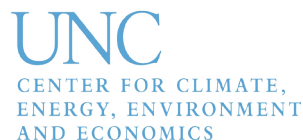


Illuminating the Energy Policy Agenda: Electricity Sector Issues Facing the Next Administration

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Review

The work reported in this publication benefited from review from experts in the field. The preliminary analysis was shared with external parties, and this publication reflects their feedback. However, this publication has not undergone a formal review process due to the timely nature of its contents.

SUMMARY

The next president will take office during a period of rapid market and regulatory change for the U.S. electricity sector. Due to statutory deadlines, pending lawsuits, and agency rulemakings—if not by choice—the next president will tackle energy policy. To prepare policy makers for what promises to be a dynamic period in electricity law and policy, this report provides an overview of each of six key areas of federal policy and, for each area, identifies the decision points—in time or circumstances—that will force the next administration to make choices that shape the future of the grid. For each decision point, the report explores the next president's options and the federal agencies and authorities that he or she could deploy.

INTRODUCTION

The next president will take office during a period of rapid and significant change for the U.S. electricity sector. Energy policy will be part of the next administration's agenda, perhaps by deliberate choice but certainly in reaction to issues as they emerge. This paper outlines electricity sector issues that the next president will face beginning on his or her first day in office and identifies the policy levers and approaches for responding to them.

A combination of regulatory, technological, and market factors are driving the electricity sector's ongoing transformation. Perhaps the most important market trend has been the boom in unconventional natural gas resources. The glut in low-cost natural gas has reduced wholesale power prices and enabled gas-fired power plants to gain market share. In 2015, for the first time ever, the sector generated the same amount of electricity from natural gas as from coal.

The fundamentals of renewable energy have changed rapidly as well. Costs for wind generation and solar generation have fallen 61% and 82%, respectively, since 2009.¹ Between 2009 and this writing, wind generation has increased 258%, and solar, more than 2,000%. Renewable energy was the largest source of new generation capacity in 2015.² Experts expect that falling prices and the recent extension of federal tax credits will spur continued growth in renewables.³ Like low-priced natural gas, renewable generation tends to reduce wholesale power prices because of low operating costs.

Growth trends for natural gas and renewables are putting significant pressure on coal and nuclear generation in many parts of the country. Natural gas prices declined just as many coal plant owners were facing decisions regarding large capital investments in pollution control technology. Coal capacity has decreased precipitously in response to these developments. More than 30 GW of coal capacity has retired since 2005 (almost 10% of 2005 coal capacity); an additional 65 GW is projected to retire by 2020.⁴ This decline is affecting employment throughout the coal value chain, including mining, transport, and coal-fired electricity generation.⁵ Many nuclear plants are also facing increased competition due to low natural gas prices.

Federal agencies are involved in many aspects of the electricity sector transition, and their decisions will have long-lasting impacts on electricity prices, technology development, employment, the environment, and public health. The Federal Energy Regulatory Commission (FERC), the Environmental Protection Agency (EPA), the Department of Energy (DOE), and the Nuclear Regulatory Commission (NRC) are poised to play important roles. In doing so, they will be challenged to apply statutes enacted decades ago to new realities of the grid. Other agencies, ranging from the Bureau of Land Management (BLM) to the Department of Labor (DOL), are likely to play smaller roles but will nonetheless have significant impacts on the electricity sector's evolution.

This paper focuses on six key areas of federal policy: electricity market regulation, climate policy, nuclear energy, shale gas oversight, economic development in communities affected by coal's decline, and government procurement. This list is not exhaustive—important questions remain regarding the federal government's role in energy innovation, energy infrastructure development, and energy efficiency incentives and mandates. The policy decisions discussed here are distinguished by their time sensitivity due to statutory deadlines, pending lawsuits, and agency rulemakings.

Several of these six policy areas relate to the fuels used to power the U.S. grid and therefore bear directly on the sector's environmental impact. States retain considerable authority with respect to the fuel mix. The federal government's role has historically been to set parameters, such as emissions performance or safety standards, for various technologies, rather than to mandate a specific fuel mix. Nonetheless, federal standards influence state and industry decisions, and the next administration is likely to face many decisions, such as the legal defense of carbon emissions standards to regulation of methane emissions from natural gas infrastructure, that will shape the electricity sector's fuel choices. Other policy areas, particularly economic development in coal-affected communities, are in the nascent stages of development. The next administration may play a considerable role in forming policies in this arena.

To prepare policy makers for what promises to be a dynamic period in electricity law and policy, this paper provides an overview of each of the six key areas of federal policy listed above and, for each area, identifies the decision points—in time or circumstances—that will force the next administration to make choices that shape the future of the grid. For each decision point, the paper explores the next president's options and the federal agencies and authorities that he or she could deploy.

FEDERAL REGULATION OF ELECTRICITY MARKETS

At a Glance

Federal Actors: Federal Energy Regulatory Commission (FERC).

Appointments: In January 2017, the five-member FERC will have two vacancies.

Legal Authorities: Federal Power Act (FPA) and Public Utilities Regulatory Policies Act of 1978 (PURPA).

Decision Points:

- Whether to incorporate state policies regarding the generation mix—e.g., renewable energy policies—into federally regulated markets, to move to preempt these state policies, or to maintain the status quo.
- How to clarify the jurisdictional line between state authority over distributed energy resources, such as rooftop solar, and FERC authority over wholesale energy sales.
- Whether to update PURPA rules in light of the increasing competitiveness of renewable resources.
- Whether to update competition policy—including FERC oversight of utility mergers and Federal Trade Commission and Department of Justice anti-trust policy—in light of increased industry consolidation and proliferation of distributed energy resources.

The line between federal and state jurisdiction over the electricity sector is shifting. FERC once played a limited role in sector oversight, but regionalization of the electric grid and development of interstate markets for electricity, electric capacity, and transmission development have expanded its responsibilities. At the same time, states have retained jurisdiction over generation facilities and retail markets. They have used this authority to implement policies, such as mandates for renewable energy and tariffs for rooftop solar, that may affect the federally regulated planning processes and markets. Whether and how FERC accommodates states' policy goals, and the extent to which states can regulate the industry without intruding into federal regulatory space, are questions that FERC has traditionally addressed on a case-by-case basis.

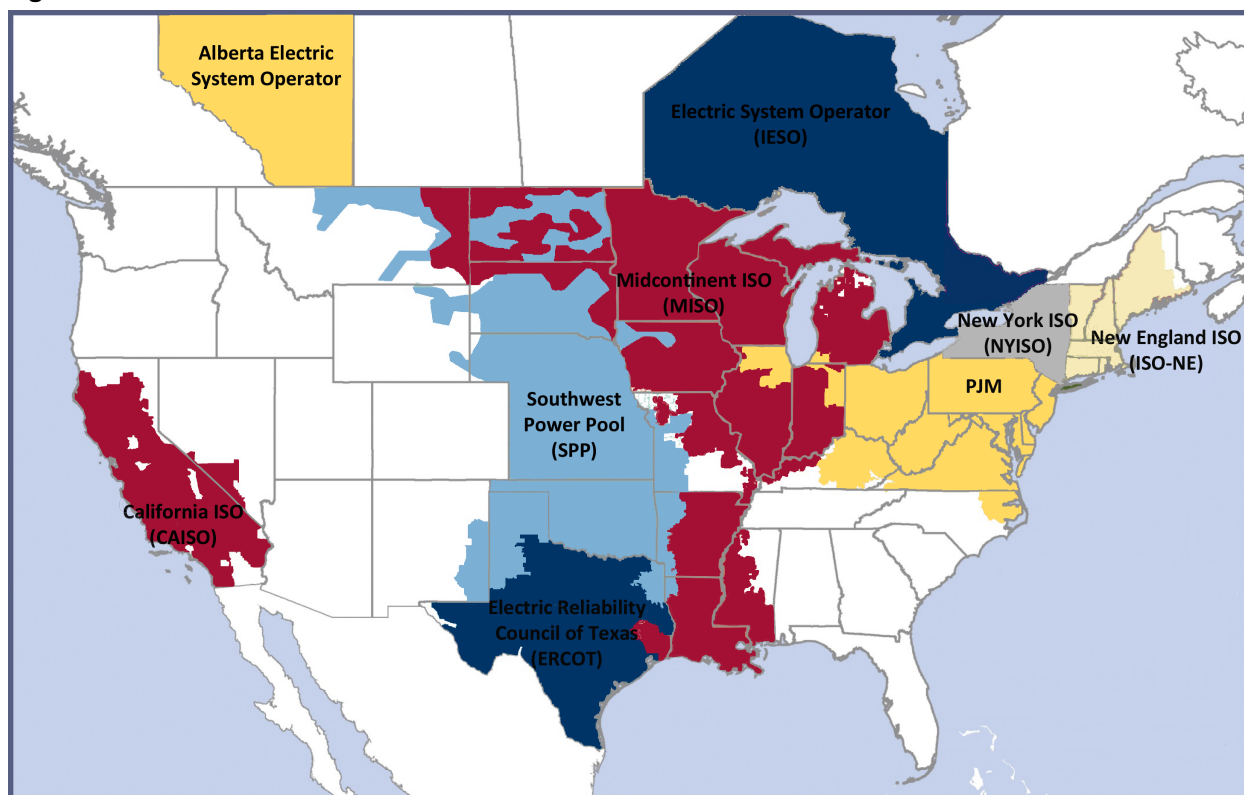
Despite three Supreme Court decisions in the past two years regarding state and federal jurisdiction over energy regulation, tensions between state and federal policies are likely to continue.

Ongoing disputes relate to the generation mix, resource adequacy, compensation for distributed energy resources, implementation of the Public Utilities Regulatory Policies Act of 1978 (PURPA), and competition policy. Although disputes involving the generation mix and resource adequacy are most pertinent to states with restructured electricity markets, other issues—including compensation for distributed resources, PURPA implementation, and competition policy—have broad implications regardless of a state's system of utility regulation. Responses by federal officials, including FERC Commissioners that the next president will appoint, will determine how to address these disputes, the resolution of which could have broad impacts on the industry.

Background

Historically, state public utility regulators oversaw local or regional monopolies that generated power and served all ratepayers in their assigned territories. The Federal Power Act (FPA) reserved traditional state authority over power plants and sales to consumers and granted FERC jurisdiction over what were then limited wholesale electricity transactions.⁶ However, reforms initiated by Congress in the Energy Policy Act of 1992 (EPAct) and furthered by a series of FERC orders in the 1990s expanded the scope of federal regulation in some regions.⁷ Today, regional transmission organizations (RTOs) run auction markets that determine which power plants generate energy, operate the high-voltage grid, and engage in long-term transmission planning.⁸ FERC regulates these entities under the FPA. Outside of the RTO service territories (see white areas in Figure 1), the traditional system of state-dominated utility regulation prevails, and investor-owned utilities (IOUs), government-owned utilities, or electric cooperatives perform these functions.

Figure 1. RTO territories



Source: Federal Energy Regulatory Commission, *Energy Primer: A Handbook of Energy Market Basics* (2015), <http://www.ferc.gov/market-oversight/guide/energy-primer.pdf>.

Note: ERCOT is regulated by the state of Texas, not FERC.

IOUs distribute power to approximately 70% of U.S. residents.⁹ In most states, including many states covered by RTOs, IOUs are vertically integrated and earn returns on their capital expenditures (including electricity generation and transmission infrastructure investments) through state-regulated retail rates paid by consumers. IOUs in 14 “restructured” states (all covered by RTOs) own only transmission and distribution infrastructure; they transferred ownership of power plants to corporate affiliates or third

parties. In these states, generation owners do not collect retail rates from consumers. Therefore, they make investment decisions on the basis of market prices rather than regulated rates of return. FERC regulation expanded in states with restructured electricity markets, encompassing industry activities that states once regulated exclusively. Federal courts must now decide jurisdictional disputes.¹⁰ The disputes typically focus on whether a state policy (1) intrudes into FERC’s exclusive regulatory space or (2) conflicts with the operation of federally regulated RTO markets. Although the precise issues differ in each case, the fundamental question is how to divide up regulatory roles.

The Supreme Court decided an unprecedented number of FERC cases during the 2014–2015 and 2015–2016 terms:

- *OneOK v. Learjet* (2015): The court held that FERC’s regulation of interstate sales of natural gas under the Natural Gas Act does not preempt claims against sellers under state antitrust law and stated that a clear dividing line between state and federal authority in energy regulation is a “Platonic ideal.”¹¹
- *FERC v. Electric Power Supply Association (EPSA)* (2016): The court held that FERC may regulate the price that RTOs pay to providers of demand response who reduce consumption when the price of energy is high, and it noted that federal and state regulation are “complementary.”¹²
- *Hughes v. Talen Energy* (2016): The court held that a Maryland order requiring distribution utilities to sign contracts with a natural gas generator with prices tied to RTO auctions was preempted by the FPA because the state had “invade[d] FERC’s regulatory turf.” The court emphasized that its decision was limited to the contracts at issue, which effectively changed the price of a FERC-regulated wholesale sale; meanwhile, Justice Sonia Sotomayor’s concurring opinion noted that the FPA is a “collaborative federalism statute.”¹³

In each case, the court’s opinion or a concurring opinion observed that responsibility for energy regulation is shared by federal and state regulators. However, the court’s decisions do not resolve questions regarding limits of those authorities, leaving regulators, courts, and legislators to continue to navigate jurisdictional uncertainty.¹⁴

Congress has noted these tensions and could opt to amend the 80-year old jurisdictional language in the FPA. In June 2016, the House Committee on Energy and Commerce sent a letter to FERC commissioners asking “how [] new technologies, programs, incentives, and policy changes at the state and federal levels affect the jurisdictional [] line” between FERC and state authority and whether the jurisdictional split in the FPA drawn by Congress in 1935 “continue[s] to be well-suited for today’s electricity sector.”¹⁵ If Congress amends the FPA’s core language, the new FERC commissioners will set important precedent in applying it. However, given that Congress has never amended the statute’s jurisdictional language, FERC will likely continue to operate under the existing legal framework.

Decision Points

FERC Appointments

The next president will have an immediate opportunity to nominate two commissioners to the five-member FERC. The FPA stipulates that no more than three commissioners “shall be appointed from the same political party.”¹⁶ All three current FERC commissioners are registered Democrats, thus appointees to both open seats must be affiliated with another party or independents, regardless of the party of the president.

Through their decisions on specific matters before FERC, these new commissioners may shape how federal regulation interacts with state policies. FERC often reacts to developments in the industry by approving or disapproving proposed rule changes submitted by RTOs, responding to complaints about RTO market rules and petitions requesting declaratory relief, and weighing in on lawsuits filed in federal and state courts by market participants or industry stakeholders. FERC may also initiate its own reforms if it concludes that they are needed to maintain just, reasonable, and not unduly discriminatory rates.¹⁷ An example of a FERC-initiated reform is Order No. 745, which set compensation levels for demand-response resources in RTO markets and which was upheld by the Supreme Court this year.¹⁸

Generation Mix

States have used their authority over generation facilities to require utilities to procure renewable energy, meet energy efficiency and demand response targets, and undertake long-term resource planning. States have also set rates for distributed resources (e.g., rooftop solar), mandated that utilities procure energy storage, considered proposals for supporting existing resources (e.g., nuclear and coal-fired power plants at risk of retirement), and initiated pilot projects to test new technologies. These policies and initiatives make states “the test beds for the evolution of the grid of the future.”¹⁹ And they are having major impacts on the nation’s electric grids; for example, the Lawrence Berkeley National Lab found that nearly 60% of renewable energy growth since 2000 was built to meet a state’s renewable energy mandate.²⁰

As noted above, FERC may be called on to respond to these policies in three ways. First, an RTO might propose changes to its market rules. For example, in 2014 PJM submitted new capacity market rules that it stated were designed to ensure that generators produce energy when needed during emergency conditions. In comments filed at FERC, opponents argued that the proposed rules erect barriers for demand-response resources and do not account for the full value of renewable resources.²¹ Meanwhile, the nuclear industry supported the rule changes, concluding that their plants would benefit from payments for performance. Over Chairman Bay’s dissent, the commission approved the new rules, but a legal challenge is pending in the D.C. Circuit.²²

As of October 2016, participants in the New England market are engaged in a stakeholder process for incorporating state renewable energy and environmental policy requirements into the wholesale market rules. Proposals include a carbon price in the energy market, a forward market for clean energy, and a zero-emissions capacity procurement mechanism. If stakeholders finalize a proposal, they or the ISO will file tariff amendments with FERC. The commission will then have to determine whether the proposal is “just and reasonable” and address any legal objections to including renewable energy requirements or accounting for carbon emissions in a FERC-jurisdictional market.

A party might petition FERC to require changes to RTO market rules. For example, in June 2016, in response to state policies that facilitate expansion of natural gas pipelines, several generators filed a complaint requesting that FERC institute changes to ISO New England market rules to mitigate these allegedly discriminatory policies.²³ The commission subsequently dismissed the complaint, concluding that state policies were in flux following a court decision and that the allegations were therefore speculative.

Similarly, a party might petition for a declaratory order that a particular state policy violates federal law. FERC often accommodates state policy choices, by choosing not to act on complaints.²⁴ But the complaints are likely to continue, particularly as state mandates, pilot projects, and incentives expand. While FERC could steer complainants to federal courts, the commission may be better positioned to resolve jurisdictional disputes in ways that are consistent with the goals and operations of the RTO markets. In August 2016, two cooperative utilities in Maryland asked FERC to find that the state's new community solar program is preempted by the FPA and PURPA.²⁵ Details of community solar programs vary by state; 15 states have taken legislative or regulatory action to enable such programs.²⁶ A FERC ruling against Maryland could have implications for how solar is deployed in other states.

Third, FERC often participates in federal litigation to which it is not a party. In 2014, the Third Circuit invited FERC to weigh in on a New Jersey incentive that facilitated construction of new natural-gas-fired generators. FERC argued that the state's policy is preempted, and this year it filed similar arguments at the Supreme Court about a nearly identical Maryland program. Both courts sided with FERC, holding that the states' policies are preempted.

FERC can also act on its own and order rule modifications to meet new circumstances. One example is Order 764, facilitating integration of renewable resources.²⁷ FERC has consistently remained neutral on technologies and fuels used to generate electricity. It has not required RTO market rules that benefit specific technologies, but it has acted to ensure that those rules do not "unduly discriminate" against certain technologies.²⁸

Across these scenarios, FERC's key decision will be to determine whether it should actively accommodate state policy preferences, move to preempt state policies that are inconsistent with interstate markets, or remain silent on a potential conflict between state policy and federal policy. There may be no one-size-fits-all approach to addressing the tensions between state regulation and federal regulation, and FERC may continue to make case-by-case determinations.

Resource Adequacy

In addition to supporting specific types of energy resources, state policies also seek to ensure that sufficient generation capacity exists to meet consumer demand. However, in states that have opted to restructure their electricity markets, state-regulated utilities no longer construct new generation facilities and must therefore procure sufficient capacity to meet demand through federally regulated wholesale purchases. Although resource adequacy was once under the exclusive purview of state regulators, it is now largely addressed at the wholesale level. State efforts to encourage construction of new generation are therefore aimed at federally regulated wholesale markets and may run afoul of the FPA. For example, as noted above, the Supreme Court held in *Hughes v. Talen Energy* that FERC's regulation of interstate capacity markets preempted a Maryland incentive that supported the development of a new power plant.²⁹

As it oversees capacity market rules and resolves complaints in a post-*Hughes* world, FERC can choose to clarify how state policies regarding generation procurement can exist alongside federally regulated markets, or it may conclude that such policies are preempted by its regulation of interstate markets.

Compensation for Distributed Energy Resources

Under the FPA, FERC has jurisdiction over sales of electric energy for resale in interstate commerce. Nearly every state requires utilities to offer a net metering tariff that establishes a rate for sales from distributed energy resources (DERs), such as rooftop solar installations, to the utility. Practitioners and scholars have debated whether these sales fall under FERC's jurisdiction.³⁰ FERC has consistently declined to assert jurisdiction to preempt state net metering policies. As distributed energy resources, including energy storage, continue to gain market share, and states reevaluate their net metering regimes, a utility or other market participant may ask FERC to regulate sales from DERs. In addition, RTOs may bring their own proposals for DERs to FERC for approval. For instance, FERC recently approved a California ISO market program that allows aggregators of DERs to sell energy and grid services.³¹ Relatedly, New York is in the midst of a major reform effort that tasks utilities with the operation and facilitation of distribution-level markets.³² Other states and RTOs may pursue measures similar to those under way in California and New York. Depending on how the states implement these markets, they could implicate FERC's jurisdiction over wholesale transactions and could create multiple decision points regarding compensation for distributed energy resources.

PURPA Implementation

Passed by Congress in 1978, PURPA requires utilities to purchase power from certain renewable energy and cogeneration facilities, and it tasks states with setting rates for those sales. At the time, the utility system did not have competition, and Congress intended the law to spur innovation in electricity generation. In 2005, Congress relaxed the purchase obligations for utilities that participate in RTO markets.³³ In light of growth in renewable energy and creation of RTO markets, FERC recently convened a technical conference to discuss PURPA implementation.³⁴ Meanwhile, several recent lawsuits in federal courts argue that state implementation of PURPA is contrary to the law.³⁵ Congress tasked FERC with administering the statute, and the Commission may choose to update its rules in light of industry changes during the next administration. FERC also regularly adjudicates complaints against states and utilities about PURPA implementation, and it could articulate new policies through its decision in these cases.

Competition Policy

In 2012, Duke Energy merged with Progress Energy, creating the largest electric utility in the country.³⁶ Just four years later, Exelon reached settlement agreements in multiple states and the District of Columbia to finalize its merger with Pepco. The mergers epitomize an industry trend since 2005, when Congress repealed the Public Utility Company Holding Act, which rescinded the Securities and Exchange Commission's (SEC) jurisdiction over multi-state utilities.

The FPA requires FERC to determine whether proposed mergers of public utilities are "consistent with the public interest."³⁷ FERC considers whether a proposed transaction would result in one tranche of ratepayers subsidizing others, and it explores the effects of proposed mergers on competition, rates, and regulation.³⁸ FERC approved the Exelon-Pepco transaction, under a long-standing merger policy that it reaffirmed in 2012. The American Antitrust Institute had unsuccessfully urged the U.S. Department of Justice (DOJ) to stop the merger. AAI argued that FERC's review was inadequate and highlighted the

limitations of settlements approved by state regulators.³⁹ Some analysts believe that industry consolidation is likely to continue, which could renew focus on the commission's merger policies. In September 2016, FERC released a Notice of Inquiry seeking comment on its analysis of merger applications.⁴⁰

Stakeholders may also raise anti-competitiveness concerns over utility policies concerning DERs. In June 2016, the Federal Trade Commission (FTC) held a workshop on competition and consumer protection issues related to rooftop solar, highlighting its interest in competition between utilities and rooftop solar providers. Opponents of federal action in this area argue that state oversight of utilities is sufficient to mitigate competitive concerns. However, DERs may ultimately compete with wholesale generation, and such interstate competition is beyond a state's jurisdiction. Antitrust falls under DOJ and FTC jurisdiction, not FERC jurisdiction, and these agencies could be influential in these cases. For example, in a recently filed brief, DOJ urged the Ninth Circuit Court of Appeals to reject a utility's defense to its allegedly anti-competitive rates for rooftop solar.⁴¹

At a Glance

Federal Actors: Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), and the White House’s Office of Management and Budget (OMB).

Appointments: The next president will appoint the heads of the EPA, DOE, and the OMB.

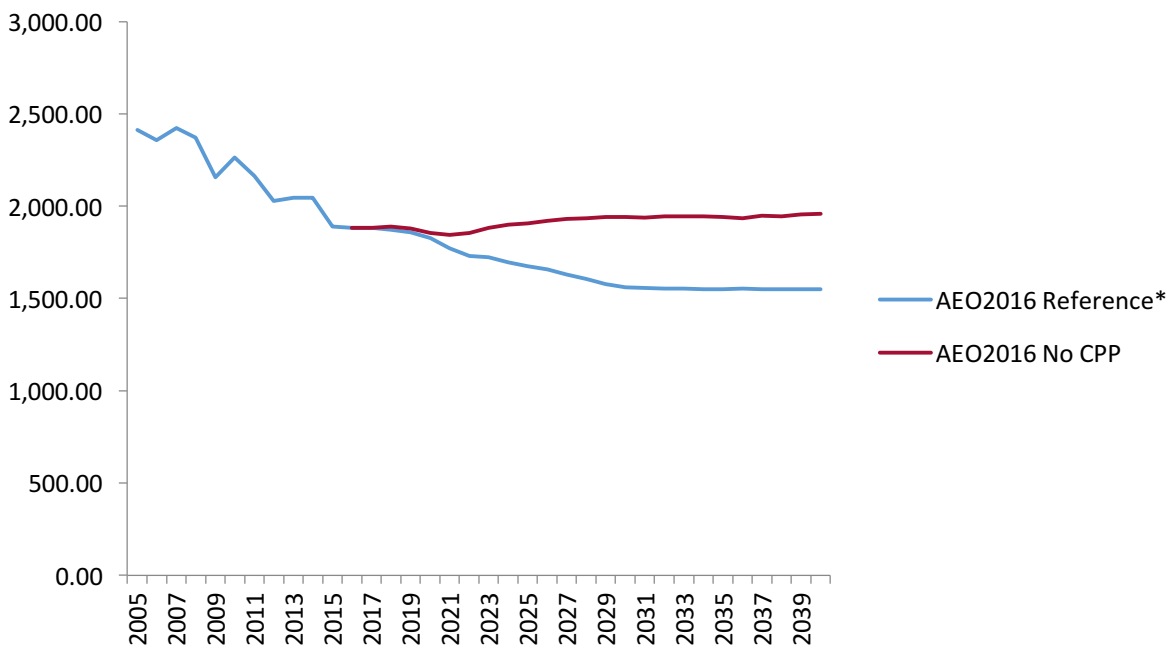
Legal Authorities: The Clean Air Act, Executive Order 12866.

Decision Points:

- Whether to seek Supreme Court review of any part of the D.C. Circuit’s Clean Power Plan decision, and how to move forward following the court’s review.
- Whether and how to regulate other sectors under Section 111(d) of the Clean Air Act.
- Whether and how to require additional emissions reductions necessary to meet the U.S. commitment to the Paris Agreement.
- Whether and how to use the social cost of carbon in agency rulemakings in light of recent circuit court decisions upholding its use.

The nation’s greenhouse gas (GHG) emissions have declined significantly since the 2009 recession due to a combination of factors, including a shift from coal to natural gas electricity generation, advances in energy technologies, energy efficiency improvements, and environmental regulations that have pressured coal plants to retrofit or retire (e.g., mercury regulations). Even as Congress has declined to enact comprehensive climate policy, a number of federal programs address greenhouse gases under existing law, including emissions from the power sector. However, emissions reductions under these programs—including the EPA’s Clean Power Plan—are modest compared with estimated emissions reductions necessary to limit global warming.⁴² Thus, the next administration will face a number of near-term decisions as it determines whether and how to pursue a suite of federal regulations aimed at reducing GHG emissions.

Figure 2. Historical and projected U.S. carbon dioxide emissions from the electricity sector (in million metric tons)



Source: EIA, Annual Energy Outlook 2016.

*The AEO2016 Reference case assumes that states' Clean Power Plan implementation covers new and existing sources. The projected reductions compared to 2005 emissions equate to 740 million metric tons (mmts) per year by 2025, which is equal to 43% of the U.S. commitment to the Paris Agreement. Projected to 2040, the AEO2016 Reference case forecasts 865 mmts of emissions reductions compared to 2005 levels, equal to 16% of the U.S. commitment to reduce total annual emissions by approximately 5,344 mmts by 2050.

Background

The current federal approach to regulating GHG emissions began with the U.S. Supreme Court's 2007 decision in *Massachusetts v. EPA*, which found that greenhouse gases are pollutants subject to regulation under the Clean Air Act.⁴³ That conclusion required the EPA to determine whether greenhouse gases endanger public health and welfare. In 2009, the EPA made such a finding, which in turn required the agency to take steps to limit emissions.⁴⁴ Subsequent actions included emissions limits on motor vehicles, mandatory emissions reporting for large emitters, and permitting requirements for new and modified power plants and industrial facilities.⁴⁵ The EPA's 2015 Clean Power Plan marked another significant step by establishing the nation's first GHG emissions limits for the electric power sector.⁴⁶ Beyond the Clean Air Act, the Obama Administration has used other legal authorities to address climate change, such as the SEC's authority to mandate disclosure of climate risks for publicly traded companies and the DOE's authority to implement appliance efficiency standards.⁴⁷

Domestic climate policy will also affect the next administration's approach to international relations. The United States pledged to reduce emissions as part of the Paris Agreement pursuant to the United Nations Framework Convention on Climate Change.⁴⁸ Additionally, in 2015, the United States and China—the world's two largest emitters of greenhouse gases—announced a series of bilateral measures to address climate change, including actions to reduce methane and hydrofluorocarbon emissions, implement vehicle

and building efficiency standards, and cooperate on technology innovation. Cooperative efforts to address climate change have also been a major aspect of the U.S. relations with India.⁴⁹ In 2016, the United States also joined Canada and Mexico to announce a goal of 50% clean power generation by 2025.⁵⁰

Decision Points

Clean Power Plan

The Clean Power Plan, developed pursuant to Section 111(d) of the Clean Air Act, establishes GHG emissions limits for the existing fleet of fossil fuel-fired power plants.⁵¹ The EPA projects that the rule will reduce emissions from regulated plants approximately 30% from 2005 levels by 2030.

The EPA is defending the Clean Power Plan against legal challenges in the D.C. Circuit. On September 27, 2016, the full D.C. Circuit Court will hear oral arguments on the rule.⁵² The court could issue a decision by early 2017. The most immediate climate policy decision likely facing the next president, therefore, will be whether to seek Supreme Court review of any part of the D.C. Circuit's Clean Power Plan decision. This decision will turn on the court's reasoning and final opinion, the likely makeup of the Supreme Court by the time it hears the case, and the next president's perspective on climate change and the merits of using the Clean Air Act to impose emissions limits. States and environmental organizations that intervened in support of the Clean Power Plan could also seek this review.

This paper does not seek to predict the outcome of the litigation. Notably, if the D.C. Circuit or Supreme Court vacates the Clean Power Plan or significantly restricts the EPA's authority under Section 111(d), the EPA would retain the authority to address GHG emissions using other sections of the Clean Air Act, such as sections 108–110 (National Ambient Air Quality Standards) and Section 115 (international air pollution).

Application of Section 111 to Additional Sectors

The Clean Power Plan potentially represents the first step in a sector-by-sector approach to regulating GHG emissions under the Clean Air Act. Environmental and public health groups may petition the EPA to create regulations for new and existing sources in additional sectors.⁵³ Thus, either by choice or in response to petitions from public interest organizations, the next administration may face questions of whether and how to proceed with respect to sectors such as refineries, chemical manufacturing, cement, pulp and paper, and other sectors.

If the next administration does proceed, the EPA may need to consider which sectors to address first, perhaps by considering each sector's cumulative GHG emissions, emissions reductions opportunities, and economic sensitivity to regulation.⁵⁴ When evaluating how to regulate additional sectors under Section 111(d), the next administration may also consider whether to use existing source categories as defined in current Section 111(b) rules or to redefine categories that could allow for broadened market-based compliance mechanisms.

Paris Agreement Next Steps

Decisions by the next administration concerning climate policy will affect international relations, given U.S. commitments in international agreements, such as the Paris Agreement described above. Pursuant to the Paris Agreement, the United States pledged to reduce emissions by 26% to 28% below its 2005 level

in 2025 and to develop a 2030 emissions reduction goal in its intended nationally determined contribution (INDC).⁵⁵ The INDC identified the Clean Air Act, the Energy Policy Act, and the Energy Independence and Security Act as relevant to meeting this target, citing many of the above-described regulations. For the accord to take legal force, 55 signatories producing 55% of global emissions must ratify it.⁵⁶ In September 2016, the United States and China ratified their commitments, which together total almost 38% of global emissions.⁵⁷ However, existing regulations may not be sufficient to meet the Paris goal. Thus, in addition to the domestic pressures outlined above, the next administration may face international pressure to require further reductions pursuant to the country's commitment to develop a 2030 goal.

Social Cost of Carbon

The next administration may also face decisions regarding whether and how to incorporate the social cost of carbon into cost-benefit analyses conducted for agency rulemakings. Inclusion of this metric in cost-benefit analysis began in 2008, after the Ninth Circuit Court of Appeals held that the National Highway Transportation Safety Administration acted arbitrarily and capriciously when it failed to monetize the value of carbon emissions reduction when setting vehicle emissions standards.⁵⁸

Following this decision, the Department of Energy (DOE), the Department of Transportation (DOT), and the EPA began using independently developed estimates for the social cost of carbon in rulemaking—estimates ranging from \$0 to \$159 per metric ton of carbon dioxide emitted.⁵⁹ To improve consistency, an Interagency Working Group selected four social cost of carbon values for use in regulatory analyses in 2010 and updated these values in 2013.⁶⁰ In 2015, the group charged the National Academies with reviewing the current modeling approach.⁶¹ The National Academies expects to release its final report in January 2017.

In August 2016, the Seventh Circuit Court of Appeals upheld the DOE's use of the social cost of carbon in its analysis of energy efficiency standards for commercial refrigeration equipment.⁶² Given the Seventh and Ninth Circuit cases, government agencies that do not include a social cost of carbon in cost-benefit analyses risk legal challenge. The next administration could choose to take this risk, or it might change the way the cost is calculated. For example, the next administration might alter the underlying assumptions previously used to estimate this cost, e.g., limiting the analysis to domestic rather than global costs.⁶³

NUCLEAR ENERGY

At a Glance

Federal Actors: Nuclear Regulatory Commission (NRC), U.S. Department of Energy (DOE), Federal Energy Regulatory Commission (FERC).

Appointments: The next president will have the opportunity to nominate at least three NRC commissioners.

Legal Authorities: The Atomic Energy Act, the Nuclear Waste Policy Act (NWPA), the Federal Power Act.

Decision Points:

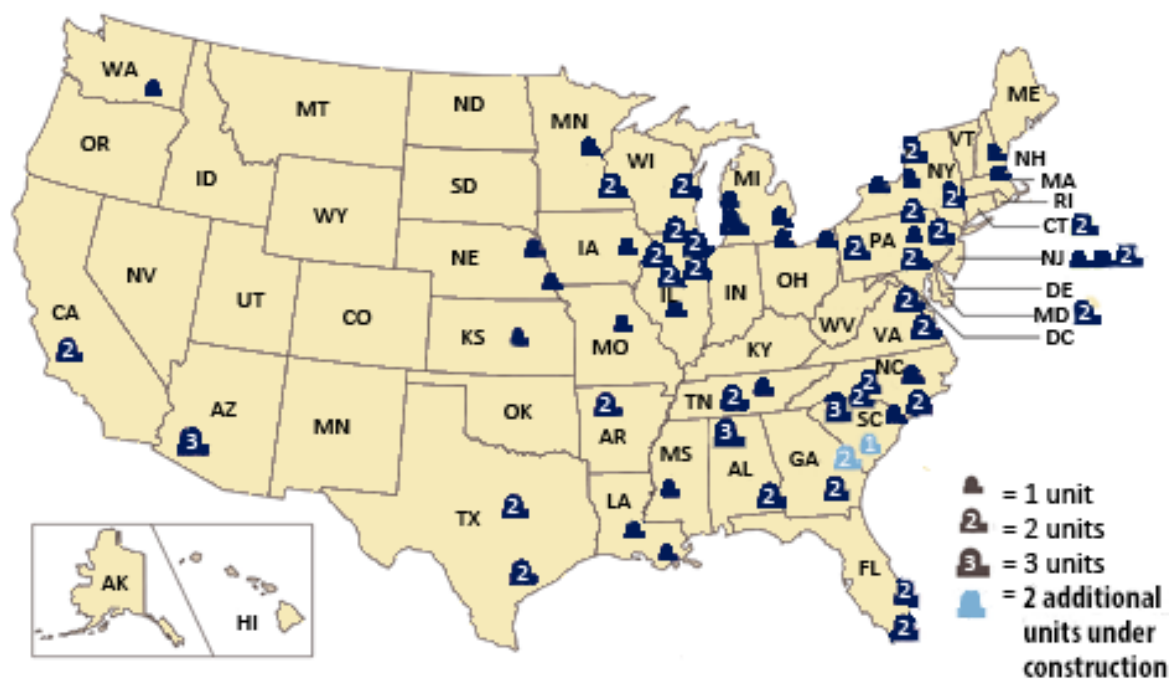
- Whether and how to use FERC's jurisdiction over interstate electricity markets to influence the economics of nuclear power plants or to accommodate or preempt state policies.
- How to prepare for and respond to the first applications to extend the life of existing nuclear units from 60 to 80 years.
- How to prepare for and respond to applications to construct and operate advanced nuclear technologies, including small modular reactors and non-light-water reactors.
- How to address nuclear waste in light of the Obama administration's attempt to abandon Yucca Mountain and move toward a consent-based siting process.

Nearly 60 years after the world's first full-scale nuclear power plant opened in Shippingport, Pennsylvania, the U.S. nuclear power industry is in flux. Nuclear plants operating in FERC-regulated RTOs are facing economic challenges due to low wholesale prices, which are contributing to a recent wave of retirements. The nation's nuclear fleet is aging and the Nuclear Regulatory Commission (NRC) will soon oversee the relicensing process for existing units that wish to operate beyond the terms of their current operating license. Nascent technologies promise lower costs, increased safety, and added flexibility but face their own set of regulatory and market challenges. Meanwhile, the DOE has yet to site a permanent repository for nuclear waste nearly two decades after the Nuclear Waste Policy Act's (NWPA) goal of commencing operation in 1998.⁶⁴

Background

The first new reactor in two decades began operation in 2016. Four additional units are under construction in South Carolina and Georgia; all have faced significant delays and cost overruns.⁶⁵ No other new reactors will open in the near future. But if the Clean Power Plan proceeds, or other climate policies are deployed, the electricity sector would rely more heavily on zero-emission power plants. Federal policies could influence the role of nuclear and other technologies in meeting this need. Existing nuclear units currently provide more than 60% of carbon-free power in the United States.⁶⁶

Figure 3. Commercial nuclear reactors



Source: NRC (Note image last updated November 2015).

Four nuclear power plants have retired since 2013, another five have announced plans to retire by 2019, and more are considered at risk of retirement.⁶⁷ Although several factors have contributed to plant closures, a number of retiring or at-risk plants are (1) located in RTO regions (see Figure 1) and (2) earning—or claim to be earning—insufficient revenue through wholesale markets to cover their operating costs. Low natural gas prices, federal tax credits for renewable energy, and relatively flat electricity demand have driven prices down in wholesale markets.⁶⁸ Nuclear power plants operating in RTO markets that are located in states that no longer regulate generation under cost-of-service ratemaking face direct competition from other electricity generators. Some observers argue that the retirements are a sign the markets are working—by discouraging ongoing operation of uneconomic plants in favor of more competitive generation—while others argue the retirements reflect flaws in the markets.⁶⁹

Decision Points

NRC Appointments

The next president will have an opportunity to nominate at least three commissioners to the five-member NRC. Through their decisions about relicensing existing plants and permitting new advanced reactors, these new commissioners may shape the future of the nuclear power industry. FERC appointments will be critical as well, given that commission’s role in regulating wholesale markets in which nuclear plants have been struggling to compete.

Retirements

The recent wave of retirements—and potential for additional retirements absent policy intervention—has prompted state policy responses and broad discussions of reliability and market design within RTO/ISOs and at FERC. For example, in August 2016, New York regulators finalized a clean energy standard that

requires distribution utilities to procure zero-emission credits (ZECs) from qualifying existing nuclear plants.⁷⁰ The program provides additional payments to nuclear plants to ensure their continued operation.⁷¹ In the 2016 legislative session, stakeholders mounted an unsuccessful campaign for Illinois to enact a similar policy.⁷²

At the RTO/ISO level, compensation for nuclear power plants has factored into broad discussions of resource adequacy. In 2014 and 2015, PJM and ISO-New England adopted new capacity market performance rules that are intended to provide bonus payments to high-performing resources, such as nuclear units.⁷³ The nuclear industry argues that these changes are insufficient to preserve struggling units because nuclear power plants earn most of their revenue through energy markets, rather than capacity markets.⁷⁴ More recently, stakeholder discussions in these market regions are vetting other mechanisms for ensuring a sufficient supply of zero-emission resources to meet state goals.⁷⁵

In 2014, FERC initiated an inquiry into price formation in RTO markets for energy and ancillary services.⁷⁶ One analyst characterized the inquiry as a potential boon for the nuclear industry.⁷⁷ Any changes that cause energy prices to rise would provide substantial revenue to nuclear plants, which have large capacities and operate nearly year round. So far, FERC has proposed limited adjustments to rules governing offer prices (bids)—rules meant to prevent abuse of market power—but it has not moved forward with additional changes.

As discussed above in the section on federal regulation of electricity markets, FERC could weigh in on the nuclear subsidy debate by approving or disapproving proposed rule changes submitted by RTOs, responding to complaints about RTO rules and petitions requesting a declaratory order, weighing in on claims filed in federal and state courts by market participants or industry stakeholders, or acting on its own to require RTOs to adopt market rules that aim to preserve existing nuclear capacity.⁷⁸

Beyond influencing FERC's oversight of wholesale markets, the next administration could affect the future of the existing nuclear fleet through its approach to climate policy. For example, pricing carbon through a carbon tax, an RTO carbon price, or another market-based policy would give value to the carbon-free attributes of nuclear-powered electricity.

Relicensing

The NRC has broad authority to license the production of nuclear power for commercial or industrial use.⁷⁹ The Atomic Energy Act and NRC regulations allow the NRC to issue initial operating licenses for 40 years and subsequent licenses in up to 20-year increments.⁸⁰ Most of the current fleet of nuclear power plants was built in the 1960s and 1970s; many are now operating under their first 20-year license extension. In 2019, the NRC is likely to receive its first application to extend the operating license of a nuclear power plant beyond 60 years; Dominion Virginia Power announced it would seek a second 20-year extension for its Surry Power Station units 1 and 2 at that time.⁸¹

The existing legal and regulatory framework allows for extensions beyond 60 years, and research by the Electric Power Research Institute (EPRI) and the DOE has identified no generic technical barriers to life extension.⁸² However, the specific requirements for obtaining a subsequent license extension are not yet final. Under the Obama Administration, the NRC initiated an update to its relicensing guidance—including its *Generic Lessons Learned for Subsequent License Renewal Report* and *Standard Review Plan*

for Review of Subsequent License Renewal Applications for Nuclear Power Plants—with a goal of finalizing the guidance documents in July 2017.⁸³ The next administration could finalize this guidance or change course by, for example, deciding not to extend the life of these plants or agreeing only to extend the life of plants that can meet the requirements for initial re-licensing.

Advanced Reactors

The current fleet of U.S. nuclear power plants employs light-water-reactor (LWR) technology, which was initially developed in the 1950s to propel submarines and naval ships. In light-water reactors, energy released from splitting atoms is used to make steam, and the steam drives a turbine to produce electricity. These reactors use light (normal) water as a coolant. Emerging technologies have the potential to deliver safer, more secure, and more flexible nuclear power, including small modular reactors (SMRs)—also referred to as integral pressurized light-water reactors—and reactors that use a coolant other than water, such as molten salt or liquefied metal (advanced non-light-water reactors).⁸⁴

The federal government may determine the future of advanced nuclear power technology through the NRC's role in licensing commercial reactors. The NRC expects to receive design certification and early site permit applications for small modular reactors by the end of 2016.⁸⁵ Over the next 5 to 10 years, the NRC anticipates applications to license advanced non-LWR technologies.⁸⁶

Advanced nuclear technologies face many of the same barriers as new nuclear units with conventional light-water reactors, including long construction timelines, high construction costs, uncertainty regarding electricity demand, and competition from natural gas and renewable energy. In addition, because the NRC developed existing regulations for light-water reactors, some of the general design criteria are not applicable to advanced reactors.⁸⁷ The NRC's regulations provide for exemptions under certain circumstances, but some proponents of advanced nuclear technology argue that a streamlined, risk-based framework that targets advanced reactor licensing would better serve innovation and safety.⁸⁸ A 2012 NRC report to Congress suggests that the NRC agreed.⁸⁹

Since 2012, the NRC has identified technical and policy issues associated with licensing advanced reactors, including small modular reactors and non-LWR designs, and has developed draft guidance on general design criteria for advanced non-light-water reactors. This guidance will aid applicants and NRC staff in interpreting existing regulations as applied to non-LWR designs.⁹⁰ However, the NRC has not yet articulated a process or initiated a rulemaking to develop a new framework for advanced non-LWR reactors. Stakeholders have pressed for legislation that would direct the NRC to create that framework.⁹¹

Beyond influencing the NRC's responsibility for licensing nuclear power plants, the federal government—especially the DOE—could help bring advanced reactors, including SMRs and non-light-water reactors, to market. The DOE and the Atomic Energy Commission played a critical role in commercializing the first generation of nuclear power plants, and some argue that successfully developing and deploying advanced reactors will similarly require federal involvement.⁹²

The DOE hosts programs that support the licensing of SMRs—including partnerships with the Tennessee Valley Authority (TVA) and NuScale Power to pursue NRC early-site permits and design certification, respectively, for a first-of-a-kind project at TVA's Clinch River site—and research, demonstration, and deployment of advanced non-light-water reactors and small modular reactors.⁹³

Permanent Storage of Nuclear Waste

Nuclear waste complicates the picture for both existing and new nuclear power plants. The Nuclear Waste Policy Act (NWPA) of 1982 directs the DOE to establish and operate a deep geological repository for the permanent storage of civilian nuclear waste and requires operators of nuclear power plants to contract with the DOE to store used fuel.⁹⁴ The DOE has yet to site a permanent waste repository.

The NRC placed a temporary moratorium on the issuance of new or extended operating licenses for nuclear power plants from 2012 to 2014, after a court ordered the commission to consider the possibility that a permanent waste repository is never built.⁹⁵ In 2014, the NRC issued a new “continuous storage” rule that finds waste can be stored safely at the sites of existing nuclear power plants—replacing its previous “waste confidence” rule that anticipated a repository would be available by 2009—and resumed licensing activities.⁹⁶ The generic environmental impact statement that the rule relies on assumes existing plants remain operational for up to 80 years, reflecting a second 20-year license extension.

Owners and operators of nuclear power plants have successfully sued the federal government for the cost of managing used fuel absent a permanent repository.⁹⁷ The GAO estimates that federal liability for managing spent nuclear fuel—because the DOE has not met its contractual obligations to dispose of that fuel—is \$21.4 billion through 2071.⁹⁸ In addition, the DOE currently holds more than \$30 billion for a permanent storage facility in its Nuclear Waste Fund, paid into by nuclear plant operators until 2014.⁹⁹

In 1988, Congress directed the DOE to consider Yucca Mountain in Nevada as the only possible site for the permanent waste repository.¹⁰⁰ In mid-2008, the Bush Administration submitted a license application to the NRC for the repository at Yucca Mountain, over Nevada’s strong opposition.¹⁰¹ The Obama Administration later abandoned the Yucca Mountain repository, declaring it unworkable and defunding its license application.¹⁰² The Obama Administration attempted to revoke the 2008 license application, but in 2013, the D.C. Circuit Court of Appeals directed the NRC to resume consideration of the application with previously appropriated funds. The DOE subsequently proposed a new waste management agency and initiated a public outreach process on consent-based siting, with goals of opening a pilot interim storage facility in 2021, a full-scale interim storage facility in 2025, and a permanent waste repository in 2048.¹⁰³ Legislation is required to authorize this approach.

The next administration must determine how to move forward to address the growing volume of civilian nuclear waste, much of which is a byproduct of nuclear power production. Under President Obama, the DOE has taken steps to outline a process for consent-based siting, but moving forward with candidate sites other than Yucca Mountain requires new legislative authority. In the absence of a federal repository, the federal government’s liability for the cost of storing nuclear waste on site continues to mount, and the long-term safety of waste storage remains an important factor in the role of nuclear power.

NATURAL GAS

At a Glance

Federal Actors: Environmental Protection Agency (EPA), Bureau of Land Management (BLM), U.S. Department of Energy (DOE), U.S. Department of Transportation (DOT) (including the Pipeline and Hazardous Materials Safety Administration, PHMSA), Federal Energy Regulatory Commission (FERC).

Appointments: The next president will appoint the heads of the EPA and the BLM.

Legal Authorities: Clean Air Act (CAA), Clean Water Act (CWA), Pipeline Safety Act, Resource Conservation and Recovery Act (RCRA), Safe Drinking Water Act (SDWA), Toxic Substances Control Act (TSCA), Federal Land Policy and Management Act (FLPMA), Mineral Leasing Act (MLA), Natural Gas Act (NGA), research and development funding in DOE appropriations bills, energy legislation.

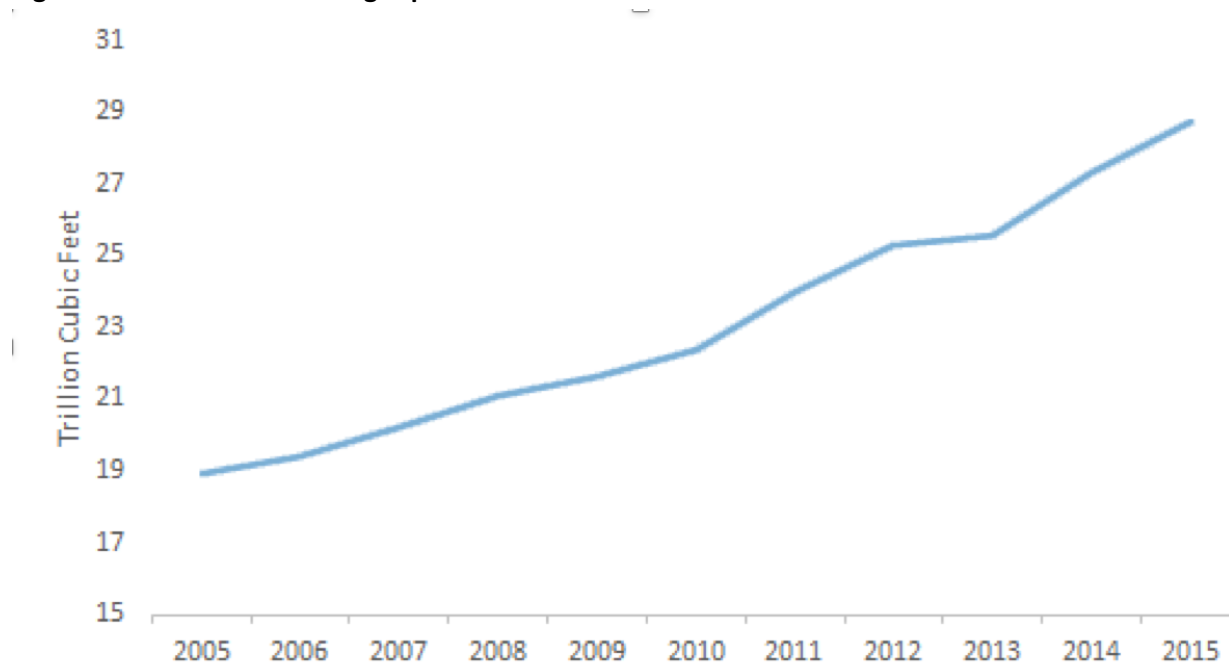
Decision Points:

- Whether and how to encourage displacement of coal with natural gas, such as under the Clean Power Plan, or to pursue more ambitious climate policy that targets GHG emissions from natural gas.
- Whether and how to use the federal government's role as a regulator and a landowner to expand or reduce the supply of natural gas.
- Whether to approve or deny applications for natural gas export terminals and natural gas pipelines that will drive demand for natural gas.

Natural gas is a major and growing fuel source for electricity generation. When combusted, it emits 7% of the nitrogen oxides and 0.2 % of the sulfur dioxides that coal emits to produce the same megawatt hour (MWh) of electricity.¹⁰⁴ It also emits less than half the carbon dioxide, leading some to call it the “bridge” fuel to a low-carbon future.¹⁰⁵ Others raise concerns that new and more heavily utilized natural gas power plants may extend reliance on fossil fuels and inhibit deployment of zero-carbon-emitting sources of electricity.¹⁰⁶

The shale gas boom drove the power sector's increased natural gas use. After years of declining conventional reserves and high natural gas prices, advances in directional drilling and hydraulic fracturing made it feasible to produce natural gas from shale and other unconventional formations.¹⁰⁷ Shale gas created jobs and economic development.¹⁰⁸ It also sparks debates about the risks of unconventional natural gas development, including methane leaks, water-intensive production methods, and chemical use.

Figure 4. U.S. annual natural gas production



Source: U.S. Energy Information Administration.

Shale gas has strong supporters and detractors, promising to make this a high-profile and controversial issue for the next administration. Different agencies and levels of government regulate natural gas production and create policies affecting natural gas demand. This shared responsibility complicates the regulatory picture and puts much of the regulatory burden on the states. Yet new federal rules, pending litigation, petitions for additional EPA regulation, and market forces driving coal from the power sector will require attention and policy responses from the next administration. Key issues include the role of natural gas in decarbonizing the electricity sector, policies that affect natural gas production, and policies that drive demand for natural gas.

Background

In 2005, coal accounted for 49% of U.S. electricity generation, while natural gas supplied less than 20%.¹⁰⁹ Then, the shale boom occurred. By 2015, coal and natural gas each generated about one-third of electric output.¹¹⁰ The EIA projects that 2016 will be the first year that natural gas generation exceeds coal generation.¹¹¹

States are the primary regulators of oil and natural gas production in the United States,¹¹² unless the production occurs on federal or Indian land or into the federal mineral estate. The Bureau of Land Management (BLM) manages federal natural gas leasing; the U.S. Forest Service and the National Park Service also play minor roles in development as federal land managers.

The EPA and other agencies, including the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, possess generic authorities that may apply to natural gas production. For instance, under the Clean Air Act, the EPA regulates volatile organic compounds (VOCs) and methane emissions from natural gas wells, processing facilities, and other components across the natural gas supply chain.¹¹³

Under the Clean Water Act, the EPA may regulate storm water run-off from well production sites or wastewater treatment facilities that treat fracking wastewater.¹¹⁴ A number of federal environmental statutes preclude the EPA from regulating oil and gas activities¹¹⁵ or place the burden on the EPA to determine whether it is appropriate to regulate this sector.¹¹⁶

The federal government also plays a key role in supporting the natural gas industry, from research and development to tax incentives and policies to induce the use of this fossil fuel.

Decision Points

Climate Policy Decisions Affecting Electricity Generation

Any federal efforts to de-carbonize the electricity sector will affect the amount of generation fueled by natural gas. The EPA's Clean Power Plan, discussed above in the section on climate policy, is the primary example of rulemaking in this category.¹¹⁷ Modest GHG reduction goals for the electric sector, such as those set by the Clean Power Plan, will benefit natural gas plants over plants burning more carbon-intensive coal. However, tougher GHG policies may also target emissions reductions from natural gas plants; the relative climate benefit of natural gas plants compared to coal plants still falls short of the GHG reduction target encouraged by the international community (80% by 2050).¹¹⁸ Policies embraced and deployed by the next administration could focus on building the natural gas bridge or on integrating zero-emitting sources onto the grid to meet longer-term goals

Policies Affecting Natural Gas Production

Federal regulation can affect natural gas supply by preventing development in certain areas or making it more or less expensive to produce natural gas. As noted, much of the regulatory authority sits with the states. Nonetheless, the federal government plays two roles in exercising regulatory authority over shale gas production: regulator and landowner. As a regulator, the federal government may set environmental, health, or safety standards for natural gas production, processing, or transportation. As a landowner, the federal government can establish royalty rates, bonding requirements, and permitting conditions to mitigate the effects of natural gas development on public lands, natural resources, and human health.

Thus far, the Clean Air Act has served as the primary mechanism for federal regulation of shale gas production. In 2012, the EPA finalized rules addressing volatile organic compounds (VOCs) from new natural gas wells, other production components, and processing plants.¹¹⁹ Following release of President Obama's methane strategy, the EPA expanded coverage of these new source performance standards (NSPS) to regulate methane, new oil wells, and additional aspects of the oil and gas value chain.¹²⁰ In the expanded NSPS Rule, the EPA noted its intent to set standards for *existing* infrastructure as well.¹²¹ Section 111(d) of the Clean Air Act likely requires issuance of regulations for existing sources.¹²² Therefore, the next administration will need to decide whether to promulgate these regulations or face a court challenge meant to force their promulgation. Studies such as those undertaken by university researchers, industry, and the Environmental Defense Fund informed the development of these rules and the EPA's methane inventory.¹²³ The next administration might therefore seek to invest in similar research.

One of the major public controversies over shale gas is the exclusion, in 2005, of hydraulic fracturing—the process of cracking shale rock with highly pressurized water and chemicals to release natural gas—

from certain Safe Drinking Water Act (SDWA) requirements. Responding to concerns that drinking water is therefore at risk from shale gas extraction, the EPA began a multi-year assessment of the issue. The agency released its draft in 2015.¹²⁴ Depending on the timing and substance of the final report, the next administration may face pressure to move quickly on certain types of regulation or to defer to states. (Although the draft assessment stated that EPA “did not find evidence that [hydraulic fracturing has] led to widespread, systemic impacts on drinking water resources in the United States,” the agency’s Scientific Advisory Board found that “EPA did not support quantitatively its conclusion.”¹²⁵)

Environmental groups are pressing the EPA to regulate other aspects of shale gas production. For instance, in March 2016, the Natural Resources Defense Council (NRDC) petitioned the EPA to revisit aquifer exemptions under the SDWA.¹²⁶ Western states use these exemptions to provide water for oil and natural gas development or to allow fracking into formations that contain underground sources of water. The EPA issued guidance in 2014.¹²⁷ The NRDC petition cites ongoing contamination of potential underground sources of drinking water and calls for EPA rulemaking. The next administration could receive an approved petition to implement or the decision to approve or deny this action. The NRDC could sue following denial of the petition.

Meanwhile, in May 2016, environmental groups sued the EPA to reconsider the agency’s 1998 determination that oil and natural gas waste is not “hazardous” under the Resource Conservation and Recovery Act (RCRA).¹²⁸ In the event that the next administration’s EPA decides that oil and natural gas wastes should be treated—and regulated—as hazardous, the statute requires congressional approval of the ensuing rules. These recent petitions and lawsuits suggest that the next administration may need to respond to these and similar challenges.

As chief federal land manager, the BLM finalized rules regulating hydraulic fracturing on public land in 2015.¹²⁹ These rules established enhanced casing specifications for hydraulically fractured wells, required closed containers for waste storage, and imposed relatively robust chemical disclosure requirements. Industry and several states challenged these rules in federal district court in Wyoming. The BLM rule is pending before the Tenth Circuit; the outcome of the case will inform the next administration’s options for overseeing shale gas extraction on federal and tribal lands.

The BLM could finalize a proposal in fall 2016 to regulate methane leaks from natural gas production facilities on public lands.¹³⁰ Industry and some states will challenge this rule, resulting in yet another rule defense.

Policies Driving Natural Gas Use

Federal policies can drive or reduce demand for natural gas in the electricity and other sectors. For instance, FERC licenses liquid natural gas (LNG) export terminals, which could open international markets to U.S. shale gas producers. LNG export terminal permit applications are pending at FERC, and the next administration’s appointees to FERC may act on these or future applications.¹³¹

Environmental and community groups have challenged FERC approvals under the National Environmental Protection Act (NEPA).¹³² In July 2016, the D.C. Circuit issued two opinions that sided with FERC’s decision not to account for GHG emissions associated with combustion of the exported gas. Environmental groups have also challenged the DOE’s general approval of the export of natural gas.

In addition to LNG terminals, FERC approves interstate pipelines and grants eminent domain authority to natural gas pipeline companies.¹³³ Pending lawsuits seek to require consideration of environmental impacts during the pipeline approval process.¹³⁴ FERC may increasingly find itself at the center of these disputes.

The next president may seek opportunities to support the shale gas industry, whether through research and development of increasingly efficient production techniques or through environmental mitigation technologies, tax breaks, or tax incentives and other policies driving demand for natural gas. The DOE's Office of Fossil Energy and the National Energy Technology Laboratories might house relevant research and development programs. Alternatively, the next president could push to leapfrog shale gas and other fossil fuels by ramping up research and development and tax incentive packages for renewable energy and battery storage technologies.

ECONOMIC DEVELOPMENT

At a Glance

Federal Actors: U.S. Department of Agriculture (USDA), Employment and Training Administration (ETA), Economic Development Administration (EDA), U.S. Department of Labor (DoL), U.S. Department of Commerce (DoC), Dislocated Workers National Reserve, Appalachian Regional Commission, Economic Development Assistance Programs, Environmental Protection Agency (EPA).

Appointments: The next president will appoint the heads of the EPA, USDA, DoL, and DoC as well as directors in other agencies that oversee economic development programs.

Legal Authorities: Numerous authorizing statutes and budgetary provisions.

Decision Points:

- How to implement the \$9 billion Power+ Program, if Congress allocates funding to the program for FY 2017.
- How to implement workforce development provisions of the omnibus energy bill, if enacted.

Rapid changes in the electricity sector have altered the economic landscape in many parts of the country. U.S.-based manufacturing sectors, particularly energy-intensive sectors and sectors relying on natural gas as a feedstock, are benefitting from low natural gas prices.¹³⁵ Employment in renewable-energy-related fields continues to expand.¹³⁶ Although these trends are having a positive impact in many parts of the United States, the pace and scope of the nation's energy transition is resulting in rapid job losses in many communities dependent on coal-related jobs. The next administration will face decisions related to economic development in these communities.

Background

Job losses are not new to the coal extraction sector. Mining jobs have declined for decades while production remained relatively constant, particularly in the Appalachian region.¹³⁷ However, the current job losses extend throughout the coal value chain due to the retirement of aging coal-fired power plants.¹³⁸ According to the Bureau of Labor Statistics, 14,700 coal mining jobs were lost between 2009 and 2015.¹³⁹ During the same period, 4,450 jobs were lost in petroleum and coal products manufacturing; 10,270 jobs were lost in electric power generation, transmission, and distribution; and 11,260 jobs were lost in rail transportation.¹⁴⁰

The federal government has numerous job creation and workforce training programs designed to assist communities and states facing economic hardship due to the changes in the nation's electricity generation mix. These programs range from tax benefits, loans, grants, and education to assist with job training and incentivize business development at the local, state, and regional levels.¹⁴¹

In 2015, the Obama Administration launched the Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative—an effort to provide a more coordinated federal response

to communities experiencing coal-related job losses.¹⁴² This executive branch initiative involves 10 federal agencies and relies on discretionary funding available through existing agency budgets. The POWER Initiative is the economic development component of the Obama Administration’s broader “POWER+ Plan” to revitalize communities affected by the ongoing energy transition, to provide health and retirement benefits to former mineworkers, and to support development of clean coal technologies.¹⁴³

Decision Points

Future of the POWER+ Plan

The Obama Administration’s FY 2017 budget requested more than \$9 billion to fund the POWER+ Plan.¹⁴⁴ If Congress allocates funding to the program, agencies will need to decide how to administer millions of dollars in competitive grants and loans to communities affected by changes in the coal industry. Table 1 summarizes POWER+ Plan initiatives included in the FY 2017 budget and identifies the degree of discretion provided to implementing agencies. Within the bounds described, federal agencies will decide how to implement programs, where to focus their efforts, and what types of activities to support.

Table 1. POWER+ plan administration decisions, FY2017

Program	Initiatives	FY2017 budget allocation	Limitations
Department of Labor, Dislocated Workers National Reserve	Provides grants for re-employment services, job training, subsidized employment, and supportive services from funds for dislocated workers from coal mines and coal-fired power plants	\$20 million	Project must respond to a mass layoff or plant closing in the coal industry
Appalachian Regional Commission	Provides grants in the Appalachian region to support entrepreneurship and infrastructure in communities affected by changes in the coal industry	\$50 million	Project must target an economically-distressed community in 1 of 13 Appalachian states
Department of Commerce, Economic Development Assistance Programs	Coordinates the POWER Initiative with communities and federal agencies; provides grants to economically distressed communities for job creation and economic growth	\$215 million	Funding is no longer reserved for projects specific to coal communities
Environmental Protection Agency, Brownfields Program	Provides grants for communities to assess and clean up brownfield sites related to retirement of coal-fired power plants	\$5 million	Project must target a brownfield related to the changing coal economy with a comprehensive mitigation strategy
Department of Agriculture, Rural Economic	Provides grants and loans for rural utilities that will create and retain employment in rural areas where	\$97 million	Funding is not reserved for projects specific to coal communities

Program	Initiatives	FY2017 budget allocation	Limitations
Development Loan and Grant Program	changes in the coal industry are causing economic distress		
Department of the Interior, Abandoned Mine Reclamation Fund	Funds mine reclamation projects specifically designed to create jobs and revitalize coal mine communities	\$200 million per year for five years	Allocations based on states' historic coal production

Source: Office of Management and Budget, "Investing in Coal Communities, Workers, and Technology: The Power+ Plan," https://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/fact_sheets/Investing%20in%20Coal%20%20Communities.pdf.

Energy Bill Provisions

The U.S. House of Representatives and the U.S. Senate each passed versions of a comprehensive energy bill in 2016.¹⁴⁵ Although it is unclear whether Congress will successfully consolidate and pass the bill into law, this legislation contains examples of energy workforce development programs being considered by the federal government.

The Senate version of the bill proposes three workforce training initiatives to be managed by the DOE. A 21st Century Workforce Advisory Board would develop a strategy for meeting current and future energy sector needs through the support and development of a skilled workforce. A pilot program would award competitive grants to job training programs that result in industry credentials. And finally, the DOE would provide grants to training programs that certify students in the installation of energy-efficient building technologies.

The House version of the bill creates no funding initiatives for energy workforce development, but it states that energy and manufacturing job training is a priority for the nation. It also establishes a DOE clearinghouse to disseminate information about existing workforce development programs.

If these provisions become law, either through the bill pending before the current Congress or through action by the next Congress, the next administration may face many choices as it considers how to implement the new workforce initiatives. If Congress fails to resolve the differences in the competing versions of the bill, then the next administration must determine the degree to which it wishes to target existing job training and economic development programs to assist communities facing economic hardship due to the changes under way in the electricity sector.

FEDERAL GOVERNMENT PROCUREMENT

At a Glance

Federal Actors: General Services Administration (GSA), Department of Defense, Department of Energy, other Federal Agencies, White House.

Appointments: The next president will appoint the heads of the General Services Administration (GSA) and the Office of Management and Budget (OMB).

Legal Authorities: 40 U.S.C. § 501, 40 U.S.C. § 121(c), National Energy Conservation Policy Act.

Decision Points:

- Whether to continue implementation of Executive Order 13693, which establishes new energy and greenhouse gas reduction goals for federal agencies, or retreat to less ambitious goals set by Congress in 2005 and 2007.
- How to implement procurements that consider supply-chain GHG emissions.
- How to spur deployment of electric vehicle infrastructure and expand the federal government's ownership of electric vehicles.

The federal government spends approximately \$5 billion per year on electricity, which is more than 1% of the entire nation's electric bill.¹⁴⁶ The U.S. government is also the nation's largest vehicle fleet operator, with approximately 600,000 total vehicles.¹⁴⁷

Congress established renewable energy and efficiency mandates for federal agencies in 2005 and 2007; those have recently plateaued.¹⁴⁸ Both President George W. Bush and President Obama issued executive orders encouraging energy efficiency in the federal government. In 2015, President Obama issued an executive order that expands and extends the congressional mandates into the 2020s and that sets a goal to reduce the federal government's GHG emissions by 40% by 2025.¹⁴⁹ Achieving these goals will require a range of procurement and reporting programs. However, because the goals are enshrined only in an executive order and implementing agency documents, the next president could disregard them.

Background

Congress tasks the General Services Administration (GSA) with procuring public utility services for federal government buildings, although agencies can request delegated authority from GSA.¹⁵⁰ The GSA also procures vehicles for about two-thirds of the federal fleet and owns and leases to federal agencies approximately 200,000 vehicles. Beginning in 1992, a series of congressional acts and executive orders established efficiency, GHG emissions, and renewable energy or alternative fuel goals for federal agency energy consumption and vehicle procurement and use.

For federal buildings, Congress required each agency to establish incentives for energy efficiency and conservation and authorized agencies to participate in utility efficiency programs.¹⁵¹ Since 1994, DOE's Federal Energy Management Program has leveraged \$2.8 billion through utility partnerships and has

provided agencies with a range of technical assistance. In 2005, Congress required agencies to reduce building energy consumption 20% by 2015, and in 2007, it increased that target to 30%.¹⁵² Congress also tasked DOE with “seek[ing] to ensure that, to the extent economically feasible and technically practicable,” at least 7.5% of energy purchased by the federal government come from renewable sources. A 2007 executive order implemented these requirements.¹⁵³

For the federal fleet, the Energy Policy Act of 1992 set purchasing mandates for “alternative fueled vehicles.”¹⁵⁴ In 2007, Congress required agencies to reduce vehicle petroleum consumption by 20% and to increase alternative fuel use by 10%, both by 2015. The 2007 Energy Independence and Security Act also prohibited agencies from acquiring light duty vehicles or medium duty passenger vehicles that the EPA did not identify as “low greenhouse gas emitting vehicles.”¹⁵⁵ A 2009 executive order expanded Congress’s target, requiring agencies to reduce consumption by 30% from a 2005 baseline.¹⁵⁶

In 2015, the Obama Administration issued Executive Order 13693, which established new energy goals for agencies and rescinded the Bush Administration’s Executive Order 13423 and Obama’s earlier Executive Order 13514.¹⁵⁷ It requires each agency to reduce building energy intensity by 2.5% per year through 2025, to source at least 25% of building electricity and thermal energy from renewable and alternative energy by 2025, and to generate no less than 30% of building electricity from renewable energy by 2025. For the federal fleet, the order requires that 50% of all new agency passenger vehicles be zero emission or plug-in hybrid by 2025 and that agencies reduce per-mile GHG emissions by 30%. Overall, the order sets a goal of reducing federal government GHG emissions by 40% by 2025, and it identifies a host of other procurement, waste management, and water reduction targets and practices.

Decision Points

Carrying out the Executive Order

Achieving the goals established by Executive Order 13693 will require a sustained commitment by the executive branch. The order establishes a federal chief sustainability officer, provides key roles to the Council on Environmental Quality (CEQ) and Office of Management and Budget (OMB), and directs each agency head to develop and implement a strategic sustainability plan. Implementing instructions issued by CEQ in June 2015 detail the actors and policies involved.¹⁵⁸ The next administration could implement this agenda and build on the 2015 executive order with a new set of goals that extend past 2025, or it could retreat to the less ambitious goals established by Congress in 2005 and 2007.

Much of the work needed to meet the 2015 executive order’s goals is under way. For instance, federal data centers are installing advanced energy meters and aiming to achieve specific power-use effectiveness targets. In August 2016, the Federal Chief Information Officer set a September 2018 target date for achieving the energy use goals and included procurement goals.¹⁵⁹ A recent U.S. Government Accountability Office report highlights that half of all federal data centers identified in 2015 are scheduled to close by 2019.¹⁶⁰ By then, it may be appropriate to consider new targets for data center energy use. As another example, the GSA has entered into binding contracts with energy service companies to implement energy efficiency measures to cut energy costs in government buildings.¹⁶¹

Accounting for Emissions in the Supply Chain

The Obama Administration may finalize a recently proposed procurement rule but would rely on the next administration for its implementation. Proposed in May 2016 by the Department of Defense, GSA, and National Aeronautics and Space Administration (NASA), the rule would facilitate compliance with Executive Order 13693's directive to implement procurements that consider contractors' GHG emissions.¹⁶² If finalized and implemented, the rule would establish a contractor reporting system. The next administration would use the information to identify opportunities to reduce supply chain emissions and implement procurements that incorporate consideration of those emissions.

Government Automobile Fleet and Transportation Infrastructure

A number of events may spur deployment of electric vehicle infrastructure and expand the federal government's ownership of electric vehicles. First, a provision in the 2015 transportation bill (the "FAST" Act), authorizes the GSA to install and operate electric vehicle charging stations in government parking facilities.¹⁶³ Although this move could facilitate compliance with Executive Order 13693, it might induce the federal government to purchase electric vehicles even if the order is rescinded. Meanwhile, the Department of Justice's proposed settlement with Volkswagen for alleged cheating on diesel engine emissions tests requires the car manufacturer to submit to the EPA a draft national plan that details how the company will spend \$2 billion on zero-emission vehicle investments.¹⁶⁴ Under the terms of the proposed agreement, the next administration's EPA would have to approve this plan and manage its implementation. Overseeing deployment of billions of dollars in electric-vehicle infrastructure could poise the next administration to usher in an unprecedented expansion of electric or other zero-emission vehicles in the government fleet.

ENDNOTES

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- ² See U.S. EIA, *Electric Power Monthly*, Aug. 24, 2016, http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1_a; see also U.S. EIA, *Wind Adds the Most Electric Generation Capacity in 2015, Followed by Natural Gas and Solar*, TODAY IN ENERGY, Mar. 23, 2016, http://www.eia.gov/todayinenergy/detail.cfm?id=25492_.
- ³ *New Energy Outlook 2016: Powering a Changing World*, BLOOMBERG NEW ENERGY FINANCE, <http://www.bloomberg.com/company/new-energy-outlook/#form> (last visited Sept. 12, 2016).
- ⁴ See U.S. EIA, *ELECTRIC POWER ANNUAL 2014* (2016), <http://www.eia.gov/electricity/annual/pdf/epa.pdf>; see also U.S. EIA, *Coal Made up more than 80% of Retired Electricity Generating Capacity in 2015*, TODAY IN ENERGY, Mar. 8, 2016, <http://www.eia.gov/todayinenergy/detail.cfm?id=25272>.
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- ⁶ 16 U.S.C. §§ 791a *et seq.* (1920).
- ⁷ See Energy Policy Act of 1992, Pub. L. No. 102-486, § 711, 106 Stat. 2776, 2909; FERC, Order 888: Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 78 FERC ¶ 61,220 (1997); *New York v. FERC*, 535 U.S. 1 (2002).
- ⁸ See FED. ENERGY REG. COMM'N, *ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS* (2015), <http://www.ferc.gov/market-oversight/guide/energy-primer.pdf>.
- ⁹ Statistic derived from U.S. EIA, Form 861 (2014), Spreadsheet labeled "Sales_Ult_Cust_2014."
- ¹⁰ See <http://www.statepowerproject.org> for summaries of recent and ongoing litigation in federal courts. ST. POWER PROJECT, <https://statepowerproject.org/> (last visited Sept. 12, 2016).
- ¹¹ 135 S. Ct. 1591 (2015).
- ¹² 136 S. Ct. 760 (2016).
- ¹³ 136 S. Ct. 1288 (2016).
- ¹⁴ See, e.g., Order, *Entergy Nuclear Fitzpatrick v. Zibelman*, no. vc-00230 (N.D.N.Y. Apr. 20, 2016) (directing parties to file briefs about the implications of the Supreme Court's ruling in *Hughes v. Talen*); Jim Rossi, *The Brave New Path of Energy Federalism*, 95 TEX. L. REV. (forthcoming 2016).
- ¹⁵ Letter from Rep. Fred Upton and Rep. Ed Whitfield to FERC Chairman Norman Bay, June 10, 2016.
- ¹⁶ 16 U.S.C. § 792 (2012).
- ¹⁷ 16 U.S.C. § 824e.
- ¹⁸ FERC, Order 745, 134 FERC ¶ 61,187 (2011) (upheld in *FERC v. Electric Power Supply Ass'n.*, 136 S.Ct. 760 (2016)).
- ¹⁹ QUADRENNIAL ENERGY REVIEW: ENERGY TRANSMISSION, STORAGE, AND DISTRIBUTION INFRASTRUCTURE S-15 (2015), http://energy.gov/sites/prod/files/2015/07/f24/QER%20Full%20Report_TS%26D%20April%202015_0.pdf.
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- ²¹ FERC, Order on Proposed Tariff Revisions, PJM Interconnection LLC, 151 FERC ¶ 61,208 at PP 61–62 (2015).
- ²² *Advanced Energy Mgmt. All., et al. v. FERC*, D.C. Cir. Case No. 16-1234.
- ²³ FERC, Order Dismissing Complaint, 156 FERC ¶ 61,150 (2016).
- ²⁴ See, e.g., FERC, Order Denying Request for Declaratory Order, 94 FERC ¶ 61,340 (2001) (denying a utility's request for a determination that Iowa's net metering rules are preempted by federal law); FERC, Notice of Intent Not to Act, 148 FERC ¶ 61,233 (2014) (declining to act on a complaint about Massachusetts' rates for renewable energy under PURPA).
- ²⁵ Pet. Declaratory Order of Southern Maryland Electric Cooperative, Inc. and Choptank Electric Cooperative, Inc., FERC Docket No. EL16-107 (Aug. 23, 2016).
- ²⁶ TOM STANTON & KATHRYN KLINE, NRRI, *THE ECOLOGY OF COMMUNITY SOLAR GARDENING: A 'COMPANION PLANTING' GUIDE* (2016), <http://nrri.org/download/nrri-16-7-community-solar>.
- ²⁷ See, e.g., FERC, Order 764: Integration of Variable Energy Resources, 139 FERC ¶ 61,246 (2012), <http://www.ferc.gov/whats-new/comm-meet/2012/062112/E-3.pdf>.
- ²⁸ See FERC, Order 764: Integration of Variable Energy Resources, 139 FERC ¶ 61,246 (2012), FERC, Order. 792: Small Generator Interconnection Agreements and Procedures, 145 FERC ¶ 61,159 (2013).
- ²⁹ RTO-run capacity markets are designed to ensure enough generation is available to reliably meet peak power demands. Traditionally, utilities satisfied their obligations to maintain adequate generation with owned generation or bilateral contracts with other suppliers. The RTOs in New York, New England, and the Mid-Atlantic (PJM) require utilities to procure capacity

through an auction. See FERC, ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS (2015), <http://www.ferc.gov/market-oversight/guide/energy-primer.pdf>.

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³² Order Adopting Regulatory Policy Framework and Implementation Plan (No. 14-M-0101) ((N.Y. P.S.C., Feb. 26, 2015).

³³ 16 U.S.C. § 824a-3(m).

³⁴ FERC Docket No. AD16-16.

³⁵ See, e.g., *Allco Finance v. Klee*, no. 16-cv-00508 (D. Conn.); *Winding Creek Solar v. Peevey*, no. 13-cv-04934 (D. No. Cal.).

³⁶ Matthew L. Wald, *Duke and Progress Energy Become Largest U.S. Utility*, N. Y. TIMES, Jul. 3, 2012.

³⁷ 16 U.S.C. §824b.

³⁸ FERC, Order Reaffirming Commission Policy and Terminating Proceeding, 138 FERC ¶ 61,109 (2012).

³⁹ Letter from Diana L. Moss, President, Am. Antitrust Inst., to William J. Baer, Assistant Att’y Gen., U.S. Dep’t of Justice (Feb. 25, 2015), http://antitrustinstitute.org/sites/default/files/Exelon-Pepco_AA1%20letter_2-25-15.pdf.

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⁴³ 549 U.S. 497 (2007).

⁴⁴ Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act; Final Rule, 74 Fed. Reg. 66,496 (Dec. 15, 2009).

⁴⁵ Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25,324 (May 7, 2010); Mandatory Reporting of Greenhouse Gases; Final Rule, 74 Fed. Reg. 56,260 (Oct. 30, 2009); Prevention of Significant Deterioration and Title V Permitting for Greenhouse Gases: Removal of Certain Vacated Elements, 80 Fed. Reg. 50,199 (Aug. 19, 2015).

⁴⁶ Carbon Pollution Emission Guidelines for Existing Stationary Sources; Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,662 (Oct. 23, 2015).

⁴⁷ *Zero Zone, Inc. v. EPA*, nos. 14-2147, 14-2159, 14-2334 (7th Cir. Aug. 8, 2016).

⁴⁸ United States Cover Note and Accompanying Information, Intended Nationally Determined Contribution, UNFCCC, <http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf> [hereinafter U.S. Cover Note].

⁴⁹ See, e.g., White House, *FACT SHEET: The United States and India – Moving Forward Together on Climate Change, Clean Energy, Energy Security, and the Environment*, June 7, 2016, <https://www.whitehouse.gov/the-press-office/2016/06/07/fact-sheet-united-states-and-india-%E2%80%93-moving-forward-together-climate>.

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⁵¹ 80 Fed. Reg. 64,661 (Oct. 23, 2015).

⁵² In May 2016, the D.C. Circuit opted to forgo the typical three-judge panel and move directly to an en banc hearing on the Clean Power Plan. The D.C. Circuit has a chief judge and 11 active judges. Chief Judge Garland has recused himself from all cases while he remains a nominee for the U.S. Supreme Court. The remaining active judges heard the case September 28, 2016.

⁵³ 42 U.S.C. § 7411(d)(1) (“The [EPA] shall prescribe regulations . . . for any existing source for any air pollutant . . . to which a standard of performance under this section would apply if such existing source were a new source.”).

⁵⁴ For a discussion of the challenges and opportunities for regulating existing petroleum refineries under Section 111(d), see Allison Donnelly et al., *Regulating Greenhouse Gas Emissions under Section 111(d) of the Clean Air Act: Implications for Petroleum Refineries*, NI WP 14-05 (2014), https://nicholasinstitute.duke.edu/sites/default/files/publications/ni_wp_14-05_final.pdf.

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⁵⁶ U.N. Framework Convention on Climate Change, *Paris Agreement—Status of Ratification*, http://unfccc.int/paris_agreement/items/9444.php (last visited Sept. 19, 2016).

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- ⁵⁹ U.S. GAO, REGULATORY IMPACT ANALYSIS: DEVELOPMENT OF SOCIAL COST OF CARBON ESTIMATES 5 (2014); William Pizer et al., *Using and Improving the Social Cost of Carbon: Regular, Institutionalized Updating and Review are Essential*, 346 SCIENCE 1189 (2014).
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- ⁶² *Zero Zone, Inc., v. DOE*, 2016 U.S. App LEXIS 14541.
- ⁶³ Experts have suggested that the social cost of carbon requires regular review and revision when using in government policy-making. See Pizer et al., *supra* note 59, at 1189–90.
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- ⁶⁵ See U.S. EIA, *First New Nuclear Reactor in Almost Two Decades Set to Begin Operating* TODAY IN ENERGY, June 14, 2016, <http://www.eia.gov/todayinenergy/detail.cfm?id=26652>; See also Peter Maloney, *House Committee Votes to Lift 2020 Deadline on Nuclear Power Tax Credit*, UTILITY DIVE, Sept. 23, 2016, <http://www.utilitydive.com/news/house-committee-votes-to-lift-2020-deadline-on-nuclear-power-tax-credit/426850> (stating that four nuclear units under construction in South Carolina and Georgia, originally expected online in 2016 and 2017, are currently slated to begin operating in 2019 and 2020).
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- ⁶⁷ There are 61 commercial nuclear power plants in the United States operating 99 reactors as of mid-2016. Since 2013, plants that have retired include: Vermont Yankee (VT), San Onofre (CA), Crystal River (FL), and Kewaunee (WI). See *Frequently Asked Questions: How Many Nuclear Power Plants are There in the United States and Where are They Located?*, U.S. EIA, last updated Aug. 2, 2016, <https://www.eia.gov/tools/faqs/faq.cfm?id=207&t=3>. Plants that have announced retirement include: Pilgrim (MA), Oyster Creek (NJ), Fort Calhoun (OK), Quad Cities (IL), and Clinton (IL). For an overview of retiring and at risk plants, see Thomas Overton, *U.S. Faces Wave of Premature Nuclear Retirements*, POWER MAG., Jan. 14, 2015, <http://www.powermag.com/u-s-faces-wave-of-premature-nuclear-retirements>. Although some of these retirements have been attributed to economic headwinds, reactors have also retired as a result of maintenance issues. For example, Southern California Edison permanently closed its San Onofre Nuclear Generating Station following the unexpected degradation of tubes in its newly installed steam generators. After replacing its steam generators and discovering damage to the concrete containment building that surrounds the reactor vessel, Duke Energy closed its Crystal River Nuclear Plant. See *Plans for Decommissioning of San Onofre Nuclear Generating Station Units 2 and 3*, U.S. NRC (July 8, 2016), <http://www.nrc.gov/info-finder/decommissioning/power-reactor/songs/decommissioning-plans.html>; see also *Crystal River Unit 3 Nuclear Generating Plant*, U.S. NUCLEAR REG. COMM'N (Mar. 4, 2016), <http://www.nrc.gov/info-finder/decommissioning/power-reactor/cr3.html>.
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