Rate Improvement Potential at Coal-Fired Power Plants*.

[280] CPP Final Rule, p. 64787.

[281] ACE Proposal. CRS identified one study that examined the potential for a rebound effect using modeling information EPA provided with the 2018 proposed ACE rule. See Amelia T. Keyes et al., "The Affordable Clean Energy Rule and the Impact of Emissions Rebound on Carbon Dioxide and Criteria Air Pollutant Emissions," *Environmental Research Letters*, April 9, 2019.

[282] ACE Final Rule, p. 32543. CRS identified one study that examined the potential for a rebound effect under the final ACE rule. The authors used EPA's modeling framework to analyze a scenario that included the 45Q tax credit and NSR reform and concluded that the "magnitude of state-level emissions rebound of the ACE rule, and the resulting local air quality and health impacts, are likely to be larger than the magnitude estimated in the final ACE RIA." Lambert et al., *Carbon Standards Re-Examined*.

Figure 7. EPA Estimates of CO_2 Emissions Changes Under ACE Rule Policy Scenario Compared to the Reference Case (2030)

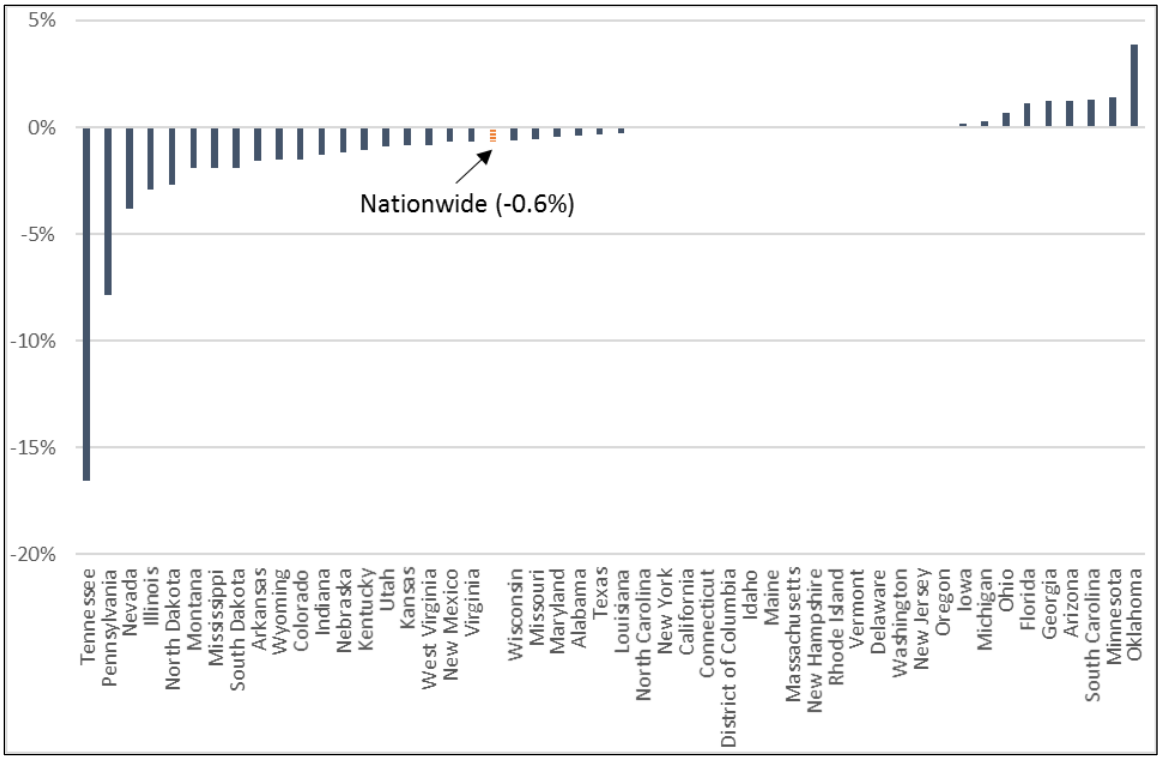


Source: Prepared by CRS. Data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule and data from analysis for the CPP final rule. Figure does not include Alaska and Hawaii because the ACE rule does not apply to those states.

Similarly, EPA projected that under the ACE rule scenario, SO_2 and NO_x emissions would decrease nationally while increasing at the state level in some states. EPA projected that SO_2 and NO_x emissions would decrease nationally by 0.6% and 0.9%, respectively, in 2030 compared to the reference scenario. SO_2 and NO_x emissions would also increase by at least 1% in six states and four states, respectively, compared to the reference case in 2030.[283] **Figure 7** and **Figure 8** illustrate the SO_2 and NO_x results, respectively, from EPA's modeling. Each figure compares the ACE rule policy scenario with EPA's reference case scenario in 2030. The projected SO_2 changes in 2030 ranged from a decrease of 17% (Tennessee) to an increase of nearly 4% (Oklahoma). The projected NO_x changes in 2030 ranged from a decrease of 19% (Tennessee) to an increase of 3% (Georgia).

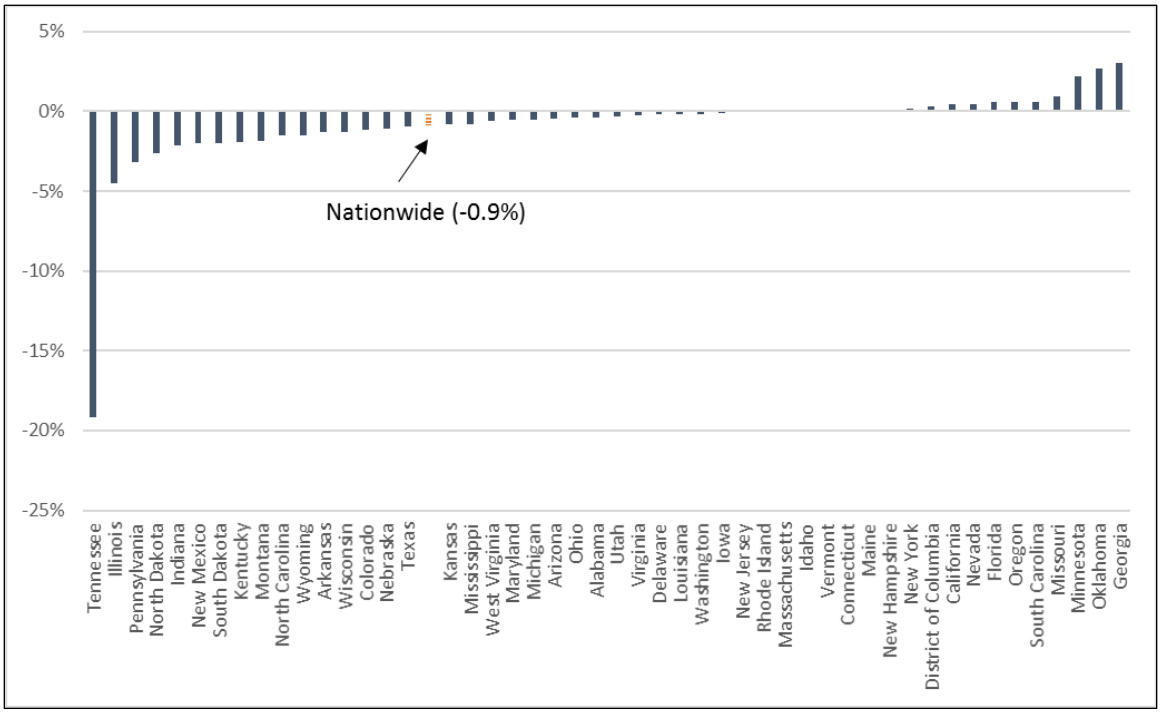
[283] CRS analysis of data from EPA's power sector analysis for the ACE final rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule; and data from analysis for the CPP final rule.

Figure 8. EPA Estimates of SO_2 Emissions Changes Under ACE Rule Policy Scenario Compared to the Reference Case (2030)



Source: Prepared by CRS. Data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule and data from analysis for the CPP final rule. Figure does not include Alaska and Hawaii because the ACE rule does not apply to those states.

Figure 9. EPA Estimates of NO_x Emissions Changes Under ACE Rule Policy Scenario Compared to the Reference Case (2030)



Sources: Prepared by CRS. Data from EPA's power sector analysis for the final ACE rule at https://www.epa.gov/airmarkets/analysis-final-ace-rule; and data from analysis for the CPP final rule. Figure does not include Alaska and Hawaii because the ACE rule does not apply to those states.

Q: What are EPA's estimated costs and benefits of the proposed repeal of the CPP?

A: EPA quantified the estimated emission impacts of repealing the CPP under several scenarios but did not monetize the associated benefits and costs. While EPA's modeling projected CO_2 emission changes under two of the CPP scenarios, EPA concluded that "the most likely result" of implementing the CPP would be "no change in emissions and therefore no [changes in monetized costs or benefits] relative to a world without the CPP."[284] EPA stated that it does not expect repealing the CPP "to have a meaningful effect on emissions of CO_2 or other pollutants or regulatory compliance costs."[285] EPA based this conclusion on its power sector modeling as well as its consideration of power sector trends, including fuel prices, technology changes, the age of different portions of the generating fleet, and "recent commitments by many utilities that include long-term CO_2 reductions across the EGU fleet."[286]

Q: What are EPA's estimated costs and benefits of the final ACE rule?

A: EPA estimated the value of the costs and benefits associated with projected emission changes under an illustrative ACE rule policy scenario. EPA reported the compliance costs as the projected

[284] Final RIA, p. 2-1.

[285] Final RIA, p. 2-5.

[286] Final RIA, pp. ES-2, 2-1.

additional cost for the power industry to implement HRI. These estimates also include the expected costs for monitoring, reporting, and recordkeeping.[287] On the benefits side, EPA estimated the "climate-related" benefits from changes in CO_2 emissions under the ACE rule. EPA also estimated human health benefits of reductions in exposure to ambient fine particulate matter ($PM_{2.5}$) and ozone. These are referred to as "co-benefits" because the ACE rule does not directly target these pollutants. In particular, EPA projected changes in SO_2 and NO_x emissions—precursor emissions that contribute to the formation of particulate matter (PM) and ozone—and estimated the value of changes in human exposure to $PM_{2.5}$ and ozone.[288]

The agency's analysis showed that the combined domestic climate benefits and human health co-benefits estimates would outweigh the compliance cost estimates. The present value of the net benefits from these comparisons ranged from $1.1 billion to $8.8 billion, depending on the discount rate, over a 15-year period (2023-2037).[289] EPA estimated the present value of the ACE rule compliance costs as $1.6 billion over a 15-year period (2023-2037) and the present value of the combined domestic climate benefits and human health co-benefits as $4.6 billion to $10 billion over the same period (2023-2037).[290]

EPA's analysis also presented less favorable benefit-cost comparisons. EPA excluded the estimated human health co-benefits from these comparisons, describing it as a way to consider the benefit of reducing the "targeted pollutant" (CO_2) against the compliance cost.[291] These "targeted pollutant" benefit-cost comparisons showed that compliance costs would outweigh the domestic climate benefits, with the present value of net costs ranging from $910 million (7% discount rate) to $980 million (3% discount rate) over a 15-year period (2023-2037).[292] The present value of the estimated compliance costs remained the same in these comparisons—$1.6 billion at a 3% discount rate—and outweighed the present value of the estimated domestic climate benefits—$640 million at a 3% discount rate.[293] For more information about EPA's consideration of co-benefits, see "Q: How did EPA estimate the human health co-benefits?"

Q: How did EPA estimate the climate benefits?

A: EPA used a power sector model to estimate the change in CO_2 emissions and then applied the social cost of carbon dioxide (SC-CO_2) to estimate the economic value of the associated climate

[287] ACE Final Rule, p. 32562.

[288] EPA did not quantify the health risks associated with ambient concentrations of SO_2 and NO_x that are independent of $PM_{2.5}$ and ozone. EPA also did not monetize the projected ancillary reductions in mercury emissions, citing "data, resource, and methodological limitations." See Final RIA, chap. 4.

[289] Traditionally, benefit-cost comparisons are shown as estimates of the "net impact," which is the difference between total costs and total benefits. "Net benefits" result when the benefits outweigh the costs, and "net costs" result when the costs outweigh the benefits. Regarding the ACE analysis, the present value of estimated net benefits over the period 2023-2037 is $3.0 billion to $8.8 billion at a 3% discount rate and $1.1 billion to $4.1 billion at a 7% discount rate. These net benefit estimates account for both estimated domestic climate benefits and estimated human health co-benefits. Final RIA, p. 6-9.

[290] Present value calculated at a 3% discount rate. EPA also calculated the present value at a 7% discount rate: Costs were an estimated $970 million, and the corresponding climate benefits and health co-benefits ranged from $2.1 billion to $5 billion. See Final RIA, p. 6-9.

[291] Final RIA, pp. ES-9 to ES-10.

[292] Final RIA, p. 6-8.

[293] Present value calculated for years 2023-2037. EPA also calculated present value for 2023-2037 at a 7% discount rate: Costs were an estimated $970 million, and the corresponding domestic climate benefits were an estimated $62 million.

change impacts.[294] The SC-CO_2 is an estimate of the monetary value of impacts associated with changes in CO_2 emissions in a given year. It includes net changes in agricultural productivity, property damage from increased flood risk, and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning.[295] For each year of the analysis, EPA applied two SC-CO_2 estimates—one that was discounted at a 3% rate and the other discounted at a 7% rate.[296] (Discounting, which is standard practice in benefit-cost analysis, allows for apples-to-apples comparisons of economic impacts that occur at different times.) The SC-CO_2 estimates that EPA used to value emissions changes in the years 2025-2035 are as follows: $7-$9 per metric ton of CO_2 emissions (in 2016 dollars) using a 3% discount rate and $1-$2 per metric ton of CO_2 emissions (in 2016 dollars) using a 7% discount rate.[297]

The SC-CO_2 estimates used in the ACE rule analysis garnered stakeholder interest, in particular with respect to their scope and the use of a 7% discount rate. EPA developed these SC-CO_2 values in 2017, based on E.O. 13783, and labeled them as "interim values."[298] The interim SC-CO_2 estimates are domestic values, meaning that they are intended to measure the projected impacts of climate change anticipated to occur within U.S. borders.

EPA also applied global SC-CO_2 estimates to the estimated CO_2 reductions in a sensitivity analysis. The global SC-CO_2 estimates applied to emissions changes in the years 2025-2035 are as follows: $53-$63 per metric ton of CO_2 emissions (in 2016 dollars) using a 3% discount rate and $6-$9 per metric ton of CO_2 emissions (in 2016 dollars) using a 7% discount rate.[299] EPA did not report those global climate benefits in comparison to the ACE rule compliance costs.

Q: What are the implications of using the "interim SC-CO_2" estimates to estimate climate benefits?

The domestic perspective and use of a 7% rate lowered the SC-CO_2 estimates compared to the estimates used in previous analyses, including the agency's 2015 analysis of the CPP.[300] EPA attributed its focus on domestic SC-CO_2 estimates and the application of the 7% discount rate to direction given in E.O. 13873 and OMB Circular A-4.[301]

Stakeholders disagree about whether EPA should use domestic or global SC-CO_2 values. Those recommending use of global values have concluded that there is no clear distinction between domestic and global climate change impacts and that a domestic SC-CO_2 understates the benefits to the United States because of spillover effects—that is, climate impacts that occur outside U.S.

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[294] EPA multiplied the SC-CO_2 estimates for a given year by the estimated CO_2 emissions reduction in that same year to estimate the monetary value of the associated climate benefits.

[295] CRS In Focus IF10625, *Social Costs of Carbon/Greenhouse Gases: Issues for Congress*, by Jane A. Leggett.

[296] SC-CO_2 values vary depending on the year of emissions. SC-CO_2 values are calculated using models that translate changes in emissions into economic impacts through a multi-step process. EPA ran three models using five socioeconomic scenarios and two discount rates, which resulted in many estimates. EPA selected the average SC-CO_2 at each discount rate (3% and 7%) in a given year for use in the analysis.

[297] Final RIA, p. 4-4.

[298] As part of a broader executive order, E.O. 13783, the Trump Administration withdrew the SC-CO_2, social cost of methane, and social cost of nitrous oxide estimates developed by an Obama Administration interagency working group.

[299] Final RIA, pp. 7-7 to 7-8.

[300] Between 2009 and 2016, federal agencies used SC-CO_2 estimates in regulatory analysis that were global measures and discounted at rates of 2.5, 3, and 5%.

[301] Final RIA, p. 4-2.

borders could nonetheless affect the U.S. economy.[302] Other stakeholders disagree with this position. Those who disagreed with the previous Administration's focus on global values criticized the comparison of impacts measured on different scales—global benefits versus domestic costs—and concluded that using a global SC-CO_2 overstates the benefits of a country-specific rulemaking. That is, the benefit-cost comparison may seem more favorable when counting benefits that accrue to non-U.S. populations but would be less favorable when considering only the U.S. benefits.[303]

Stakeholders also disagree about the discount rate used to calculate the SC-CO_2.[304] The intergenerational aspect of climate change makes selection of a discount rate challenging when calculating the SC-CO_2—in part because it has implications for how much the current generation values the climate change impacts experienced by future generations.[305]

Environmental and public interest groups have generally emphasized the intergenerational considerations and recommended that the federal government use lower discount rates or rates that decline over time. Industry groups have generally recommended higher rates, such as the 7% rate. The published literature largely shows application of lower discount rates in climate change studies. According to the National Academies, the majority of climate change impacts studies cited in the Intergovernmental Panel on Climate Change Fifth Assessment Report (2014) used rates of no more than 5%.[306]

While there is no consensus on the appropriate rate to choose in an intergenerational context, it is well understood that higher discount rates result in lower present values and that lower discount rates result in higher present values.[307] In addition, the literature shows that SC-CO_2 estimates are highly sensitive to discount rate selection.

For more information about scope and discount rate considerations and the range of stakeholder views on these factors, see CRS In Focus IF10625, *Social Costs of Carbon/Greenhouse Gases: Issues for Congress*, by Jane A. Leggett and CRS Report R45119, *EPA's Proposal to Repeal the Clean Power Plan: Benefits and Costs*, by Kate C. Shouse.

Q: How did EPA estimate the human health co-benefits?

A: EPA estimated the human health co-benefits of reductions in exposure to ambient $PM_{2.5}$ and ozone under the final ACE rule.[308] First, EPA projected changes in SO_2 and NO_x emissions, which

[302] For additional discussion about the critiques of global versus domestic SC-CO_2, see CRS Report R45119, *EPA's Proposal to Repeal the Clean Power Plan: Benefits and Costs*, by Kate C. Shouse.

[303] For additional discussion about the critiques of global versus domestic SC-CO_2, see CRS Report R45119, *EPA's Proposal to Repeal the Clean Power Plan: Benefits and Costs*, by Kate C. Shouse.

[304] The choice of a discount rate has implications for how much one values current consumption over future consumption. Higher discount rates give less present value to benefits or costs that accrue in the future, whereas lower discount rates give more present value.

[305] For example, the current generation must select a discount rate on behalf of the future generation and without the benefit of input from the future generation. It also raises questions about the extent to which the current generation would account for the future generation's potential preferences, particularly if doing so comes at the expense of the current generation.

[306] National Academies of Sciences, Engineering, and Medicine (NAS), *Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide* (Washington, DC: National Academies Press, 2017), p. 168, https://doi.org/10.17226/24651.

[307] NAS, *Valuing Climate Damages*, p. 161.

[308] ACE Final Rule, pp. 32562-3. See also Final RIA, chap. 4.

are precursor emissions that contribute to the formation of $PM_{2.5}$ and ozone.[309] EPA then conducted air quality modeling to project changes in $PM_{2.5}$ and ozone concentrations associated with the projected changes in SO_2 and NO_x emissions. Next, EPA used the Benefits Mapping and Analysis Program—Community Edition model to quantify the human health impacts and economic value of the projected air quality changes. These estimates represented the value of reductions in premature deaths and illnesses, such as non-fatal heart attacks and asthma, associated with exposure to $PM_{2.5}$ and ozone.[310] The value of avoided premature deaths accounts for most of the monetized co-benefits—98% of the estimated value of the co-benefits related to $PM_{2.5}$ and 90% of the estimated value of the co-benefits related to ozone.[311]

EPA's analysis and presentation of the human health co-benefits has garnered stakeholder interest. Specifically, EPA excluded the co-benefits from some of the ACE rule benefit-cost comparisons, describing it as a way to consider the benefit of reducing the "targeted pollutant" (CO_2) against the compliance cost.[312] In other cases, EPA omitted the PM-related health co-benefits below specified thresholds for $PM_{2.5}$, reporting only the PM-related health co-benefit above the threshold.[313] EPA stated that the application of the thresholds provides "insight into the level of uncertainty in the estimated $PM_{2.5}$ mortality benefits."[314] EPA based one threshold on the current federal air quality standard for $PM_{2.5}$—12 micrograms per cubic meter ($\mu g/m^3$)—and omitted deaths attributable to $PM_{2.5}$ concentrations less than 12 $\mu g/m^3$. EPA based the second and lower threshold on the "lowest measured level" of $PM_{2.5}$ from the two long-term studies it used to estimate deaths related to $PM_{2.5}$. For the lowest measured level threshold, EPA omitted deaths attributable to $PM_{2.5}$ at or below the lowest measured level of the Krewski et al. 2009 study (5.8 $\mu g/m^3$) and the Lepeule et al. 2012 study (8 $\mu g/m^3$).[315] EPA selected these thresholds because the agency has greater confidence in the estimates that fall within the "bulk of observed" $PM_{2.5}$ concentrations in the Krewski et al. 2009 study and the Lepeule et al. 2012 study.

For more information about co-benefit considerations, see CRS Report R44840, *Cost and Benefit Considerations in Clean Air Act Regulations*, by James E. McCarthy and Richard K. Lattanzio and CRS Report R45119, *EPA's Proposal to Repeal the Clean Power Plan: Benefits and Costs*, by Kate C. Shouse.

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[309] EPA did not quantify the health risks associated with ambient concentrations of SO_2 and NO_x that are independent of $PM_{2.5}$ and ozone. Final RIA, p. 4-6.

[310] EPA based estimated reductions in non-fatal heart attacks on reduced exposure to $PM_{2.5}$. EPA based the asthma-related impacts associated with exposure to $PM_{2.5}$ and exposure to ozone on exacerbation of asthma symptoms in individuals with asthma ages 6-18. See Final RIA, Table 4-4, for a complete list of the human health impacts considered.

[311] Final RIA, p. 4-23.

[312] Final RIA, pp. ES-9 to ES-10.

[313] EPA refers to the thresholds as "alternative concentration cut-points" and applied them to health benefits related to $PM_{2.5}$ exposure; EPA did not apply any thresholds to the estimated ozone health co-benefits. See Table 6 in the ACE Final Rule, p. 32563.

[314] Final RIA, p. 4-26.

[315] See Final RIA, pp. 4-26 to 4-28. EPA used each study to estimate benefits and the results from a range with one "low" estimate and one "high" estimate. EPA used the lowest measured level from each study to adjust the high and low $PM_{2.5}$ co-benefits. See also D. Krewski et al., "Extended Follow-Up and Spatial Analysis of the American Cancer Society Linking Particulate Air Pollution and Mortality," *Health Effect Institute Research Report*, vol. 140 (2009); and J. Lepeule et al., "Chronic Exposure to Fine Particles and Mortality: An Extended Follow-Up of the Harvard Six Cities Study from 1974 to 2009," *Environmental Health Perspectives*, vol. 120, no. 7 (2012), pp. 965-70.

Q: What are the implications of EPA's approach to co-benefits in the ACE analysis?

A: EPA's "targeted pollutant" approach excluded the co-benefits from some of the ACE rule benefit-cost comparisons. This approach departed from previous analyses, such as the 2015 CPP analysis. EPA's benefit-cost analysis did not serve as the basis for the final ACE rule—which was based on EPA's current legal interpretation about the BSER—but is nonetheless consequential, because it may set a precedent for the way EPA accounts for co-benefits in future rulemaking analyses.[316] Separate from the final ACE rule, EPA is developing a proposal related to its treatment of benefits in air pollution regulatory analyses.[317]

Consideration of co-benefits and other indirect impacts is typically viewed as a principle of benefit-cost analysis and consistent with federal guidance. A federal guidance document entitled "OMB Circular A-4" directs agencies to "look beyond the direct benefits and direct costs" of a rulemaking and quantify and monetize co-benefits as well as adverse impacts not already considered in the direct cost estimates.[318] Likewise, EPA's *Guidelines for Preparing Economic Analyses* recommends that the agency's economic analysis "include directly intended effects and associated costs, as well as ancillary (or co-) benefits and costs."[319] EPA described its approach as "consistent" with OMB Circular A-4 because even though some of the benefit-cost comparisons exclude co-benefits, other parts of the agency's analysis report the co-benefits and include them in some of the benefit-cost comparisons.[320] As discussed further below, stakeholder opinion varies regarding this approach.

EPA's use of thresholds to estimate $PM_{2.5}$ mortality impacts also diverged from past analyses and lowered some of the estimated health co-benefits under the ACE rule, specifically the portion of benefits related to reductions in $PM_{2.5}$.[321] According to EPA's ACE rule analysis, the percentages of monetized health co-benefits attributable to $PM_{2.5}$ were as follows:

- 78%-81% (assuming no threshold),

[316] In responding to public comments on co-benefits, EPA clarified that its benefits analysis does not provide "information on which the agency is relying in making its determination of the BSER or other determinations in the ACE final rule. This information is presented for disclosure in compliance with relevant executive orders." ACE RTC, see chap. 7, p. 60.

[317] According to the Spring 2020 Semiannual Regulatory Agenda, the proposal will seek to "provide the public with a better understanding on how EPA is evaluating benefits and costs when developing Clean Air Act regulatory actions and allow the public to provide better feedback to EPA on potential future proposed rules." See RIN 2060-AU51 at https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202004&RIN=2060-AU51.

[318] OMB Circular A-4 refers to co-benefits as "ancillary benefits." OMB Circular A-4, "Regulatory Analysis," September 17, 2003, p. 26.

[319] EPA, National Center for Environmental Economics, *Guidelines for Preparing Economic Analyses*, May 2014, p. 11-2, https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses.

[320] ACE RTC, see chap. 7, p. 57.

[321] EPA applied the same threshold approach to the co-benefits estimates in its 2018 analysis of the ACE proposal and in its 2017 analysis of the proposed CPP repeal. CRS is unaware of analyses conducted under prior Administrations that used thresholds to adjust the monetized co-benefit estimates. Examples of EPA analyses from prior Administrations that did not apply thresholds to the co-benefit estimates include 2015 CPP RIA and *Regulatory Impact Analysis for the Stationary Internal Combustion Engine NESHAP*, February 2004, https://www3.epa.gov/ttn/ecas/docs/ria/ic-engines_ria_final-rice-engines_2004-02.pdf. For additional examples of EPA analyses, conducted under each Administration dating back to the President Reagan, that have incorporated co-benefits, see letter from Institute for Policy Integrity, New York University School of Law, to EPA, Docket ID EPA-HQ-OAR-2017-0355, October 31, 2018, p. 18, https://www.regulations.gov.

- 51%-80% (assuming lowest measured level threshold),[322] and
- 5%-9% (assuming $PM_{2.5}$ NAAQS threshold).[323]

Historically, EPA has reported lower confidence in benefits that occur from reductions at lower concentrations of $PM_{2.5}$ while clarifying that less confidence does not mean there are no benefits at lower concentrations. EPA has also stated that "scientific evidence provides no clear dividing line" to specify an exposure level at which the agency has low confidence in the mortality impacts.[324] EPA's 2015 CPP analysis concluded that "the best estimate of benefits includes benefits both above and below the levels of" the federal air quality standard and described this practice as consistent with scientific evidence and reviews of the independent Clean Air Scientific Advisory Committee.[325] While EPA has previously used benchmark concentration levels to examine the uncertainty of estimated $PM_{2.5}$ mortality benefits, the ACE analysis differed by applying benchmark concentrations as thresholds when monetizing some of the co-benefits.[326] EPA's ACE analysis stated that use of benchmark concentrations (i.e., thresholds) was intended to "increase transparency rather than imply a specific lower bound on the size of the ancillary health co-benefits."[327] The agency's application of thresholds, however, effectively considers two dividing lines by omitting a fraction of the health co-benefits from some of its benefit-cost comparisons.

Stakeholder opinion on consideration of co-benefits varies. For example, stakeholders critical of EPA's 2015 CPP analysis commented that inclusion of the monetized co-benefits made it difficult to understand the impact of the CPP on CO_2.[328] More recently, some stakeholders commented that EPA should not use co-benefits to justify promulgation of the ACE rule.[329] Other stakeholders agreed with EPA's approach to co-benefits in the ACE rule, which they viewed as striking "a better balance between the need to focus on the pollutant to be targeted by the regulation (CO_2), while also quantifying the ancillary benefits of reducing non-targeted pollutants (SO_2, NO_x, $PM_{2.5}$)."[330] Other stakeholders disagreed with EPA's "targeted pollutant" approach, commenting that the use of a threshold effectively establishes a dividing line, which the scientific literature does not support, and that exclusion of co-benefits is inconsistent with OMB guidance and "decades of EPA statements and practice."[331] In addition, a 2019 article offering "an economic perspective" observed that individuals and corporations in the private market "account for the

[322] Refers to the "lowest measured level" of $PM_{2.5}$ from two long-term studies. See "Q: How did EPA estimate the human health co-benefits?"

[323] Final RIA, p. 4-30.

[324] Final RIA, p. 4-26.

[325] EPA, *EPA's Responses to Public Comments on the EPA's Carbon Pollution Emission Guidelines for Existing Stationary Sources*, Docket ID EPA-HQ-OAR-2013-0602-37106. See chap. 8, §§8.7-8.9, p. 102.

[326] EPA's 2015 CPP analysis used the lowest measured levels from published studies as a benchmark concentration level to examine the uncertainty of estimated $PM_{2.5}$ mortality benefits. Specifically, it presented the portion of the population exposed to annual mean $PM_{2.5}$ levels at or above different concentrations. The 2015 RIA did not use the benchmark concentration levels to adjust the monetized estimates. The 2015 analysis also clarified that EPA did not view this benchmark as a threshold below which benefits fell to zero. See 2015 RIA, p. 4-39.

[327] Final RIA, p. 6-10.

[328] EPA, *EPA's Responses to Public Comments on the EPA's Carbon Pollution Emission Guidelines for Existing Stationary Sources*, Docket ID EPA-HQ-OAR-2013-0602-37106. See chap. 8, §§8.7-8.9, pp. 90-93.

[329] ACE RTC, see chap. 7, pp. 52-53.

[330] ACE RTC, see chap. 7, pp. 52-53.

[331] Letter from Institute for Policy Integrity to EPA, p. 14.

whole suite of benefits when deciding on a purchase or investment" and concluded that omission of co-benefits in a regulatory analysis "amounts to distorting analysis."[332]

For more information about co-benefit considerations and related stakeholder views, see CRS Report R44840, *Cost and Benefit Considerations in Clean Air Act Regulations*, by James E. McCarthy and Richard K. Lattanzio and CRS Report R45119, *EPA's Proposal to Repeal the Clean Power Plan: Benefits and Costs*, by Kate C. Shouse.

General Implementing Regulations for Section 111(d)

Q: What are the general implementing regulations for Section 111(d)?

A: The general implementing regulations establish procedures for state plans submitted under CAA Section 111. The general implementing regulations for CAA Section 111 are different from source-specific regulations that EPA has promulgated under CAA Section 111(d), such as the ACE rule. EPA refers to the ACE rule and other source-specific regulations promulgated under CAA Section 111(d) as "emission guidelines."[333] Whereas the general implementing regulations establish procedures for state plan submissions, the emission guidelines establish binding requirements that states are required to address when they develop plans to regulate the existing sources.

EPA first promulgated the general regulations to implement CAA Section 111(d) in 1975 and codified them at Title 40, Part 60, Subpart B, of the *Code of Federal Regulations*. In July 2019, EPA promulgated a new set of implementing regulations in the same *Federal Register* notice as the final ACE rule.[334] EPA codified the new implementing regulations in a new subpart, Title 40, Part 60, Subpart Ba.

EPA did not repeal the Subpart B regulations and chose to apply the Subpart Ba regulations prospectively in order to provide regulatory certainty.[335] Specifically, the Subpart Ba regulations apply to the ACE rule, "ongoing emission guidelines,"[336] and all future emission guidelines promulgated under CAA Section 111(d).

[332] Joseph E. Aldy, *Benefits Are Benefits—Regardless of How They Are Legally Obtained*, Environmental Law Institute, May/June 2019, https://scholar.harvard.edu/files/jaldy/files/aldy_forum_2019_may-june.pdf.

[333] For emission guidelines promulgated prior to ACE, EPA defines *emission guideline* at Title 40, Section 60.21(e), of the *Code of Federal Regulations*. For ACE and any future emission guidelines, EPA defines *emission guideline* at Title 40, Section 60.21a(e).

[334] EPA determined that the "new implementing regulations are a separate and distinct rulemaking" from the final ACE rulemaking. For simplicity, this report refers to the *Federal Register* notice promulgating ACE and new implementing guidelines as "ACE Final Rule." See ACE Final Rule, p. 32564.

[335] EPA also retained the Subpart B regulations because they apply to regulations promulgated under CAA Section 129, which address waste incineration. The Subpart B regulations will continue to apply to EPA regulations promulgated under CAA Section 129. ACE Final Rule, p. 32564.

[336] EPA refers to "ongoing emission guidelines" where state plan submittal and review processes are still ongoing for existing CAA Section 111(d) emission guidelines. See ACE Final Rule, p. 32564.

Q: What changes did EPA make to the schedules for submission and review of state plans and federal plans?

A: The implementing regulations for CAA Section 111(d) specify timing requirements for the submission and review of state plans as well as federal plans. The schedule for submission and review of state and federal plans presented in Subpart Ba regulations differs from the schedule in Subpart B regulations, as shown in **Table 4**.

Table 4. Timing Requirements

Submission and Review of CAA Section 111(d) State and Federal Plans (40 C.F.R. Part 60)

Action	Subpart B (Existing regulations)	Subpart Ba (New regulations)
State submission timing[a]	9 months after EPA promulgates final emission guidelines	3 years after EPA promulgates final emission guidelines
EPA completeness check[b]	Not applicable	Within 60 days of receiving the plan but no later than six months of receipt
EPA action on state plan submission	4 months after submittal deadline[c]	12 months after EPA determines state plan is complete[d]
EPA promulgation of federal plan, as relevant[e]	6 months after submittal deadline	2 years after finding of plan submission to be incomplete, finding of failure to submit a plan, or disapproval of a plan

Source: CRS, as adapted from EPA, ACE Final Rule, Table 8, p. 32565.

Notes:

a. The Subpart B regulations allow the EPA Administrator to, "whenever he determines necessary, extend the period for submission of any plan" (40 C.F.R. §60.27(a)). The Subpart Ba regulations allow EPA to "shorten the period for submission" of state plans (40 C.F.R. §60.27a(a)).

b. The Subpart Ba regulations require EPA to make a "completeness check," determining whether a state plan is complete (40 C.F.R. §60.27a(g)).

c. The Subpart B regulations require EPA to determine whether to approve or disapprove the plan or portion of the plan (40 C.F.R. §60.27).

d. The Subpart Ba regulations require EPA to determine, within 12 months of the completeness determination, whether the plans are "satisfactory" under CAA Section 111(d)(2)(A) and either approve or disapprove the plan or portion of the plan (40 C.F.R. §60.27a(b)).EPA issues a federal plan in the event that a state fails to submit a state plan, if EPA disapproves a state plan, or if EPA determines a state plan is incomplete.

e. EPA issues a federal plan in the event that a state fails to submit a state plan, if EPA disapproves a state plan, or if EPA determines a state plan is incomplete.

Q: Why did EPA establish new schedules for submission and review of state plans and federal plans?

A: EPA established new schedules for submission and review of state plan and federal plans because the agency concluded that the Subpart B schedule was inconsistent with the CAA.[337] CAA Section 111(d) directs EPA to establish a state plan procedure "similar to that provided by

[337] ACE Final Rule, p. 32567.

section 110."[338] Noting that the 1990 CAA amendments revised the "timing requirements" for submission and review of SIPs as well as federal implementation plans (FIPs) in Section 110, EPA changed the schedule for state plans and federal plans "under CAA section 111(d) to be consistent with the current timing requirements for SIPs and FIPs under section 110."[339]

According to EPA, some commenters disagreed with the new schedules for review of state plans. These commenters concluded that it was "inappropriate" to use the same schedules used for SIPs because "section 111(d) states plans are narrower in scope and less complex than section 110 SIPs."[340] For example, state plans address one source category, such as power plants, whereas SIPs cover various types of sources from which emission reductions are required to meet federal air quality standards. EPA acknowledged some of the differences between state plans and SIPs but concluded that "[e]stablishment of standards performance under CAA section 111(d) state plans also may not be as straightforward as commenters suggest," noting among other things that states must consider source-specific factors that would "necessitate development of a different standard than the degree of emission limitation that the EPA identifies."[341]

EPA Postpones Decision Regarding New Source Review (NSR) Changes

Q: What changes to New Source Review applicability did EPA propose in August 2018?

One of the three actions that EPA proposed in the August 2018 ACE rule focused on NSR, a CAA preconstruction permitting program for new and modified stationary sources. The NSR program generally requires emission limits based on the best available control technology when new facilities are built or when existing facilities make a change that increases emissions above specified thresholds. Historically, NSR applicability determinations have been contentious and extensively litigated.[342] In August 2018, EPA proposed to revise the test used to determine whether physical or operational changes to an EGU constitute a "major modification" that triggers NSR. The proposed revision would not be mandatory. Rather, states would have the option to incorporate it into state regulations.[343]

The current test for an NSR permit, which is codified in the NSR regulations,[344] requires consideration of emissions increases on an *annual* basis. EPA proposed to consider whether the modification at an existing EGU would increase CO_2 emissions on an *hourly* basis. Under the proposal, NSR would not be triggered if the modification to an existing EGU does not increase emissions on an hourly basis. These EGUs would not be required to meet CO_2 emission limits

[338] 42 U.S.C. §7411(d)(1); 42 U.S.C. §7410.

[339] ACE Final Rule, p. 32567.

[340] ACE Final Rule, p. 32567.

[341] ACE Final Rule, pp. 32567-68.

[342] For more about the history of NSR, including efforts by prior Administrations to modify the program, see CRS Report R43699, *Key Historical Court Decisions Shaping EPA's Program Under the Clean Air Act*, by Linda Tsang.

[343] ACE Proposal, p. 44782.

[344] 40 C.F.R. §§52.21(b)(2)(i), 52.21(b)(23)(i). See also 40 C.F.R. Part 50, Subpart I.

based on the "best available control technology" assessment, even if the modification leads to an increase in annual emissions.[345]

Q: Why did EPA propose changes to NSR applicability in the ACE proposal?

A: EPA explained that the proposed NSR revision would, in part, facilitate "prompt implementation of a revised CAA Section 111(d) standard for EGUs."[346] EPA noted that "over the years, some stakeholders have asserted that the NSR rules discourage companies" from implementing energy-efficiency projects.[347] EGUs that adopt HRI measures—that is, the BSER proposed under the ACE rule—and operate more efficiently may be used for longer time periods, thereby increasing annual emissions and potentially triggering NSR under existing regulations. Under the ACE proposal, NSR would not be triggered if the EGU modification did not increase emissions on an hourly basis, even if the modification increases annual emissions.

Some stakeholders have suggested that the proposed NSR revision has broader implications for the energy and air quality programs.[348] For example, one state agency described ACE as "a significant overhaul" of NSR that would increase the number of "projects that are excluded from requirements to install reasonable controls," thereby allowing "poorly controlled and grandfathered sources to continue to operate without cost-effective controls."[349]

Q: What is the status of the changes EPA proposed for NSR in the ACE proposal?

A: As of July 2020, EPA has not finalized the proposed revision to the applicability test under NSR for certain power plants. The final ACE rule did not explain why EPA did not finalize the NSR proposal but noted that EPA intends to take final action at a later date. EPA projected that it would finalize this proposal in December 2020.[350]

Issues for Congressional Consideration

The CPP and the ACE rule present different legal interpretations of CAA Section 111 authority. EPA's 2017 review concluded that the CPP exceeded EPA's statutory authority by using measures that applied to the power sector as a whole rather than measures carried out within an individual facility. The final ACE rule applies a narrower interpretation than the CPP of the BSER, defining it as on-site HRIs for existing coal-fired units. These interpretations arguably raise broader questions about CAA regulation of GHG emissions. The ACE rulemaking may also raise questions about state and federal roles under the CAA and how benefit-cost analysis may

[345] On the other hand, if the modification increases hourly emissions, the owner or operator would need to continue with the NSR applicability test as it is currently codified (ACE Proposal, pp. 44780-44781).

[346] ACE Proposal, pp. 44775-44776.

[347] ACE Proposal, p. 44775. EPA has previously sought to address this concern through the rulemaking process, most recently through a 2007 proposed rulemaking that was never finalized. See EPA, "Supplemental Notice of Proposed Rulemaking for Prevention of Significant Deterioration and Nonattainment New Source Review: Emission Increases for Electric Generating Units; Proposed Rule," 72 *Federal Register* 26202, May 8, 2007.

[348] Letter from William T. Pound, Executive Director, National Conference of State Legislatures, et al., to Andrew Wheeler, EPA Administrator, September 13, 2018, https://www.regulations.gov, see EPA-HQ-OAR-2017-0355-21870.

[349] Letter from John Linc Stine, Commissioner, Minnesota Pollution Control Agency, to Andrew Wheeler, EPA Administrator, September 17, 2018, https://www.regulations.gov, see EPA-HQ-OAR-2017-0355-21873.

[350] OMB, Semiannual Regulatory Agenda, EPA, RIN 2060-AU58, Spring 2020.

inform decisionmaking. The remainder of this section discusses issues that Congress may consider regarding EPA's interpretation and implementation of the CAA.

CAA Regulation of GHG Emissions

EPA and stakeholders continue to debate the scope of EPA's authority and its methods for regulating GHG emissions under the CAA. EPA's varying legal interpretations and regulatory approaches to regulating GHG emissions from existing power plants has raised novel issues that policymakers and the courts have not addressed previously. Because of the interconnected nature of the power sector, EPA's legal interpretation and regulatory approach in the CPP are distinct from previous Section 111(d) guidelines for other industries.[351]

Although the Supreme Court clarified EPA's authority to regulate GHGs under specific CAA programs in *Massachusetts v. EPA* and subsequent cases,[352] regulatory developments and judicial decisions raise questions concerning the breadth of EPA's authority under CAA Section 111 to consider various emission reduction measures for existing industrial sources of pollution.[353] As discussed in this report, stakeholders critical of the ACE rule have argued that EPA has authority to expand the scope of the BSER to achieve greater emissions reductions by including other systems of emission reduction and other types of EGUs.[354] Other stakeholders view EPA's authority under CAA Section 111 as limited to measures implemented directly at the designated facility regardless of GHG reduction policy goals.[355] Stakeholders and EPA may continue to litigate and debate the scope of EPA's authority to regulate GHG emissions under CAA Section 111.

Many in Congress have taken an active interest in EPA's interpretation of its authority to determine the BSER under CAA Section 111 for power plants. For example, some Members of Congress filed amici curiae briefs opposing the CPP repeal and ACE rule. In one amici curiae brief filed by 68 Members of the House of Representatives and six Senators, the Members argue that the CPP was a "lawful exercise of the authority that Congress conferred on EPA when it enacted the CAA."[356] Another amici curiae brief filed by five Senators assert that the court should vacate the ACE rule because it is "the product of EPA political leadership uninterested in the science or economics of climate change and completely beholden to the fossil-fuel industry via close political, financial, and professional ties" and "constitutes an illegal delegation of the agency's rulemaking authority to private entities: fossil-fuel companies and organizations

[351] In the ACE rule, EPA states that prior to the CPP, all previous Section 111(b) NSPS and Section 111(d) emission guidelines "applied technologies, techniques, processes, practices, or design modifications directly to individual sources." ACE Final Rule, p. 32526.

[352] Massachusetts v. EPA, 549 U.S. 497 (2007). *See, e.g.*, Util. Air Regulatory Group v. EPA, 573 U.S. 302, 314-334 (2014); Am. Elec. Power Co. v. Connecticut, 564 U.S. 410 (2011).

[353] EPA has also considered GHG emissions from other sectors in separate rulemakings. In 2016, EPA promulgated emission standards for methane, a GHG, under Section 111(b) for the oil and gas sector without a cause and contribute finding. EPA subsequently proposed to rescind these limits on methane. For more information about Section 111 regulations applicable to the oil and gas sector, see CRS Report R42986, *Methane and Other Air Pollution Issues in Natural Gas Systems*, by Richard K. Lattanzio. EPA has also proposed and finalized a cause and contribute finding for GHG emissions from aircraft. For more information, see CRS Report R40506, *Cars, Trucks, Aircraft, and EPA Climate Regulations*, by James E. McCarthy and Richard K. Lattanzio.

[354] See "Litigation Challenging the CPP Repeal and the ACE Rule."

[355] See "Litigation Challenging the CPP Repeal and the ACE Rule."

[356] Brief for Members of Congress as *Amici Curiae* in Support of Petitioners at 2-4, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 24, 2020).

representing their interests."[357] In 2016, several Members of Congress also filed amici curiae briefs on both sides of the CPP litigation. A brief opposing the CPP argued, among other things, that EPA "usurped the role of Congress" through the CPP's "expansive regulatory requirements" that went beyond the fenceline of affected power plants or to require fuel switching to reduce CO_2 emissions.[358] A brief in support of the CPP argued, among other things, that Congress conferred "broad authority" on EPA and that the CPP is "consistent with the text, structure, and history" of the CAA.[359]

Progress toward more ambitious GHG targets supported by some Members[360] would likely require reductions throughout the economy, not just the power sector. The electricity sector has historically accounted for the largest percentage of anthropogenic U.S. CO_2 emissions, though transportation activities have more recently accounted for a slightly larger share. Congress may consider whether and how regulatory tools under the CAA could support cost-effective economy-wide strategies that may reduce GHG emissions from the power sector as well as the transportation, industrial, commercial, and residential sectors.

Federal and State Roles to Implement the ACE Rule

Congress may consider how the final ACE rule may affect federal and state roles to implement CAA Section 111(d), in particular with respect to establishing performance standards for existing sources. The ACE rule does not establish a binding, numeric performance standard for CO_2 emissions from existing coal-fired units. The ACE rule allows states to establish CAA Section 111(d) performance standards that, based on site-specific considerations, are less stringent than the standard expected to result from a direct application of the BSER identified by the EPA. EPA characterized this approach as consistent with the "cooperative federalism structure of CAA section 111," noting that while the agency determines the degree of emission limitation achievable through application of the BSER, states "have considerable discretion under section 111(d) and the ACE Rule, so long as they reasonably exercise this discretion and adequately explain their choices."[361] Some stakeholders agree with this unit-specific, state-led approach, while others disagree.[362] Those who disagree maintain that allowing unit-specific HRIs as the BSER would not result in significant emission reductions and that it is "inconsistent with the EPA's role under the CAA: to establish a minimum level of environmental protection and to allow states the flexibility to be more protective."[363]

While EPA emphasizes that states have primary responsibility in establishing performance standards for existing units under CAA Section 111, EPA also limits some of the compliance

[357] Brief for U.S. Senators Sheldon Whitehouse, Jeff Merkley, Kirsten Gillibrand, Brian Schatz, and Edward J. Markey as *Amici Curiae* in Supporting the State and Muni. Petitioners, Pub. Health and Envtl. Petitioners, Power Co. Petitioners, and Clean Energy Trade Ass'n. Petitioners at 3-4, Am. Lung Ass'n. v. EPA, No. 19-1140 (D.C. Cir. Apr. 24, 2020).

[358] Brief for Members of Congress as *Amici Curiae* in Support of Petitioners at 13-25, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Feb. 23, 2016).

[359] Brief for Current Members of Congress and Bipartisan Former Members of Congress as *Amici Curiae* in Support of Respondents at 8-14, West Virginia v. EPA, No. 15-1363 (D.C. Cir. Mar. 31, 2016).

[360] For example, S. 3269, the Clean Economy Act of 2020, sets and aims to meet a national goal of net-zero GHG emissions by 2050.

[361] ACE RTC, see chap. 3, p. 3. See also ACE Final Rule, p. 32567. EPA cites Title 42, Section 7411(d)(1)(B), of the *U.S. Code*, among other things, as the basis for its interpretation.

[362] ACE Final Rule, p. 32536.

[363] ACE RTC, see chap. 3, p. 3.

measures that states may allow under the ACE rule. For example, under EPA's current interpretation of CAA Section 111(d), the ACE rule bars states from using averaging and trading or biomass co-firing as compliance measures, even if these measures may be more cost-effective.

In addition, this report discussed some states' concerns about implementing the ACE rule. For example, NACAA reported that establishing unique performance standards for each unit in a state's jurisdiction would draw on limited agency resources and staff hours and possibly trigger a public review process.[364] Further, some states are concerned that the lack of uniform, national emission standards in the ACE rule could increase their litigation risks as stakeholders may challenge the standards the state sets for each EGU. Congress may consider the interaction of the ACE rule and state and local GHG reduction programs and the resulting implications for state planning efforts. For example, it may be more efficient for states to rely on existing, non-federal GHG emission reduction programs to fulfill the ACE rule requirements rather than implementing separate state and federal standards for the same emission sources. While the ACE rule does not prohibit states from implementing GHG programs under state authority, it is unclear whether state plans that incorporate non-federal GHG emission reduction programs would meet the ACE rule requirements. This may raise questions about how these states would demonstrate compliance with the ACE rule in addition to continuing their participation in non-federal GHG programs.

Role of Benefit-Cost Analysis in CAA Rulemakings

Benefit-cost analysis is one of various factors that inform the development and promulgation of regulations. Other factors include legal considerations, technical feasibility, statutory criteria, and ethical considerations. EPA based the CPP repeal and promulgation of the ACE rule on a change in the agency's legal interpretation of Section 111(d) of the CAA. The benefit-cost analysis of the ACE rulemaking is nonetheless consequential because it reveals methodological changes relative to prior analyses, such as EPA's 2015 CPP analysis.

Congress may consider how policy choices have influenced EPA's benefit and co-benefit estimates in ACE and other CAA rulemakings. While some changes may reflect technical updates, such as using more recent emissions projections in the modeling analysis, other changes involve some degree of policy choices, such as what discount rate to use or how much weight to give to the co-benefits in the benefit-cost comparisons. This report described changes in the way EPA estimates the SC-CO_2, a metric used to monetize the benefit of CO_2 reductions, under two Administrations. The SC-CO_2 estimates used in the ACE rule analysis garnered stakeholder interest, in particular with respect to their domestic scope and the use of a 7% discount rate. Reliance on domestic SC-CO_2 values meant that the main benefit-cost analysis considered only domestic benefits of the ACE rule, excluding benefits that occur outside the United States. Reliance on the 7% discount rate makes certain assumptions regarding how much the current generation values the climate change impacts experienced by future generations. The domestic perspective and use of a 7% rate lowered the SC-CO_2 estimates compared to the estimates used in EPA's 2015 analysis of the CPP.[365]

This report also described changes in EPA's assessment of the human health co-benefits under the final ACE rule. EPA excluded the co-benefits from some of the ACE rule benefit-cost comparisons, describing it as a way to consider the benefit of reducing the "targeted pollutant"

[364] Letter from NACAA to EPA, p. 5.

[365] Between 2009 and 2016, federal agencies used SC-CO_2 estimates in regulatory analyses that included global measures and discount rates of 2.5, 3, and 5%.

(CO_2) against the compliance cost.[366] In other cases, EPA omitted the PM-related health co-benefits below two specified thresholds for $PM_{2.5}$, reporting only the PM-related health co-benefit above the thresholds.[367] While EPA has previously used these thresholds—based on "benchmark concentration levels"—to examine the uncertainty of estimated $PM_{2.5}$ mortality benefits, the ACE analysis differed by applying benchmark concentrations as thresholds when monetizing some of the co-benefits.[368] EPA's ACE analysis stated that use of benchmark concentrations was intended to "increase transparency rather than imply a specific lower bound on the size of the ancillary health co-benefits."[369] The agency's application of thresholds, however, effectively considers two dividing lines—the lowest measured level and the primary $PM_{2.5}$ NAAQS—by omitting a fraction of the health co-benefits from some of its benefit-cost comparisons.

Congress, in its oversight role, may wish to consider whether EPA's analysis of the ACE rule adheres to federal economic guidance while incorporating current, peer-reviewed economic methods. For example, the ACE analysis raises questions about how omitting information—that is, the co-benefit estimates—from some cases impacts transparency. Some stakeholders agreed with EPA's approach to co-benefits in the ACE rule, describing it as a way to "better balance" consideration of benefits from the targeted pollutant with consideration of co-benefits. Other stakeholders disagreed with EPA's "targeted pollutant" approach, commenting that the scientific literature does not support use of a threshold and that exclusion of co-benefits is misleading and inconsistent with OMB guidance and past EPA practice.

EPA's benefit-cost analysis for the ACE rule may set a precedent for the way EPA accounts for co-benefits in future rulemaking analyses. Separate from the final ACE rule, EPA is developing a proposal related to its treatment of benefits in air pollution regulatory analyses.[370] In its oversight role, Congress may wish to consider this forthcoming proposal, in particular what kind of guidance that proposal may offer regarding the scope of benefits considered in EPA's analyses (e.g., domestic and global climate benefits), the selection of discount rates to assess climate change impacts, and the weight given to benefits and ancillary impacts.

Beyond questions about how EPA estimates benefits and costs, Congress could consider development of legislation that addresses how EPA and other federal agencies factor benefits and costs into rulemaking decisions. For example, Congress may explore opportunities to clarify how much weight an agency gives to benefits and ancillary impacts. Such legislation may involve consideration of the tension between providing more specific direction to the agencies and allowing an agency sufficient discretion to tailor its approach as warranted. While legislative direction may provide greater consistency across administrations, it may also limit an agency's discretion to consider case-specific factors and apply its evolving understanding of the science and economics.

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[366] Final RIA, pp. ES-9 to ES-10.

[367] EPA based one threshold on the current federal air quality standard for $PM_{2.5}$—12 $\mu g/m^3$—and omitted deaths attributable to $PM_{2.5}$ concentrations less than 12 $\mu g/m^3$. EPA based the second and lower threshold on the "lowest measured level" of $PM_{2.5}$ from the two long-term studies it used to estimate deaths related to $PM_{2.5}$. For the lowest measured level threshold, EPA omitted deaths attributable to $PM_{2.5}$ at or below the lowest measured level of the Krewski et al. 2009 study (5.8 $\mu g/m^3$) and the Lepeule et al. 2012 study (8 $\mu g/m^3$).

[368] EPA's 2015 CPP RIA used the lowest measured levels from published studies as a benchmark concentration level to examine the uncertainty of estimated $PM_{2.5}$ mortality benefits. Specifically, it presented the portion of the population exposed to annual mean $PM_{2.5}$ levels at or above different concentrations. The 2015 CPP RIA did not use the benchmark concentration levels to adjust the monetized estimates. The 2015 CPP RIA also clarified that EPA did not view this benchmark as a threshold below which benefits fell to zero. See 2015 CPP RIA, p. 4-39.

[369] Final RIA, p. 6-10.

[370] See RIN 2060-AU51 at https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202004&RIN=2060-AU51.

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