Mt. Storm Power Station, West Virginia (public domain photo)

In 2015, EPA set greenhouse gas emissions standards for new coal-fired and natural gas-fired power plants under the Clean Air Act's New Source Performance Standards program, Section 111(b) of the Act. These standards ensure that new plants can be built only if they incorporate state-of-the-art emissions controls. Unfortunately, in late 2018, the Trump Administration EPA proposed rolling back the coal plant standards. The looser standard would allow new plants to be built without using the most up-to-date pollution control technology, enabling the power sector to continue contributing to climate change even where new emissions are avoidable (see this excellent summary and critique by Romany Webb and Jessica Wentz of Columbia). Last week, Emmett Institute faculty filed comment letters on behalf of experts in two separate fields–electrical grid management, and the relationship between regulation and pollution control technology innovation–exposing some of the flaws in the new proposed standard. The standard seems to be designed to prop up coal's inevitably-declining share of the U.S. power market, rather than to protect grid reliability or to apply demonstrated technology to limit emissions.

The future of coal-fired power in the U.S. is bleak for reasons unrelated to EPA rules; cheap production of natural gas and falling costs of renewable energy make it uneconomical to invest in new coal plants, regardless of regulatory initiatives. But power companies may decide to try to site a new coal power plant anyway, for a variety of reasons. Performance standards for any proposed new plants present an opportunity to ensure they are built, if at all, only under conditions that sharply limit their potential to contribute to climate change and other pollution-related harms. These standards also present an opportunity to develop pollution control technology that may have value beyond a few specific plants they cover. In

this case, the 2015 standard presents an opportunity to encourage further development and market diffusion of carbon capture and storage (CCS)–one of several "negative emissions" technologies that would likely be necessary under any scenario that would limit emissions to a level that would avoid risks of a globally dangerous level of climate change. The new proposed standard would miss all these opportunities.

Here's how the standard works. By law, for any particular type of source (in this case, electrical generating units), EPA has to set an emissions standard for new plants at a level achievable through application of the "best system of emission reduction" that the agency determines has been "adequately demonstrated." In 2015, EPA set a standard for greenhouse gas emissions from new coal-fired power plants. The 2015 standard requires these plants to be designed to achieve emissions reductions equivalent to a state-of-the-art coal-fired power plant capturing 40% of its carbon dioxide emissions and ensuring they are never released into the atmosphere. As I noted in 2016:

> The standards are important when they were because they (1) ensure that new power plants can be built only with strict emission controls, (2) send a signal to other countries that the US is serious about GHG reductions, and (3) support development and diffusion of important technology including carbon capture and storage, both domestically and internationally.

My former colleague Megan Herzog provided an extensive analysis of the 2015 rule shortly after it was enacted. Megan noted:

> Clean Air Act § 111 requires EPA to establish greenhouse gas emission standards for fossil-fuel-fired power plants. These performance standards must "reflect[] the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the [EPA] Administrator determines has been adequately demonstrated" (§111(a)(1)). This standard is otherwise known as "BSER." Sources do not necessarily need to adopt the BSER, but they must meet the associated performance standard. Performance standards allow sources flexibility to pursue cost-effective compliance options, and encourage investment in technological research and development.

> Section 111 holds new sources to more stringent pollution-control standards than existing sources, reflecting Congress' recognition that new construction is the ideal time to implement pollution-control systems. Installing pollution-control devices in new construction is generally less costly than retrofitting existing plants, and costs can be amortized over the life of the plant. Additionally, because the new plant will be in operation for a long time, the Clean Air Act recognizes the importance of controlling emissions from the outset.

In late 2018, the Trump EPA reversed course, claiming that CCS technology is not adequately demonstrated, is cost-prohibitive, and inappropriately geographically limits siting of new coal power plants. The agency claimed that increased costs would deter coal power and thus have negative consequences on electricity supply. At the same time, EPA's basic analytical conclusion that generation is shifting away from coal–essentially, that new coal plants will continue to be uneconomical on the whole for reasons unrelated to this rule–remains unchanged.

On March 18, I submitted a comment letter on behalf of experts in technology innovation, diffusion, and pollution control, arguing that EPA's proposal to weaken these standards isn't based on sound analysis and does not meet the requirements of the law. The experts conclude that the prior standard, adopted by the agency in 2015, is the proper one. The law is intended to ensure that new plants adopt the best system of emission reduction that is adequately demonstrated, and the 2015 Rule meets that mandate by requiring emissions control achievable through partial carbon capture and storage, a technology that is already in use and will decline in cost and improve in performance with each successive application. Because the law has always been intended to promote the commercialization and diffusion of cutting-edge technology, EPA should not replace the existing standard with a weaker standard based on readily available technology that is not the best system. The commenters conclude that the new Proposed Rule, which incorporates only outdated efficiency improvements and not partial carbon capture and storage, is arbitrary and capricious.

I filed the letter on behalf of five academic researchers with deep expertise in technology innovation and regulation: Nicholas Ashford of MIT, Ed Rubin and Granger Morgan of Carnegie Mellon, Chris Frey of North Carolina State, and Margaret Taylor of Lawrence Berkeley National Laboratory. My clients are experts in the relationship between regulation and the innovation and diffusion of new technology, and in how the costs of new pollution control technology lessen as technology commercializes and is adopted by new users in new applications. They have shown in their research that regulation drives technological innovation and use of cutting-edge technology in the pollution control sector, when that

regulation requires plants to meet emission standards that force adoption of the most stringent controls available. They have also shown that the cost of implementing the technology decreases as a technology matures and becomes available for implementation. That cost continues to decrease with further commercial application over time. The experts have concluded that CCS is the appropriate system from which to derive new performance standards for coal-fired power plants. (The comment is adapted from a brief we filed in the appeal of the 2015 standard.) From our letter:

> EPA's 2015 final rule establishing New Source Performance Standards ("NSPS") for carbon pollution from fossil-fuel fired power plants properly determined that partial CCS is the best system of emission reduction, both because it is a demonstrated technology and because the costs are reasonable. CCS is presently used in multiple sectors, and as of 2015 was already fully demonstrated in commercial electric power applications. The 2015 Rule set a numerical performance standard based on the level of emission reduction achievable with the application of partial CCS. The 2015 Rule created incentives to advance and diffuse CCS technology, and to innovate by developing and applying other technologies that can achieve the same or deeper carbon dioxide emission reductions. EPA found in 2015 that CCS had been adequately demonstrated. The agency also found it to be cost-effective, based on analysis of the projected costs of deployment of the technology.
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> EPA's 2015 analysis was not only reasonable, but was conservative since it did not fully take into account the expected decline in future cost to implement the technology. In addition to reducing pollution directly, stimulating increased adoption of CCS will lead to a decline in capital and operational costs associated with the technology, similar to declines the experts have documented in the cost of other pollution control technologies fostered by previous EPA regulations. This decline has already been documented in CCS applications since the adoption of the 2015 Rule.
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> The development and implementation of technology is an iterative process that has multiple stages and depends on various conditions. The commenters have studied that process in the pollution control context. They and others in their field have observed that pollution regulation stimulates innovation and deployment of technology to meet that standard, which leads to design and operating improvements, which reduce costs further. Regulators and policy experts often rely on the cost reduction trajectories, or "learning curves,"

> documented from comparable technologies when assessing the possible future cost trajectory of a technology. Here, EPA found in 2015 that both capital costs and the levelized costs of electricity were not exorbitant, based on a sound analysis of the costs for the next commercial application of CCS technology. Based on the commenters' analysis of the history of pollution control technology diffusion and related regulation and cost dynamics, costs are likely to decline substantially further over time.
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> Congress intended that Section 111 standards reduce emissions to the maximum practicable degree and reflect the latest available pollution control methods. The D.C. Circuit has upheld such standards before. Technology need not have actually been adopted by sources prior to a standard's enactment so long as it will be available to new sources. Here, EPA's 2015 standard, based on adoption of partial CCS, is consistent with that statutory purpose and legal precedent. CCS has been adopted by existing sources, and it is also available to new sources.
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> In light of the appropriateness of the BSER EPA set in the 2015 Rule, the new Proposed Rule, which incorporates only efficiency improvements and not adoption of CCS, is arbitrary and capricious. EPA cannot reasonably determine that the "best system of emissions reduction" is an outdated system that achieves substantially less emission reduction than the 2015 standard.

My colleagues Cara Horowitz, Ann Carlson, William Boyd, and Nat Logar filed comments on the same proposed rule on behalf of a group of experts in the management of the electrical grid. While Nat will be posting about their letter shortly in more detail *(update: Nat has explained this comment letter in more detail* here), I'll excerpt the top-line conclusions here:

> Two aspects of the NSPS proposed rule particularly trouble us and, in our view, fail to reflect fundamental characteristics of electricity grids and their operations.
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> First, the EPA argues that identifying CCS as BSER would increase the cost of new coal-fired EGUs to a degree that harms their place in the dispatch order, reduces fuel diversity, and adversely affects the supply of electricity. [citation omitted] But as the EPA's own analysis states, generation will shift away from coal regardless of this proposed rule. [citation omitted] We argue that grid operations and the supply of electricity have not been harmed by recent growth

> in non-coal sources and will not be harmed by the continuation of the 2015 rule. EPA has misevaluated the underlying costs of CCS. Abandoning CCS as BSER in an effort to stimulate investment in coal generation is unnecessary and unwise, because the grid has shown itself to be capable of shifting generation to cheaper, cleaner resources.
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> Second, the EPA argues that CCS is not as viable as it found in 2015 because of uncertainty about the geographic availability of geologic storage for CO2. [citation omitted] But in making this argument, the EPA does not sufficiently account for grid interconnectedness. Due to the interconnected nature of the grid, new plants could be sited taking the availability of geologic resources into account, while still serving load in locations where geologic sequestration resources are scarcer.

Both our letters include ample detail to support the experts' analysis and conclusions. In the end, the new EPA proposal is impossible to see as a good-faith attempt to support future electrical power reliability. As my colleagues note in their letter, "EPA's concern for diversification appears to be, in fact, a loosely disguised concern for maintaining coal's dominant market share. This has never been a goal of state or federal energy regulators, much less environmental regulators."