This post is the second in a mini-series (see first post) exploring likely legal challenges to the New Source Performance Standard (NSPS) for power-plant greenhouse gas emissions under Clean Air Act § 111(b), and how those challenges might affect the Clean Power Plan.

In my first post on EPA’s New Source Performance Standard (NSPS) for greenhouse gas emissions from new and modified fossil-fuel-fired power plants, I described the content of the final rule, introduced the general controversy over CCS, and explored some of the legal arguments regarding whether carbon capture and sequestration (CCS) technology is “adequately demonstrated” within the meaning of Clean Air Act § 111.

In order for EPA to use CCS as the basis for developing greenhouse gas emission performance standards, **§111 also requires EPA to determine that CCS is the “best” available system of emission reduction for coal-fired power plants, considering costs.** In this post, I dig into likely legal challenges related to the cost of CCS technology.

The cost of CSS technology is a major source of concern for industry opponents of the NSPS—and one of the biggest potential weaknesses of the rule. In determining whether a system of emission reduction is the “best,” EPA must take into consideration whether the cost of achieving the resultant standard would be “excessive” or “exorbitant” (*Sierra Club v. Costle*, 657 F.2d 298, 343 (1981); *Lignite Energy Council v. EPA*, 198 F.3d 930, 933 (D.C. Cir. 1999)). Notably, §111 grants EPA considerable discretion in deciding how to consider costs. Courts have historically deferred to EPA’s selection of a cost-calculation methodology unless costs are unreasonable.

The proposed NSPS for coal-fired power plants, **1100 lbs CO_2/MWh**, was more stringent than the final version. The National Mining Association argued that the cost of achieving the proposed standard with CCS would be “so exorbitant that this factor alone disqualifies the technology as BSER for coal-fired EGUs.” After receiving many other comments raising concerns about the cost of CCS technology, EPA loosened the final performance standard to

1400 lbs CO_2/MWh. EPA believes that the final standard should be "implementable at reasonable cost" (NSPS p. 16), either through installation of CCS technology that captures and stores approximately 16-23 percent of the CO_2 produced at the plant, or through co-firing with natural gas. EPA projects that implementing partial CCS would increase the capital costs of a supercritical pulverized coal (SCPC) plant by **21.7 percent** (p. 260). EPA notes, however, that utilizing captured CO_2 for enhanced oil recovery or other industrial applications can reduce net costs. EPA also projects that compliance costs will decrease as more facilities incorporate CCS (p. 285-88).

Opponents maintain that EPA has failed to consider cost impacts adequately, with some even going so far as to argue that the costs of meeting the performance standard will "effectively ban the construction of new coal-fired power plants." Furthermore, opponents claim, these costs "will be reflected in higher prices for consumers. Because everything Americans use and produce requires energy, consumers will take hit after hit. . . . The result is fewer opportunities for American workers, lower incomes, less economic growth, and higher unemployment."

In litigation, the D.C. Circuit (and likely the Supreme Court) will have to determine whether the projected NSPS compliance cost projections are commercially reasonable for the coal industry. This raises a fundamental question: what is a reasonable cost for controlling greenhouse gas emissions from new coal-fired power plants?

What is a Reasonable Capital Cost Increase for the Coal Power Sector?

Coal-fired power plants are very capital-intensive. Some opponents argue that EPA failed to consider properly how the NSPS will influence capital costs. EPA argues in the final rule that the anticipated costs of the greenhouse gas NSPS are similar to those of its past NSPS rules, which the D.C. Circuit has upheld. For instance, in 1971, EPA estimated that a new NSPS requiring coal-fired power plants to control particulate matter, sulfur dioxide, and nitrogen oxide would increase capital costs by **15.8 percent**. The D.C. Circuit confirmed that these costs were reasonable (*Essex Chem. Corp.*, 486 F. 2d at 440). And EPA's 1978 NSPS for coal plants required pollution controls that increased capital costs **10-20 percent** (p. 258). According to EPA, this history demonstrates the coal power sector's capacity to absorb capital costs on the magnitude of those presented by the greenhouse gas NSPS (pp. 249, 257). Notably, though, the estimated cost of implementing CCS to meet the greenhouse gas NSPS is somewhat higher than the cost of historical rules.

Opponents further claim that EPA "fails to discuss in a realistic manner the issue of whether control costs can be passed on to consumers." In its comments on the proposed rule, the

industry group CCS Alliance points out that in some states, developers of new power plants can no longer assume that they will be able to recover capital costs from customers through set rates, and must instead obtain capital financing with the assumption that the new facility will sell power at competitive rates on the wholesale market. And in other states where utilities can still recover costs through a set rate of return, state public utility commissions typically require utilities to justify the costs of a new capital investment against other alternatives. This regulatory context is the result of federal and state legal changes in the late 1970s-1990s that helped to encourage competition in the electricity generation market. Opponents argue that this differentiates the current greenhouse gas NSPS from the NSPSs of the 1970s.

I suggest that we need to zoom out even further. Opponents’ arguments about capital cost increases must be understood in the broader context of America’s changing energy system. The electric sector is in the midst of a major transformation, even without considering the NSPS and the Clean Power Plan. Coal has historically been the primary fuel for electricity generation in the United States; but much of our aging generation fleet is on the verge of retirement. Recently, natural gas and renewable resources such as solar and wind have consumed a larger portion of utility portfolios because they are often cheaper, more efficient, and cleaner than coal. Additionally, many states have Renewable Portfolio Standards that require investments in renewables. Utilities are also increasingly turning to energy efficiency and electricity demand management instead of sinking capital into new infrastructure. Distributed generation and storage assets are challenging utility monopolies. With technological and management innovations, utilities may no longer necessarily need to rely on one massive coal or nuclear plant to provide baseload power at a constant rate. Meanwhile, federal and state environmental and climate policies have helped to promote natural gas and renewables as cleaner alternatives to power the grid. The upshot is that over the past fifteen years, **natural gas and renewables have accounted for about 90 percent of new U.S. electric generating capacity** (p. 71).

Opponents of the NSPS contend that in deciding whether CCS costs are reasonable, EPA should be comparing the cost of a new coal-fired power plant with CSS to the cost of a new natural gas combined cycle (NGCC) power plant. But regardless of the NSPS, “[n]umerous studies have predicted that few new fossil fuel-fired steam generating units will be constructed in the future” (p. 18). It makes no sense to talk about new CCS-equipped coal plants competing with natural gas and renewables on the wholesale energy market when a typical coal plant today is not competitive even without CCS.

Nonetheless, EPA recognizes that even if natural-gas-fired power plants and renewable resources are cheaper and cleaner than coal-fired power plants, utilities “may be willing to

pay a premium” for coal units for the purposes of achieving fuel diversity, as a hedge against possible rising gas prices, or to co-produce chemicals (p. 273-74). Thus, EPA concluded that it is appropriate to compare the cost of new coal plants to other non-gas alternatives that a utility seeking fuel diversity might consider: nuclear or biomass plants (p. 269). EPA determined that a SCPC plant with partial CCS is similar in cost to a new nuclear or biomass plant (p. 183), and therefore reasonable in cost.

Some opponents have pointed out that comparing coal to nuclear is not “an apples-to-apples comparison since a new nuclear plant . . . has no carbon, while a partial CCS coal plant still has significant carbon emissions.” But of course, there is no such thing as an apples-to-apples comparison when it comes to comparing electric generating resources. For example, nuclear also has none of the conventional air pollutant emissions that characterize coal, but it does face unique permitting and siting challenges. And renewable electricity resources have their own technical, financing, and siting limitations. Utilities and other developers take a lot more than just capital cost and carbon emissions into consideration when planning their resource portfolios.

All of this said, it cannot be denied that the projected costs associated with the BSER are substantial—higher than the most expensive new source standards that EPA imposed on the power sector in the past, and perhaps expensive enough to seem “excessive” to a reviewing court. Section 111 is aggressive in seeking pollution reductions, but Congress did not intend to cripple regulated sectors. EPA’s cost modeling suggests that coal with partial CCS will still be competitive with other non-gas resources, arguably in keeping with Congress’ intent that costs be commercially reasonable. And EPA predicts that costs will drop over time as more facilities adopt CCS and the technology develops. But should EPA’s cost predictions be trusted?

Model Predictions vs. Real-World Costs

Opponents have criticized EPA’s use of economic models to estimate costs, emphasizing that EPA can point to few existing or under-construction coal plants with CCS in the real world. Industry is concerned, for example, that models do not adequately consider the costs associated with finding a suitable geologic area for sequestration, resolving uncertainties related to subsurface property rights, permitting a sequestration well and pipeline, constructing a pipeline, and developing sequestration wells. Opponents have raised various other technical objections to EPA’s chosen cost estimates and methodologies, which I will not get into in detail here. The main thrust of industry’s arguments is that EPA should be using the *real* costs at proposed and under-construction coal CCS facilities and demonstration projects, rather than model estimates, to predict compliance costs. Real-

world CCS projects have a history of running notoriously over-budget. For instance, the CCS-equipped Kemper facility cost $6.2 billion, making it one of the most expensive power plants ever built (although EPA blames cost overages on the IGCC technology rather than the CCS technology (p. 315)).

EPA admits that the real costs of large-scale projects “appear to be consistently higher than those projected by techno-economic models.”

> However, the costs from these full-scale projects represent first-of-a-kind (FOAK) costs and, it is reasonable to expect these costs to come down to the level projected in . . . technoeconomic studies for the next new projects that are built . . . . (p. 312).

In other words, EPA presumes that the NSPS will make CCS cheaper than it is now by “further boost[ing] research and development in CCS technologies” (p. 19). EPA draws on experience with other pollution-control technologies, where regulatory requirements drove cost reductions.

But opponents have perversely argued that the NSPS will stifle CCS technological development. According to industry, because the standard will deter the construction of new coal plants, there will be few to no new coal plants with CCS, and therefore less research and development. Thus, any new coal plants would still reflect first-of-a-kind technology and current real-world costs. As one coal industry group describes:

> By requiring CCS prematurely, EPA’s proposed NSPS will serve as a de facto ban on new coal plants. Without new coal plants, second generation CCS demonstration projects will not go forward. Without second generation CCS demonstration projects, CCS costs will remain high, performance will remain uncertain, and commercial availability will be limited.

Opponents maintain that “CCS is not a ‘pull me’ technology”—meaning that new regulations would not influence technological development. They say this is in part because the electricity market is not made up solely of coal-fired power plants; if pollution control for a coal plant is too expensive, a utility can simply opt to generate power from another resource, avoiding CCS research and development altogether.

Industry's sweeping predictions about the perverse effects of the NSPS are hard to swallow. First, few to no new coal plants are in the works anyway. Second, EPA cites utility statements and modeling indicating that any new coal-fired power plant built between now about 2030 likely would have carbon-emission controls anyway, even in the absence of the NSPS (pp. 28-29). A number of states (including California) have emission performance standards that limit the amount of carbon any new power plant can emit. NGCC plants can already meet these performance standards, but as coal combustion is generally more carbon-intensive than natural-gas combustion, a new coal-fired power plant would have to implement CCS to comply. Other environmental and climate policies are pushing in the same direction. Additionally, coal plants may be constructed specifically for the co-benefit of harvesting carbon for industrial activities such as enhanced oil recovery, and therefore would have CCS anyway. The market for captured carbon is growing.

In any case, regardless of what happens in the United States, CCS technology is developing around the world. The list of under-development international projects that EPA cites is telling. Demonstration projects, industrial projects, and retrofits of existing facilities here and abroad will help to move the technology down the cost curve even if no new utility coal plants are constructed in the United States.

Still, it does not help EPA's case that opponents can cite to the extraordinarily high costs of past CCS projects to bolster their argument that EPA is out to kill coal, while EPA must rely on cost projections and tales of past pollution-control victories, which, however compelling, do not seem entirely parallel to the CCS story. EPA should receive *Chevron* deference from a reviewing court; but as I noted in my prior post, courts' application of *Chevron* is not always predictable where greenhouse gases are involved. Legal arguments related to costs are likely to be technical, which might favor EPA as the expert agency. But if industry is able to convince a court that CCS costs are exorbitant and extraordinary for an industry that has played such a key role in the U.S. economy and history, a court might be willing to toss out EPA's cost methodology altogether. To sway the courts, EPA will need to tell an equally persuasive story about the evolution of the power system and the history of technology-forcing pollution regulations, and frame CCS in this context as eminently reasonable. The NSPS recognizes that for a variety of reasons, the power system is moving toward lower-carbon power sources and CCS for coal; therefore, an NSPS that did not contemplate CCS for coal-fired power plants would represent a step backward from business as usual. Emission-control standards should always be propelling industry forward. It remains to be seen whether a court will see EPA's new source rule as well within that tradition, or an abuse of EPA's administrative authority that imposes unreasonable burdens on utilities.

Stay tuned for my next post in this mini-series, which will explore EPA's rejection of

CCS in determining the best system of emission reduction for natural-gas-fired power plants.