

EPA REGULATION OF GREENHOUSE GAS EMISSIONS FROM NEW POWER PLANTS



The U.S. Environmental Protection Agency (EPA) released a new proposal to limit greenhouse gas emissions from new power plants on September 20, 2013. The proposed "Carbon Pollution Standard for New Power Plants" replaces an earlier proposal released by EPA in March 2012. It would establish New Source Performance Standards [2] (NSPS) under the Clean Air Act to limit emissions of carbon dioxide (CO₂) from coal- and natural gas-fired power plants. Under a June 2013 directive [3] from President Obama, EPA is also developing a proposal to limit carbon emissions from existing power plants.

WHY IS REGULATION OF GREENHOUSE GAS EMISSIONS FROM POWER PLANTS IMPORTANT?

Electric power generation is responsible for about 40 percent of U.S. emissions of carbon dioxide, the primary greenhouse gas.

Since the federal government adopted new vehicle standards in August 2012 to reduce transportation-related emissions, the power sector represents the next opportunity to achieve significant carbon reductions.

Coal and natural gas are used to fuel over two-thirds of U.S. electricity generation, and are responsible for nearly 100 percent of power sector CO₂ emissions. As shown in Figure 2, the United States currently obtains 30 percent of its electricity from natural gas. Since 2000, however, natural gas has accounted for over 90 percent of new fossil generation capacity, and most new generation planned for the next few years will be fueled by natural gas.

There is one new coal plant planned for 2014: Southern Company's Kemper Plant, which will employ carbon capture and storage (CCS). There is one new coal plant planned for 2015, which is a combined heat and power (CHP) plant that would likely not be subject to the proposed EPA standard.

HOW WOULD THE STANDARDS WORK?

New Source Performance Standards set limits on emissions based on EPA's assessment of available technologies. As with many other Clean Air Act programs, EPA establishes a standard for a given category of facility, which state environmental agencies then translate into requirements for individual facilities.

EPA's proposed "Carbon Pollution Standard for New Power Plants" was developed under Section 111(b) of the Clean Air Act. Section 111(b) calls for a standard that "reflects the degree of emissions limitation achievable through the application of the best system of emissions reduction which (taking into account the cost of achieving such reduction and any non-air quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated." The emissions limit must take the form of a standard – in the case of power plants, maximum allowable CO₂ emissions per unit of electricity – and may not prescribe a particular technology.

The Act ostensibly requires EPA to review the technological options available and, if appropriate, establish a new standard every eight years. In practice, standards have typically remained unexamined and unchanged for much longer than eight years, often because of resource constraints at EPA.

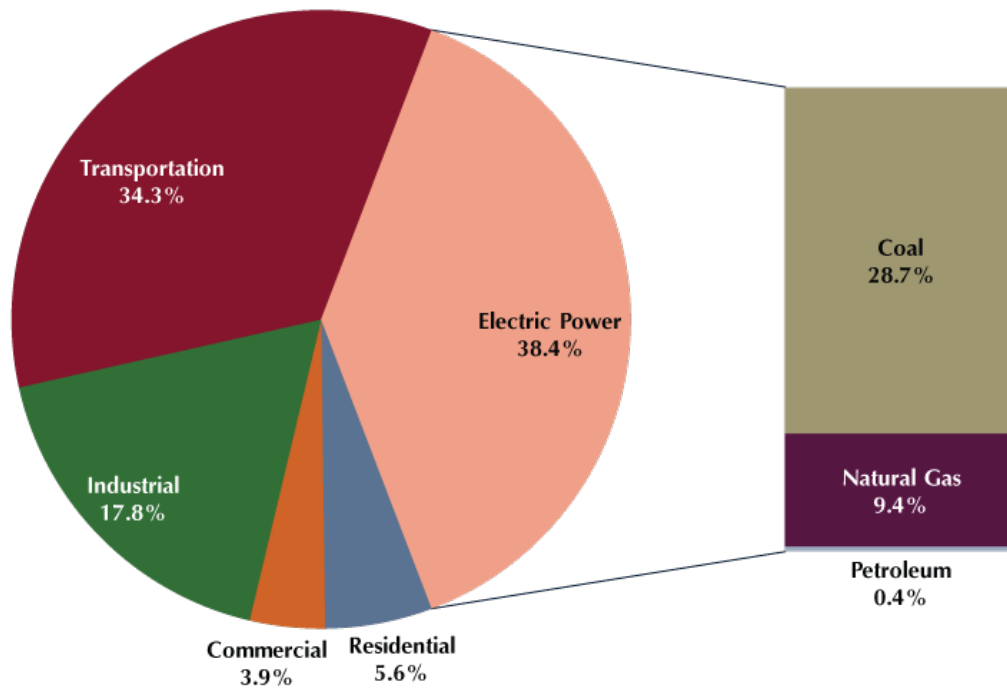


Figure 1: 2012 U.S. CO₂ Emissions. *Source: Energy Information Administration*

WHAT DOES THE STANDARD REQUIRE?

The proposed rules would set separate standards for power plants fueled by natural gas and coal. New, large plants (roughly 100 MW or larger) fueled by natural gas could emit no more than 1,000 pounds of carbon dioxide per megawatt-hour (MWh) of electricity produced, which is achievable with the latest combined cycle technology. Smaller natural gas plants, which tend to be less efficient and operate less frequently, would have to achieve a less stringent rate of 1,100 lbs CO₂/MWh. Coal plants would have two compliance options, either of which would require the use of CCS technology. Under one option, coal plants would have to begin using CCS soon after startup to achieve a 12-month average emission rate of 1,100 lbs CO₂/MWh. Alternatively, coal plants could begin using CCS within seven years of startup to achieve a seven-year average emission rate of between 1,000 and 1,050 lbs CO₂/MWh, with EPA inviting comment as to the final standard within that range. CCS is not yet in use at any commercial-scale power plants, but is currently being built into large coal plants in Kemper County, Mississippi and Saskatchewan, Canada. CCS technology is

also in place in several industrial facilities, some of which generate as much carbon dioxide as a commercial-scale power plant.

A handful of states already have greenhouse gas limits in place for electricity generation. California, Oregon, and Washington all have limits of 1,100 lbs CO₂/MWh. New York has a stricter limit of 925 lbs CO₂/MWh. If finalized, EPA's proposed standard would supersede the standards in California, Oregon, and Washington, while New York would be able to maintain its stricter standard since the Clean Air Act allows states to go beyond the federal standard.

WHAT ARE THE COSTS ASSOCIATED WITH THE PROPOSED STANDARDS?

EPA expects this standard to have negligible costs through 2022 (the intended time horizon of the standard), since very few new coal plants are planned, even without the proposed standard, and since developers of new natural gas plants should see minimal,

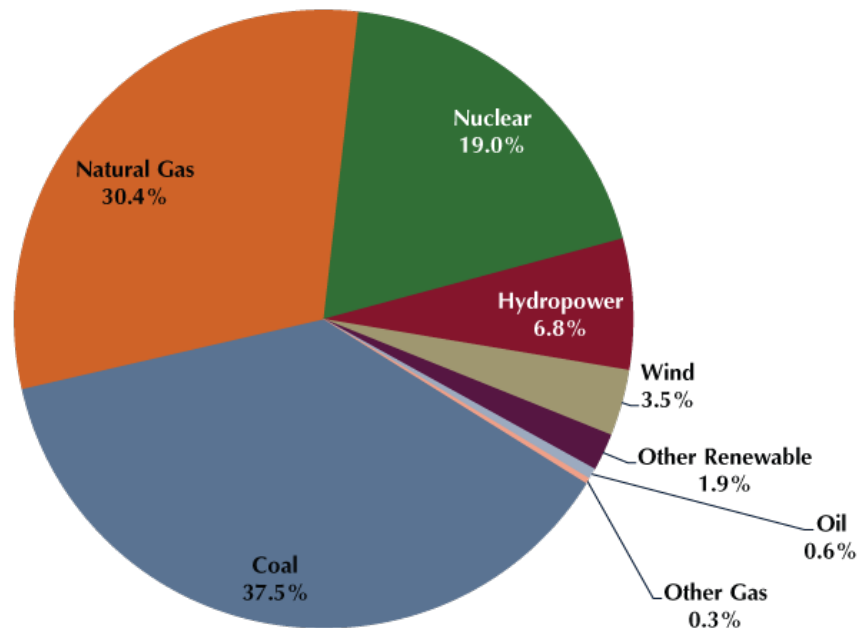


Figure 2: 2012 U.S. Electricity Generation. *Source: Energy Information Administration*

if any, additional costs.

If a developer chooses to build a new coal plant, the proposed standards could add considerable costs to the project because it will have to employ CCS technology. Since CCS technology is so new, especially for power plant applications, its costs are still high. However, as with any new technology, costs will come down as developers gain experience and new innovations are made.

WHAT EFFECT IS THIS PROPOSAL EXPECTED TO HAVE ON CARBON DIOXIDE EMISSIONS?

In the near future, the proposed standard is expected to have very little impact on emissions because so few new coal plants would likely be built even without the standard. Nearly all new fossil-fuel power plants in the planning stages will be fueled by natural gas, using generation technology that should be able to comply with EPA's proposed standards without any alterations. Power plant developers already have strong incentive to use the most efficient technology to maximize the amount of electricity that can be generated from each unit of fuel.

If a developer chooses to build a new coal plant, the

requirement that the plant install CCS technology within seven years will drastically reduce its emissions. Increased deployment of CCS technology at power plants will very likely drive CCS costs down and make it a more viable option at other new coal plants. Through experience and innovation, CCS costs may come down enough to be viable on new natural gas power plants, or as retrofits on existing coal plants, to reduce carbon dioxide emissions from the power sector even further.

HOW IS THIS DIFFERENT FROM THE STANDARD EPA PROPOSED IN 2012?

EPA's first proposal for limiting carbon emissions from new power plants was released on March 27, 2012. Under that proposal, all new power plants would have been subject to a uniform standard: 1,000 lbs CO₂/MWh. Under this standard, new coal plants would have been possible only if CCS technology were employed to capture an average of about 50 percent of CO₂ emissions over 30 years. However, EPA viewed combined cycle natural gas plants as the primary compliance pathway because it did not project a demand for any new coal plants in the near future regardless.

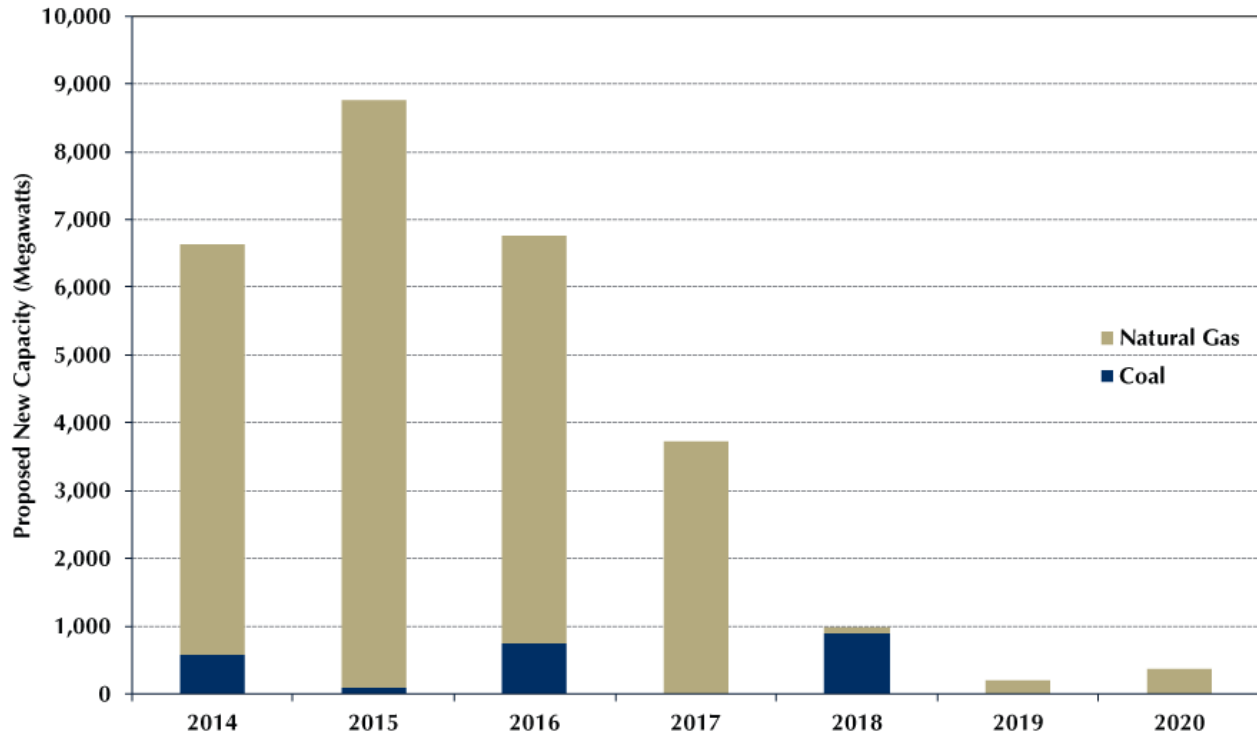


Figure 3: Proposed U.S. Fossil Generation Capacity. *Source: Energy Information Administration*

Many of the public comments received by EPA on its initial proposal objected to the unprecedented use of a single standard for both coal- and natural gas-fired plants. EPA has responded in its new proposal by including a separate standard for each fuel. However, since CCS would still be required for new coal plants, the net effect of the new proposal would be similar.

WHAT CAN POWER PLANTS DO TO REDUCE EMISSIONS?

New natural gas plants can reach the proposed CO₂ standard by employing the most efficient generation technology. In older steam turbine plants, natural gas is combusted to heat water, which creates steam to turn a turbine and generate electricity. These plants have thermal efficiencies of 30-35 percent, meaning about one third of the chemical energy stored in natural gas is converted to electricity. In contrast, new combined cycle combustion turbines more effectively take advantage of the energy in natural gas to operate with a thermal efficiency above 60 percent.

New coal plants, on the other hand, cannot achieve the proposed standard through efficiency alone. The most efficient type of coal plants, using ultra-supercritical boilers or integrated gasification combined cycle technology, can currently achieve a CO₂ emission rate of around 1,700 lbs/MWh. Thus new coal plants can only meet the standard through the use of CCS, which traps CO₂ exiting the plant, transports it, and injects it into an underground geological formation for permanent storage. New plants can either begin using CCS soon after startup, or begin using it later to reach a seven-year average emission rate between 1,000 and 1,050 lbs CO₂/MWh, which would require the capture of about 40 percent of CO₂ emissions. EPA is inviting comment on the appropriate point within this range to set the standard.

IF NEW COAL PLANTS MUST USE CARBON CAPTURE AND STORAGE TECHNOLOGY, WHAT WILL THAT MEAN FOR THE FUTURE OF COAL? HOW FAR ALONG IS CCS TECHNOLOGY?

Even if EPA were not moving forward with this standard, very few new coal plants would likely be built, in large part because of the availability of affordable natural gas. The Energy Information Administration lists only four potential coal plants between now and 2018, compared with more than 200 expected natural gas plants.

Today, there are nine active commercial-scale CCS projects at industrial plants around the world (six of them in the United States). The world's first two commercial-scale CCS power plants – Southern Company's coal-fueled Kemper County energy facility in Mississippi and the Boundary Dam Power Station in Saskatchewan, Canada – are under construction and expected to be completed in 2014.

Approximately 50 additional commercial-scale CCS projects in the power and industrial sectors are in various stages of development around the world.

HOW WOULD EXISTING STATE POLICIES, SUCH AS THE REGIONAL GREENHOUSE GAS INITIATIVE, BE AFFECTED?

The proposed standard for new power plants would likely be layered on top of existing state programs. For example, a new plant operating in the Regional Greenhouse Gas Initiative (RGGI) territory would have to achieve the proposed federal standard, and would also have to submit tradable emission allowances annually to comply with the requirements of RGGI.

HOW DOES THIS PROPOSAL RELATE TO EPA'S WORK ON A STANDARD FOR EXISTING POWER PLANTS?

Section 111 of the Clean Air Act requires EPA to regulate greenhouse gas emissions from new and existing power plants under two separate but related provisions. Section 111(b) requires EPA to set emission performance standards for new, modified, and reconstructed power

plants, while Section 111(d) requires EPA to set guidelines for existing power plants. The guidelines for existing power plants cannot be finalized until a final standard is in place for new power plants.

Section 111(b) vests relatively more authority in EPA, and is more straightforward. EPA is required to find emission-reduction technology that has been adequately demonstrated and use this to set federal, numerical performance standards that new power plants must meet. These Section 111(b) standards are implemented by the states, as are most EPA air rules, but states do not have much flexibility to alter the standards set by EPA. On the other hand, under Section 111(d), states have greater flexibility in how they implement the EPA standard. For instance, Section 111(d) allows for the possibility of market-based mechanisms to reduce emissions system-wide, rather than focusing on individual power plants.

HOW LONG WILL IT TAKE EPA TO FINALIZE THIS STANDARD?

President Obama's June 2013 memo to EPA directed the agency to propose standard for new power plants by September 2013, but did not set a deadline for finalizing the standard. Federal agencies typically have a year to finalize proposed regulations.

EPA must finalize the standard for new power plants before it can finalize its guidelines for existing power plants. Since President Obama set a deadline of June 1, 2015, for the final standards for existing power plants, this may effectively serve as the deadline for a final standard for new power plants.

UNDER WHAT AUTHORITY IS EPA REGULATING GREENHOUSE GAS EMISSIONS?

EPA is required by the Clean Air Act to develop and enforce regulations on greenhouse gases, much in the way it regulates other air pollutants. This authority was clarified in the U.S. Supreme Court decision in *Massachusetts v. EPA* (2007). The decision was a result of 12 states petitioning EPA to regulate greenhouse gases from new motor vehicles in 1999. The Supreme Court ruled that greenhouse gases meet the definition of air pollutants under the Clean Air Act and must be regulated

if these gases could be reasonably anticipated to endanger public health or welfare. Responding to the Court's ruling, EPA finalized an endangerment finding in December 2009. Based on overwhelming scientific evidence it found that six greenhouse gases, including carbon dioxide, constitute a threat to public health and welfare. Thus, it is the Supreme Court's interpretation of the existing Act and EPA's assessment of the scientific evidence that form the basis for EPA's regulatory actions.

Once any substance becomes a regulated pollutant under the Clean Air Act, certain other provisions of the Act automatically kick in. Greenhouse gases first became regulated under the Act with EPA's rule setting new standards for light-duty vehicles. This, in turn, triggered the requirement that major new or modified stationary sources be subject to a handful of Clean Air Act provisions, including Section 111(b).

HAS EPA REGULATED GREENHOUSE GAS EMISSIONS BEFORE?

Yes. In addition to its existing greenhouse gas standards for new light duty vehicles, EPA regulates greenhouse gas emissions from new, large stationary sources through a process called New Source Review (NSR). If a new emissions source, including a power plant, will emit above a certain threshold, it must acquire a permit to emit greenhouse gas. This permit will include a requirement that the source employ the Best Available Control Technology (BACT) to ensure it will take all feasible steps available to limit greenhouse gas emissions. BACT is set on a source-specific basis, and so far EPA has determined BACT for greenhouse gas emissions from power plants to be efficiency improvements. Once EPA's proposed NSPS is finalized, new power plants will have to comply with both this NSPS and NSR, as well as other permitting requirements already in place.



The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.