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EPA's Proposed Clean Power Plan: Protecting Climate and Public Health by Reducing Carbon Pollution From the U.S. Power Sector

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Introduction

It has been nearly a quarter century since President George H.W. Bush signed, and Congress ratified, the United Nations Framework Convention on Climate Change (UNFCCC)—the first major accord in which the United States and other countries acknowledged the growing threat of climate change and committed to "prevent[ing] dangerous anthropogenic interference with the climate system."[1] In the years since, evidence has continued to mount that rising concentrations of carbon dioxide, methane, and other greenhouse gases pose serious threats to public health, infrastructure, and the natural systems our society depends on.[2] Moreover, there is a growing recognition within the United States government that the deteriorating stability of Earth's climate is already having immediate and costly impacts. As the government's most recent National Climate Assessment concludes, "Climate change, once considered an issue for a distant future, has moved firmly into the present. . . . The observed warming and other climatic changes are triggering wide-ranging impacts in every region of our country and throughout our economy."[3] The assessment documents numerous ways in which climate change has already adversely affected the lives of Americans in recent years, including more frequent and intense heat waves,

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1. United Nations Framework Convention on Climate Change, art. II, *opened for signature*, May 9, 1992, S. TREATY DOC. NO. 102-38 (1992).

2. *See, e.g., Climate Change 2014: Synthesis Report, Summary for Policymakers*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 2 (2014), http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf ("Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.").

3. *Climate Change Impacts in the United States*, U.S. GLOBAL CHANGE RES. PROGRAM (2014), http://s3.amazonaws.com/nca2014/low/NCA3_Climate_Change_Impacts_in_the_United%20States_LowRes.pdf?download=1.

more severe droughts, flooding events in coastal cities affected by sea level rise, and impacts on crop production and agriculture.[4]

Since January 2009, the U.S. Environmental Protection Agency (EPA) has been engaged in a comprehensive effort to apply existing Clean Air Act authorities to reduce greenhouse gas emissions from the nation's largest sources. This Article focuses on EPA's most recent, and significant, undertaking: an initiative to reduce emissions of carbon dioxide (CO_2) from existing fossil fuel-fired power plants under § 111(d) of the Clean Air Act (the Act), known popularly as the "Clean Power Plan." Fossil fuel-fired power plants are far and away the largest source of greenhouse gas emissions in the United States, and emit CO_2 at levels that dwarf the emissions of many individual countries. In 2013, fossil fuel-fired power plants emitted more than 2 billion metric tons of CO_2, equivalent to approximately 37% of total U.S. emissions of CO_2 and 30% of all U.S. greenhouse gas emissions.[5]

Pursuant to a Presidential Memorandum issued in summer of 2013, EPA published the proposed Clean Power Plan in June 2014.[6] EPA also issued two companion proposals that would establish emission standards for new, modified, and reconstructed fossil fuel-fired power plants under § 111(b).[7] All three rules are expected to be finalized by mid-summer of 2015—a milestone that, in the case of existing power plants, will launch a process by which states craft individualized plans to establish emission standards consistent with EPA's guidelines. These rules will, for the first time, establish nationwide limits on emissions of CO_2 from the United States power sector. Under the proposed Clean Power Plan, power sector emissions of CO_2 would decline to 30% below 2005 levels by 2030—representing an important first step towards achieving the long-

4. *Id.* at 7-13 (summarizing findings of Third National Climate Assessment, including rising average temperatures in the post-1970 period; increased incidence of prolonged high temperatures and high nighttime temperatures; a 27% to 71% increase in heavy precipitation events in the Southeast, Midwest, and Northeast; a doubling in the rate of sea level rise since 1992; droughts and longer wildfire seasons in the Southwest).

5. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013*, U.S. ENVTL. PROT. AGENCY. ES-5, ES-7 (2015), http://www.epa.gov/climatechange/pdfs/ usinventoryreport/US-GHG-Inventory-2015-Main-Text.pdf. The transportation sector is the only category of greenhouse gas emission sources that approaches the scale of power plants, with emissions of approximately 1.75 billion metric tons of CO_2 in 2013.

6. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,830 (proposed June 18, 2014) [hereinafter "Proposed Clean Power Plan"].

7. Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 1,430 (proposed Jan. 8, 2014) [hereinafter "Proposed NSPS"]; Carbon Pollution Standards for Modified and Reconstructed Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34,960 (proposed June 18, 2014).

term reduction in emissions needed to mitigate the worst impacts of climate change.[8] Reductions of other harmful pollutants emitted by the power sector would also decline substantially, yielding significant near-term "co-benefits" for human health.[9]

This Article explores key policy and legal dimensions of the Clean Power Plan. Parts I, II, and III provide critical background on the Clean Power Plan—including the legal developments that led up to the issuance of the proposal, relevant statutory context, and an overview of the proposed rule and the related proposals for new and modified power plants. Part IV discusses policy aspects of the Clean Power Plan, including the anticipated impacts on climate and public health, economic impacts, and implications for the power sector itself and for states. Part IV also identifies the policy advantages of a key feature of the Clean Power Plan—the "interim goals" for carbon reduction for the period from 2020 to 2029. Lastly, Part V discusses the legal basis for EPA's proposed determination that the "best system of emission reduction" for existing power plants includes shifting generation from high-emitting facilities to low and zero-emitting alternatives, and argues that this determination is fully consistent with the language, structure and history of the Clean Air Act.

I. The Road to the Clean Power Plan

The Clean Power Plan is the latest in a series of actions that EPA has taken to apply long-standing provisions of the Clean Air Act to the problem of greenhouse gas emissions. This process began after *Massachusetts v. EPA*, in which the Supreme Court remanded EPA's denial of several administrative petitions seeking regulation of greenhouse gas emissions from motor vehicles.[10] The Supreme Court held that the Act's definition of the term "air pollutant" clearly encompasses greenhouse gases[11] and ordered EPA to make a science-based determination under § 202 of the Act as to whether greenhouse gas emissions

8. *Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants*, U.S. Envtl. Prot. Agency 3-20 tbl.3-6 (June 2014), http://www2.epa.gov/sites/production/files/2014-06/documents/20140602ria-clean-power-plan.pdf [hereinafter "RIA"].

9. *Id.* at 3-21 tbl.3-7 (showing that the proposed Clean Power Plan would reduce power sector emissions of mercury by 24%, emissions of nitrogen oxides by 28%, emissions of sulfur dioxide by 31%, and emissions of particulate matter by 29%, all relative to "business as usual" levels in 2030).

10. Massachusetts v. EPA, 549 U.S. 497, 510-514, 534-535 (2007). The Environmental Defense Fund was one of the organizations that filed the petition for certiorari in *Massachusetts*.

11. *Id.* at 528-32.

from motor vehicles "cause, or contribute, to air pollution which may reasonably be anticipated to endanger public health and welfare."[12]

In December 2009, the Obama administration responded to *Massachusetts* by issuing a detailed scientific finding affirming that climate change caused by six greenhouse gases endangers public health and welfare and that motor vehicles contribute to such air pollution.[13] Under § 202 of the Act, this Endangerment Finding obligated EPA to issue the nation's first greenhouse gas standards for light-duty passenger vehicles and heavy-duty trucks.[14] These standards also caused greenhouse gases to become regulated pollutants under the Act's Prevention of Significant Deterioration (PSD) permitting program for new and modified stationary sources.[15]

Massachusetts, and the Endangerment Finding, also had implications for the power sector under § 111 of the Act—which, in language similar to § 202, requires EPA to regulate a stationary source if it "causes, or contributes significantly to, air pollution which may reasonably be anticipated to endanger public health or welfare."[16] At the time *Massachusetts* was decided, legal challenges were pending in the United States Court of Appeals for the D.C. Circuit over whether the Agency was obligated to regulate greenhouse gas emissions from certain fossil fuel-fired power plants under § 111. After *Massachusetts*, the D.C. Circuit remanded the question to EPA upon the Agency's own motion.[17] In

12. *Id.* at 533; *see also* 42 U.S.C. § 7521(a).

13. The Endangerment Finding included carbon dioxide, methane, nitrous oxide, and various fluorinated gases. Endangerment and Cause or Contribute Findings for Greenhouse Gases Under § 202(a) of the Clean Air Act, 74 Fed. Reg. 66496, 66516 (Dec. 15, 2009).

14. EPA has issued greenhouse gas standards for light-duty motor vehicles in model years 2012-2016 and in model years 2017-2025, as well as medium and heavy-duty vehicles in model years 2014-2018. *See generally* Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25324 (May 7, 2010) (model years 2012-2016); 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule, 77 Fed. Reg. 62624 (Oct. 15, 2012) (model years 2017-2025); Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, 76 Fed. Reg. 57106 (Sept. 15, 2011). EPA is developing a second phase of standards for medium and heavy-duty vehicles in model years 2019 and later.

15. The consequences of the vehicle greenhouse gas regulations for the PSD program were the subject of extensive regulatory proceedings and litigation, with the result that greenhouse gas emissions from major stationary sources are subject to the program's "best available control technology" requirement, but greenhouse gas emissions by themselves do not trigger the applicability of the permit requirements. *See* Utility Air Regulatory Group v. EPA, 134 S. Ct. 2427, 2449 (2014).

16. 42 U.S.C. § 7411(b)(1)(A).

17. State of New York v. EPA, No. 06-1322, Order on Motion to Govern (D.C. Cir. Sept. 24, 2007).

2011, the Supreme Court held in *American Electric Power Co., Inc. v. Connecticut* that § 111 "speaks directly" to the problem of CO_2 emissions from existing power plants and cited EPA's authority to regulate existing power plants under that provision as a basis for dismissing federal common law suits brought by states and private land trusts against several major power companies.[18]

In July 2013, the Obama administration—as part of an overall "Climate Action Plan" committing the federal government to take action on climate change—issued a Presidential Memorandum with a specific timetable for EPA to issue standards for CO_2 from new and existing power plants under § 111 of the Clean Air Act.[19]

II. Statutory Background

Section 111 provides for the establishment of nationwide emission standards for each category of stationary sources that "causes, or significantly contributes" to air pollution that endangers public health and welfare.[20] Fossil fuel-fired power plants have been in listed source categories under § 111 since 1971.[21]

Section 111 addresses the regulation of both "new" and "existing" sources. For new (and modified) sources, § 111(b) directs EPA to establish nationwide "standards of performance."[22] Section 111(d), in turn, requires the establishment of standards of performance for "any existing source" that would be subject to a § 111(b) standard if it were a new source. Emission standards are not established under § 111(d) for pollutants regulated under § 112 or § 108 of the Clean Air Act, which respectively provide for regulation of hazardous air pollution and criteria air pollutants from existing sources.[23]

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18. 131 S. Ct. 2527, 2537 (2011).

19. Presidential Memorandum, Power Sector Carbon Pollution Standards (June 25, 2013), http://www.whitehouse.gov/the-press-office/2013/06/25/presidential-memorandum-power-sector-carbon-pollution-standards.

20. 42 U.S.C. § 7411(b)(1)(A).

21. *See* Air Pollution Prevention and Control: List of Categories of Stationary Sources, 36 Fed. Reg. 5931 (Mar. 31, 1971). The original source category listing includes coal, oil, and natural gas-fired generators that rely on steam turbines to produce electricity, and has since been expanded to include coal-fired integrated gasification combined cycle (IGCC) facilities. In 1979, EPA listed a separate source category for natural gas-fired combustion turbines, including "combined cycle" facilities (in which a combustion turbine is paired with a steam generator) and "simple cycle" configurations that lack a steam generator. Proposed NSPS, *supra* note 7, 79 Fed. Reg. at 1,454. For simplicity, this Article refers to all of these regulated units as "fossil fuel-fired power plants."

22. 42 U.S.C. § 7411(b)(1).

23. *Id.* § 7411(d)(1)(A)(i). There are several pending legal challenges to the proposed Clean Power Plan that are premised on the theory that EPA cannot regulate *any* pollutant under § 111(d) if it is emitted from a *source category* that is regulated under § 112—even if the pollutant at issue is not actually regulated under § 112. *See*

These standards of performance—for both new and existing sources—must reflect the emission reductions achievable through application of the "best system of emission reduction" (BSER) that EPA finds has been "adequately demonstrated" after taking into account costs, "energy requirements," and any non-air quality health and environmental impacts.[24] For existing sources, EPA issues "emission guidelines" to the states that include a determination of the BSER as well as other guidance.[25] States then develop and submit plans that implement and enforce standards of performance for existing sources.[26] If a state fails to submit a "satisfactory" plan, EPA must establish a federal plan for that state.[27]

III. Overview of the Clean Power Plan and Related Rulemakings

As noted above, the Clean Power Plan is the centerpiece of a series of three § 111 rulemakings that will together limit CO_2 emissions from the U.S. power sector. This Part describes each of those rules in turn.

1. *New Source Performance Standards.* Proposed in January 2014, this rule establishes CO_2 emission standards under § 111(b) for *newly constructed* fossil fuel-fired power plants. For natural gas-fired combustion turbines, EPA proposed an emission standard based on "combined cycle" technology—the most prevalent technology used in new natural gas-fired power plants.[28] For coal-fired power plants, EPA proposed an emission standard based on partial carbon capture and sequestration (CCS)—a technology that has been demonstrated in

State of West Virginia, v. EPA, No. 14-1146 (D.C. Cir.); *In re* Murray Energy Corp. v. EPA, Nos. 14-1112, 14-1151 (D.C. Cir.). Under this theory, EPA would lack authority to regulate carbon dioxide from the power sector, because mercury and other hazardous air pollutants from certain power plants are already being regulated under § 112. A full discussion of these issues is beyond the scope of this Article; however, EPA's long-standing interpretation holds that § 111(d) applies to any pollutant not regulated under § 108 and not regulated from the source category in question under § 112. *See* Revision of December 2000 Regulatory Finding on the Emissions of Hazardous Air Pollutants From Electric Utility Steam Generating Units and the Removal of Coal- and Oil-Fired Electric Utility Steam Generating Units From the § 112(c) List, 70 Fed. Reg. 15,994, 15,999 (Mar. 29, 2005). The Supreme Court's holding in *American Electric Power Co., Inc. v. Connecticut* (2011) is also premised on the recognition that EPA can regulate CO_2 from existing power plants under § 111(d). *See* 131 S. Ct. at 2537.

24. *Id.* § 7411(a)(1).

25. This process was first set forth in a 1975 Federal Register notice promulgating general regulations for implementing § 111(d). *See* State Plans for the Control of Certain Pollutants From Existing Facilities, 40 Fed. Reg. 53,340 (Nov. 17, 1975).

26. *Id.* § 7411(d)(1)(A).

27. 42 U.S.C. § 7411(d)(2).

28. Proposed NSPS, 79 Fed. Reg. at 1,485-86.

various industrial settings,[29] and that is now operating at commercial scale at a coal-fired power plant in Saskatchewan.[30] This proposed standard represents an approximately 30 to 50% reduction in emissions from a typical pulverized coal power plant.[31]

2. *Proposed Emission Guidelines.* The § 111(d) emission guidelines were proposed in June 2014. As required by the statute, these guidelines cover the same types of power plants that, if new, would be subject to the § 111(b) standards—including large existing coal-, oil- and gas-fired steam generating units, and gas-fired combustion turbines.[32]

Since the Clean Power Plan is a set of guidelines directed at the states, the proposed rule does not directly apply to any particular power plant. Nor would it require states to adopt any particular technology or policy to limit emissions. Instead, the proposed rule sets forth a flexible framework that allows each state to craft tailored policy solutions that are most appropriate and cost-effective for that state. In many cases, states will be able to use or build on existing environmental and energy policies to help achieve compliance.

The proposed rule has three core elements. First, the rule presents EPA's proposed determination as to the BSER for reducing CO_2 emissions from existing power plants, taking into account the statutory factors of costs and energy requirements. Second, the Clean Power Plan provides each state with unique, state-wide emission goals for its fossil fuel-fired power plants, reflecting the application of the BSER in each state through 2030.[33] Third, the Clean Power Plan sets forth procedural requirements for state plans, including filing deadlines,

29. *See Technical Support Document: Effect of EPAct 05 on BSER for New Fossil Fuel-Fired Boilers and IGCCs*, U.S. ENVTL. PROT. AGENCY 17-21 (Jan. 8, 2014), http://www2.epa.gov/sites/production/files/2014-01/documents/2013_proposed_cps_for_new_power_plants_tsd.pdf (noting that capture of carbon dioxide from industrial gases has been demonstrated since the 1930's, and providing several examples of both pre-combustion capture and post-combustion capture projects that demonstrate CCS technology).

30. *See* Peter Fairley, *A Coal Plant That Buries its Greenhouse Gases*, MIT TECH. REV. (Apr. 12, 2015, 3:08 PM), http://www.technologyreview.com/demo/533351/a-coal-plant-that-buries-its-greenhouse-gases/.

31. Proposed NSPS, 79 Fed. Reg. at 1,436.

32. The Clean Power Plan defines an "existing" power plant as one that commenced construction prior to January 8, 2014, the date the proposed NSPS was published in the *Federal Register*. Proposed Clean Power Plan, 79 Fed. Reg. at 34,954 (proposed 40 C.F.R. § 60.5790).

33. No state goals are proposed for Vermont and the District of Columbia, because neither of these jurisdictions has existing fossil fuel-fired power plants. In October 2014, EPA issued a supplemental proposal with proposed goals for existing fossil fuel-fired power plants in Indian Country, Guam, and Puerto Rico. Carbon Pollution Emission Guidelines for Existing Stationary Sources: EGUs in Indian Country and U.S. Territories; Multi-Jurisdictional Partnerships, 79 Fed. Reg. 65,482, 65,484 (Nov. 4, 2014).

minimum elements of a satisfactory plan, compliance flexibilities, and provisions to help ensure states adhere to their plans.

BSER Determination. The heart of the Clean Power Plan is the BSER determination, which under the proposal consists of four well-demonstrated, cost-effective measures for reducing carbon pollution from the fleet of existing power plants.[34] These four measures, which EPA refers to as "building blocks," include:

1. Efficiency improvements at existing coal-fired power plants;
2. Increased utilization of low-emitting, existing natural gas-fired power plants;
3. Increased deployment of zero-emitting generation, including renewable energy; and
4. Increased investment in the efficiency of electricity end-use.

As EPA recognizes in the proposal, these measures—with the exception of building block 1 —generally reduce emissions by *shifting generation* from high-emitting power plants to low or zero-emitting alternatives. This structure recognizes certain realities of the power sector, including that power plants operate as part of an interconnected and centrally dispatched system in which different sources of supply are regularly substituted for each other in real time, and in which the kinds of generation shifts reflected in the building blocks already regularly occur.[35] Further, this structure also recognizes that a variety of states and power companies have already reduced power sector carbon pollution through precisely the methods outlined above, demonstrating the system is both "adequately demonstrated" and cost-effective.[36] Finally, the system recognizes that there are limited options for reduing emissions from existing power plants through technological controls implemented "at the stack."[37]

State Goals Based on the BSER. As indicated above, states are *not* required to adopt any of the four building blocks in their state plans. Indeed, there are options for reducing carbon pollution that were not included in the building blocks, and which states may opt to incorporate in their state plans.[38] The role

34. Proposed Clean Power Plan, 79 Fed. Reg. at 34,836.

35. Proposed Clean Power Plan, 79 Fed. Reg. at 34,880-81.

36. *Id.; see also* Proposed Clean Power Plan, 79 Fed. Reg. at 34,887.

37. Although CCS technology can be retrofitted to existing power plants, the cost and feasibility of doing so varies considerably based on site- and facility-specific circumstances. For this reason, EPA proposed to designate CCS as the BSER for new coal-fired power plants, but not for existing plants. Proposed Clean Power Plan, 79 Fed. Reg. at 34,856-57. However, state plans can still use CCS as a compliance strategy to meet the state goals. *Id.*

38. For example, EPA's proposed building block 4 (energy efficiency) was based on energy savings achievable through traditional ratepayer-funded energy efficiency programs. Office of Air & Radiation, *GHG Abatement Measures, Technical Support Document for Carbon Pollution Guidelines for Existing Power Plants*, ENVTL. PROT. AGENCY 5-31 (June 10, 2014), http://www2.epa.gov/sites/production/files/2014-

of the building blocks is, instead, to provide a basis for calculating state-wide emission goals that will ensure state plans and standards of performance reflect the BSER, as required by the statute. To that end, the Clean Power Plan proposes a *level* of deployment for each building block that EPA found to be economically and technically feasible through the year 2030.[39] EPA then applied these deployment levels to the unique generating portfolio in each state. The result is a set of state-wide emission goals, expressed in terms of pounds of CO_2 per megawatt-hour, that reflects the combination of the four building blocks as applied to each state's unique circumstances.[40] For each state, EPA proposed a "final goal" that must be met by 2030, as well as an "interim goal" that must be achieved *on average* over the period from 2020-2029.

The Clean Power Plan includes multiple compliance alternatives, in addition to the significant flexibility described above with regard to the manner and pace of emission reductions. First, states have the option of adopting "mass-based" state goals that are expressed in terms of *total tons of emissions* per year, in lieu of the "rate-based" goals above.[41] This may be an attractive option for states that have adopted or intend to adopt emissions trading programs, such as California and the nine states participating in the Regional Greenhouse Gas Initiative (RGGI). Second, states have the option of coordinating with each other to jointly comply with state goals.

Submission of State Plans. The proposed Clean Power Plan sets forth a specific procedure and timetable for submitting state plans. Under the proposal,

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06/documents/20140602tsd-ghg-abatement-measures.pdf. As such, it did not account for energy savings from, among other things, transmission and distribution system upgrades; private energy efficiency investments made by energy service companies or other providers; or changes in state building codes and appliance standards.

39. For example, EPA concluded that plant-level efficiency improvements (building block 1) would reduce average emission rates from coal-fired steam generating units by 6%; that existing natural gas combined cycle (NGCC) facilities could increase utilization up to an average annual capacity factor of 70%; and that states could gradually increase savings from energy efficiency to a level of 1.5% of annual retail sales. Proposed Clean Power Plan, 79 Fed. Reg. at 34,896, 34,906.

40. A detailed description of the goal computation procedure is provided in the proposed rule and EPA's technical documentation. *See* proposed Clean Power Plan, 79 Fed. Reg. at 34,895-897; *see generally* Office of Air & Radiation, *Goal Computation Technical Support Document for Carbon Pollution Guidelines for Existing Power Plants* (June 2014) (explaining "step by step" how the building blocks were used to calculate each state's emission goal), http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-goal-computation.pdf.

41. EPA issued guidance in fall of 2014 explaining this conversion procedure. *See generally* Office of Air and Radiation, *Translation of the Clean Power Plan Emission Rate-Based CO_2 Goals to Mass-Based Equivalents*, U.S. ENVTL. PROT. AGENCY (Nov. 2014), http://www2.epa.gov/sites/production/files/2014-11/documents/20141106tsd-rate-to-mass.pdf.

state plans would be submitted by June 30, 2016. States that need additional time to prepare state plans could request a one-year extension until July 2017, and states that are planning regional or multi-state compliance programs would be allowed until July 2018.[42]

EPA has announced that it intends to issue a proposed federal plan by summer of 2015. This federal plan could serve as a template for approvable state plans, and would also be applied to existing fossil fuel-fired power plants in states that fail to submit satisfactory state plans.[43]

3. *Proposed Standards for Modified and Reconstructed Sources.* This proposed rule, issued simultaneously with the Clean Power Plan in June 2014, would establish carbon pollution standards for modified and reconstructed power plants—which are defined as "new sources" in the statute and EPA's § 111 regulations.[44] Like the proposal for newly constructed power plants, this proposal includes separate standards for coal-fired power plants and natural gas-fired combustion turbines.[45] This rule also clarifies that existing power plants would remain subject to their § 111(d) state plans after undertaking a modification or reconstruction, in addition to complying with new source standards.[46]

IV. Policy Implications of the Clean Power Plan: Impacts on Public Health, the Power Sector, and the States

The Clean Power Plan is anticipated to have significant benefits for human health and the environment, in terms of both long-term reductions in climate-destabilizing pollution and near-term improvements in public health associated with reduced emissions of other harmful pollutants from the power sector. Contrary to the claims of many critics of the Clean Power Plan, the state goals are also eminently feasible and cost-effective to attain—due in large part to transformations in the power sector that are already under way and steep reductions in the cost of low and zero-emitting generation. Indeed, many states have already demonstrated that effective environmental regulatory tools can be used to encourage the kinds of shifts in patterns of generation and dispatch

42. Proposed Clean Power Plan, 79 Fed. Reg. at 34,851.

43. *See* Kyle Danish et al., *Early Clean Power Planning: A Hedging Strategy for Sec. 111(d),* PUB. UTIL. FORTNIGHTLY 37 (Feb. 2015), http://64.106.168.122/files/11153_Danish,%20Smith,%20Zevin%20-%20Early%20Clean%20Power%20Planning%20-%20PUF.pdf (describing the dual roles of a federal plan).

44. 42 U.S.C. § 7411(a)(2) (defining "new source" to include sources that are modified); 40 C.F.R. § 60.15(a) (providing that reconstructed facilities are to be regarded as regulated sources under the NSPS program).

45. The proposed standards are generally based on the efficient operation of conventional generating technologies. 79 Fed. Reg. 34,964-65.

46. 79 Fed. Reg. 34,963.

contemplated in the BSER.[47] As a result, there is a strong case that further reductions would be technically and economically feasible to achieve before 2030.

Climate and health benefits. The costs and benefits of implementing the Clean Power Plan will ultimately depend on how the states choose to achieve the state goals. Nonetheless, EPA has undertaken detailed long-term modeling of the power sector—using the Integrated Planning Model (IPM) that it has used for years to evaluate other power sector emission standards—to predict how the power sector will respond to the Clean Power Plan, taking into account expected resource costs, the dynamics of the power grid, and other variables.

This modeling indicates that the Clean Power Plan would have significant impacts on pollution from the power sector throughout the 2020 to 2030 period. By 2030, total CO_2 emissions from the U.S. power sector would be 30% below 2005 levels, and approximately 25% below anticipated levels in the absence of the Clean Power Plan.[48] The latter reductions represent well over a half-billion tons of reduced carbon pollution per year—greater than the entire annual carbon dioxide emissions of many individual countries.[49]

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47. As noted above, California and nine Northeastern states have already implemented emissions trading programs that require existing power plants to reduce emissions over time through flexible market-based mechanisms. Since the RGGI program commenced in September of 2008, carbon dioxide emissions from power plants in the member states have fallen by 30%. States participating in the program also generated nearly $1 billion in revenue through 2012, which has been largely dedicated to programs for assisting low-income consumers and deploying energy efficiency and renewable energy projects. Over 3 million households and 12,000 businesses have benefited from energy efficiency and ratepayer assistance programs funded by RGGI. *See* Regional Greenhouse Gas Initiative, Regional Investment of RGGI CO_2 Allowance Proceeds, 2012, 5-6 (Feb. 2014); *see also* Paul J. Hibbard et al., The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States 3 (Nov. 2011) (concluding that RGGI generated net economic benefits of $1.6 billion during its first three years of operation, after accounting for compliance costs); *see also* 79 Fed. Reg. 34,834 ("Both existing state programs (such as RGGI, the California Global Warming Solutions Act program and the Colorado Clean Air, Clean Jobs Act program) and ideas suggested by stakeholders show that there are a number of different ways that states can design programs that achieve required reductions while working within existing market mechanisms used to dispatch power effectively in the short term and to ensure adequate capacity in the long term.").

48. RIA, *supra* note 8, at 3-20 tbls.3-5 & 3-6.

49. These annual reductions are comparable to the total national 2012 greenhouse gas emissions of Australia and exceed the annual emissions of the majority of the 43 developed countries that are "Annex I" parties to the UNFCCC. *Compare* UNFCCC Subsidiary Body for Implementation, *National Greenhouse Gas Inventory Data for the Period 1990-2012*, UNITED NATIONS at 14 tbl.5 (Nov. 2014), http://unfccc.int/resource/docs/2014/sbi/eng/20.pdf, *with* RIA, *supra* note 8, at 3-20 tbls.3-5 & 3-6.

Since these reductions in carbon pollution would be achieved by gradually shifting the power sector to cleaner and more efficient modes of production, reductions of other harmful pollutants from the power sector would also occur on a similar scale. EPA estimates that in 2030, power sector emissions of sulfur dioxide—an important precursor of acid rain and particulate matter pollution—will be 30.8% lower than in the absence of the rule; emissions of nitrogen oxides, a key contributor to ground-level ozone, would be 27.9% lower; and direct emissions of particulate matter would also be 28.5% lower than in a "business as usual" scenario.[50]

Both EPA and independent assessments indicate that emission reductions on this scale would have important near-term public health benefits—translating into thousands of avoided deaths, heart attacks, childhood asthma incidents, and hospital visits each and every year.[51] These public health benefits would likely be broadly distributed, with states in the Southeast, the mid-Atlantic, and the industrial Midwest all seeing important improvements.[52] Moreover, they have a significant monetized value—amounting to between $15 and $40 billion in 2020 alone, and between $23 and $62 billion in 2030.[53] When considered together with the monetized benefits of reduced climate risk, the *total net* benefits of the Clean Power Plan—after counting compliance costs—will be approximately $46 to $84 billion in 2030, or approximately $6 to $11 for every dollar spent on compliance.[54]

Impacts on the power sector. In economic terms, the impacts of the Clean Power Plan on the power sector as a whole are expected to be modest. According to EPA, the compliance costs associated with the Clean Power Plan amount to a one to two percent increase in the cost of producing and supplying electricity.[55] And consumers, on average, may end up with *lower* electricity bills as a re-

50. RIA, *supra* note 8, at 3-21.

51. RIA, *supra* note 8, at 4-34 to 4-36 (quantifying health benefits in 2020, 2025, and 2030); *see also* Joel Schwartz et al., *Health Co-benefits of Carbon Standards for Existing Power Plants*, HARV. SCHOOL OF PUB. HEALTH 19 (Sept. 30, 2014), http://www.chgeharvard.org/sites/default/files/userfiles2/Health%20Co-Benefits%20of%20Carbon%20Standards.pdf (quantifying health benefits of a policy scenario that results in comparable reductions in emissions by 2020, based on the same IPM power sector model used by EPA).

52. *See* Schwartz et al., *supra* note 51 at 24, 26, 28. These results should be taken as indicative, given that the Harvard study evaluated a policy scenario that is somewhat more stringent than the proposed Clean Power Plan.

53. RIA, *supra* note 8, at ES-23, Table ES-10, RIA at ES-21 Table ES-8.

54. *Id.*

55. RIA, *supra* note 8, at 3-23 ("EPA's projection of $4.2 to $7.4 billion in additional costs in 2020. . .should be put into context for power sector operations. . .the power sector is expected in the base case to expend over $359 billion in 2020 to generate, transmit, and distribute electricity to end-use consumers. Therefore, the projected costs of compliance with the proposed rule amount to a one to two per-

sult of energy efficiency programs that are anticipated to be implemented under the Clean Power Plan.[56]

These low anticipated costs are unsurprising, given that the U.S. power sector is already undergoing significant transitions—including unprecedented declines in coal-fired generation, rapid growth in deployment of renewable energy and energy efficiency, and increases in use of natural gas combined cycle (NGCC)—that are reducing emissions and that parallel the "building blocks" that underlie the Clean Power Plan. Generation from renewable resources (excluding large hydroelectric) more than tripled over the period from 2005 to 2014,[57] a trend that is driven both by important state-level policies and dramatic declines in the price of solar and wind power.[58] Utility energy efficiency savings increased by 130% over 2008 to 2013,[59] and savings are expected to increase by more than 50% over 2010 levels by 2025 under current trends.[60] And generation from conventional, high-emitting coal-fired power plants declined by 20% over 2008 to 2013, due to a combination of economic forces and policy developments.[61] Indeed, the power sector today *already* emits approximately 15% less

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cent increase in the cost to meet electricity demand, while securing public health and welfare benefits that are several times more valuable. . .").

56. RIA, *supra* note 8, at 3-43 (indicating that the Clean Power Plan would result in an average bill *decrease* of 8.4% to 8.7% in 2030, and a short-term average bill increase of 2.7% to 3.2% in 2020).

57. U.S. ENERGY INFO. ADMIN. (EIA), ELECTRIC POWER MONTHLY WITH DATA FOR DECEMBER 2014, Table 1.1 (Feb. 2015) (showing non-hydroelectric renewables generation increased from roughly 87 million MWh in 2005 to roughly 281 million MWh in 2014).

58. Approximately 29 states have renewable portfolio standard (RPS) policies that require utilities to purchase a minimum amount of renewable generation. *Renewable Portfolio Standards Policies*, N.C. CLEAN ENERGY TECHNOLOGY CENTER (Sept. 2014), http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2015/01/RPS_map.pdf.

59. *Compare* AMERICAN COUNCIL FOR AN ENERGY EFFICIENT ECONOMY (ACEEE), THE 2010 STATE ENERGY EFFICIENCY SCORECARD 16 (Oct. 2010) (reporting total savings of 10.6 million MWh in 2008 from ratepayer-funded efficiency programs), *with* ACEEE, THE 2014 STATE ENERGY EFFICIENCY SCORECARD 33 (Oct. 2014) (reporting total savings of 24.4 million MWh in 2013 from ratepayer-funded efficiency programs).

60. Galen L. Barbose et al., *The Future of Utility Customer-Funded Energy Efficiency Programs in the United States: Projected Spending and Savings to 2025*, LAWRENCE BERKELY NAT'L LAB. 22 (Jan. 2013), http://emp.lbl.gov/sites/all/files/lbnl-5803e .pdf.

61. U.S. Energy Information Administration (EIA), *supra* note 57, at Table h.1. EIA and other analyses generally attribute the decline in coal-fired generation (and recent, substantial retirements of coal-fired generating units) to a combination of market pressures—including sustained low natural gas prices, slow growth in

CO_2 than in 2005, meaning that the power sector as a whole is well on its way to achieving the cumulative reductions projected by EPA. The Clean Power Plan recognizes and builds on the existing state-level policies and economic forces that have driven these trends, and is designed to establish long-term market and regulatory signals that will guide the next generation of long-term investments in clean energy resources and infrastructure.

These realities of the modern power sector have not stopped critics of the Clean Power Plan from arguing that the state goals will prove to be excessively costly, or threaten the reliability of the power grid. Recent experience, and analysis by independent energy policy experts, suggests both concerns are misplaced. First, the significant decline in power sector emissions over the past decade has not been accompanied by significant cost increases.[62] To the contrary, the highest-emitting coal-fired power plants are now being dispatched less (and construction of new such plants has virtually ceased) because they tend to *cost more* than energy efficiency, renewables, and natural gas-fired generation.[63] The cost of wind and solar power is already competitive with fossil fuels in many states,[64] and continues to decline as the technology improves.[65] And energy efficiency continues to be one of the most cost-effective ways of meeting demand

electricity demand, and the costs of emission controls for mercury, sulfur dioxide, and nitrogen oxides required by EPA and the states. *See* EIA, ANNUAL ENERGY OUTLOOK 2014, IF-34 (Apr. 2014).

62. *See* EIA, SHORT-TERM ENERGY OUTLOOK 22 (Feb. 2015) (showing that growth in electricity prices has fluctuated between 0.3% and 3% per year since 2008, when the shift away from coal-fired generation began—a significantly lower rate of growth than in the years leading up to 2008).

63. Even without federal tax incentives, the levelized cost of new onshore wind and utility-scale solar PV projects is now estimated to be less than that of a conventional pulverized-coal power plant (and competitive even with NGCC). *See* Ron Binz et al., *Practicing Risk-Aware Electricity Regulation: 2014 Update* 4, CERES (Nov. 2014) 8-9, http://www.ceres.org/resources/reports/practicing-risk-aware-electricity-regulation-2014-update; *see also* Nicholas Bianco et al., *Seeing is Believing: Creating a New Climate Economy in the United States*, WORLD RESOURCES INST. (2014) 12, 14-16, http://www.wri.org/sites/default/files/seeingisbelieving_working_paper.pdf (comparing levelized costs and recent power purchase prices for coal, natural gas, and renewable generation).

64. *See* Bianco et al., note 64, at 14-15 (summarizing market surveys by power companies and public utility commissions in several states, as well as various studies concluding that renewable energy generation leads to lower ratepayer costs in many markets). Recent reports have indicated that utilities are entering into long-term power purchase agreements for onshore wind power at prices as low as two to three cents per kilowatt-hour, and for utility-scale solar power at prices as low as five cents per kilowatt-hour. Binz et al., *supra* note 63, at 9.

65. *See Lazard's Levelized Cost of Energy Analysis—Version 8.0*, LAZARD 10 (Sept. 2014), http://www.lazard.com/PDF/Levelized%20Cost%20of%20Energy%20-%20Version%208.0.pdf (reporting 60% decline in cost of wind power over the last five years, and 80% decline in cost of solar PV).

for electricity services, helping consumers reduce their electricity bills while also reducing the need for fossil generation.[66] These trends are creating significant opportunities for further cost-effective emission reductions in the power sector.

Neither will the Clean Power Plan impair the ability of utilities and grid operators to maintain a reliable flow of power, as some critics have alleged. Such concerns have been routinely leveled against many of the nation's most successful air pollution policies in the past—including Title IV of the Clean Air Act, which significantly reduced emissions of sulfur dioxide from the power sector during the 1990's, as well as more recent regulatory programs to reduce interstate air pollution as well as mercury and air toxics.[67] Yet the power sector has repeatedly demonstrated flexibility and resilience not just in response to these important environmental policies,[68] but to other significant regulatory and market transformations.[69] As noted above, the ongoing shift from coal-fired generation to cleaner generating resources, described above, has taken place over a span of just five years without compromising the reliability of electric service.

The demonstrated reliability of the grid in response to these developments is no accident. Rather, it is a testament to the robust network of institutions, monitoring and planning processes, and market instruments that have developed over many years to ensure a steady flow of power on a real-time basis, under a variety of conditions.[70] Key elements of this network include the Federal Energy Regulatory Commission (FERC), which is charged with approving and enforcing reliability standards for the bulk power system; the North American

66. *See, e.g.,* Bianco et al., *supra* note 63, at 52 (reporting that cost of energy efficiency to utilities is "about one-half to one-third the cost of new electricity generation options"); Binz et al., *supra* note 63, at 14 (concluding that "energy efficiency is far and away the lowest cost resource" for utilities).

67. *See* Susan Tierney, et al., *Electric System Reliability and EPA's Clean Power Plan: Tools and Practices*, ANALYSIS GROUP 9 n.10, 16 n.29 (Feb. 2015), http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Electric_System_Reliability_and_EPAs_Clean_Power_Plan.pdf (summarizing recent market transformations, including environmental policies, that have raised widespread concerns over reliability).

68. *Id.* at 19 n.34 ("To our knowledge, there has never been a resource adequacy event (e.g., a brownout or blackout) due to implementation of an environmental regulation.").

69. *Id.* at 19 ("In practice, there are exceptionally few instances where industry has failed to provide for resource adequacy. . . Although there have been rare occasions where a relatively near-term resource adequacy problem has been identified, regulators, market participants, grid operators, customers and reliability organizations have taken the steps needed to assure that the lights stayed on. There are well-known examples from around the country where the industry (including its regulators) did what was necessary to keep power flowing to consumers.").

70. *See id.* at 10-13 (describing measures that FERC, system operators and other entities are taking to ensure reliability amidst recent changes in the power markets).

Electric Reliability Corporation (NERC) and regional reliability entities, which develop reliability standards and conduct regular short and long-term reliability assessments; regional transmission planning processes created by FERC Order No. 1000, which will ensure that transmission investments are designed to maintain reliability and satisfy other energy and environmental policy objectives; and "reliability must-run" contracts that ensure reserve capacity is available on standby to meet unexpected shortfalls in supply. There is every reason to believe this robust system will just as capably respond to the Clean Power Plan—with its multiple compliance flexibilities and fifteen-year timeframe for planning and implementation—as it has to other recent market and regulatory developments.[71]

Impacts on the states. As the statutory framework requires, states will have a critical role in implementing the Clean Power Plan by developing and carrying out plans for meeting their state-wide emission reduction goals. Because the Clean Power Plan affords broad flexibility to the states to determine the best path to compliance, the state planning process offers opportunities for the states to effectively align their environmental and energy policies—and ensure that these policies maximize consumer benefits, job creation, and public health benefits, while achieving overall carbon pollution goals. In search of innovative solutions, many states will likely find it desirable to convene discussions among environmental regulators, public utility commissions, state energy offices, regulated utilities, environmental and public health advocates, and independent generators and cooperatives. Some states will also consider whether there are advantages to regional cooperation — whether that takes the form of formal negotiated agreements among states (such as RGGI), or more informal agreements to adopt mutually compatible state plans that reflect "common elements" (such as mutually recognized compliance instruments and trading platforms).[72]

71. Notably, the modeling carried out for the RIA of the Clean Power Plan specifically evaluated the impacts of the proposed rule on resource adequacy and grid management. Based on this modeling, EPA concluded that "none of the policy cases were found to raise concerns over regional resource adequacy. . .[and] None of the interregional changes in the policy cases. . .would raise significant concerns about grid congestion or grid management." RIA, *supra* note 8, at 3-33. Similarly, the Brattle Group recently published an extensive review of reliability issues related to the Clean Power Plan, which concluded that "The combination of the ongoing transformation of the power sector, the steps already taken by system operators, the large and expanding set of technological and operational tools available and the flexibility under the Clean Power Plan are likely sufficient to ensure that compliance will not come at the cost of reliability." Jurgen Weiss et al., *EPA's Clean Power Plan and Reliability: Assessing NERC's Initial Reliability Review*, THE BRATTLE GROUP iv (Feb. 2015), http://publicpower.org/files/spdfs/EPAs-Clean-Power-Plan—Reliability-Brattle.pdf.

72. For a general description of this "common elements" approach, *see generally* Jonas Monast *et al., Enhancing Compliance Flexibility Under the Clean Power Plan: A Common Elements Approach to Capturing Low-Cost Emissions Reductions* (Duke

While many states will find it beneficial to adopt new or expanded clean energy policies along with their state plans, the Clean Power Plan does not *require* that states do so.[73] Indeed, state air quality regulators can fully implement the state goals using traditional tools of environmental regulation, in the form of emission limitations applicable to individual power plants. One possible avenue for doing so is to implement a traditional emissions trading program among covered power plants in the state.[74] Many Eastern states adopted similar programs for the power sector under EPA's Clean Air Interstate Rule and the NO_x State Implementation Plan (SIP) Call.[75] Other states, such as Utah, have adopted such emissions trading programs to meet federal regional haze requirements, acting under standing legal frameworks to protect air quality.[76] A second alternative is for states to require each covered power plant within its

Nicholas Institute for Environmental Policy Solutions, Policy Brief NI PB 15-01, Mar. 2015), http://nicholasinstitute.duke.edu/sites/default/files/publications/ni_pb_15-01.pdf.

73. *See* 79 Fed. Reg. 34,901-02 (noting that it is possible for states to develop plans under § 111(d) that achieve the state goals by relying exclusively on emission limitations applied to individual fossil fuel-fired power plants, and noting that such state plans could be designed to coordinate with other clean energy policies external to the state plan).

74. Under this approach, each state would establish an annual emission "budget" for its power plants and create a stock of tradable emission rights (or allowances) equivalent to that budget. Each covered power plant in the state would be subject to a requirement to hold allowances sufficient to cover its emissions on an annual basis, which it could obtain from the state or by trading with other covered facilities. By design, this system would ensure that power sector emissions stay within the state goal without requiring supplemental mechanisms to track avoided emissions from renewable generation or energy efficiency.

75. Under the Clean Air Interstate Rule, EPA approved state implementation plans establishing state-wide budgets for power sector emissions of SO_2 and NO_x in at least twenty-five states. *See EPA Rulemaking Actions on States' CAIR SIP Submissions: Federal Register Notices*, ENVTL PROT. AGENCY (Apr. 8, 2015, 7:11 PM), http://www.epa.gov/airmarkets/progsregs-old/cair/rulemakingactions.html.

76. *See* Utah Admin. Code r.307-250 (2014) (establishing sulfur dioxide trading program to comply with regional haze requirements of the Clean Air Act, and invoking general rulemaking authority of the Utah Department of Environmental Quality). EPA has approved similar programs in at least three states. *See* Final Rule, Approval and Promulgation of State Implementation Plans; State of Wyoming, 77 Fed. Reg. 73,926, 73,926 (Dec. 12, 2012) (codified at 40 C.F.R. pt. 52); Final Rule, Approval, Disapproval and Promulgation of State Implementation Plans; State of Utah, 77 Fed. Reg. 74,355, 74,355 (Dec. 14, 2012) (codified at 40 C.F.R. pt. 52); Final Rule, Approval and Promulgation of State Implementation Plans; State of New Mexico, 77 Fed. Reg. 70,693, 70,693 (Nov. 27, 2012) (codified at 40 C.F.R. pt. 52); Final Rule, Approval and Promulgation of State Implementation Plans; City of Albuquerque-Bernalillo County New Mexico, 77 Fed. Reg. 71,119, 71,119 (Nov. 29, 2012) (codified at 40 C.F.R. pt. 52).

borders to achieve an emission rate (in pounds per megawatt-hour) equivalent to its state goal—and then allow power plants to demonstrate compliance with that emission rate by averaging their emissions with lower-emitting plants and purchasing credits that represent reduced emissions from energy efficiency or renewable energy.[77] Both of these state plan designs reflect traditional approaches to air quality regulation, and could be complemented—if the state so chooses—with new or expanded clean energy programs adopted outside the four corners of the state plan (such as energy efficiency or renewable energy incentives).

Importance of the interim target. From an environmental policy perspective, one of the most critical features of the Clean Power Plan is the system of interim goals that require state plans to achieve an *average* level of emissions over the period from 2020 to 2029. These interim goals serve two vital purposes.

First, the interim goals will encourage highly beneficial near-term investments in emission reduction. In 2020, the Clean Power Plan is expected to reduce emissions of carbon pollution by 18% relative to a "business as usual" scenario and to reduce emissions of other pollutants by 23% to 27%.[78] Even without considering the climate benefits, the immediate public health benefits of these reductions have an estimated value of $15 to $40 billion in 2020 alone— approximately two to five times the anticipated cost of compliance.[79] These reductions and their associated public health and climate benefits would not occur in the absence of a strong interim standard.

Second, the interim goals provide critical near-term market signals that will help guide the billions of dollars in capital investments that the power sector is expected to make in the next few years. According to one recent analysis, utilities are poised to invest as much as $2 trillion in new generation, transmission, and distribution infrastructure between 2010 and 2030—a historically high rate of capital investment that is needed to modernize aging generating facilities and grid systems.[80] Approximately 70% of U.S. generating capacity is more than thirty years old, which means that power companies (and their regulators) are

77. One version of this approach is described in an August 2014 white paper by Western Resource Advocates, describing a "carbon reduction credit" program that would allow covered power plants to reduce their emission rates by using credits obtained from lower-emitting power plants, clean energy resources, and providers of verified energy efficiency savings. *See* Steven Michel & John Nielsen, *Carbon Reduction Credit Program: A State Compliance Tool for EPA's Clean Power Plan Proposal*, 28 Elect. J., 39 (2015).

78. RIA, *supra* note 8, at ES-6 (Table ES-2). All figures reflect the 2020 projections for the "State Compliance Approach," which assumes that states will elect to comply on an individual basis rather than coordinate to comply on a regional basis; the emission reductions for a regional compliance approach are slightly lower.

79. RIA, *supra* note 8, at ES-21. All figures reflect the state compliance approach for "Option 1," which is the approach EPA proposed.

80. Binz et al., *supra* note 63, at 15.

facing critical decisions now about whether and how to meet electricity demand in coming decades.[81] Much of this infrastructure will be very long-lived and will influence the industry's emissions and cost structure for many years into the future. Rigorous, long-term carbon reduction goals are essential to ensure that such investments are made in a prudent way that optimizes cost, reliability, and environmental benefits.

V. EPA's Approach to Defining the BSER Best Satisfies the Statutory Factors and Comports With the Clean Air Act

As noted above, one of the central pillars of the Clean Power Plan is EPA's determination that the "best system of emission reduction" (BSER) for carbon pollution from existing power plants is a combination of: 1) onsite efficiency improvements at existing coal-fired power plants; 2) increased use of low-emitting natural gas combined cycle (NGCC) facilities; 3) increased deployment of zero-emitting generation; and 4) increased deployment of end-use energy efficiency. At their core, these approaches all have the same result—reducing emissions from existing high-emitting fossil fuel-fired power plants by either making those plants more efficient, or by relying on cleaner alternatives.

This approach best satisfies the statutory factors that are weighed in determining the BSER, in that it is "adequately demonstrated" and achieves the greatest degree of reductions in emissions while taking into account costs and energy requirements. All four of these "building blocks" represent cost-effective means of reducing emissions from existing power plants, and they have all been in widespread use for decades. Indeed, states and power companies that have successfully reduced carbon pollution in recent years have *primarily* done so by adopting some combination of these measures.[82] Renewable energy and energy efficiency have also been used as means of controlling emissions of other pollutants from the power sector, and have been incorporated into EPA-approved state implementation plans to address interstate air pollution and achieve compliance with national air quality standards.[83] EPA's approach sensibly reflects what is already happening "on the ground" in many states.

As noted above, EPA's approach also reflects the unique nature of the power sector itself. Unlike most other industrial source categories, the power sector

81. *Id.*

82. An excellent compilation of "success stories" illustrating how states and power companies have reduced carbon pollution by leveraging energy efficiency and low or zero-emitting generation appears in *Reducing Carbon Emissions in the Power Sector: State and Company Successes*, GEO. CLIMATE CTR. (Dec. 2013), http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/Reducing_Carbon_Emissions_in_the_Power_Sector-Success-Stories.pdf.

83. Office of Air Quality Planning & Standards, *Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans*, ENVTL. PROT. AGENCY 35-3, app. K at K-8 & K-9 (July 2012), http://epa.gov/airquality/eere/pdfs/EEREmanual.pdf.

consists of an interconnected network of centrally dispatched facilities, which is designed to perfectly balance supply and demand in real time and which provides consumers with a fungible and undifferentiated product (electricity). It is because of these distinctive features that power companies and states can and do deploy energy efficiency, renewable energy, and shifts in utilization to reduce carbon pollution from the system. In addition, these features have enabled EPA and the states to build sophisticated modeling tools that quantify emission reductions resulting from these measures on a variety of time scales—even on an hourly basis.[84] For all of these reasons, EPA's proposed determination that the building blocks represent the "best system" for existing power plants is a reasonable one.

This proposed approach is also firmly within EPA's authority under the Clean Air Act. The discussion that follows demonstrates this point by considering the Act's language and structure; the legislative history of the relevant terms; and relevant precedents from other programs under the Act.

Text and structure. The language and structure of § 111 give EPA significant discretion to determine which system of emission reduction best serves the statutory goals. Neither the term "best system of emission reduction" nor its components are given technical definitions in the Act, and the term "system" has a broad and flexible meaning in common usage.[85] In particular, the ordinary meaning of the term "system" is not limited to "end-of-pipe" control technologies or other mechanical interventions at the plant. Indeed, the term "system" is used elsewhere in the Clean Air Act to refer to a variety of non-technological systems of emission reduction that involve, among other things, shifting utilization among sources—suggesting that Congress used that term in a flexible way that could, in the appropriate context, include systems such as the proposed building blocks.[86] By the same token, the broad language of § 111 con-

84. EPA's freely available Avoided Emissions and Generation Tool (AVERT), for example, uses detailed historical data of grid operations to "[e]xamine regional, state, and county level emission impacts of different [energy efficiency and renewable energy] programs based on temporal energy savings and hourly generation profiles." *See Avoided Emissions and Generation Tool (AVERT)*, ENVTL. PROT. AGENCY (Mar. 31, 2015, 7:30 PM), http://www.epa.gov/avert/.

85. When § 111 was adopted in 1970, the term "system" was defined as "a complex unity formed of many often diverse parts subject to a common plan or serving a common purpose." WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 2322 (1967).

86. For example, the term "system" is used in Title IV of the Clean Air Act to describe the system of tradable allowances for sulfur dioxide from the power sector, one stated purpose of which was to "encourage energy conservation, use of renewable and clean alternative technologies, and pollution prevention as a long-range strategy. . .for reducing air pollution and other adverse impacts of energy production and use." 42 U.S.C. § 7651(b). Similarly, § 183 of the Clean Air Act authorizes EPA to reduce volatile organic compound emissions through "any system or systems of regulation as the Administrator may deem appropriate, including. . .prohibitions, limitations, or economic incentives (including marketable

trasts with other sections of the Act that explicitly require EPA to establish standards based on technological systems that can be applied to individual sources.[87] This contrast suggests that Congress made a deliberate choice not to bind EPA's hands in this regard under § 111.[88]

Legislative history. The legislative history of § 111 further indicates that EPA's interpretation is a reasonable one. Congress deliberately rejected terms that were more restrictive than "best system of emission reduction" in crafting § 111, and expressed a clear intent that EPA take a flexible approach in identifying solutions to reduce emissions specifically from existing sources.

This intent is reflected first in the history of the term "standard of performance." The original language of § 111, enacted in 1970, defined the term "standard of performance" using language almost identical to the current definition.[89] Although this term was not initially applicable to existing sources (which were subject to "emission standards," a then-undefined term), Congress amended § 111(d) in 1977 to ensure that existing sources—like new sources—would be subject to "standards of performance."[90] Thus, the 1970 legislative history of the term "standard of performance" is helpful in interpreting how that term should be applied to existing sources.

That history reveals that a "standard of performance," and the "best system of emission reduction" upon which such standards are based, rely on broad concepts beyond mere add-on technologies. The Senate bill that was incorporated in the Clean Air Act of 1970 included broad language describing what a "standard of performance" would entail: specifically, the Senate bill provided that such standards must "reflect the greatest degree of emission control which the Secretary determines to be achievable through application of the *latest*

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permits and auctions of emissions rights) concerning the manufacture, processing, distribution, use, consumption, or disposal of the product." *Id.* § 7511b(e)(4).

87. For example, the regional haze program in § 169A of the Clean Air Act is explicit in requiring that certain existing stationary sources "procure, install, and operate, as expeditiously as practicable (and maintain thereafter) the best available retrofit technology. . .for controlling emissions *from such source. . .*" *Id.* § 7491(b)(2)(A) (emphasis added).

88. *Cf.* Entergy Corp. v. Riverkeeper, Inc., 556 U.S. 208, 222 (2010) (noting that statutory silence on whether costs could be considered when setting effluent standards under the Clean Water Act "is meant to convey nothing more than a refusal to tie the agency's hands as to whether cost-benefit analysis should be used, and if so to what degree").

89. CAA Amendments of 1970, Pub. L. No. 91-604, § 4(a), 84 Stat. 1676, 1683. The original definition lacks the language directing EPA to consider "any nonair quality health and environmental impact and energy requirements." 42 U.S.C. §7411(a)(1).

90. *See* Pub. L. No. 95-95, § 109(b), 91 Stat. 685, 699 (1977).

available control technology, processes, operating methods, or other alternatives."[91] Moreover, the Senate report accompanying the bill stated that "standards of performance" would embrace "other means of preventing or controlling pollution" in *addition* to "application of the latest available emission control technology."[92] The Senate report explained that the then-new concept of a "standard of performance" refers to the "degree of emission control which can be achieved through process changes, operation changes, direct emission control, or other methods."[93]

This broad, innovative concept of a "standard of performance" was incorporated into the version of § 111 proposed by the conference committee and ultimately enacted into law. The conference bill introduced the phrase "best system of emission reduction" in defining the term "standard of performance."[94] Although the conference bill did not define "best system of emission reduction" and the conference committee report did not discuss that phrase, the Senate's summary of the conference bill indicated that the "best system of emission reduction" mirrored the intent of the Senate bill described above. According to that summary: "The [Conference] agreement authorizes regulations to require new major industry plants . . . [to] achieve a standard of emission performance based on the latest available control technology, processes, operating methods, and other alternatives," reflecting the language the Senate originally used to describe a "standard of performance."[95] This broad inquiry, well beyond mere add-on technology, was captured by the broad reference to "best system of emission reduction" as the basis for § 111 standards.

The subsequent history of § 111(d) further confirms the broad nature of the BSER inquiry. In 1977, Congress made significant changes to the term "standard of performance" with respect to *new* sources only, requiring that such standards be based on "best technological systems of continuous emission reduction."[96] For *existing* sources, however, Congress required standards to reflect the "best system of continuous emission reduction"—essentially preserving the 1970 language.[97] The conference report to the 1977 amendments indicates that this was a deliberate legislative choice, reflecting Congress' intent that standards under § 111(d) "are to be based on available means of emission control (*not necessarily technological*)."[98] In 1990, Congress removed the requirements that standards

91. *Id.* (emphasis added).

92. S. REP. NO. 91-1196, at 16 (1970) (emphasis added).

93. *Id.* at 17.

94. H.R. 17255 (conf. bill), 91st Cong. §4(a) (as reported by Senate-House Conf. Comm., Dec. 17, 1970) (enacted); H.R. REP. NO. 91-1783 (1970).

95. 116 CONG. REC. 42384 (1970) (Senate Agreement to Conference Report on H.R. 17255).

96. CAA Amendments of 1977, Pub. L. No. 95-95, §109(c)(1)(A), 91 Stat. 685, 699-700.

97. *Id.*

98. H.R. REP. NO. 95-564, at 129 (1977) (Conf. Rep.) (emphasis added).

for new sources be based on "technological" systems and that standards for both new and existing sources achieve "continuous" reductions, restoring use of the broad "best system of emission reduction" language for both new and existing source standards.[99] The current text of the Act thus reflects both Congress' more recent decision to allow EPA to select a non-technological system of emission reduction when promulgating standards for new sources under § 111(b), as well as Congress' longstanding policy of allowing that approach for existing sources under § 111(d).

Other Clean Air Act programs. Lastly, EPA's conception of the "best system" is consistent with several other pollution control programs that have been developed for the power sector under the Clean Air Act. Under § 110(a)(2)(D) of the Clean Air Act, for example, EPA has adopted a series of rulemakings that limit emissions of nitrogen oxides and sulfur dioxide from the power sector by establishing state-wide emission budgets based on state or regional application of pollution control measures. EPA's 2011 Cross State Air Pollution Rule (CSAPR)—recently upheld by the Supreme Court as a "permissible, workable, and equitable interpretation" of § 110[100]—established emission budgets based on power sector modeling of emission reductions achievable through "increased dispatch of lower-emitting generation" and fuel-switching, among other compliance options.[101] In the case of the 1998 NO_x State Implementation Plan (SIP) Call, these budgets were based on modeling of a multi-state emissions trading system designed to achieve an average emission rate expressed in pounds per unit of heat input—taking into account changes in dispatch and other measures available to reduce aggregate NO_x emissions from the power sector.[102] In both of these major power sector rulemakings, EPA established state-wide emission targets that reflected sector-wide measures to achieve aggregate emission reductions from the power sector—just as EPA proposes to do in the Clean Power Plan.[103] Notably, the state plan process established under § 111(d) is

99. CAA Amendments of 1990, Pub. L. No. 101-549, §403(a), 104 Stat. 2399, 2631.

100. EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584, 1610 (2014).

101. Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals, 76 Fed Reg. 48,208, 48,252, 279-80 (Aug. 8, 2011).

102. *See* Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone, 63 Fed. Reg. 57,356, 57,400-401 (Oct. 27, 1998) (NO_x SIP Call) (explaining approach to developing cost curves and state emission budgets).

103. Both of these major power sector rulemakings have been upheld by the courts as appropriate exercises of EPA's authority to protect public health against harmful ozone and particulate pollution that crosses state lines. *See* EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584 (2014) (upholding Cross-State Air Pollution Rule); Michigan v. EPA, 213 F.3d 663 (D.C. Cir. 2000) (upholding NO_x SIP Call rulemaking).

explicitly modeled on § 110, the provision that EPA relied upon in issuing CSAPR and the NOx SIP Call.[104]

Conclusion

The proposed Clean Power Plan is a vitally important undertaking for reducing the United States' contribution to climate change, protecting public health, and continuing a long-term transition toward a cleaner and more efficient power sector. As this Article indicates, the basic structure of the Clean Power Plan also reflects a careful balance between multiple legal and policy prerogatives. The proposed rule provides long-term carbon pollution goals for the states, while respecting the principles of state flexibility and cooperative federalism that are at the heart of § 111(d). The goals themselves reflect the multiple emission reduction opportunities inherent in the interconnected nature of the power sector, but are firmly grounded in measures that states and power companies themselves have implemented over decades. The proposal is designed to push the existing fleet of power plants towards ever more-efficient and less carbon-intensive modes of production, while building on emission reduction trends that have been evident in the power sector for nearly a decade. And although the Clean Power Plan has been attacked as an example of regulatory overreach, the general approach has close parallels in other Clean Air Act programs and can be implemented using traditional and time-tested regulatory tools. Given the inherent complexities associated with regulating the nation's vast and interconnected power sector, EPA's combination of rigorous long-term goals coupled with significant compliance flexibility is an eminently practical approach that reasonably carries out the broad mandates of § 111(d).

104. The Clean Air Act provides that the procedure for establishing standards of performance for existing sources under §111(d) is to be "similar" to that of §110. 42 U.S.C. §7411(d)(1). Section 110, in turn, expressly provides that emission limitations and control measures can include "fees, marketable permits, and auctions of emissions rights." *Id.* § 7410(a)(2)(A). This is yet another indication that Congress viewed such non-technological systems as valid and reasonable "control measures, means, or techniques" under the Clean Air Act.