

# Scenarios for New Greenhouse Gas Policies in the Next Ten Years

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## I. Introduction

The purpose of this paper is to identify policies a President committed to addressing climate change, and his or her successor, would likely consider promulgating in the next 10 years in the absence of new authority from Congress.

The pressure on the next President to implement new greenhouse gas (GHG) policies will be almost immediate. Under the Paris climate agreement,<sup>1</sup> the United States submitted an Intended Nationally Determined Contribution (INDC) in which it pledged to reduce the country's GHG emissions by 26% to 28% below 2005 levels by 2025.<sup>2</sup> Several studies have concluded that the Obama Administration's current and planned policies will fall short of meeting this goal.<sup>3</sup> Furthermore, the Paris agreement commits the United States and other parties to submit new pledges by 2020 to achieve even deeper reductions starting after 2025.<sup>4</sup>

Yet, the next President is likely to encounter a Congress that remains deadlocked on issue of climate change policy. Indeed, this deadlock could continue even into the administration of the President's successor. This means that Congress would not establish new (or restrict existing) legal authorities and the President will have to look to existing laws.

To be sure, the next President might be opposed to an expansion of GHG regulation and seek to roll back existing policies. Under such a scenario, the U.S. Supreme Court's *Massachusetts v. EPA*<sup>5</sup> decision would make it difficult if not impossible to avoid any GHG regulation altogether. Therefore, such a President would likely explore pathways to reverse or scale-back the regulations and other policies introduced under the Obama Administration, including by revisiting prior interpretations of legal authorities and methodologies for establishing emission standards. This could involve requesting a voluntary remand of current litigation challenging the regulations, or waiting until decisions have been rendered and then taking stock of potential actions. In any event, in order to revise regulations, the President would need to follow the requirements of the Administrative Procedure Act and the Clean Air Act, including supplying a "reasoned analysis" to support the change of course.<sup>6</sup> These actions presumably would draw significant legal challenges. We have not undertaken a full legal analysis of this scenario.

The balance of this paper reviews the pathways that a President committed to further development of climate policies would consider following. The paper analyzes only policies beyond those already assumed in the U.S. INDC— which includes not only already-promulgated policies (such as the Clean Power Plan and GHG emissions standards for new motor vehicles) but also some anticipated policies (such future limits on existing sources of methane emissions from the oil and gas sector).<sup>7</sup>

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We have focused on sectors that account for the largest quantities of U.S. GHG emissions, and divided those sectors into two categories: stationary sources of emissions (the electric power sector, the industrial sector, and the residential and commercial sector) and mobile sources (light-duty cars and trucks, heavy-duty trucks and other vocational vehicles, and aircraft). We have not analyzed policies affecting sources and sinks in the land use, land use change, and forestry sector.

In addition, our research has assumed that the next President's first focus would be on legal authorities that the government already has used to develop climate policies. Accordingly, we have not analyzed other policy pathways that have received scholarly and advocacy attention—including the use of Clean Air Act authorities to address international air pollution (section 115)<sup>8</sup>—although such pathways could serve as an important alternative or supplement to policies analyzed in our project.

Implementing climate policies without new authorities from Congress implies enduring some significant constraints. The policy pathways described below involve multiple rulemakings, including by both the federal government and states, resulting in potentially substantial administrative costs for the government and for regulated entities. In addition, the Executive Branch is constrained in designing policies that are market-based and apply across states and sectors, which means that new policies may be less ambitious or more costly (or both) relative to a carbon tax or cap-and-trade program enacted by Congress. Each pathway would involve varying levels of legal risk and strain on administrative capacity. In addition, the viability of some pathways would depend on the outcomes of current litigation on regulations promulgated by the Obama Administration. A comprehensive legal analysis of each of the pathways is beyond the scope of this paper.

Nevertheless, our analysis indicates that the next two Presidents would have a number of potentially viable pathways for regulation even without new authorities from a deadlocked Congress. These initiatives could achieve significant additional GHG emission reductions. The analysis suggests that, if these pathways are not foreclosed by court decisions, the pathways could attain substantial emission reductions, and could contribute to putting the United States on a path to “deep decarbonization.”<sup>9</sup>

As discussed below, our key findings are:

- *Power Sector.* Assuming favorable outcomes in the courts, the next President likely will seek to tighten the emission standards in the Clean Power Plan Rule in light of decreasing costs and increasing deployment of renewable energy. In addition, within the next 10 years, the Environmental Protection Agency (EPA) is likely to prescribe emission standards for new gas-fired power plants that assume use of carbon capture and sequestration (CCS).
- *Industrial Sector.* Driving major emission reductions in the industrial sector is challenging but feasible. We expect future administrations to focus on emission standards that would apply to new fossil fuel-combusting equipment that is used across the sector—including requirements to use electricity or combined heat and power in lieu of on-site industrial boilers and process heaters wherever feasible.

- *Commercial and Residential Sector.* In the commercial and residential sector, we expect future administrations to continue to roll out standards that would increase the efficiency of appliances that use electricity. We also expect future administrations to explore whether EPA could regulate manufacturers in order to require the production of less carbon-intensive equipment.
- *Public Lands.* Another policy lever that future administrations might apply is to increase royalty rates for extraction of coal and natural gas public lands and impose stringent environmental requirements on new leases.
- *Transportation Sector.* We expect the next administration to consider revising the existing model year (MY) 2022-2025 GHG emissions standards for light-duty vehicles as part of the “mid-term evaluation” currently underway. We also expect future administrations to extend and strengthen these standards for post-MY2025 vehicles, potentially by adopting standards that require faster adoption of zero-emission vehicle technology. Future administrations may also adopt fuels-based emission regulations that will drive reductions from existing vehicles. Finally, we expect a future administration to adopt emission standards for new aircraft and aircraft engines and to adopt a market-based mechanism for offsetting emissions from international flights in line with anticipated international agreements.

## **II. Discussion**

### **A. Power Sector**

By far the largest stationary source emitter of GHGs is the electric power sector. The sector accounted for approximately 2060 MMT of carbon dioxide equivalent (CO<sub>2</sub>-e), or 33% of total GHG emissions in 2014, dominated by emissions of carbon dioxide from combustion of coal and natural gas.<sup>10</sup>

To address power sector emissions, the next President would likely consider expanding and strengthening two regulatory programs EPA promulgated in 2015. One of the regulations is the Carbon Pollution Standards Rule, which sets standards for new, modified and reconstructed power plants.<sup>11</sup> The second regulation is the Clean Power Plan, which establishes a federal-state regulatory program addressing existing power plants.<sup>12</sup>

Each is an exercise of the agency’s authority under section 111 of the Clean Air Act, which authorizes the establishment of emission performance standards based on the “best system of emission reduction” that EPA determines is “adequately demonstrated” taking into account cost and energy requirements. Both rules currently are subject to legal challenges, and the U.S. Supreme Court has imposed a stay on the Clean Power Plan pending the outcome of litigation. Assuming for the sake of argument that each rule is upheld in its current form, the next President probably will consider amendments that would impose deeper emission reduction requirements.

For new and modified power plants, the President likely would focus on amendments to the standards affecting gas-fired plants because very few, if any, new coal-fired power plants are expected to be constructed in the next decade.<sup>13</sup> The key question is whether EPA could justify a determination that, for such new plants, CCS is the “best system of emission reduction” that has

been “adequately demonstrated.” At this point in time, CCS for new gas-fired plants likely could not meet the “adequately demonstrated” test. However, with continued public and private investment in research, development, and deployment, CCS on new gas-fired plants may be able to achieve this status within the next 10 years.

Existing power plants account for a far greater proportion of GHG emissions than new or modified plants. The Clean Power Plan establishes emission limits for such plants through 2030 and beyond. However, we expect that the President would evaluate strategies for tightening those limits, citing recent studies that suggest that the current rule left some amount of potential emission reductions on the table.<sup>14</sup> EPA might finalize revisions to the rule as part of a proceeding to establish new rule deadlines after the Supreme Court stay has been lifted.<sup>15</sup> To pursue this pathway, the agency would have to overcome objections by some litigants that section 111(d) of the Clean Air Act only authorizes EPA to promulgate section 111(d) guidelines for a source category once and thereafter precludes any revisions to those guidelines.<sup>16</sup>

Assuming EPA may go forward with revisions, the most likely pathway for strengthening the Clean Power Plan would be for EPA to find that it is reasonable to expect greater penetration of renewables into the grid than the agency assumed in the 2015 version of the rule. EPA could point to a development that occurred after promulgation of the rule: the Congressional enactment of extensions to the production tax credit and the investment tax credit, which benefit wind and solar generation projects.<sup>17</sup> In addition, the agency likely would cite new studies that identify decreasing costs for renewable technologies; advances in electricity storage; and more rapid development and deployment of renewables in the next decade.<sup>18</sup>

A second pathway would be for EPA to re-assess and adopt technological approaches it deemed to be too expensive in its 2015 rule. For example, EPA could assume the availability of off-shore wind, rooftop solar photovoltaics, and renewable biomass. The agency could also assume that coal-fired plants could implement co-firing or fuel switching to biomass or natural gas. To support these approaches, EPA would have to provide new evidence that costs have fallen for these emissions reduction options.

A third pathway would be for EPA to revisit abatement strategies that it rejected for legal or policy reasons, such as demand-side energy efficiency or incentives for states to maintain existing nuclear power plants deemed “at risk” of retirement. In a revised rule, EPA could re-evaluate these decisions, but this pathway could entail higher legal risk than the two other pathways discussed above.

EPA would need to carefully consider the timing of amendments to the Clean Power Plan rule in order to provide sufficient notice to state regulators and to owners of affected power plants, particularly if the amendments contemplate significant changes to the mix of generation resources in the sector.

## ***B. Industrial Sector***

With roughly 1,450 MMT CO<sub>2</sub>-e emitted in 2014, industrial sources account for approximately 20% of total U.S. GHG emissions.<sup>19</sup> The sector consists of many different types of sources. Only three sub-sectors contribute 1% or more of total U.S. emissions: refineries (2.5%), iron and steel (1.2%), and cement (1%).

Across all industrial facilities, nearly 60% of emissions derive from onsite fossil fuel combustion for the production of heat, power, and steam to drive industrial processes. The turnover of such equipment is relatively slow in this sector. The remaining emissions in the sector are byproducts of particular industrial processes (primarily chemical reactions during the production of chemicals, iron and steel, and cement).<sup>20</sup> These industrial processes are highly tailored to different sub-sectors, and lower-emitting alternatives are not widely available.

Because industrial emissions result from stationary facilities, they can be regulated under Clean Air Act section 111(b) (for new and modified sources) and section 111(d) (for existing sources). Given the challenging emissions profile of the industrial sector, we expect that EPA would look closely at regulatory approaches that could achieve meaningful reductions with minimal administrative costs.

In particular, we believe EPA likely would consider a non-traditional, hybrid approach to section 111 regulation. As one component of such a hybrid, EPA would set emission standards for the types of fossil fuel-combusting equipment that are in wide use across the industrial sector and that account for 60% of the sector's emissions.

For new and modified combustion equipment, a cross-sector "best system of emission reduction" evaluation could include: (1) use of new higher efficiency boilers and process heaters;<sup>21</sup> (2) use of lower emitting fuels in place of coal and oil (natural gas, biomass co-firing, or full use of biomass fuels with relatively low lifecycle GHG emissions); or (3) most significantly, the use of electric boilers and process heaters in certain circumstances, with zero emissions for the production of steam or process heat.

For existing boilers, EPA might evaluate the "best system of emission reduction" in terms of an overall improvement in efficiency (similar to what the agency has contemplated for coal-fired power plants in the Clean Power Plan). EPA has previously identified possible efficiency improvement measures for industrial boilers.<sup>22</sup>

EPA could supplement these cross-sector standards with more traditional rulemakings targeting process-related emissions in particular sub-sectors. Here, we believe the agency likely would be selective given the great number and variety of emitting units in different sub-sectors and the limited availability of cost-effective abatement strategies, particularly for existing sources. For the next 10 years, this hybrid approach may be the optimal, feasible approach for the industrial sector.

The next Presidential administrations might also re-consider whether section 111 authorizes EPA to establish an emission standard that takes into account a multi-sector emissions trading program. In the Clean Power Plan rulemaking, the agency concluded that it did not have such authority.<sup>23</sup> However, a subsequent administration may opt to revisit that interpretation. If EPA had such authority, it could impose a more stringent set of standards on the industrial sector, and allow industrial sources to comply at least in part by purchasing credits from lower-cost emission reductions in other sectors, resulting in greater emission reductions overall.

### ***C. Commercial and Residential Sector***

The commercial and residential sector accounts for approximately 10% of total U.S. GHG emissions, with roughly 584 MMT CO<sub>2</sub>e emitted in 2014.<sup>24</sup> This sector includes all homes and

commercial businesses, with the exception of industrial and agricultural businesses. Direct GHG emissions derive primarily from combustion of fossil fuels for heating and cooking needs.

The next Presidential administrations could adopt a range of approaches to regulating GHG emissions from this sector. First, we expect the Department of Energy (DOE) would continue to drive reductions in emissions from appliances through standards set under the Energy Policy and Conservation Act (EPCA).<sup>25</sup> To target GHG emissions, DOE might work to promulgate aggressive new and updated EPCA standards for emitting appliances such as oil- and natural gas-fired furnaces, gas-fired stoves, and gas-fired water heaters.

Second, EPA might target residential and commercial sources that directly emit GHG (as opposed to just consuming electricity) by setting section 111 standards. If EPA were to take this approach, it would consider the “source” of pollution to be an appliance or product that creates emissions. EPA would then control emissions by setting standards which only allow the sale, importation, and distribution of products and appliances that achieve or exceed a certain GHG emissions threshold. This threshold would, as always, have to be based on the “best system of emissions reduction.”

The method described above is not the traditional approach EPA takes to setting section 111 standards. Typically, such standards apply at the point of use (e.g., the power plant), not at the point of manufacture, sale, import, or distribution. Due to the sheer number of emitting appliances and the political and administrative burden of regulating them directly, if EPA were to use section 111(b) to address residential and commercial emissions, standards would almost certainly apply to the entities that manufacture or distribute the products in question, rather than the end users (e.g., homes and businesses).

While this is a less common approach, EPA has recently adopted this approach for new residential wood heaters, hydronic heaters, and forced air furnaces.<sup>26</sup> EPA might consider setting standards similar to the new wood heater standards for GHG emissions from stoves, HVAC systems, and water heaters.

Because the agency has rarely issued standards of this sort in the past, it could face significant legal and political opposition. Nonetheless, we expect EPA would evaluate reductions that could be achieved through this regulatory pathway.

#### ***D. Public Lands***

In addition to strengthening emission limits on stationary sources that burn fossil fuels, the next administrations might consider policies that would increase the cost of fuels supplied to those sources. In particular, the leasing of federal lands for fossil fuel extraction may have an impact on the price of these fossil fuel resources and, as such, may impact the relative cost of coal, gas, and fossil-free electric, heat, and steam production.<sup>27</sup>

At the extreme, there have been calls for the Department of Interior (DOI) to cease leasing lands for fossil fuel production completely.<sup>28</sup> However the next administrations are unlikely to take on such an approach. More likely, future administrations might consider gradually scaling back the amount of new lands (including offshore) that are offered for lease, and revise royalty rates—the rates that fossil fuel production companies pay the federal government for the right to produce the resource—to account for the environmental costs of that production.<sup>29</sup>

These regulations could take a number of forms. For example, DOI already has taken a first step towards reviewing royalty rates for oil and gas production on federal lands.<sup>30</sup> In addition, DOI has temporarily suspended new federal coal leasing while it reviews the program to identify potential reforms that take the environmental consequences of coal production into account.<sup>31</sup> Finally, DOI has already proposed regulations to limit waste of natural gas resources through methane leakage and flaring, which will have the effect of limiting GHG emissions from natural gas production on federal lands.<sup>32</sup>

Importantly, these measures are limited to the production of fossil fuels on *federal* lands. DOI has no legal authority to limit production of fossil fuels on state or private lands. However, the portion of fossil fuel production on federal lands can be substantial. Coal mining on federal lands accounts for 41% of all coal produced in the U.S.<sup>33</sup> Approximately 14% of natural gas production in the U.S. occurs on federal land (including offshore).<sup>34</sup>

Additionally, any action by a new president would likely be limited to *new* fossil fuel leases. DOI likely does not have authority to cancel existing leases or to change royalty rates on existing leases. This may limit the effectiveness of any lease-based or royalty-based policy approach. For example, existing federal coal leases are sufficient to sustain current levels of production from federal land for approximately 20 years.<sup>35</sup>

#### ***E. Transportation Sector***

Emissions from the transportation sector constitute the second largest share of GHG emissions. In 2014, the transportation sector accounted for 1,810 MMT of CO<sub>2</sub>-e emissions. This is equivalent to a little less than one third of total U.S. GHG emissions.<sup>36</sup> Transportation sector emissions are almost completely the result of fossil fuel combustion—primarily gasoline, diesel fuel, and jet fuel—by passenger vehicles and light duty trucks, medium and heavy duty trucks, and aircraft. The Clean Air Act provides EPA authority to set emission standards for each of these components of the transportation sector in sections 202 and 231.

In a series of joint rulemakings, EPA and the National Highway Traffic Safety Administration (NHTSA) have established fuel economy and GHG emission standards for passenger vehicles and light-duty trucks through MY2025. The agencies also agreed to a “mid-term evaluation” in 2018 in which they would review the MY2021-2025 standards in light of technological progress. A new administration, therefore, will likely consider whether cost reductions and continued technological progress enable more stringent emission standards for MY2021-2025; the new administration might also consider establishing post-MY2025 standards. These standards could take a number of forms in order to drive further emission reductions from passenger vehicles including:

- *Increasing the Stringency under Current Methodology.* A future administration might adopt more aggressive assumptions about the cost-effectiveness and achievability of technologies that reduce emissions, including greater penetration of alternative fuel vehicles such as battery and plug-in hybrid vehicles and fuel cell vehicles.<sup>37</sup> Affirmative findings could form the basis of more stringent standards than under the current standard-setting methodology.
- *Adopting a New ZEV Mandate.* A future administration might follow California’s lead and require that a minimum percentage of vehicles sold by manufacturers are zero

emission vehicles (ZEVs).<sup>38</sup> However, because it is untested, this approach may present additional legal and implementation risks.

- *Revising the Treatment of Advanced Vehicle Technology.* A future administration might revise its requirement that the calculation of emission rates for alternative fuel vehicles take into account “upstream” emissions associated with electricity and hydrogen production, which serves as a disincentive to deployment of those technologies.
- *Modifying the Current “Footprint” Approach.* The joint EPA-NHTSA approach sets standards for particular classes of vehicle (based on size or “footprint”) and is weighted by sales. This approach is designed to be “size-neutral” but its effect is to limit the overall emission reductions that occur if a greater number of large vehicles are sold than expected. A future administration might consider making the emission rates less size-neutral, so that manufacturers have strong incentives to make larger vehicles more efficient (with lower emissions) or to modify their product mix to reduce the number of large vehicles relative to smaller vehicles.<sup>39</sup>

EPA and NHTSA recently finalized joint standards for heavy-duty trucks and medium-duty “vocational vehicles” through MY2027.<sup>40</sup> A future administration might consider adopting more stringent post-MY2027 standards, including through the policy changes outlined above for passenger vehicles. Most significantly, more stringent standards could be issued by increasing the assumed penetration rate of currently deployed technologies (such as Rankine cycle waste heat recovery, advanced materials, and improved drivetrains), as well as through more aggressive assumptions about previously unconsidered technologies (such as hybrid, battery electric, fuel cell, and natural gas vehicles).

Finally, a future administration is likely to establish emission limits for aircraft and aircraft engines. EPA has recently finalized the predicate “endangerment” finding for regulation of aircraft engines. EPA has generally aligned its regulations under section 231 with the International Civil Aviation Organization (ICAO). EPA and the Federal Aviation Administration (FAA) have worked with other countries through the ICAO to develop harmonized international aircraft GHG emission limitation measures; however the ICAO process has been criticized for limiting regulation to aircraft engine designs and not covering in-use aircraft. A future administration might work with the ICAO or adopt EPA emission standards outside the ICAO process that require emission reductions from new aircraft engines using existing designs, and reductions from in-use aircraft.

Importantly, EPA’s authority to establish emission standards is limited to *new* vehicles.<sup>41</sup> Relatively limited vehicle turnover rates mean that even new stringent standards might not result in substantial reductions from the sector for some time.<sup>42</sup> To mitigate emissions from the existing vehicle fleet, a future administration might adopt regulation of vehicle *fuels*.<sup>43</sup> An administration might pursue this approach in a number of ways. First, EPA might consider revising the Renewable Fuel Standard (RFS), which requires the sale of specified volumes of biofuels, to limit the use of higher-emission biofuel types such as corn-based ethanol and increase requirements on lower-emission types such as cellulosic biofuels and biogas. Alternatively, the agency could focus on mandating higher octane levels. EPA has relatively broad authority to revise the RFS after 2022; however any revision may depend on the availability of new advanced biofuel technologies. Second, EPA might consider adopting a program modeled on California’s Low Carbon Fuel Standard. Third, EPA might consider



adopting a cap-and-trade program for vehicle fuels.<sup>44</sup> Options two and three may present significant legal risks. Finally, EPA and the FAA have separate authority to establish fuel regulations for aircraft fuel, which could be used to limit aircraft emissions.<sup>45</sup> Each of these fuel regulations presents certain legal and implementation challenges, but could achieve substantial reductions in emissions from the transportation sector.

### III. Conclusions

The next two Presidents will face significant expectations to implement new climate policies, but may continue to encounter a Congress that will not provide new legal authorities for such policies. Under such conditions, our analysis has identified a number of potentially viable policy pathways that a President committed to addressing climate change is likely to consider. Implementation of these policy pathways over the next 10 years could result in significant additional emission reductions.

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<sup>1</sup> United Nations, Paris Agreement (2015), available at [http://unfccc.int/files/essential\\_background/convention/application/pdf/english\\_paris\\_agreement.pdf](http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf) [hereinafter “Paris Agreement”].

<sup>2</sup> United States INDC, available at <http://www4.unfccc.int/Submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf>.

<sup>3</sup> John Larsen et al., Rhodium Group, *Taking Stock: Progress Toward Meeting US Climate Goals* (Jan. 28, 2016), available at [http://rhg.com/wp-content/uploads/2016/01/RHG\\_Taking\\_Stock\\_of\\_US\\_Climate\\_Goals\\_Jan28\\_2016.pdf](http://rhg.com/wp-content/uploads/2016/01/RHG_Taking_Stock_of_US_Climate_Goals_Jan28_2016.pdf); Doug Vine, Center for Climate and Energy Solutions, *Achieving the United States’ Intended Nationally Determined Contribution* (July 2016), available at <http://www.c2es.org/docUploads/achieving-us-indc.pdf>; Karl Hausker et al., World Resources Institute, *Delivering on the U.S. Climate Commitment: A 10-Point Plan Toward a Low-Carbon Future* (June 2015), available at [http://www.wri.org/sites/default/files/WRI15\\_WorkingPaper\\_post-2020\\_0.pdf](http://www.wri.org/sites/default/files/WRI15_WorkingPaper_post-2020_0.pdf).

<sup>4</sup> Paris Agreement art. 4.9.

<sup>5</sup> 549 U.S. 497 (2007).

<sup>6</sup> *Motor Vehicle Mfrs. Ass’n, Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 42 (1983).

<sup>7</sup> See, e.g., Larsen, *supra* note 3.

<sup>8</sup> See, e.g., Michael Burger et al., *Legal Pathways to Reducing Greenhouse Gas Emissions under Section 115 of the Clean Air Act* (Jan. 2016), available at [http://web.law.columbia.edu/sites/default/files/microsites/climate-change/legal\\_pathways\\_to\\_reducing\\_ghg\\_emissions\\_under\\_section\\_115\\_of\\_the\\_caa.pdf](http://web.law.columbia.edu/sites/default/files/microsites/climate-change/legal_pathways_to_reducing_ghg_emissions_under_section_115_of_the_caa.pdf) (outlining an approach to regulation under Clean Air Act § 115, 42 U.S.C. § 7415 (2012)); see also Center for Biologic Diversity & 350.org, *Petition to Establish National Pollution Limits for Greenhouse Gases Pursuant to the Clean Air Act* (Dec. 2, 2009), available at [http://www.biologicaldiversity.org/programs/climate\\_law\\_institute/global\\_warming\\_litigation/clean\\_air\\_act/pdfs/Petition\\_GHG\\_pollution\\_cap\\_12-2-2009.pdf](http://www.biologicaldiversity.org/programs/climate_law_institute/global_warming_litigation/clean_air_act/pdfs/Petition_GHG_pollution_cap_12-2-2009.pdf) (petitioning EPA to list and regulate GHGs as criteria air pollutants under Clean Air Act §§ 108-109, 42 U.S.C. §§ 7408-7409).

<sup>9</sup> See, e.g., Energy & Environmental Economics, Inc., Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory, *Pathways to Deep Decarbonization in the United States: US 2050 Vol. 1 Technical Report* (Nov. 2015), available at [http://deepdecarbonization.org/wp-content/uploads/2015/11/US\\_Deep\\_Decarbonization\\_Technical\\_Report.pdf](http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf).

<sup>10</sup> EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014*, at 3-10 (Apr. 15, 2016), available at <https://www.epa.gov/sites/production/files/2016-04/documents/us-ghg-inventory-2016-main-text.pdf> [hereinafter “GHG Inventory”]; *id.* at ES-7 (showing total emissions in 2014 were 6108 MMT CO<sub>2</sub>-e when taking into account land use sources and sinks); *id.* at 3-6 (showing contribution of coal and natural gas to electric sector GHG emissions).

<sup>11</sup> Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,510 (Oct. 23, 2015).

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<sup>12</sup> Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,662 (Oct. 23, 2015) [hereinafter “CPP”].

<sup>13</sup> Energy Information Administration, “Projected Electric Capacity Additions are Below Recent Historical Levels” (May 11, 2015), <http://www.eia.gov/todayinenergy/detail.php?id=21172>.

<sup>14</sup> See Center for Climate and Energy Solutions, *Insights from a Comparative Analysis of Clean Power Plan Modeling* (Sept. 2016), available at <http://www.c2es.org/docUploads/insights-comparative-analysis-clean-power-plan-modeling.pdf> (analyzing studies from the Bipartisan Policy Center; the M.J. Bradley Group; the U.S. Energy Information Administration; the Rhodium Group and the Center for Strategic and International Studies; and the Nicholas Institute for Environmental Policy Solutions at Duke University). Among other things, the Center for Climate and Energy Solutions analysis finds that, in most scenarios analyzed by the studies, the effects on retail electricity rates is between a 2% decrease and a 5% increase. *Id.* at 2.

<sup>15</sup> EPA’s experience with the Cross-State Air Pollution Rule (CSAPR) provides a precedent for this kind of post-stay revision of a Clean Air Act rule. In 2015, after a litigation-based stay was lifted on the CSAPR, EPA proposed revisions to strengthen the emission limits in the rule for 2017 and beyond, citing developments that had occurred during the stay. See Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS; Proposed Rule, 80 Fed. Reg. 75,706 (Dec. 3, 2015).

<sup>16</sup> See, e.g., Comments of the Utility Air Regulatory Group on EPA’s Proposed “Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills,” at 2-4, Docket ID No. EPA-HQ-OAR-2014-0451 (Oct. 26, 2015) (asserting that Congress intended to preclude revision of section 111(d) emission guidelines because the provision is silent on revisions while section 111(b) explicitly mandates that EPA review and, if appropriate, revise standards for new and modified sources); *but see* Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills; Final Rule, 81 Fed. Reg. 59,276, 59,277-78 (Aug. 29, 2016) (asserting that EPA has discretion to revise section 111(d) emission guidelines in light of the gap-filling function of section 111(d) and the general purposes of the Clean Air Act to protect and enhance air quality). The Utility Air Regulatory Group position also raises questions about whether EPA could make section 111(d) emission guidelines less stringent or correct technical errors.

<sup>17</sup> Consolidated Appropriations Act, Pub. L. No. 114-113 §§ 301-303, 129 Stat. 2242, 3038-39 (2015).

<sup>18</sup> See, e.g., U.S. Department of Energy, *Revolution Now: The Future Arrives for Five Clean Energy Technologies – 2016 Update* (Sept. 2016), available at

[http://energy.gov/sites/prod/files/2016/09/f33/Revolutiona%CC%82%E2%82%ACNow%202016%20Report\\_2.pdf](http://energy.gov/sites/prod/files/2016/09/f33/Revolutiona%CC%82%E2%82%ACNow%202016%20Report_2.pdf);

Advanced Energy Economy, *Advanced Energy Now 2016 Market Report: Global and U.S. Markets by Revenue 2011-2015 and Key Trends in Advanced Energy Growth* (Mar. 2016), available at

<http://info.aee.net/hubfs/PDF/AEN-2016-Market-Report.pdf?t=1464027401576>; Bloomberg New Energy Finance,

*New Energy Outlook 2016*, <https://www.bloomberg.com/company/new-energy-outlook/>.

<sup>19</sup> GHG Inventory at 3-10 (related to industrial sector fossil fuel combustion); *id.* at 4-1 (related to Industrial Process and Product emissions).

<sup>20</sup> See EPA, Sources of Greenhouse Gas Emissions, Industry Sector Emissions,

<https://www3.epa.gov/climatechange/ghgemissions/sources/industry.html> (last visited Oct. 26, 2016).

<sup>21</sup> World Resources Institute, *Can the U.S. Get There from Here? Using Existing Federal Law and State Action to Reduce Greenhouse Gas Emissions* at 58 (Feb. 2013), available at

[http://www.wri.org/sites/default/files/pdf/can\\_us\\_get\\_there\\_from\\_here\\_full\\_report.pdf](http://www.wri.org/sites/default/files/pdf/can_us_get_there_from_here_full_report.pdf) (“EPA concluded that existing industrial boilers could achieve efficiency improvements of 1-10 percent”).

<sup>22</sup> EPA, *Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boilers* (Oct. 2010), available at <https://www.epa.gov/sites/production/files/2015-12/documents/iciboilers.pdf>. This paper provided information for states and others in conducting permitting under the prevention of significant deterioration program and the assessment of best available control technology. EPA found that efficiency improvements in the range of 4-5% were achievable.

<sup>23</sup> CPP, 80 Fed. Reg. at 64,762.

<sup>24</sup> GHG Inventory at 3-10.

<sup>25</sup> Pub. L. No. 94-163, 89 Stat. 871 (1975) (codified at 42 U.S.C. § 6291 et seq.).

<sup>26</sup> 40 C.F.R. §§ 60.530-60.539b.

<sup>27</sup> There is also substantial production of oil on federal lands. However, because oil is sold on a global market, changes to U.S. royalty and leasing policies with respect to oil production are unlikely to significantly impact the price of oil or oil-derived products such as gasoline and diesel.

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- <sup>28</sup> Greenpeace, Keep it in the Ground, <http://www.greenpeace.org/usa/global-warming/keep-it-in-the-ground/> (last visited Oct. 26, 2016); Center for Biological Diversity, Keep it in the Ground, [http://www.biologicaldiversity.org/campaigns/keep\\_it\\_in\\_the\\_ground/](http://www.biologicaldiversity.org/campaigns/keep_it_in_the_ground/) (last visited Oct. 26, 2016).
- <sup>29</sup> Institute for Policy Integrity, *Illuminating the Hidden Cost of Coal: Summary for Policymakers* at 2-3 (Dec. 2015), available at <http://policyintegrity.org/files/publications/CoalCostsSummary.pdf>.
- <sup>30</sup> See Oil and Gas Leasing; Royalty on Production, Rental Payments, Minimum Acceptable Bids, Bonding Requirements, and Civil Penalty Assessments, 80 Fed. Reg. 22,148 (Apr. 21, 2015).
- <sup>31</sup> Press Release, Department of the Interior, Secretary Jewell Launches Comprehensive Review of Federal Coal Program (Jan. 15, 2016), <https://www.doi.gov/pressreleases/secretary-jewell-launches-comprehensive-review-federal-coal-program>.
- <sup>32</sup> Waste Prevention, Production Subject to Royalties, and Resource Conservation; Proposed Rule, 81 Fed. Reg. 6616 (Feb. 8, 2016).
- <sup>33</sup> U.S. Energy Information Administration, *Sales of Fossil Fuels Produced from Federal and Indian Lands, FY 2003 through FY 2014* at 4 (July 2015), available at <http://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf>.
- <sup>34</sup> *Id.*
- <sup>35</sup> Press Release, Department of the Interior, Secretary Jewell Launches Comprehensive Review of Federal Coal Program (Jan. 15, 2016), <https://www.doi.gov/pressreleases/secretary-jewell-launches-comprehensive-review-federal-coal-program>.
- <sup>36</sup> GHG Inventory at ES-23 (Table ES-6).
- <sup>37</sup> For example, recent EPA analyses estimate that only 2-3% of new vehicle sales in MY2025 need to be hybrid, plug-in hybrid, and battery electric vehicles in order to meet the MY2025 standards. EPA, NHTSA & California Resources Board, *Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025*, at ES-10, EPA-420-D-16-901 (July 2016), available at <https://www3.epa.gov/otaq/climate/documents/mte/420d16901.pdf>. This is despite significant measured and predicted decreases in electric vehicle technology costs. *Id.*
- <sup>38</sup> California State Motor Vehicle Pollution Control Standards; Notice of Decision Granting a Waiver of Clean Air Act Preemption for California's Advanced Clean Car Program and a Within the Scope Confirmation for California's Zero Emission Vehicle Amendments for 2017 and Earlier Model Years, 78 Fed. Reg. 2112, 2144 (Jan. 9, 2013).
- <sup>39</sup> Abandoning the joint rulemaking process and directing EPA to adopt a uniform emission rate (with cost impacts mitigated through market-based trading mechanisms) is another alternative but raises a number of issues. NHTSA's CAFE program is mandatory and cannot simply be abandoned. Because it must be "attributable-based," it cannot easily be integrated with a uniform emission rate. The uniform emission rate would also have major competitive impacts for U.S. manufacturers who would have to purchase credits from foreign-based manufacturers, or, alternatively, pay substantial civil penalties.
- <sup>40</sup> EPA and NHTSA, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2; Final Rule (Aug. 2, 2016) (pre-publication version), available at <https://www3.epa.gov/otaq/climate/documents/2016-08-ghg-hd-final-rule-phase2-preamble.pdf>.
- <sup>41</sup> EPA's authority to set aircraft emission standards is *not* limited to new aircraft or aircraft engines. However, EPA has, to-date, only adopted emission standards applicable to new aircraft engines.
- <sup>42</sup> Bart Wesselink & Yvonne Deng, *Sectoral Emission Reduction Potentials and Economic Costs for Climate Change: Summary Report* at 13 (Oct. 2009), available at [http://www.ecofys.com/files/files/serpec\\_executive\\_summary.pdf](http://www.ecofys.com/files/files/serpec_executive_summary.pdf) (showing an 8% annual turnover rate of passenger vehicles). In fact, there is some concern that increasing standards will extend the life of existing vehicles. Carley et al., *Rethinking Auto Fuel Economy Policy: Technical and Policy Suggestions for the 2016-17 Midterm Reviews* (Feb. 2016), available at <https://spea.indiana.edu/doc/research/working-groups/fuel-economy-policy-022016.pdf>.
- <sup>43</sup> EPA has authority to regulate fuels under section 211 of the Clean Air Act.
- <sup>44</sup> See Jack Lienke & Jason A. Schwartz, *Shifting Gears: A New Approach to Reducing Greenhouse Gas Emissions from the Transportation Sector* 7 (NYU School of Law, Institute for Policy Integrity Policy Brief No. 13, 2014), available at [http://policyintegrity.org/files/publications/Shifting\\_Gears.pdf](http://policyintegrity.org/files/publications/Shifting_Gears.pdf).
- <sup>45</sup> 49 U.S.C. § 44714(1) (2012).