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How Obama-Era Regulations Are Shutting Down Perfectly Good Power Plants

By Isaac Orr and Fred Palmer*

Second in a Series

Introduction

Coal has been a mainstay of economic growth and human well-being in the United States for more than a century. Coal powered the Industrial Revolution and enabled the United States to electrify in the twentieth century, creating the most successful economy in human history.

Even today—135 years after the first coal-fired central power station was built in New York City—coal supplies roughly one-third of the electricity generated in the United States. But coal’s future appears uncertain. Competition from low-cost

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natural gas, rules imposed on coal-fired power plants by the Obama administration, and subsidies to renewable energy have forced into retirement hundreds of coal-fired power plants around the nation.

We refer to Obama-era rules and subsidies as *zombie regulations*: “undead” legacies of President Barack Obama’s war on coal that was ended by President Donald Trump. The legal and scientific basis of these zombie regulations was the “Endangerment Finding” issued in 2009 by the Environmental Protection Agency (EPA).

The Endangerment Finding asserted that increasing concentrations in the atmosphere of several greenhouse gases, primarily carbon dioxide, “[t]hreaten the public health and welfare of current and future generations,” and therefore those gases must be regulated under the Clean Air Act.¹

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¹ Environmental Protection Agency, “[Final Rule, Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202\(a\) of the Clean Air Act](#),” *Federal Register* 74, p. 66,496, December 15, 2009.

The Endangerment Finding was the basis for all Obama-era regulations on greenhouse gases, and it is a shaky foundation. The evidence used to justify the Endangerment Finding is weak, and global warming predictions based on that evidence have not been supported by temperature observations over the past 10 years.

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In addition to imposing regulations on greenhouse gas emissions from power plants, the Obama administration promulgated more stringent regulations on traditional pollutants. The imposition of these regulations made operating coal-fired power plants more expensive, in

some cases prohibitively so, by forcing owners of older power plants to install costly pollution control equipment.² EPA unilaterally rewrote the Clean Air Act: Existing power plants had been statutorily exempted from emission control requirements imposed on so-called “new sources.” The Trump administration is repealing and rolling back some of these unnecessary and destructive regulations.

This *Policy Study*, the second in a series, offers in Part 1 a brief overview of the “war on coal” and the damage done by the Obama-era zombie regulations. Part 2 discusses two of those regulations in more depth: the Clean Power Plan and the addition of carbon dioxide to New Source Performance standards for new power plants. It then explains why the Endangerment Finding should be rescinded.

Part 3 addresses seven zombie regulations unrelated to carbon dioxide that are adversely affecting coal-fired plants: Mercury and Air Toxics Standards, New Source Review Standards, Cross-State Air Pollution Rule, Coal Combustion Residuals Rule, Effluent Limitations Guidelines, National Ambient Air Quality Standards for Ozone, and the Stream Protection Rule.

Part 4 describes how the Trump administration has begun the process of replacing Obama-era zombie regulations with policies based on real science and sound economics. It also provides concluding observations. An appendix shows coal-fired power plant retirements expected between 2016 and 2021.

Part 1 The War on Coal

President Barack Obama’s environmental regulations were explicitly intended to prevent new coal-fired electricity generating facilities from being built and to drive out of business—that is, into early or premature retirement—those already in operation.

A premature retirement is a closure of a coal-fired power plant that would otherwise be the source of the lowest-cost electricity available if not for excessive regulatory burdens. Those

² Benjamin Storrow, “[Coal: Big, Younger Plants Are Closing. Is it a New Trend?](#)” *E&E News*, April 27, 2017.

burdens include the Obama-era rules and regulations, state-level renewable energy mandates, and federal subsidies for wind and solar power, all of which distort electricity markets to the detriment of coal.

The average service life of coal-fired generators ranges between 35 and 50 years. Larger, more modern plants can be retrofitted to generate low-cost power with fewer emissions for decades beyond this lifespan. Most of the coal-fired capacity in the United States was built before 1990, and the average age of the coal fleet is now 38 years old. Especially if allowed to retrofit, these power plants have the potential to generate affordable electricity for decades to come.^{3,4} No new coal plants are currently scheduled for construction in the United States.⁵

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The War on Coal

The war on coal was very real. It was led from the White House and backed by hundreds of millions of dollars in funding from left-wing foundations including the Rockefeller Brothers, the Hewlett Foundation, the MacArthur Foundation, Bloomberg Philanthropies, and even Chesapeake Energy, a natural gas drilling company seeking to grow demand for its product.⁶ These millions were funneled to environmental activist groups including Greenpeace, the Sierra Club, and Natural Resources Defense Council. Just one donor, billionaire Michael Bloomberg, has given more than \$168 million to the Sierra Club to support the effort.⁷

A 2015 article in *Politico* reported,

The war on coal is not just political rhetoric, or a paranoid fantasy concocted by rapacious polluters. It's real and it's relentless. Over the past five years, it has killed a coal-fired power plant every 10 days. It has quietly transformed the U.S. electric grid and the global climate debate.⁸

³ U.S. Department of Energy, "[Staff Report to the Secretary on Electricity Markets and Reliability](#)," August 2017.

⁴ U.S. Energy Information Administration, "[Coal Made Up More Than 80% of Retired Electricity Generation Capacity in 2015](#)," *Today in Energy* (website), March 8, 2016.

⁵ U.S. Department of Energy, *supra* note 3.

⁶ Paul M.J. Suchecki, "[A Billionaire Co-Founder of Yahoo and His Wife Quietly Help Fund the 'War on Coal'](#)," *Inside Philanthropy*, July 13, 2015.

⁷ Dylan Brown, "Bloomberg Puts up Another \$64M for 'War on Coal,'" *Greenwire*, October 11, 2017.

⁸ Michael Grunwald, "[Inside the War on Coal](#)," *Politico*, May 26, 2015.

Later in that article, the author describes the anti-coal campaign in greater detail:

The Sierra Club can't claim full credit for the coal bust. It didn't ratchet down the prices of gas, wind and solar or enact the flurry of EPA rules ratcheting up the price of coal, although its lobbyists and lawyers have pushed hard for government support for renewables while fighting in court over just about every coal-related regulation. It didn't produce the energy efficiency boom that has reined in electricity demand, either. Still, a Bloomberg Philanthropies analysis found that at least 40 percent of U.S. coal retirements could not have happened without Beyond Coal's advocacy. The status quo wields a lot of power in the heavily regulated power sector, where economics and mathematics don't always beat politics and inertia. The case for change keeps getting stronger, but someone has to make the case.

Two years later, *Politico* reported the latest effects of this campaign:

So far, coal is continuing its slump despite Trump's support. Utilities have announced the retirements of 12 more coal-fired power plants since he took office, including two massive ones in Texas added to the closure list on Friday. That announcement marked a milestone: Half of America's coal fleet has been marked for mothballs since 2010, a total of 262 doomed plants.⁹

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Obama's war on coal had its intended effect. More than 250 coal-fired power plants were retired between 2010 and 2017, taking offline more than 34,000 megawatts (34 gigawatts) of power generation capacity.¹⁰ Coal's share of U.S. electricity generation fell from 50 percent

of total generation in 2008 to 31 percent in 2017.¹¹ Reduced demand resulted in significant job losses in the coal industry, a matter discussed in the third *Policy Study* in this series.¹²

Premature Retirements

Obama-era regulations and competition from low-cost natural gas effectively delivered a one-two punch to coal-fired facilities: (1) coal companies were required to make extensive upgrades to their facilities by installing costly pollution control equipment; and (2) rising generation capacity from low-cost natural gas generators reduced power prices, making it more difficult for coal facilities to recover capital expenses. Wholesale electricity prices also were artificially depressed by generous government subsidies to wind and solar generators.¹³

⁹ Michael Grunwald, "[Trump's Love Affair with Coal](#)," *Politico*, October 15, 2017.

¹⁰ Trevor House, *et al.*, "[Can Coal Make a Comeback?](#)" Center on Global Energy Policy, April 2017.

¹¹ U.S. Energy Information Administration, "[Short Term Energy Outlook](#)" (website), September 12, 2017.

¹² Isaac Orr and Fred Palmer, "Public Policy and Coal-Fired Power Plants," *Policy Study* No. 147, The Heartland Institute, February 2018.

¹³ James Conca, "[Why Do Federal Subsidies Make Renewable Energy So Costly](#)," *Forbes*, May 30, 2017.

These two forces or trends forced owners of coal-fired power plants to weigh the costs of complying with the new rules and regulations against the market prospects for recovering those costs. That task—already difficult because utility companies must make decisions in terms of decades, not years—was made significantly more challenging by the hostile regulatory environment. Power plant owners had to speculate whether future regulatory regimes would allow recovery of their costs in future operating years or impose even stricter standards.¹⁴ Plant owners faced what is often referred to as the “retrofit-or-retire” dilemma. In many cases, coal-fired power plants were retired rather than retrofitted.

Of the 59,392 megawatts (MW) of coal-fired power plant capacity retired between 2002 and 2016, approximately 82 percent was retired between 2012 and 2016, when compliance deadlines loomed for several significant environmental regulations, including the Mercury and Air Toxics Standards and Clean Power Plan (see Figure 1).

The trend away from coal has gone too far and must be stopped and possibly reversed.

Many of the facilities retired were older, smaller units, with 88 percent of them having a generating capacity of less than 250 MW.¹⁵ However, that pattern is changing. Newer facilities and larger coal-fired power plants are now scheduled to be retired.¹⁶

The trend away from coal has gone too far and must be stopped and possibly reversed. As energy policy expert Roger Bezdek wrote in October 2017: “[T]he U.S. may require more coal than is currently anticipated for a variety of reasons. For example, EIA forecasts that through 2050 natural gas costs to utilities will increase much more rapidly than coal costs.”¹⁷ According to Bezdek, the higher rate of economic growth forecast by the Trump administration and by increasing numbers of economists “will increase the demand for coal and coal-related jobs.” Even with moderate oil and natural gas prices, adoption of pro-coal policies “results in the creation of 5 million additional jobs—one hundred seventy thousand jobs annually.”¹⁸ That brings the cumulative number of jobs supported by coal to 15 million to 20 million.

The U.S. Department of Energy recognized the need to stop premature retirements of coal-fired generation, issuing policy recommendations in its special report on electricity markets and reliability, stating:

DOE and related Federal agencies should accelerate and reduce costs for the licensing, relicensing, and permitting of grid infrastructure such as nuclear, hydro, coal, advanced generation technologies, and transmission. DOE should review regulatory burdens for siting and permitting for generation and gas and electricity transmission infrastructure

¹⁴ U.S. Department of Energy, *supra* note 3.

¹⁵ Benjamin Storrow, *supra* note 2.

¹⁶ *Ibid.*

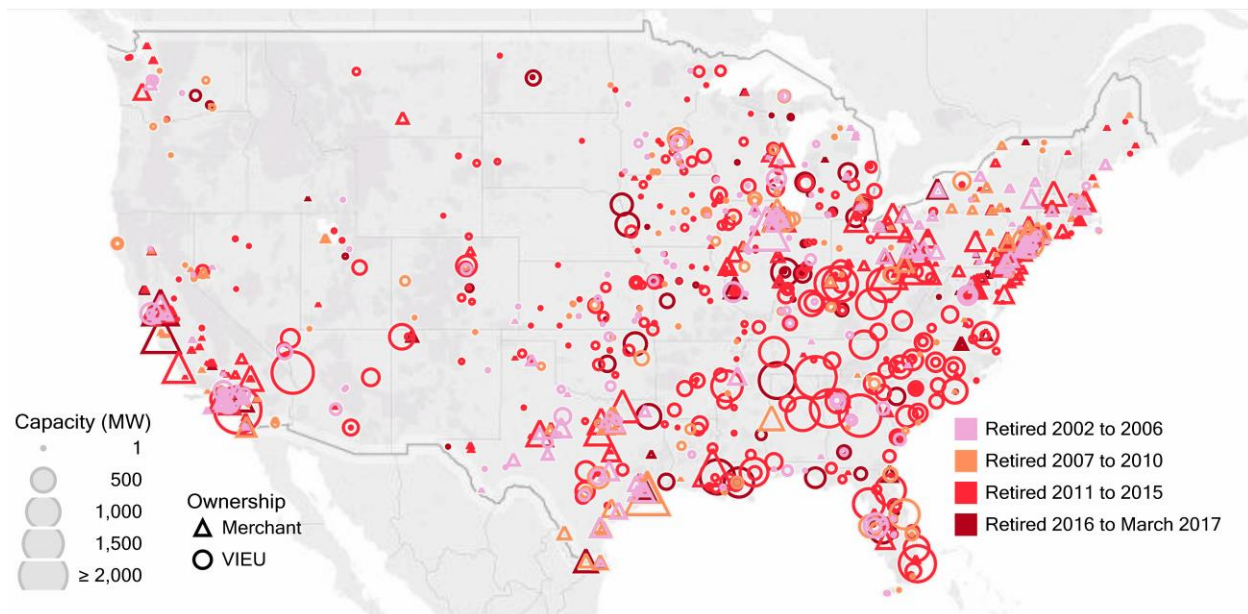
¹⁷ Roger Bezdek, “[Death of U.S. Coal Industry Greatly Exaggerated, Part Two](#),” *Public Utility Fortnightly*, mid-October 2017, pp. 23–27.

¹⁸ *Ibid.*

and should take actions to accelerate the process and reduce costs. Specific reforms could include the following:

“... Encourage EPA to allow coal-fired power plants to improve efficiency and reliability without triggering new regulatory approvals and associated costs. In a regulatory environment that would allow for improvement of the existing fleet, DOE should pursue a targeted R&D portfolio aiming at increasing efficiency.”¹⁹

Figure 1
Coal-Fired Power Plant Retirements
By Date, Location, Ownership, and Capacity



Environmental regulations enacted by the Obama administration have played a significant role in coal-plant closures. *Source:* U.S Department of Energy, “[Staff Report to the Secretary on Electricity Markets and Reliability](#),” August 2017 (colors in legend modified by The Heartland Institute).

¹⁹ U.S Department of Energy, *supra* note 3.

Part 2

Obama-Era Carbon Dioxide Regulations Responsible for Coal-Plant Closures

Two particularly harmful regulations adopted during the Obama administration in the name of “fighting global warming” were the Clean Power Plan and the addition of carbon dioxide to New Source Review standards for new power plants. These regulations were based on the Endangerment Finding, EPA’s claim, founded on dubious legal and scientific grounds, that man-made carbon dioxide emissions pose a threat to public health and welfare. This section looks at all three.

Clean Power Plan (CPP)

In October 2017, Trump’s administrator for the Environmental Protection Agency, Scott Pruitt, issued a Notice of Proposed Rulemaking to repeal the Clean Power Plan.²⁰

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The Clean Power Plan was the Obama administration’s signature climate change initiative. Its rules and regulations sought to reduce carbon dioxide emissions from existing power plants across the country to 32 percent below 2005 levels by 2030. The rules never formally took effect because a February 2016 U.S. Supreme Court decision in *West Virginia, et al. v. EPA, et al.* put the initiative on hold.²¹

Although CPP was never implemented, its looming threat caused significant damage to the energy sector. Inaccurate and problematic assumptions that underlie the initiative show just how dangerous EPA can be to the economic and even environmental health of the United States and its citizens.

The overall 32 percent emissions reduction sought by CPP was supposed to be achieved by setting targets for each state as shown in Figure 2.^{22,23}

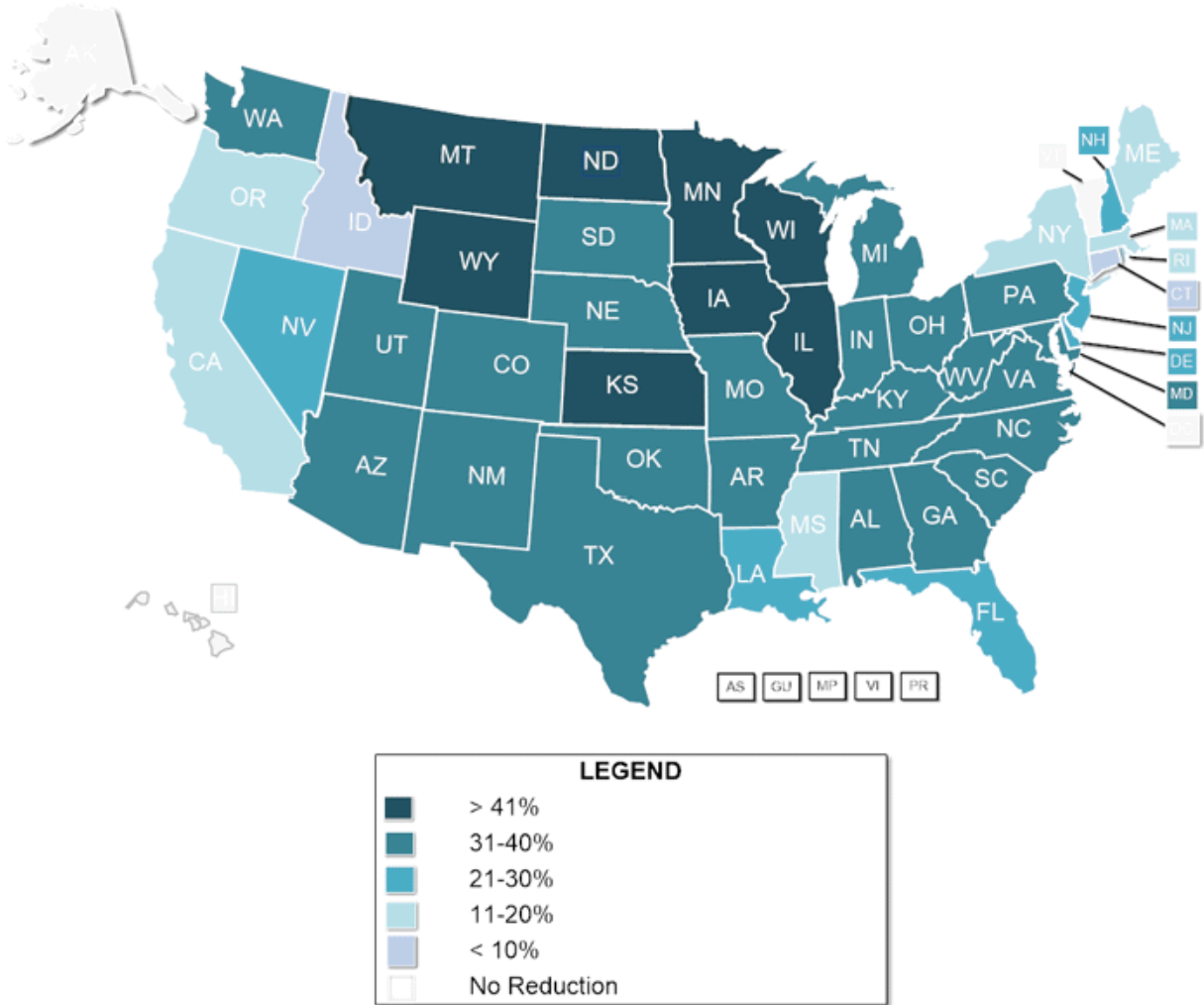
²⁰ Environmental Protection Agency, [“EPA Takes Another Step to Advance President Trump’s America First Strategy, Proposes Repeal of ‘Clean Power Plan,’”](#) October 10, 2017.

²¹ [“State of West Virginia, et al. v. EPA,”](#) U.S. Supreme Court No. 15A773.

²² Jonathan H. Adler, [“Supreme Court Puts the Brakes on EPA’s Clean Power Plan,”](#) *The Washington Post*, February 9, 2016.

²³ Jocelyn Durkay, [“States’ Reaction to EPA Greenhouse Gas Emission Standards,”](#) National Conference of State Legislatures, April 18, 2016.

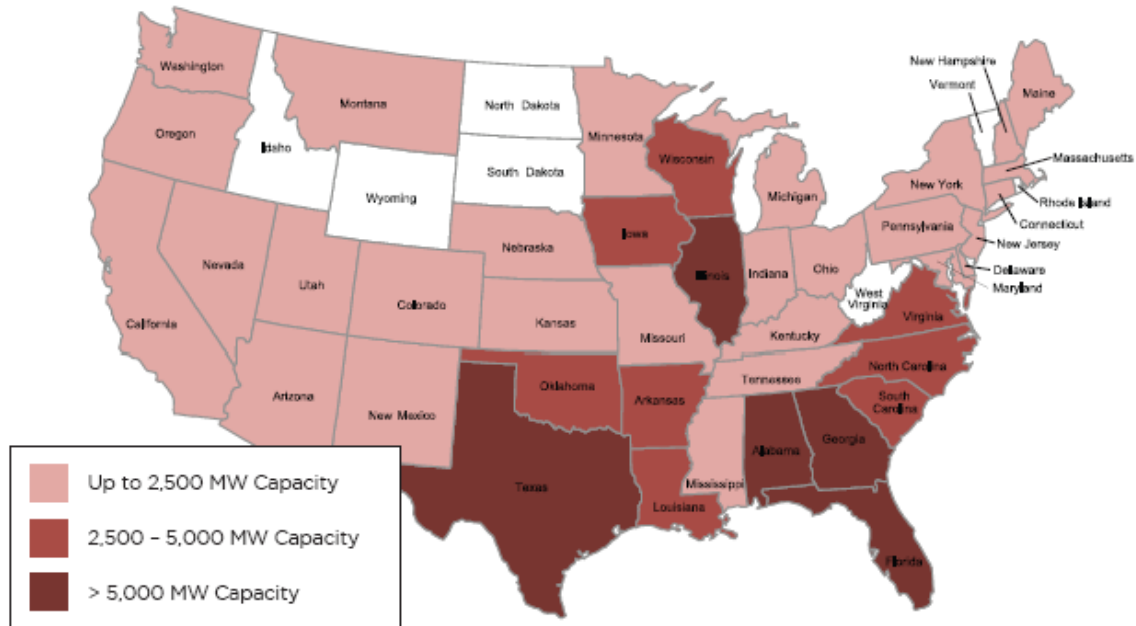
Figure 2
Total Emission Reductions Percentage by 2030
(from 2012 levels)



The emissions reductions required under the Clean Power Plan varied dramatically by state. Northern states and those in the Rust Belt would have been among those most affected had these regulations gone into effect. *Source:* Jocelyn Durkay, "[States' Reaction to EPA Greenhouse Gas Emission Standards](#)," National Conference of State Legislatures, April 18, 2016.

EPA projected the capacity of coal-fired power plants that would have to be closed in each state to meet the emissions reduction targets. (See Figure 3.)

Figure 3
EPA-Projected Coal Capacity Retirements Under 111(d) Proposal*
(2016–2020)



*Excludes committed retirements prior to 2016

Source Data: <http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0602-0220>

EPA's 111(d) regulations, more commonly known as the Clean Power Plan, were projected to result in the retirement of coal-fired power plants in nearly every state. The regulations generally affect southern and Midwestern states the most. *Source:* Southern States Energy Board, "[Projected 2016–2020 Existing Generating Unit Retirements Under 111\(d\) Proposal](#)," accessed September 19, 2017.

The prospect of complying with the Clean Power Plan weighed heavily in the decision-making process of power companies. Since burning coal for electricity generation emits approximately twice as much carbon dioxide as burning natural gas, the proposed regulations led many utility companies and state Public Utility Commissions to retire coal-fired generating units.²⁴

If implemented, CPP would have been one of the most expensive regulations in U.S. history. EPA estimated the annual cost of complying with the rules would range between \$5.1 billion and \$8.4 billion. NERA Economic Consulting estimated the rules could cost dramatically more, between \$29 billion and \$39 billion per year.²⁵ NERA also estimated CPP regulations would

²⁴ Trevor House, *et al.*, *supra* note 10.

²⁵ NERA Economic Consulting, "[Energy and Consumer Impacts of EPA's Clean Power Plan](#)," *Insight in Economics*, November 7, 2015.

have caused electricity bills to increase between 11 percent and 14 percent per year. Other studies also concluded EPA's official cost estimates were unrealistically low.²⁶

According to an Obama-era EPA-sponsored model, the CPP regulations, if implemented, would have averted only .019 degrees C of potential future warming by 2100.

Despite the high price tag associated with CPP, it would have delivered no measurable environmental benefits. According to the Obama-era EPA-sponsored Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC), the CPP regulations, if implemented, would have averted only

.019 degrees C of potential future warming by 2100.^{27,28} This amount is too low to be accurately measured with even the most sophisticated scientific equipment. Given that most climate models have predicted too much warming, the reductions in future global temperatures resulting from CPP would likely have been even lower. In other words, by EPA's own estimates, the Clean Power Plan was all pain and no gain.

EPA understood the fatal weakness of its own argument against carbon dioxide and sought to justify the enormous costs of CPP by promoting supposed additional benefits unrelated to carbon dioxide and global warming.

For example, EPA predicted CPP would prevent between 2,700 and 6,600 premature deaths each year alleged to be caused by fine particulate matter (particles 2.5 micrometers in diameter, commonly referred to as PM_{2.5})—dust or soot particles much smaller in diameter than the width of a human hair—by reducing the amount of coal burned.²⁹ EPA's claim against PM_{2.5} is grounded in two long-term epidemiologic studies: the Harvard Six Cities study³⁰ and the American Cancer Society study.³¹ These deeply flawed studies are discussed in detail in the third *Policy Study* in this series.³²

CPP is not the law of the land, thanks to the U.S. Supreme Court's 2016 ruling, and EPA is withdrawing it as quickly as the law and review requirements permit. But this message hasn't

²⁶ Jonathan A. Lesser, [Missing Benefits, Hidden Costs, The Cloudy Numbers in the EPA's Proposed Clean Power Plan](#), The Manhattan Institute, June 2016; Kevin Dayaratna, [The Economic Impact of the Clean Power Plan](#), testimony before the Committee on Science, Space and Technology, June 24, 2015, Heritage Foundation.

²⁷ *Ibid.*

²⁸ Patrick Michaels and Paul Knappenberger, [Spin Cycle: EPA's Clean Power Plan](#), Cato Institute, August 5, 2015.

²⁹ Environmental Protection Agency, [Fact Sheet: Clean Power Plan](#), U.S. EPA Archive Document, accessed November 13, 2017.

³⁰ Douglas W. Dockery, *et al.*, [An Association Between Air Pollution and Mortality in Six U.S. Cities](#), *The New England Journal of Medicine* 329 (December 9, 1993):1753–9.

³¹ C. Arden Pope, *et al.*, [Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution](#), *Journal of the American Medical Association* 287, No. 9 (March 6, 2002): 1132–41.

³² Isaac Orr and Fred Palmer, *supra* note 12.

reached many public utility commissioners, state legislators, and business and civic leaders. CPP is a prime example of an Obama-era zombie regulation, a regulation blocked by courts and being repealed by the new administration but falsely assumed still to be official policy.

EPA Administrator Scott Pruitt’s proposed repeal was published in the *Federal Register* on October 16, 2017, and the mandatory public comment period ends December 15, 2017.³³ Congress could take action at any time to rescind CPP by passing legislation to prevent regulations on carbon dioxide emissions. Unless it does so—and unless the Endangerment Finding is rescinded, as noted below—CPP or similar regulations may be just another administration away from being reinstated.

New Source Performance Standards

Whereas the Clean Power Plan sought to limit emissions from existing sources, EPA also released, on August 3, 2015, a rule to limit greenhouse gases from new, modified, or restructured power plants. Those regulations established New Source Performance Standards (NSPS), which set carbon dioxide emission limits based on EPA’s assessment of available technologies.³⁴

The regulations effectively imposed a moratorium on the construction of new coal-fired power plants. They also made it nearly impossible to retrofit existing facilities, because the rules stipulated plants can emit no more than 1,400 pounds of carbon dioxide per megawatt hour of electricity generated, a standard

EPA’s requirement that carbon capture and sequestration technology be installed was essentially designed to make coal uncompetitive with other sources of electricity generation.

coal plants cannot meet without costly carbon capture and storage technology. The rules also require new power plants to use what EPA defines as the Best Available Control Technology (BACT). BACT mandates the use of high-cost, uneconomic carbon capture and sequestration (CCS) technologies to reach emission reduction targets.³⁵

To justify mandating CCS for U.S. coal-fired plants, EPA argued those technologies had been deployed at a commercial-scale power plant in Saskatchewan, Canada. If CCS could be commercially viable in one Canadian facility, EPA argued, it could be viable in all U.S. coal-fired facilities.

In fact, EPA’s requirement that CCS technology be installed was designed to make coal uncompetitive with other sources of electricity generation. U.S. coal-fired facilities investing in CCS could not be competitive in current wholesale power markets already badly skewed by

³³ [Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units](#), *Federal Register* (website), October 16, 2017.

³⁴ Center for Climate and Energy Solutions, “[EPA Regulation of Greenhouse Gas Emissions From New Power Plants](#)” (website), accessed September 20, 2017.

³⁵ *Ibid.*

regulations and subsidies to renewable power. CCS technologies would increase the cost of electricity by an estimated 80 percent for a new pulverized coal plant.^{36,37}

To quickly help neutralize the expensive technology requirement, the Trump administration should instruct EPA to certify High Efficiency Low Emissions (HELE) coal-fired power plants as meeting the new source requirements.

While Obama’s regulations on carbon dioxide emissions generally receive the most attention, other regulations played a significant role in the retirement of more than 250 coal-fired power plants since 2010.

HELE coal plants reduce their emissions of traditional pollutants and greenhouse gases per unit of energy produced because they produce more energy per unit of coal burned. For example, the Isogo thermal power station near Yokohama, Japan houses two HELE coal-fired units. Combined, these two facilities emit 50 percent less sulfur, 80 percent less

nitrogen, 70 percent less particulate matter, and 17 percent less carbon dioxide than older coal-fired power plants with less sophisticated technology.³⁸

HELE technologies allow coal plants to operate more efficiently, reducing emissions and making them less expensive to operate than traditional plants because they have lower fuel and operating costs.³⁹ EPA certification of such facilities as meeting its new plant regulations would ease some of the burden on the coal sector.

Endangerment Finding

President Donald Trump’s efforts to end Obama’s war on coal may come to naught unless he instructs EPA to rescind its 2009 Endangerment Finding. The Endangerment Finding is the foundation for many rules and regulations that cripple the energy sector, and coal most of all. If that foundation is not removed, future administrations could bring back from the dead all of the Obama-era zombie regulations.

The online summary of EPA’s Endangerment Finding reads:

The Administrator finds that six greenhouse gases taken in combination *endanger both the public health and the public welfare of current and future generations*. The Administrator also finds that the combined emissions of these greenhouse gases from new motor vehicles and new motor vehicle engines *contribute to the greenhouse gas air*

³⁶ Center for Climate and Energy Solutions, “[Carbon Capture Use and Storage](#)” (website), accessed September 20, 2017.

³⁷ U.S. Department of Energy, “[Post-Combustion Carbon Capture Research](#)” (website), Office of Fossil Energy, accessed November 13, 2017.

³⁸ Julian Turner, “[Lean and Clean: Why Modern Coal-Fired Power Plants Are Better By Design](#),” Power-Technology.com, June 22, 2016.

³⁹ *Ibid.*

pollution that endangers public health and welfare under CAA section 202(a). These Findings are based on careful consideration of the full weight of scientific evidence and a thorough review of numerous public comments received on the Proposed Findings published April 24, 2009 (emphasis added).⁴⁰

Because EPA decided greenhouse gases, including carbon dioxide, endanger human health, the agency has authority under the Clean Air Act (CAA) to regulate those gases.

Carbon dioxide is a naturally occurring gas that makes up only .04 percent, or 400 parts per million, of the atmosphere. Only about 3 percent of that small amount is generated by human activities, with the rest coming from natural sources. In 2003, EPA determined “Congress has not granted EPA authority under the Clean Air Act to regulate CO₂ and other greenhouse gases for climate change purposes” and “setting GHG emission standards for motor vehicles is not appropriate at this time.”⁴¹

In 2007 in the case *Massachusetts v. Environmental Protection Agency*, the U.S. Supreme Court ruled in favor of plaintiffs who argued human carbon dioxide emissions met the technical definition of a “pollutant” under the Clean Air Act.⁴² Nevertheless, as late as December 18, 2008, after the election of Barack Obama but before he assumed office, EPA maintained its position that the science did not support a finding that carbon dioxide emissions posed a threat to public health or welfare.⁴³

If the Endangerment Finding remains in place, future, less energy-friendly administrations could simply take up where the Obama administration left off, using the Endangerment Finding to attack cost-effective energy production.

Barack Obama saw in the endangerment finding litigation a way to “weaponize” EPA against the coal industry. Immediately after taking office in 2009 he put EPA to work supporting rather than opposing the plaintiffs in *Massachusetts v. EPA*. His administration overruled decades of science and bipartisan policy and ignored or tried to refute the comments and testimony of hundreds of

⁴⁰ Environmental Protection Agency, *supra* note 1.

⁴¹ Environmental Protection Agency, “[EPA Denies Petition to Regulate Greenhouse Gas Emissions from Motor Vehicles](#),” news release, August 28, 2003, accessed November 16, 2017.

⁴² Oyez, “[Massachusetts v. Environmental Protection Agency](#)” (website), accessed April 11, 2017.

⁴³ David A. Fahrenthold and Steven Mufson, “[EPA Eases Emissions Regulations for New Power Plants](#),” *Washington Post*, December 19, 2008.

experts⁴⁴ and even its own staff.⁴⁵ On December 15, 2009, less than a year after Obama was sworn into office, EPA declared carbon dioxide was indeed a threat in need of regulation.⁴⁶ The Endangerment Finding was used by the Obama administration to justify dozens of regulations aimed at destroying the coal industry. It also has become a factor in infrastructure and natural resource permitting decisions affecting oil and natural gas. Federal courts have ruled regulatory agencies such as the Federal Energy Regulatory Commission (FERC) and Bureau of Land Management (BLM) did not properly evaluate whether permitting pipelines or approving the extension of coal mining leases would contribute to greenhouse gas emissions.^{47,48} Such rulings have a chilling effect on infrastructure projects and permits for natural resource development as environmental groups use the Endangerment Finding to delay or stop those projects.

The Trump administration will have little long-term success on energy policy unless it can rescind the Endangerment Finding. The good news is that there are ample legal and scientific grounds for such action.

The Trump administration will have little long-term success in promoting “clean and safe development of our Nation’s vast energy resources, while at the same time avoiding regulatory burdens that unnecessarily encumber energy production, constrain economic growth, and prevent job creation”⁴⁹ unless it can rescind the Endangerment Finding. The

good news is that there are ample legal and scientific grounds for such action.

Faulty Climate Models

EPA is required by law to provide scientific and economic justifications for the rules and regulations it imposes. EPA’s Technical Support Document for the Endangerment Finding was largely based on temperature *estimates* (not observations) derived from computer-based climate *models* (not observations) contained in the Fourth Assessment Report (AR-4) published in 2007 by the United Nations’ Intergovernmental Panel on Climate Change (IPCC). EPA is required under a separate statutory responsibility to demonstrate the objectivity of the scientific and

⁴⁴ For a collection of some of the testimony presented in opposition to the Endangerment Finding, see Tim Benson, “[Comments, Petitions, and Testimony Opposing the Endangerment Finding](#),” The Heartland Institute, January 17, 2017.

⁴⁵ Alan Carlin, “[Proposed NCEE Comments on Draft Technical Support Document for Endangerment Analysis for Greenhouse Gas Emissions Under the Clean Air Act](#),” Office of Policy, Economics and Innovation, Environmental Protection Agency, March 9, 2009.

⁴⁶ Environmental Protection Agency, *supra* note 1.

⁴⁷ Robert Walton, “[DC Circuit Rejects FERC Approval of Southeast Pipeline Project Over Climate Concerns](#),” *Utility Dive* (website), August 23, 2017.

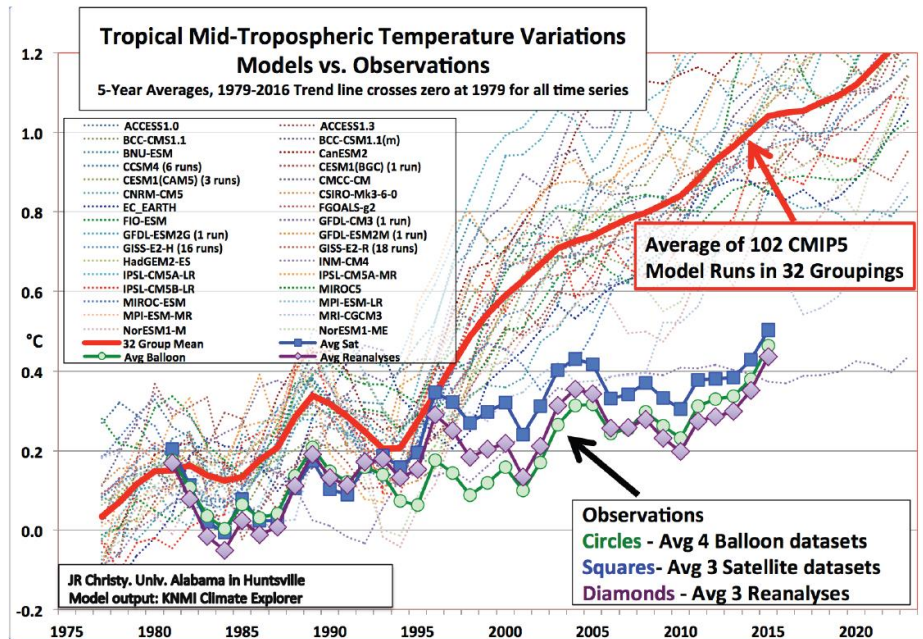
⁴⁸ Barbara Grzincic, “[U.S. Failed to Consider Climate in Mine Lease Extensions- 10th Circuit](#),” Reuters, September 15, 2017.

⁴⁹ President Donald Trump, “[Presidential Executive Order on Promoting Energy Independence and Economic Growth](#),” March 28, 2017.

technical information upon which it based its finding.⁵⁰ The agency did not do this; rather, it relied on a mere appeal to IPCC's presumed authority.

The climate models EPA used to support the Endangerment Finding predicted Earth would experience two to three times more warming than actually occurred since reliable global measurements became available in the late 1970s (see Figure 4).^{51,52} The Technical Support Document is therefore based on invalidated models. This alone is a legally and scientifically sound basis for at least reopening, if not rescinding, the Endangerment Finding.

Figure 4
IPCC Climate Models Consistently Overstate Warming



Climate models have consistently overestimated the amount of future global warming and are not a reliable basis for public policy. *Source:* John Christy, [Testimony before the U.S. House Committee on Science, Space & Technology](#), March 29, 2017, p. 5.

⁵⁰ Office of Management and Budget, [“Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Notice, Republication,”](#) *Federal Register* 67, No. 36 (February 22, 2002): 8452–60; U.S. Environmental Protection Agency, [“Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency \(EPA/260R-02-008\),”](#) 2002.

⁵¹ Pat Michaels and Chip Knappenberger, [“Climate Models Versus Climate Reality,”](#) *Climate Etc.* (blog), December 17, 2015.

⁵² Sam Kazman and Hans Bader, [“Petition of the Competitive Enterprise Institute and the Science and Environmental Policy Project for Rulemaking on the Subject of Greenhouse Gases and Their Impact on Public Health and Welfare, in Connection with EPA’s 2009 Endangerment Finding, 74 FR 66,496 \(Dec. 15, 2009\),”](#) Competitive Enterprise Institute, February 23, 2017.

Evidence collected since the Technical Support Document was written further undermines EPA's scientific claims. For example, a 2017 study by an international group of scientists, published in *Nature Geoscience*, validated skepticism about IPCC's work.⁵³ The researchers concluded the climate models used to estimate future temperatures were predicting too much warming.

The IPCC climate models projected carbon dioxide emissions generated by human activities would need to be capped at 200 billion to 400 billion tons if the global temperature increase were to be kept at or below 1.5 degrees C by the year 2100.⁵⁴ This "allowable" amount of emissions became known as the "carbon budget." At current rates of emissions, approximately 41 billion tons per year, the "carbon budget" would have been reached within five to 10 years.

One of the most important reasons the models have consistently failed to accurately predict global temperature is because they assume carbon dioxide will have a larger warming effect on the planet than has been observed.

However, the *Nature Geoscience* study concluded carbon dioxide emissions could reach 700 billion tons and warming would remain within 1.5 degrees C by 2100. The researchers gave this prediction a 66 percent chance of being accurate. This would mean carbon dioxide could be emitted for approximately 20 years at present-day emission rates and still meet

the goal of limiting global temperatures to a rise of 1.5 degrees C by 2100.⁵⁵

The *Nature Geoscience* study has its shortcomings. Like EPA, it too relies on invalidated climate models, and it incorrectly attributes to human-produced greenhouse gases all of the warming that has taken place since the early nineteenth century, 0.9 to 1 degrees C. In fact, approximately 0.4 degrees of that warming occurred before 1945, when humans started to release carbon dioxide into the atmosphere in appreciable quantities. Even with these shortcomings, the study illustrates the significant uncertainty surrounding climate science and the weak case for basing public policy on IPCC's ten-year-old models.⁵⁶

Funding for much of the flawed computer modeling that took place during the Obama administration was last renewed in 2010 and is coming up for renewal.⁵⁷ This would be a good opportunity for the Trump administration to announce it will stop throwing good money after bad and scale back government investment in climate modeling.

⁵³ Richard J. Millar, *et al.*, "[Emission Budgets and Pathways Consistent with Limiting Warming to 1.5°C](#)," *Nature Geoscience* 10 (October 2017); see also Chris Mooney, "[New Climate Change Study Could Buy the Earth Some Time – If They're Right](#)," *The Washington Post*, September 18, 2017.

⁵⁴ Joeri Rogelj, *et al.*, "[Energy System Transformations For Limiting End-of-Century Warming to Below 1.5 Degrees C](#)," *Nature Climate Change*, May 21, 2015.

⁵⁵ Chris Mooney, *supra* note 53.

⁵⁶ Patrick Michaels, "[Changes in the Climate Policy Winds](#)," Cato Institute, September 20, 2017.

⁵⁷ Caroline C. Ummenhofer, Aneesh Subramanian, and Sonya Legg, "[Maintaining Momentum in Climate Model Development](#)," *EOS*, November 15, 2017.

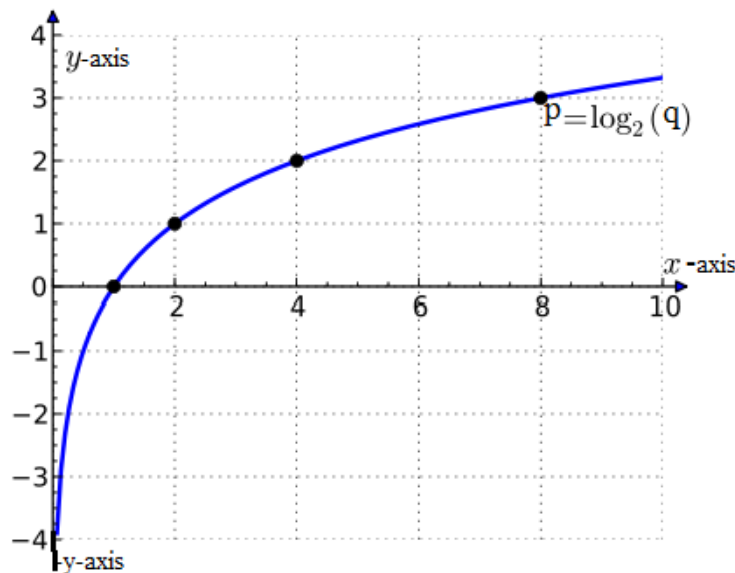
Climate Sensitivity

Climate models consistently fail to accurately predict global temperature because they assume carbon dioxide will have a larger warming effect on the planet than has been observed. This is called “climate sensitivity”: how much the planet will warm in response to increasing concentrations of carbon dioxide in the atmosphere.⁵⁸

The relationship between carbon dioxide levels and temperature is not one-to-one: If carbon dioxide levels in the atmosphere double, this does not mean temperatures will double. But how much *will* the temperature increase?

The temperature change associated with a doubling of atmospheric carbon dioxide concentrations is referred to as Equilibrium Climate Sensitivity (ECS).⁵⁹ The logarithmic nature of ECS means each additional molecule of carbon dioxide released into the atmosphere traps heat less effectively than the previous molecule. In other words, as more carbon dioxide is emitted into the atmosphere, the rate at which the temperature rises will slow (see Figure 5).

Figure 5
A Simple Logarithmic Graph



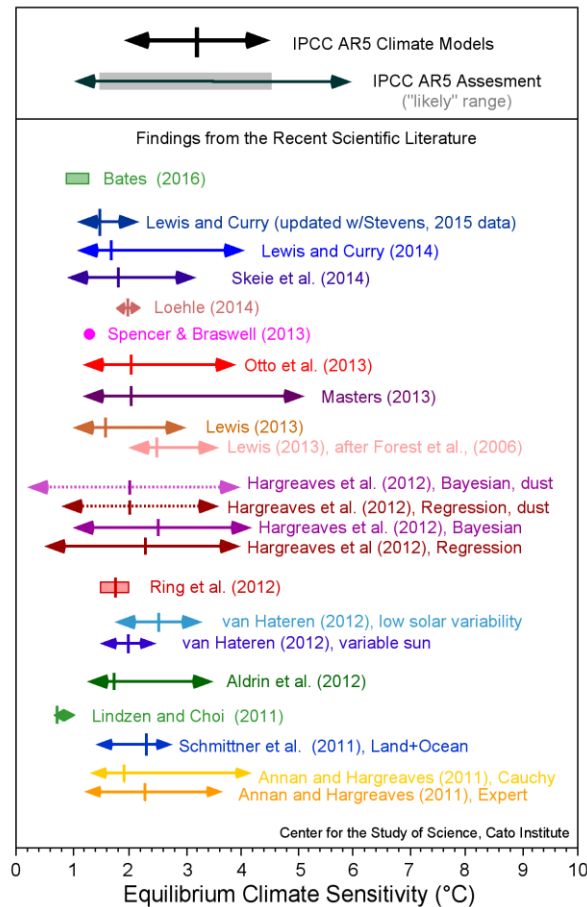
The impact of carbon dioxide on temperatures is logarithmic, meaning as more carbon dioxide is emitted into the atmosphere (x-axis), it has less impact on temperatures (y-axis).

⁵⁸ Tim Wogan, “[Earth’s Climate May Not Warm as Quickly as Expected, Suggest New Cloud Studies](#),” *Science*, May 25, 2016.

⁵⁹ Intergovernmental Panel on Climate Change, “[Climate Sensitivity and Feedbacks](#),” Fourth Assessment Report, 2007.

IPCC’s 2007 AR-4 report assumes that for every doubling of atmospheric carbon dioxide concentrations, the world will experience a temperature increase between 2 and 4.5 degrees C, with its “best estimate” to be 3 degrees C. It is now widely agreed this estimate is too high. A 2013 paper by Alexander Otto and colleagues—a group who previously led climate modeling for IPCC—concluded the likely range of temperature increase from a doubling of carbon dioxide would be between 1.2 and 3.9 degrees C, with their “best estimate” being 2 degrees C, a reduction of 33 percent compared to the values provided in AR-4 (see Figure 6).⁶⁰

Figure 6
Model Ranges of Equilibrium Climate Sensitivity Estimates



Equilibrium climate sensitivity estimates of several studies show the values used by IPCC in its AR-4 and AR-5 assessments are likely too high, causing the models to run hot. Two notable distributions are the Otto *et al.* study (red), which puts the “best guess” at 2 degrees C, and the Lewis and Curry (updated w/Stevens 2015 data) study (dark blue), which shows a very small range of possible outcomes for a doubling of carbon dioxide with a likely mean climate sensitivity of 1.4 degrees C. *Source:* Pat Michaels and Paul Knappenberger, “[You Ought to Have a Look: Ontario’s Energy Plan, Evidence-Based Policy and a New Climate Sensitivity Estimate](#),” *Cato at Liberty* (blog), Cato Institute, May 25, 2016.

⁶⁰ Alexander Otto, *et al.*, “[Energy Budget Constraints on Climate Response](#),” *Nature Geoscience*, May 19, 2013.

The Otto team's finding was published in IPCC's Fifth Assessment Report (AR-5) in 2013. The Endangerment Finding, which was based on AR-4, was not amended to reflect the most up-to-date science. This is a second legally and scientifically sound basis for reopening, if not rescinding, the Endangerment Finding.

Even the lower values for ECS presented by Otto *et al.* are subject to uncertainty and could be revised down further. For example, the estimates might reflect unrealistically high estimates of the cooling effects from sulfate aerosols.⁶¹ Sulfate aerosols are particles emitted into the atmosphere from human activity that are thought to lower the amount of global warming by helping to create more cloud cover. Cloud cover helps to reflect heat from the sun back into space, thus providing a cooling effect on the planet.

Recent studies of the impact of sulfate-aerosol cooling on global temperatures have found these particles have less cooling impact than estimated by IPCC. IPCC models had estimated sulfate aerosols will reduce temperatures between 0.1 and 1.4 degrees C.⁶² The new studies find the likely cooling effect of sulfate aerosols to be between 0.2 and 0.8 degrees C, with additional studies suggesting the most likely cooling value to be 0.4 degrees C. This means the amount of cooling that is likely occurring from sulfate aerosols is approximately 3.5 times less than expected by IPCC.

This is an important finding because global temperatures have been essentially flat since 1998, even though approximately one-third of all human carbon dioxide emissions have occurred since that year. The lower cooling effects of sulfate aerosols plus more carbon dioxide in the atmosphere should have led

The importance of accurately determining how much global warming will occur from doubling carbon dioxide concentrations in the atmosphere cannot be overstated.

to a large increase in global temperatures. That didn't happen. With the exception of 2015–2016, during which the planet experienced the warming of a record El Niño, global temperatures have been essentially flat. This strongly suggests IPCC is still overestimating the warming impact of carbon dioxide in the atmosphere.

If sulfate aerosols are not cooling the planet to “hide” carbon dioxide-induced global warming, and global temperatures have not been rising for nearly two decades despite large amounts of carbon dioxide being released into the atmosphere, then clearly carbon dioxide emissions result in less warming than predicted by IPCC computer models. Those models have predicted the planet would experience two or three times more global warming than has actually been observed by temperature satellites and weather balloons.

The importance of accurately determining how much global warming will occur from doubling carbon dioxide concentrations in the atmosphere cannot be overstated. If Earth's climate is less sensitive to increasing concentrations of carbon dioxide than IPCC says it is, efforts to prevent

⁶¹ Nathanael Massey, “[IPCC Revises Climate Sensitivity](#),” *Scientific American*, September 27, 2013.

⁶² Bjorn Stevens, “[Rethinking the Lower Bound on Aerosol Radiative Forcing](#),” *Journal of Climate*, June 2015.

future global warming by radically reducing carbon dioxide will be both ineffective and expensive. Reducing the “best estimate” for ECS from IPCC’s 2007 finding of 3 degrees C to the 1.4 degrees C found in more recent studies would effectively reduce the impact of reducing carbon dioxide emissions by one-half.⁶³

Because these models, the basis of the Endangerment Finding, have been unable to accurately predict future temperatures, the Competitive Enterprise Institute has put forward a Petition for Reconsideration of the Endangerment Finding, noting:

A rulemaking proceeding is appropriate when new developments demonstrate that an existing rule or finding rests on erroneous factual premises, and a rulemaking petition is a proper vehicle for asking an agency “to reexamine” the “continuing vitality” of a rule.⁶⁴

Part 3 Non-Carbon-Based Zombie Regulations

While Obama-era regulations on carbon dioxide emissions for new and existing power plants are responsible for some of the decline in coal-fired electricity generation, other regulations also played a significant role. These regulations are also zombie regulations: They are still being enforced or taken into account when utilities choose whether to retain or retire coal-fired plants, even though they have been repealed or are being repealed by the current administration.

The expense of installing pollution control equipment such as sulfur dioxide scrubbers can cripple small power plants.

The expense of installing pollution control equipment such as sulfur dioxide scrubbers can cripple small power plants. Pollution control equipment requires electricity to operate, referred to as “auxiliary load” or “parasitic load”

because it reduces the amount of electricity the plant has available for sale to the grid.⁶⁵ Reducing sales to the grid means lower revenues. Small power generators operate on very tight margins; unlike larger generators, they often can’t bear the burden of reduced revenues.

This section looks at seven zombie regulations unrelated to carbon dioxide that are adversely affecting coal-fired plants: Mercury and Air Toxics Standards, New Source Review Standards, Cross-State Air Pollution Rule, Coal Combustion Residuals Rule, Effluent Limitations Guidelines, National Ambient Air Quality Standards for Ozone, and the Stream Protection Rule.

⁶³ Nic Lewis, “[Updated Climate Sensitivity Estimates](#),” *Climate Etc.* (blog), April 25, 2016.

⁶⁴ Sam Kazman and Hans Bader, *supra* note 52.

⁶⁵ ABB, “[Energy Efficient Design of Auxiliary Systems in Fossil-Fuel Power Plants](#),” *ABB Energy Efficiency Handbook*, accessed September 19, 2017.

Mercury and Air Toxics Standards (MATS)

In late 2011, EPA announced its intention to issue standards to limit mercury, acid gases, and other emissions from power plants. The agency's final Mercury and Air Toxics Standards (MATS) rule was released on February 16, 2012; the initial compliance deadline was set for April 16, 2015.⁶⁶ The MATS rules were potentially very expensive, with compliance projected to cost between \$9.6 billion and \$10 billion annually.⁶⁷

Under the MATS rules, all coal- and oil-fired generators with a capacity greater than 25 megawatts (MW) were required to comply with emissions limits for toxic air pollutants associated with fuel combustion. At the time of implementation, the rule applied to 76 percent of all operating coal-fired units, which represented 99 percent of generating capacity.⁶⁸

At the time of implementation, the MATS rule applied to 76 percent of all operating coal-fired units, which represented 99 percent of generating capacity.

According to the U.S. Energy Information Administration and as shown in the pie graph in Figure 7:

- 186.6 GW (186,600 MW) of coal-fired generation capacity—62 percent of capacity as reported in December 2014—already had sufficient pollution controls by the time the MATS rules were implemented.
- 87.4 GW (87,400 MW), 29 percent of total capacity, installed pollution control systems before the final compliance date.
- 5.6 GW (5,600 MW), 1.9 percent of total capacity, complied by switching to natural gas as a fuel.
- The remaining 19.7 GW (19,700 MW), 6.6 percent of the coal fleet generation capacity, was retired before the MATS compliance deadline. About 26 percent of those retirements occurred in April 2015.⁶⁹

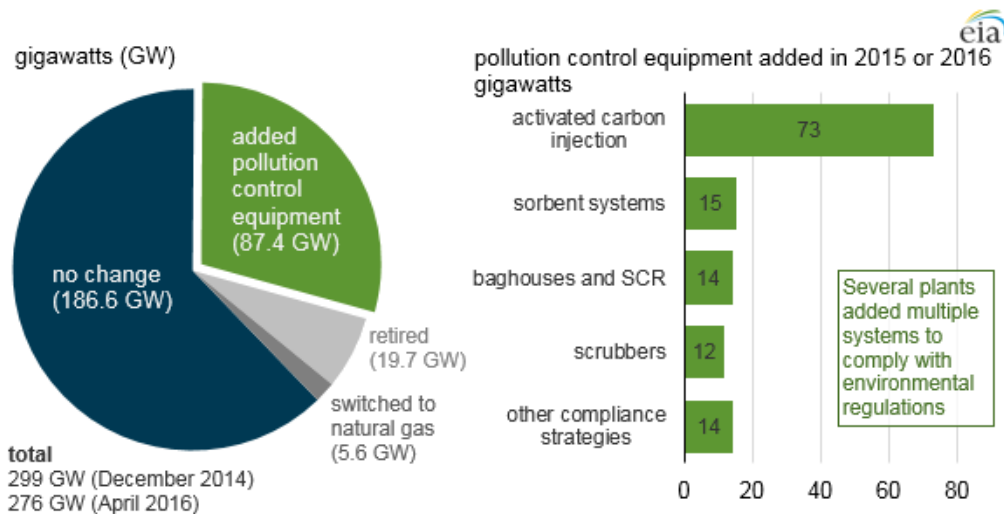
⁶⁶ U.S. Environmental Protection Agency, "[Regulatory Actions – Final Mercury and Air Toxics Standards \(MATS\) for Power Plants](#)," June 15, 2017.

⁶⁷ Anne E. Smith, *et al.*, [An Economic Analysis of EPA's Mercury and Air Toxics Standards Rule](#), NERA Economic Consulting, March 1, 2012.

⁶⁸ U.S. Energy Information Administration, "[Coal Plants Installed Mercury Controls to Meet Compliance Deadlines](#)," *Today in Energy* (website), September 18, 2017.

⁶⁹ *Ibid.*

Figure 7
Changes in U.S. Coal Capacity, December 2014 to April 2016



The pie graph at left shows the MATS compliance strategies selected by coal-fired powered plants. The green slice shows 29 percent of total coal-fired capacity installed pollution control equipment. The bar chart at right shows activated carbon injection (ACI) was the dominant compliance strategy. *Source:* U.S. Energy Information Administration, “[Coal Plants Installed Mercury Controls to Meet Compliance Deadlines](#),” *Today in Energy* (website), September 18, 2017.

As shown in the bar graph of Figure 7, the most widely installed pollution control technology was activated carbon injection (ACI). ACI systems work by injecting powdered activated carbon into the flue stack (exhaust) of a coal-fired power plant. This powdered activated carbon absorbs vaporized mercury from the flue gas and is collected in the plant’s particulate collection device. ACI technologies have the shortest construction lead time—between 12 and 18 months—and the lowest installation cost—about \$11 per kilowatt (kW). Other technologies, such as electrostatic precipitators and baghouses, have longer lead times and higher costs. Flue gas desulfurization has the highest average lead time, at 50 months, and the highest installation cost, at \$228/kW.⁷⁰ Compliance with the MATS rules was a significant expense for the plants that were not retired.

Despite the high costs of compliance with these rules, the benefits were non-existent. To build its case against mercury, Obama’s EPA systematically ignored evidence and clinical studies that contradict its regulatory agenda, which was to punish the use of coal.⁷¹ For example, in 2011, coal-burning power plants in the United States emitted an estimated 41 to 48 tons of mercury per year. In contrast, forest fires emit approximately 41 tons per year, and cremating human remains emits approximately 26 tons.⁷²

⁷⁰ *Ibid.*

⁷¹ Willie Soon and Paul Driessen, “[The Myth of Killer Mercury](#),” *The Wall Street Journal*, May 25, 2011.

⁷² *Ibid.*

All told, U.S. coal-fired power plants emitted approximately 0.5 percent of all the mercury in the atmosphere. The MATS regulations, though incredibly expensive, are powerless to remove 99.5 percent of the mercury in the air we breathe.^{73,74}

Furthermore, EPA admits the direct health benefits from reduction of mercury account for only 0.004 percent (or \$6 million) of the health benefits. And the so-called co-benefits of reducing PM 2.5 below natural ambient levels accounted for 99.996 percent of what the EPA valued as \$140 billion in health benefits from the MATS rule.⁷⁵

The high cost and illusory environmental benefits of these rules led the U.S. Supreme Court to rule in June 2015 that EPA unreasonably refused to consider the cost of compliance with MATS. The Court held EPA acted unconstitutionally because it did not conduct a thorough cost-benefit analysis as the initial step of its decision making.^{76,77} But the looming

April 2015 compliance deadline had already taken its toll, with many power plant owners either investing in expensive emissions control equipment or retiring their facilities.

The U.S. Supreme Court held EPA acted unconstitutionally because it did not conduct a thorough cost-benefit analysis as the initial step of its decision making with the Mercury and Air Toxics Standards.

New Source Review (NSR) Standards

In October 2017, the Trump administration announced it established a New Source Review Reform Task Force to review and simplify the NSR application and permit process. There is an urgent need for such review and reform.⁷⁸

NSR requires stationary sources of air pollution—including factories, industrial boilers, and power plants—to get permits before construction starts, whether the unit is being newly built or modified.⁷⁹ The Obama administration added greenhouse gases to the New Source Review standards in 2011. Prior to then, NSR standards applied only to traditional pollutants regulated under the Clean Air Act.

⁷³ Ilya Shapiro, "[Brief for the Cato Institute as Amicus Curiae In Support of Petitioners; State of Michigan et al., v Environmental Protection Agency.](#)" U.S. Supreme Court, Nos. 14-46, 14-47, and 14-49.

⁷⁴ Willie Soon and Paul Driessen, *supra* note 71.

⁷⁵ Kathleen Harnett White, "[EPA's Pretense of Science: Regulating Phantom Risks.](#)" Texas Public Policy Foundation, May 2012.

⁷⁶ "[Michigan v. Environmental Protection Agency.](#)" Oyez, accessed November 17, 2017.

⁷⁷ U.S. Supreme Court, "[Michigan v. Environmental Protection Agency.](#)" decided June 29, 2015, 576 U.S. ____ (2015).

⁷⁸ Environmental Protection Agency, "[EPA Releases Energy Independence Report.](#)" news release, October 25, 2017.

⁷⁹ U.S. Department of Energy, *supra* note 3.

This is an important concern for owners considering retrofitting an existing power plant or adding new components to improve operating efficiency. The modifications may increase total emissions—adding new capacity will do this almost by definition—but reduce the volume of emissions released per unit of electricity generated because production will be more efficient. The upgrades would constitute a “physical change” and could lead to a designation of the change as a “major modification,” subjecting the unit to NSR permitting requirements.

The addition of greenhouse gases to the list of “pollutants” regulated by the NSR review was particularly problematic for coal. Coal-fired power plant owners were discouraged from retrofitting their facilities because doing so would trigger NSR, requiring the installation of expensive carbon capture and sequestration equipment.

New Source Review played a significant role in the closures of otherwise useful power plants by affecting owners’ decision to retrofit or retire.

NSR played a significant role in the closures of otherwise useful power plants by affecting owners’ decision to retrofit or retire. The delay, cost, and uncertainty associated with obtaining an NSR permit make it difficult for power plant owners to know whether enhancements in plant

efficiency will be worth the effort. NSR discourages, rather than encourages, installation of equipment that would limit emissions, and it discourages investments in efficiency because of the additional expenditures and delays associated with the permitting process.⁸⁰

As applied to existing power plants and petrochemical plants, NSR has impeded or resulted in the cancellation of projects that would maintain and improve reliability, efficiency, and safety of existing energy capacity.⁸¹ That results in lost capacity as well as lost opportunities to improve energy efficiency and reduce air pollution.

The retrofit process could commence immediately if the Trump EPA overturns the Endangerment Finding, succeeds in its efforts to rescind the Clean Power Plan, and revises the NSR regulations so carbon dioxide emissions are no longer a determining factor in whether power plants are allowed to upgrade their facilities. These changes would allow existing coal plants to retrofit their facilities to become more efficient and emit fewer pollutants. Achieving this result is urgently needed: U.S. coal plants continue to age and capacity in such plants degrades every day because NSR, as currently written, effectively prevents them from becoming cleaner, more efficient plants.

⁸⁰ Joseph Bast and James Taylor, “[New Source Review An Evaluation of EPA’s Reform Recommendations](#),” The Heartland Institute, July 2002. Also see The National Coal Council, “[Reliable & Resilient, The Value of Our Existing Coal Fleet: An Assessment of Measures to Improve Reliability & Efficiency While Reducing Emissions](#),” May 2014.

⁸¹ U.S Department of Energy, *supra* note 3.

Cross-State Air Pollution Rule (CSAPR)

On June 6, 2011, EPA finalized the Cross-State Air Pollution Rule (CSAPR) to reduce sulfur dioxide (SO₂) and nitrogen oxide (NO_x) emissions. In its regulatory impact analysis, EPA estimated the rule would reduce U.S. coal consumption by 2 percent.⁸² The most recent iteration of the rule, the CSAPR Update issued in September 2016, affects 2,875 electric generating units at 886 coal-, gas-, and oil-fired facilities in 22 states.⁸³

When the rule was initially issued, it required states to reduce pollution that crosses state boundaries. States were required to reduce SO₂ emissions to 73 percent below 2005 levels and reduce NO_x emissions to 54 percent below 2005 levels by 2014.⁸⁴

In September 2016, EPA calculated the rule's implementation from 2017 to 2020 would cost approximately \$272 million—some \$68 million per year.⁸⁵ The agency's estimates were widely criticized as being far too low.

Air quality has been steadily improving in the United States since the Clean Air Act was passed.

As of May 2017, 27 states—more than the original 22 EPA said would be affected—were required to reduce SO₂ and NO_x emissions from power plants that could contribute to air pollution in downwind states.

Air pollution is a serious issue that merits an evidence-based discussion and careful cost-benefit analysis. But CSAPR is no longer needed. Air quality has been steadily improving in the United States since the Clean Air Act was passed. According to the most recent EPA data, all air quality requirements have been met for lead, ozone, SO₂, NO_x, carbon monoxide, and particulate matter: the six criteria pollutants regulated under the National Ambient Air Quality Standards (see Figure 8).

Power plants have successfully reduced their ozone-season NO_x emissions by more than 75 percent, a reduction of almost 2 million tons since 1997. Average ozone concentrations across the United States fell approximately 22 percent from 2000 to 2016.⁸⁶

According to Obama EPA estimates, the changes made in the CSAPR Update and other changes already underway in the power sector would cut ozone-season NO_x emissions from power plants

⁸² Trevor House, *et al.*, *supra* note 10.

⁸³ U.S. Environmental Protection Agency, "[Regulatory Impact Analysis of the Cross-State Air Pollution Rule \(CSAPR\) Update for the 2008 National Ambient Air Quality Standards for Ground-Level Ozone](#)," September 2016.

⁸⁴ *Ibid.*

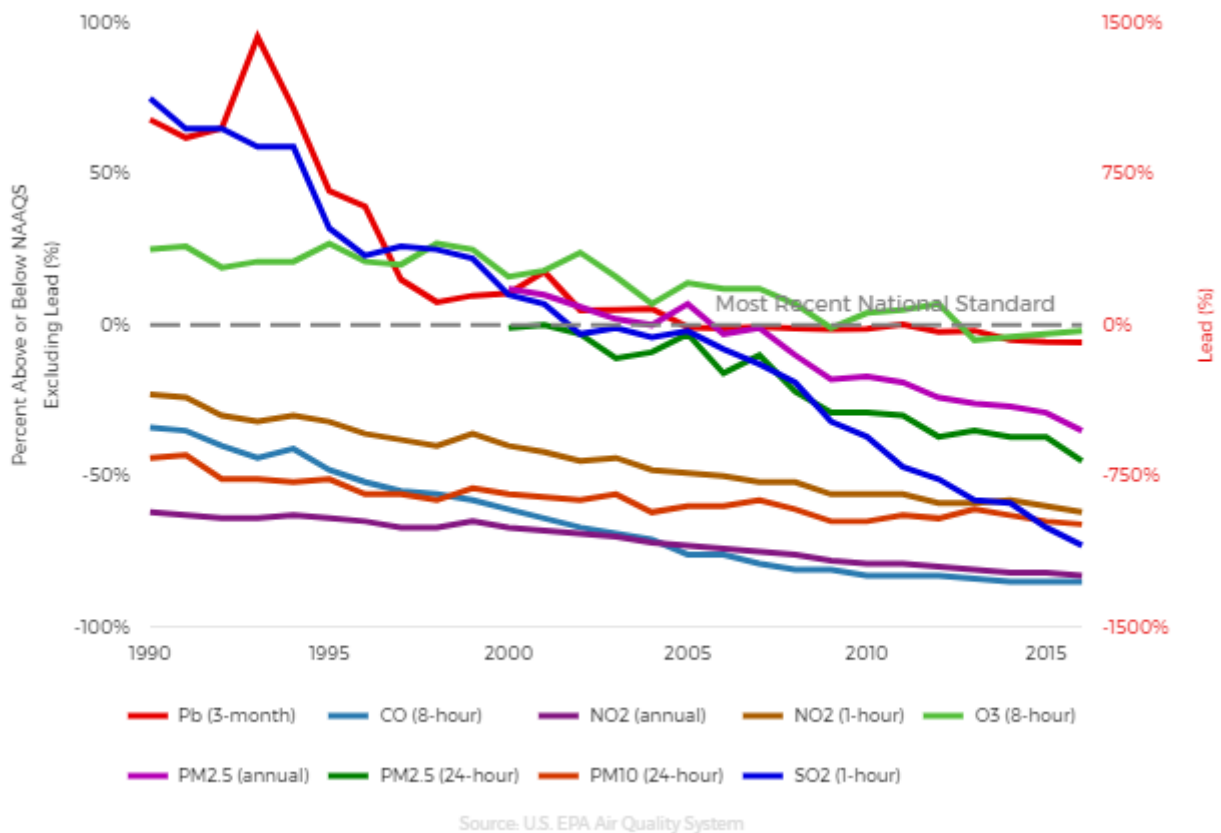
⁸⁵ *Ibid.*

⁸⁶ Environmental Protection Agency, "[Our Nation's Air](#)" (website), accessed September 22, 2017.

in the eastern United States by 20 percent—a reduction of 80,000 tons in 2017 compared to 2015 levels, just 4 percent of the reductions achieved from earlier air pollution enforcement actions.⁸⁷

The success of previous air quality rules has brought us to the point of diminishing returns with ozone emissions and other air pollutants as well.⁸⁸ Further reductions will come at an increasingly large cost for fewer environmental benefits.

Figure 8
Declining National Air Pollutant Concentration Averages



There has been a significant improvement of air quality since 1990 with large reductions in air pollutants during this time period. All of the criteria pollutants regulated under NAAQS have met the more recent and most stringent limits set by EPA for air quality. *Source:* U.S. Environmental Protection Agency, “[Our Nation’s Air](#)” (website), accessed September 22, 2017,

⁸⁷ Environmental Protection Agency, “[Fact Sheet: Final Cross-State Air Pollution Rule Update for the 2008 NAAQS](#),” June 2017.

⁸⁸ *Ibid.*

Coal Combustion Residuals (CCR) Rule

On April 17, 2015, EPA promulgated new regulations on the disposal of coal combustion residuals, also known as coal ash, by electric utilities. The rules established national standards for disposal in an effort to address groundwater contamination risks from residuals disposed of in unlined landfills and surface impoundments.⁸⁹

According to EPA, the rule may affect 414 coal-fired electric utility plants. The agency calculated the cost of the rule over a 100-year period, in part because the period during which coal ash could endanger human health is between 40 and 80 years. EPA estimates the nationwide average annualized compliance cost will be between \$509 million and \$735 million,⁹⁰ or \$50.9 billion to \$73.5 billion over 100 years.

The rule was initially problematic because it was a nationwide, one-size-fits-all measure requiring new controls (liners, monitoring, corrective action) on fly ash, bottom ash, and other residuals of coal-fired electric generation that are managed in landfills or ponds. The new regulations originally provided for enforcement through citizen lawsuits, not regulators. In order to provide evidence for the lawsuits to proceed, the regulations required power plant owner/operators to post key reports, inspections, and monitoring results to a site-specific dedicated website.

With passage of the Water Infrastructure Investment for the Nation Act, “citizen enforcement” of the Coal Combustion Residuals rule was replaced by a more traditional state and federal enforcement relationship.

The reporting burden and threat of lawsuits caused some utilities to switch from coal to natural gas. For example, Corn Belt Power Cooperative, a generation and transmission electric cooperative, has shifted to natural gas and no longer burns coal. Mike Thatcher, vice president of generation for the cooperative, told *Rural Electric Magazine*, “We would rather deal with regulators than with folks who may have an agenda.”⁹¹

The regulation-by-lawsuit fears were addressed on December 16, 2016, when Obama signed the bipartisan Water Infrastructure Investment for the Nation (WIIN) Act.⁹² The WIIN Act dramatically changed how coal-fired sites would be regulated. It allows states to apply for what is called “primacy”: If a state can show its existing permitting programs are “at least as protective” as the federal regulations and based on “site-specific” conditions, the state’s permitting programs will be considered to meet the requirements of the federal law. This gives states an incentive to address site-specific coal ash environmental threats in the least-costly

⁸⁹ Environmental Protection Agency, “[Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities](#)” (website), accessed November 10, 2017.

⁹⁰ Sam Yoder and Robynn Andracsek, “[The Real Cost of the CCR Rule](#),” *Power Engineering*, December 12, 2015.

⁹¹ Alice Clamp, “[Managing Coal Combustion Residuals](#),” *Rural Electric Magazine*, August 17, 2016.

⁹² Diane Samuels, “[President Obama Signs Bill to Enforce CCR Rules Through Permits](#),” SCS Engineers, January 3, 2017.

manner. (The municipal solid waste rules under the Resource Conservation and Recovery Act in the 1990s took a similar approach.⁹³) With the passage of this legislation, “citizen enforcement” of CCR was replaced by a more traditional state and federal enforcement relationship in states that apply for, and are granted, regulatory primacy by EPA.⁹⁴

States should fight the Coal Combustion Residuals “zombie” by applying for regulatory primacy as a means of avoiding citizen lawsuits.

EPA is currently considering modifications to the coal ash rules.⁹⁵ In the meantime, states should fight this “zombie” by applying for regulatory primacy as a means of avoiding citizen lawsuits. State lawmakers seeking to apply for primacy can follow the lead of

Kansas, whose plan for complying with coal ash rules was approved by EPA in October 2015.⁹⁶

Effluent Limitations Guidelines (ELG)

The Effluent Limitations Guidelines (ELG) establish new or additional requirements for wastewater streams emanating from steam electric power plants utilizing fossil fuels, especially coal, which involve flue gas desulfurization, fly ash transport, bottom ash transport, combustion residual leachate, and flue gas mercury controls.⁹⁷ The rules, which were finalized in 2015, were controversial because they were the product of a “sue and settle” agreement between the Obama administration and environmental groups, including the Environmental Integrity Project, Defenders of Wildlife, and Sierra Club.^{98,99}

Under “sue and settle,” special-interest groups file suit against a federal agency, which responds by agreeing to a settlement, negotiated behind closed doors and outside the normal rulemaking process, with no participation by the public or affected parties. These agreements have resulted in hundreds of new EPA regulations, including ELG and CPP.¹⁰⁰ EPA Administrator Scott Pruitt announced in October 2017 he intends to stop the practice, saying:

⁹³ Environmental Protection Agency, “[EPA History: Resource Conservation and Recovery Act](#),” accessed November 13, 2017.

⁹⁴ Diane Samuels, *supra* note 92.

⁹⁵ Environmental Protection Agency, “[EPA to Reconsider Certain Coal Ash Rule Provisions](#),” September 14, 2017.

⁹⁶ Environmental Protection Agency, “[U.S. State of Kansas Solid Waste Management Plan Approval](#),” September 8, 2016.

⁹⁷ Geosyntec Consultants, “[Final Effluent Limitations Guidelines and Standards and for the Steam Electric Power Generating Industry](#),” 2015.

⁹⁸ Environmental Protection Agency, “[Steam Electric Power Generating Effluent Guidelines - 2015 Final Rule](#),” U.S. EPA Archives, accessed November 14, 2017.

⁹⁹ United States District Court for the District of Columbia, [Defenders of Wildlife v. Jackson](#), Civil Action No. 10-1915, March 18, 2012.

¹⁰⁰ U.S. Chamber of Commerce, [Sue and Settle: Regulating Behind Closed Doors](#), October 18, 2017.

The days of regulation through litigation are over. We will no longer go behind closed doors and use consent decrees and settlement agreements to resolve lawsuits filed against the agency by special interest groups where doing so would circumvent the regulatory process set forth by Congress. Additionally, gone are the days of routinely paying tens of thousands of dollars in attorney’s fees to these groups with which we swiftly settle.¹⁰¹

On September 14, 2009, EPA Administrator Lisa Jackson received a 60-day notice of intent from the Environmental Integrity Project, which threatened to sue EPA for not updating the steam electric ELGs, which were previously revised in 1982. The next day, EPA announced plans to revise the guidelines and the next month, the agency released a “final detailed report” on its investigation of the industry for possible ELG revision.¹⁰² EPA issued a draft of the regulation in 2013, and the rules were finalized in 2015.¹⁰³

The revised ELG rule imposes stringent limits on the discharge of any water that transports bottom ash or fly ash. The alternative would be for plants to convert their wet bottom ash transport systems to “dry ash” disposal of such waste. In many cases, the associated costs could cause facilities to be closed.¹⁰⁴

“The days of regulation through litigation are over. . . . Additionally, gone are the days of routinely paying tens of thousands of dollars in attorney’s fees to these groups with which we swiftly settle.

Scott Pruitt
EPA Administrator
October 2017

In September 2015, EPA stated 134 of 1,080 steam electric power plants in the United States would have to make new investments to meet the more stringent rule. The agency estimated the annual, industry-wide cost for power plants to comply with the new regulations would be \$480 million. The actual cost for compliance is significantly different from site-to-site.¹⁰⁵

For example, the capital cost alone of installing biological treatment systems—used to remove nitrates and selenium from scrubber or flue gas desulfurization wastewater—at a single plant that might contain a variety of electricity generating units can range from \$10 million to \$60 million, according to Kansas City-based Burns & McDonnell, an engineering consulting firm.¹⁰⁶ Diane Martini of Burns & McDonnell estimated converting wet bottom ash for dry handling, installing physical and chemical precipitation methods, and following that with biological treatment

¹⁰¹ Environmental Protection Agency, “[Administrator Pruitt Issues Directive to End EPA ‘Sue & Settle’](#),” news release, October 16, 2017.

¹⁰² Environmental Protection Agency, “[EPA Expects to Revise Rules for Wastewater Discharges from Power Plants](#),” news release, September 15, 2009.

¹⁰³ Environmental Protection Agency, *supra* note 98.

¹⁰⁴ Alice Clamp, *supra* note 91.

¹⁰⁵ Duke K. McCall, “[EPA Issues Stringent Effluent Limitation Guidelines for Steam Electric Power Plants](#),” *The National Law Review* (website), October 5, 2015.

¹⁰⁶ Amena Saiyid, “[Special Report: New Power Plant Effluent Limits Too Costly, Critics Say](#),” Bloomberg, November 3, 2015.

systems for managing wastewater, could cost power plants between \$30 million and \$300 million.¹⁰⁷

EPA's estimates for complying with the ELG rules are likely too low. It's difficult to know for sure, because the agency withheld important information from regulated parties and the public.

EPA's estimates for complying with the ELG rules are likely too low. It's difficult to know for sure, because the agency invoked the concept of Confidential Business Information (CBI) to withhold from regulated parties and the public the facts, methods, and analyses on which its conclusions depended when writing the

rules. Without transparency, very little data quality assurance is possible.¹⁰⁸

Industry groups filed a petition in November 2015 asking EPA to reconsider the rules, charging the agency used obsolete or otherwise unreliable data, often decades old, in its analyses supporting its "zero discharge" requirement for bottom ash transport water.¹⁰⁹ This was in violation of both the letter and spirit of the Data Quality Act, which demands sound information and analysis be used in such decisions.¹¹⁰

When the new ELGs were issued, the compliance deadline was unclear; dates were to be set by the permitting authority "as soon as possible beginning November 1, 2018, but ... no later than December 31, 2023."¹¹¹ In September 2017, the Trump EPA imposed a two-year delay on Obama-era rules governing wastewater from coal-fired power plants to give the agency time to revisit some of the rules' requirements.¹¹²

National Ambient Air Quality Standards (NAAQS) for Ozone

In October 2017, EPA announced it would use a "newly formed Ozone Cooperative Compliance Task Force to review administrative options to meaningfully improve air quality as it relates to ozone. EPA will also work to streamline the approval of state air pollution plans, and eliminate EPA's backlog of state pollution plans."¹¹³

The Trump administration's announcement came almost exactly two years after EPA finalized new National Ambient Air Quality Standards (NAAQS) that reduced the standard for ground-

¹⁰⁷ *Ibid.*

¹⁰⁸ Harry M. Johnson III, "[Utility Water Act Group Petition for Reconsideration of EPA's Effluent Limitation Guidelines and Standards for the Steam Electric Power Generating Point Source Category, Final Rule](#)," March 24, 2017.

¹⁰⁹ *Ibid.*

¹¹⁰ United States District Court for the District of Columbia, *supra* note 99.

¹¹¹ Harry M. Johnson III, *supra* note 108.

¹¹² Environmental Protection Agency, "[EPA Finalizes Rule to Postpone Steam Electric Power Plant Effluent Guidelines Rule](#)," news release, September 13, 2017.

¹¹³ Environmental Protection Agency, *supra* note 78.

level ozone from 75 parts per billion (ppb) to 70 ppb.¹¹⁴ EPA’s Regulatory Impact Analysis for the new standard identified 30 coal-fired generators with a capacity of 5,400 MW that do not have selective catalytic reduction systems (“scrubbers”) needed to meet the standard. The agency identified an additional seven units, with a combined capacity of 3,100 MW, that have the scrubbers in place but do not always use them.

The epidemiology and toxicology cited by EPA in defense of its new ozone standard was strongly criticized at the time, but EPA ignored or disputed all objections.^{115,116} Even studies conducted by EPA itself undermined the agency’s case for stricter ozone standards.

The epidemiology and toxicology cited by EPA in defense of its new ozone standard was strongly criticized at the time, but EPA ignored or disputed all objections.

The Obama EPA conducted a study from September 2011 until March 2014 investigating the impact of high levels of ozone on human health.¹¹⁷ In the experiment, 16 study subjects ages 18 to 55 were made to exercise (ride a bike) for two hours in hot conditions (89 to 93 degrees F) while inhaling air containing 300 parts per billion (ppb) ozone—an ozone level four times the then-current standard of 75 ppb and one that does not occur anywhere in the United States. The study subjects also exercised under the same conditions but in “clean” air.¹¹⁸

No adverse effects from ozone were observed among the 16 subjects in the experiment. No clinical differences were reported between the two exposures (i.e., air with 300 ppb ozone vs. “clean” air). The results of this study were never published by EPA, presumably because they did not comport with the agency’s agenda, and the results were obtained only through a Freedom of Information Act request.¹¹⁹

Ground-level ozone concentrations have dropped by 31 percent since 1980 (see Figure 9). More than 90 percent of areas that could not meet their 1997 ozone targets now meet those standards. Since 1980, total emissions of the six criteria air pollutants have dropped by 63 percent.¹²⁰

¹¹⁴ Amanda Durish Cook, “[EPA Ozone Rules May Mean Changes for 30+ Coal Units](#),” *RTO Insider*, October 5, 2015.

¹¹⁵ X.Y. Wang, W. Hu, and S. Tong, “[Long-term exposure to gaseous air pollutants and cardio-respiratory mortality in Brisbane, Australia](#),” *Geospatial Health* 3, No. 2 (May 2009): 257–63.

¹¹⁶ Goran Krstic, “[A reanalysis of fine particulate matter air pollution versus life expectancy in the United States](#),” *Journal of the Air and Waste Management Association*, January 23, 2013.

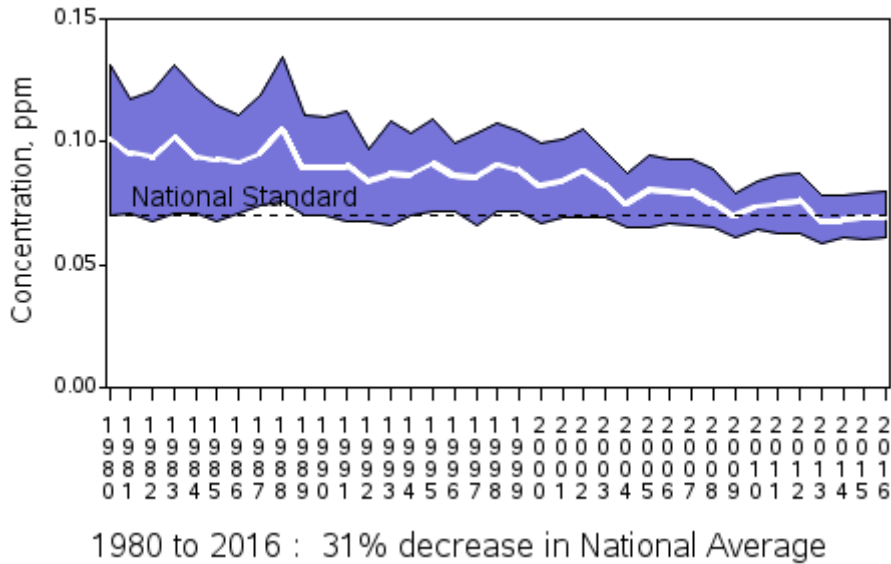
¹¹⁷ Steve Milloy, “[Revealed: Obama EPA Hid Experimental Data Debunking 2015 Ozone Rule](#),” *Junkscience.com*, September 12, 2017.

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*

¹²⁰ U.S. Environmental Protection Agency, *supra* note 86.

Figure 9
Ozone Air Quality, 1980–2016
(Annual 4th Maximum of Daily Max 8-Hour Average)
National Trend Based on 206 Sites



Ozone concentrations have fallen by 31 percent nationally. *Source:* U.S. Environmental Protection Agency, “[Ozone Trends](#)” (website), accessed September 22, 2017.

Compliance with the ozone NAAQS has become increasingly costly, even for states that have met their targets.¹²¹ Even states in compliance are required to devise emission inventories and establish a preconstruction permitting program that applies to “new or expanding sources of air pollution,” to reduce ozone emissions. These regulations affect power plants, industrial boilers, and factories.

Stream Protection Rule (SPR)

On December 20, 2016, the Office of Surface Mining Reclamation and Enforcement (OSMRE) finalized new regulations to address water pollution from underground and surface mining. Roughly two months later, on February 16, 2017, President Donald Trump signed H. J. Res. 38, passed by Congress under the Congressional Review Act, which disapproved the rule before it was implemented. The House resolution prevents OSMRE from drafting a “substantially similar” rule without authorization from Congress.¹²²

¹²¹ U.S. Environmental Protection Agency, “[EPA to Extend Deadline for 2015 Ozone NAAQS Area Designations](#),” news release, June 6, 2017.

¹²² Barbara Grzincic, *supra* note 48.

While proponents said SPR would benefit coal-mining areas, critics said it imposed a one-size-fits-all nationwide standard that did not take local into account geologic or hydrologic factors. Critics also argued the regulations were duplicative because state and federal agencies, such as EPA and the U.S. Fish and Wildlife Service, already ensure water quality in coal-mining areas.^{123,124}

The duplicative nature of SPR is a key reason why Senator Joe Manchin (D-WV) introduced a resolution under the Congressional Review Act to permanently overturn the rule. In a press release announcing the resolution Manchin stated:

If the Stream Protection Rule hadn't been reversed, it would have been among the most damaging of the zombie regulations for the coal industry.

The last Administration's long list of overreaching regulations absolutely crippled West Virginia families and businesses. Not only is the rule very alarming in its scope and potential impacts, the rule making was executed in a flawed way. Rules by the Department of the Interior and OSMRE must be based on comprehensive data that is available to stakeholders, particularly when those rules threaten to eliminate thousands of jobs. Furthermore, agencies should not be issuing duplicative rules that overlap with regulations under other environmental laws such as the Clean Water Act.¹²⁵

If SPR hadn't been reversed, it would have been among the most damaging of the zombie regulations for the coal industry. OSMRE admitted the rule would have resulted in tens of billions of dollars' worth of "technically and economically mineable" coal being left in the ground with no chance of future development. The coal deposits were referred to as "stranded reserves" because they would not be mineable as a result of the new SPR requirements and restrictions.¹²⁶

Part 4 Looking Ahead and Concluding Observations

While running for president in 2008, then-candidate Barack Obama told the editorial board of the *San Francisco Chronicle* that under his cap-and-trade proposal, anyone who wanted to build a coal-fired power plant could do so, but it would bankrupt them. Obama said "electricity rates would necessarily skyrocket"¹²⁷ under his plan.

¹²³ National Mining Association, "[NMA Strongly Opposes Interior Department's Duplicative Stream Rule](#)," news release, December 19, 2016.

¹²⁴ Joe Manchin, "[Manchin Introduces Measure to Overturn Anti-Coal Rule](#)," news release, January 30, 2017.

¹²⁵ *Ibid.*

¹²⁶ Ned Mamula and Patrick Michaels, "[Protecting Coal Mining From the Stream Protection Rule](#)," Cato Institute, February 2, 2016.

¹²⁷ Erica Martinson, "[Uttered in 2008, Still Haunting Obama](#)," *Politico*, April 5, 2012.

As president, Obama was never able to enact cap-and-trade legislation, so he sought other ways of “skinning the cat.”¹²⁸ He directed EPA to draft a series of regulations that would adversely and dramatically affect coal-fired power plants as a means of fulfilling his campaign promise to fundamentally transform the energy makeup of the United States.

The remaining two *Policy Studies* in this series will provide a roadmap for the administration and state lawmakers.

The imposition of these stringent federal regulations made operating coal-fired power plants more expensive, in some cases prohibitively so.¹²⁹ As a result, more than 250 coal-fired power plants were retired between 2010 and 2017, many with years of useful life remaining to provide reliable, low-cost electricity.

Retiring the nation’s coal-fired power plants increases electricity prices because on average, existing coal plants generate electricity more affordably than the new plants that replace them. Additionally, retiring the coal-fired power fleet puts the reliability of the grid at greater risk. Low-priced natural gas is an attractive option for generating electricity, but prices and availability can fluctuate, which is why prudent public utilities usually want electricity from a mix of sources, including coal.

As part of his America First Energy Plan,¹³⁰ Trump has vowed to revive the coal sector. His administration has made good steps in that direction, including the following:

- Revoked the Stream Protection Rule, which regulated coal mining operations near rivers and streams.
- Created an Ozone Cooperative Compliance Task Force to review administrative options to review ozone standards adopted by the Obama administration based on faulty epidemiology and toxicology.
- Imposed a two-year delay on Obama-era rules governing wastewater from coal-fired power plants to give the agency time to revisit some of the rules’ requirements.
- Rolled back unnecessary regulations on hydraulic fracturing, mining, and oil and gas exploration offshore and on federal lands.¹³¹
- Withdrew from the Paris Accord and stopped funding the Green Climate Fund.
- Retracted and rescinded Obama-era deeply flawed “social cost of carbon” estimates and stopped including them in required cost-benefit analyses of new regulations.

¹²⁸ Office of the Press Secretary, “[Press Conference by the President](#),” November 3, 2010.

¹²⁹ Benjamin Storrow, *supra* note 2.

¹³⁰ [An America First Energy Plan](#), White House, accessed November 16, 2017.

¹³¹ See the list of executive orders and secretary orders in “[Order No. 3358, Executive Committee for Expedited Permitting](#),” U.S. Department of Interior, October 25, 2017.

- Withdrew the Clean Power Plan, saying in part that there are no negative health effects below EPA’s standard for PM_{2.5}.

Importantly, the Trump administration also dissolved the inter-agency group that has produced the highly biased and alarmist National Climate Assessments, and is placing independent scholars on EPA’s scientific review boards, replacing some members who have financial conflicts of interest.¹³²

Ultimately, the administration will need to attack the Endangerment Finding, the underlying foundation of regulations built up during the Obama years, if Trump is to succeed with his energy plan and prevent activist groups or future administrations from undoing his work.

The Trump administration also dissolved the inter-agency group that has produced the National Climate Assessments and is placing independent scholars on EPA’s scientific review boards, replacing some members who have financial conflicts of interest.

The remaining two *Policy Studies* in this series will describe the needed reforms in more detail, providing a roadmap for the administration and state lawmakers seeking to protect families, businesses, and the U.S. economy from high energy bills and an increasingly unreliable power grid.

###

¹³² Environmental Protection Agency, “[Administrator Pruitt Issues Directive to Ensure Independence, Geographic Diversity & Integrity in EPA Science Committees,](#)” news release, October 31, 2017.

About the Authors

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Since joining Heartland, Orr has written a *Heartland Policy Study* on fracking titled “[Hydraulic Fracturing: A Game-Changer for U.S. Energy and Economies](#)“ and has coauthored multiple policy studies on frac sand mining, including ”[Environmental Impacts of Industrial Silica Sand \(Frac Sand\) Mining](#)“ and ”[Economic Impacts of Industrial Silica Sand \(Frac Sand\) Mining](#).”

Orr’s writing has appeared in *The Wall Street Journal*, *USA Today*, the *New York Post*, *The Hill*, *Orange County Register*, and *Washington Times*. His work on fracking is also featured in *Alternative Energy and Shale Gas Encyclopedia*, published by John Wiley & Sons, Inc. He has recorded dozens of podcasts on energy and environment topics for Heartland.

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Palmer attended the University of Arizona, where he earned a Bachelor of Arts degree in 1966 and Juris Doctorate with honors in 1969. He was inducted into the Order of the Coif honor society there in 1969 and served as Symposium Editor of the *Arizona Law Review*.

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Appendix-1 List of Power Plants Scheduled for Closure¹³³

Projected 2016-2020 EGU Retirements Under 111(d) Proposal*

EPA's IPM Assessment of Option 1 with Regional Compliance
2020 Run Year

State	Retired Capacity (MW)						
	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Alabama	5,976						5,976
Barry	886						886
Charles R Lowman	80						80
Colbert	1,184						1,184
E C Gaston	1,020						1,020
Gadsden	130						130
Gorgas	1,241						1,241
Greene County	497						497
Widows Creek	938						938
Arizona	766						766
Apache Station	350						350
Cholla	260						260
H Wilson Sundt Generating Station	156						156
Arkansas	4,007					743	4,750
Harvey Couch						123	123
Independence	1,678						1,678
Lake Catherine						620	620
Plum Point Energy Station	670						670
White Bluff	1,659						1,659
California	120	2,602	1,236			6,122	10,080
AES Alamos LLC						667	667
Agnews Power Plant		30					30
Alameda			44				44
Almond Power Plant			50				50
Berry Cogen			35				35
Berry Cogen Tanne Hills 18			14				14
Cardinal Cogen		41					41
Carson Ice-Gen Project		58	51				109
Civic Center		24					24
Coalinga 25D Cogen			11				11
Coalinga Cogeneration			36				36
Coalinga Cogeneration Facility			6				6
Combustion Turbine Project No 2			49				49

¹³³ Southern States Energy Board, [Projected 2016-2020 Existing Generating Unit Retirements Under 111\(d\) Proposal](#), accessed September 19, 2017.

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Coolwater		462					462
Cymric 31X Cogen			5				5
Cymric 36W Cogen			11				11
Cymric 6Z Cogen			5				5
DAI Oildale		30					30
Dome Project			6				6
Dynegy Morro Bay LLC						999	999
Dynegy Moss Landing Power Plant						1,509	1,509
Dynegy Oakland Power Plant			165				165
El Centro		110				116	226
Foster Wheeler Martinez		104					104
Fresno Cogen Partners		73					73
Frito-Lay Cogen Plant			6				6
Gateway Generating Station		563					563
Glanera			52				52
Gilroy Power Plant		105					105
Grayson		57					57
Greenleaf 2 Power Plant			50				50
Harbor		225					225
Harbor Cogen		81					81
Haynes						974	974
JRW Associates LP						2	2
Kern River Eastridge Cogen			42				42
Kern River Fee A Cogen			6				6
Kern River Fee B Cogen			3				3
Kern River Fee C Cogen			6				6
King City Power Plant		111					111
Kingsburg Cogen		34					34
Lodi			23				23
McClellan			77				77
McClure			112				112
McKittrick Cogen			9				9
North Midway Cogen			9				9
Oildale Energy LLC			39				39
Olive						99	99
Olive View Medical Center		5					5
OLS Energy Chino		29					29

State	Retired Capacity (MW)						
	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Panoche Peaker			40				40
Pittsburg Power						1,311	1,311
Redding Power		106					106
Rio Bravo Jasmin	33						33
Rio Bravo Poso	33						33
Roseville			42				42
Salinas River Cogeneration			33				33
San Jose Cogeneration			6				6
Santa Clara Cogen			8				8
Sargent Canyon Cogeneration			30				30
SCA Cogen 2		134					134
Scattergood						445	445
Sconza Candy Company			5				5
SPA Cogen 3		164					164
Stockton Cogen	54						54
Taft 26C Cogen			11				11
United Cogen		29					29
Walnut			47				47
Wheelabrator Lassen			43				43
Wheelabrator Norwalk Energy		27					27
Woodland			48				48
Colorado	645						645
Arapahoe	109						109
Cherokee	352						352
Valmont	184						184
Connecticut	394					1,669	2,063
Bridgeport Station	394						394
Middletown						400	400
Montville Station						491	491
New Haven Harbor						448	448
NRG Norwalk Harbor						330	330
Delaware	260						260
Edge Moor	260						260
Florida	7,260	135				2,192	9,587
Anclote						1,011	1,011
Arvah B Hopkins						76	76
Big Bend	1,552						1,552
C D McIntosh Jr	342					85	427
Cedar Bay Generating Company LP	249						249
Central Power & Lime	135						135
Crist	906						906

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Crystal River	869						869
Deerhaven Generating Station	232					83	315
Indian River						577	577
Indiantown Cogeneration LP	330						330
John R Kelly						23	23
Lansing Smith	357						357
Larsen Memorial		105					105
Sanford						138	138
Scholz	92						92
Seminole	1,310						1,310
Stanton Energy Center	886						886
Suwannee River						131	131
Tom G Smith		30				22	52
Vero Beach Municipal Power Plant						46	46
Georgia	5,178						5,178
Hammond	840						840
Harlee Branch	1,016						1,016
Kraft	201						201
Mitchell	155						155
Scherer	1,680						1,680
Yates	1,286						1,286
Idaho						3	3
Clearwater Paper IPP Lewiston						3	3
Illinois	6,058						6,058
Baldwin Energy Complex	608						608
Dallman	348						348
E D Edwards	380						380
Hennepin Power Station	282						282
Joppa Steam	1,002						1,002
Newton	1,197						1,197
Powerton	1,536						1,536
Will County	251						251
Wood River	454						454
Indiana	1,889						1,889
Eagle Valley	257						257
Frank E Ratts	241						241
Harding Street	212						212
Jasper 2	14						14
R Gallagher	280						280
R M Schahfer	472						472

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Wabash River	313						313
Whitewater Valley	100						100
Iowa	3,065						3,065
Ames Electric Services Power Plant	104						104
Earl F Wisdom	38						38
Fair Station	41						41
George Neal North	957						957
Lansing	237						237
Milton L Kapp	211						211
Muscatine Plant #1	216						216
Prairie Creek	164						164
Riverside	133						133
Streeter Station	35						35
Sutherland	78						78
Walter Scott Jr Energy Center	851						851
Kansas	535		12			147	694
Fort Dodge						147	147
Lawrence Energy Center	50						50
Nearman Creek	229						229
Quindaro	183						183
Riverton			12				12
Tecumseh Energy Center	73						73
Kentucky	1,389						1,389
Big Sandy	260						260
Cooper	334						334
Dale	195						195
E W Brown	267						267
Robert A Reid	65						65
Shawnee	268						268
Louisiana	3,051					3,192	6,243
Big Cajun 1						220	220
Big Cajun 2	1,756						1,756
Brame Energy Center	486					422	908
CII Carbon LLC	46						46
D G Hunter						130	130
Louis Doc Bonin						302	302
Louisiana 2						138	138
Michoud						813	813
Monroe						126	126
Morgan City						54	54
Plaquemine						38	38
R S Nelson	763					603	1,366

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Teche						346	346
Maine	58	93				233	384
Caribou Generation Station						14	14
Rumford Cogeneration	58						58
Verso Paper		93					93
William F Wyman						219	219
Maryland	825						825
C P Crane	385						385
Herbert A Wagner	440						440
Massachusetts	1,136	521	10			1,102	2,769
Brayton Point	1,136		10			435	1,581
Canal						566	566
Cleary Flood		108					108
Lowell Cogen Plant		29					29
NAEA Energy Massachusetts LLC						101	101
Potter Station 2		79					79
Stony Brook		306					306
Michigan	2,411	21				284	2,716
B C Cobb	312						312
Claude Vandyke		21					21
Eckert Station	301						301
Endicott Station	50						50
Erickson Station	151						151
Harbor Beach	95						95
J B Sims	73						73
J C Weadock	306						306
J R Whiting	322						322
James De Young	27						27
Mistersky						50	50
Presque Isle	431						431
River Rouge						234	234
Shiras	41						41
TES Filer City Station	60						60
Trenton Channel	188						188
White Pine Electric Power	54						54
Minnesota	828						828
Austin Northeast	29						29
Clay Boswell	428						428
Hoot Lake	138						138
Silver Lake	57						57
Taconite Harbor Energy Center	152						152

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
New Mexico	815					186	1,001
Cunningham						186	186
San Juan	815						815
New York	2,147	177		45		1,779	4,148
AES Cayuga	313						313
AES Greenidge LLC	108						108
AES Somerset LLC	686						686
AES Westover	84						84
Bowline Point						567	567
C R Huntley Generating Station	436						436
Carr Street Generating Station		96					96
Dunkirk Generating Plant	520						520
Massena Energy Holdings LLC		81					81
Roseton Generating Station						1,212	1,212
S A Carlson				45			45
North Carolina	4,532						4,532
Asheville	185						185
G G Allen	1,127						1,127
Marshall	760						760
Roanoke Valley Energy Facility II	44						44
Roxboro	2,416						2,416
Ohio	2,379						2,379
Avon Lake	736						736
Conesville	1,530						1,530
Hamilton	83						83
Orrville	30						30
Oklahoma	3,425						3,425
Hugo	440						440
Muskogee	1,022						1,022
Northeastern	920						920
Sooner	1,043						1,043
Oregon	585	726					1,311
Beaver		463					463
Boardman	585						585
Coyote Springs		246					246
Oregon State University Energy Center		17					17
Pennsylvania	1,417						1,417
AES Beaver Valley Partners Beaver Valley	129						129

State	Retired Capacity (MW)						
	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Ebensburg Power	51						51
G F Weaton Power Station	112						112
New Castle Plant	320						320
P H Glatfelter	52						52
PPL Brunner Island	371						371
Sunbury Generation LP	382						382
South Carolina	3,633						3,633
Cogen South	90						90
Cross	570						570
McMeekin	250						250
Urquhart	94						94
W S Lee	200						200
Waterree	684						684
Williams	615						615
Winyah	1,130						1,130
Tennessee	2,145						2,145
Allen Steam Plant	741						741
Gallatin	976						976
Johnsonville	428						428
Texas	9,131		4			3,265	12,400
AES Deepwater	138						138
Coleto Creek	592						592
Fayette Power Project	1,195						1,195
J Robert Massengale						20	20
J T Deely	870						870
Jones						486	486
Lake Creek			4				4
Lewis Creek						460	460
Monticello	1,130						1,130
Moore County						46	46
Nichols						457	457
Pirkey	723						723
Plant X						422	422
Sabine						954	954
San Miguel	391						391
Thomas C Ferguson						420	420
W A Parish	2,509						2,509
Welsh	1,584						1,584
Utah	225						225
KUCC	174						174
Sunnyside Cogen Associates	51						51

State	Retired Capacity (MW)						
Plant	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Vermont					620		620
Vermont Yankee					620		620
Virginia	2,862		48				2,910
Bremo Bluff	227						227
Chesapeake	373		48				421
Chesterfield	1,237						1,237
Clinch River	460						460
Mecklenburg Power Station	138						138
Spruance Genco LLC	104						104
Yorktown	323						323
Washington	1,340	1,540	596				3,476
Chehalis Generating Facility		509					509
Crystal Mountain			3				3
Encogen		158					158
Frederickson			134				134
Fredonia			280				280
Northeast			45				45
River Road Gen Plant		220					220
Sumas Power Plant		126					126
Tenaska Ferndale Cogeneration Station		271					271
Transalta Centralia Generation	1,340	256					1,596
Whitehorn			134				134
Wisconsin	2,713					9	2,722
Alma	120						120
Blount Street	101						101
Columbia	1,118						1,118
Edgewater	378						378
John P Madgett	372						372
Manitowoc	116						116
Menasha	27						27
Port Edwards Mill						5	5
Pulliam	213						213
UW Madison Charter Street Plant						4	4
Valley	268						268
Grand Total**	88,556	5,986	2,131	45	1,234	23,363	121,316

*Excludes committed retirements prior to 2016

**Totals may not match regulatory impact analysis due to how EPA assigns retrofit/retired capacity to individual units

Source Data: <http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0602-0220>

State	Retired Capacity (MW)						
	Coal Steam	Combined Cycle	Combustion Turbine	IGCC	Nuclear	O/G Steam	Grand Total
Willmar	24						24
Mississippi	2,086	69				2,193	4,348
Baxter Wilson						1,176	1,176
Delta						177	177
Gerald Andrus						712	712
Henderson						29	29
Jack Watson	706						706
L L Wilkins		35				8	43
Natchez						73	73
R D Morrow	360						360
Victor J Daniel Jr	1,020						1,020
Wright						19	19
Yazoo		33					33
Missouri	599						599
Blue Valley	51						51
James River Power Station	194						194
Lake Road	92						92
Montrose	169						169
Sibley	93						93
Montana	139		226				365
Basin Creek Plant			54				54
Colstrip Energy LP	35						35
Dave Gates Generating Station			132				132
Highwood Generating Station			40				40
Lewis & Clark	52						52
Yellowstone Energy LP	52						52
Nebraska	85						85
Lon Wright	85						85
Nevada	508	104				244	856
North Valmy	253						253
Reid Gardner	255						255
Tracy		104				244	348
New Hampshire	540						540
Merrimack	444						444
Schiller	96						96
New Jersey	1,401				614		2,015
B L England	155						155
Oyster Creek					614		614
PSEG Hudson Generating Station	614						614
PSEG Mercer Generating Station	632						632