



CLEAN AIR REGULATIONS THE ELECTRICITY SECTOR

*By Karen Palmer,
Dallas Burtraw,
Anthony Paul,
Blair Beasley,
and Matt Woerman*

*Will historic air
pollution regulations
have dramatic effects
on electricity prices and
the generation mix?*

*No, but cheap natural gas
and falling demand might.*

Two decades of air pollution rulemaking culminated last year with two landmark regulations aimed at controlling emissions from the electricity sector. One of these, the Cross-State Air Pollution Rule, would have controlled emissions of nitrogen oxides (NO_x) and sulfur dioxide (SO₂)—ingredients in smog, acid rain, and fine particulate pollution associated largely with burning coal—in the eastern half of the country. On August 21 this regulation was overturned by the DC Circuit Court of Appeals. In its place remains the Clean Air Interstate Rule. Meanwhile, also in effect while under court review are the Mercury and Air Toxics Standards. These set national emissions rates for acid gases and heavy metals, most notably mercury, which has been regulated

in industries outside the electricity sector for decades.

The scope of the new rules is such that segments of the electricity industry are expressing significant concerns about the cost of complying and the potential for the regulations to cause reliability problems. Some fear that many coal-fired power plants will opt to shut down instead of investing in expensive pollution controls, leading to electricity shortfalls. Others worry the rules will cause short-term reliability problems if large numbers of power plants temporarily go offline to install new pollution controls. And the apprehension that electricity prices will skyrocket or utility profits will plummet has fueled industry

criticism of the new regulations.

These concerns are largely misplaced, according to our analysis, using Haiku, RFF's sophisticated national electricity sector simulation model. The regulations do have a cost: they require power plants to invest in expensive technology upgrades. But even if both new rules were implemented, we find that by 2020, retail electricity prices increase by just 1 percent as a result of the two rules combined, and neither rule creates a substantial decrease in generating capacity.

Dwarfing the effects of the regulations are two long-term market trends: a drop in the growth rate of electricity demand and falling natural gas prices as new technologies enable the economical extraction of gas from domestic shale reserves. These trends

have profound impacts for the electricity industry and for expectations regarding the effects of environmental policy.

Effects on the Power Sector

The rules will lead to substantial new investment in pollution controls at existing coal-fired facilities. By 2020 the two rules would lead to the introduction of new pollution controls at about 220 gigawatts of coal-fired capacity, or roughly two-thirds of the existing coal-fired fleet. We estimate that these investments come at an annual capital cost of \$6.6 billion (in 2009 dollars) if both regulations are implemented, an increase of 39 percent over pollution control capital costs in the baseline scenario.

The costs of compliance have led to speculation that many coal-fired generators

The New Regulations

The US Environmental Protection Agency (EPA) finalized its Cross-State Air Pollution Rule on July 6, 2011. Under the rule, electricity generating units in 28 states in the eastern half of the country are required to significantly reduce air pollution that crosses state lines, including SO₂ and NO_x emissions. The rule allows unlimited intra-state trading of pollution credits between power plants and limited interstate trading. The first phase of compliance would have begun in January 2012, with a second phase of SO₂ reductions scheduled to begin in 2014. On August 21, the US Court of Appeals for the DC Circuit overturned the rule, and an EPA decision about whether to appeal the decision is pending.

In late 2011, EPA also finalized its Mercury and Air Toxics Standards for power plants. The rule requires new and existing coal- and oil-fired units to reduce emissions of heavy metals—including mercury, arsenic, chromium, and nickel—and of acid gases, such as hydrogen chloride and hydrogen fluoride. The rule allows for power plants to use a range of technologies to meet the standards. Existing sources must comply within three years, but sources can obtain an additional year from state permitting authorities if needed to complete retrofits. As a result, most plants will have until 2016 to comply. Units that play an important reliability role also can apply for an administrative order to obtain an additional year to become compliant. The rule is being challenged in the courts. And in July 2012, EPA announced that it would reconsider portions of the rule addressing new power plants. The agency is not reconsidering the rule for existing sources.



will shut down in lieu of making pollution control investments, reducing the capacity of the power system. However, we find that neither the mercury standards alone nor the mercury standards plus the Cross-State Air Pollution Rule lead to substantial changes in existing capacity. The court's rejection of the Cross-State Rule does not affect our results because the court left in place the Clean Air Interstate Rule, which we also have in place as a backstop. We expect coal capacity to fall by about 1.5 percent in 2020 under both policy scenarios. Natural gas capacity changes even less. Most striking, these reductions are small compared with anticipated changes in capacity stemming from recent projections for lower natural gas prices and reduced electricity demand growth.

We estimate total annual costs in 2020 for consumers and producers are \$7.1 billion under the mercury scenario and \$6.6 billion under both regulations. An unusual aspect of the regulatory environment is the distribution of costs between consumers and producers. Whether the Mercury and Air Toxics Standards are implemented independently or alongside the Cross-State Air Pollution Rule, consumers pay for about 70 percent of the costs associated with the regulations and producers pay the other 30

percent through 2035. While this division suggests that consumers pay most of the costs, their share is actually less than one would usually expect from environmental regulation.

The reason for this division is the complex interplay among technology, allowance prices, and retail electricity prices faced by consumers. Because the regulations require power plants to invest in pollution control technologies, emissions of SO_2 and NO_x fall, lowering the demand for associated allowances and therefore their price. For example, the mercury rule completely eliminates the need to purchase SO_2 allowances by the year 2020, representing a \$7.3 billion cost savings.

But because the allowances are given for free to coal-fired power plants, they will not save the \$7.3 billion. Instead, consumers capture the lion's share of the benefit from the reduction in allowance prices through its effect on retail prices for electricity. The opportunity cost of using allowances is part of the variable cost of operating the plants, so as this cost falls when allowance prices fall, consumers face lower prices.

On net, the electricity price reductions from the savings in allowance costs almost fully offset the price increases from expanded investment in pollution controls, yielding

a very slight increase in national average prices under both scenarios compared with the baseline. In 2020, the national average electricity price will rise by about 1 percent, from \$88 per megawatt hour in the baseline to \$89 in the scenario without the Cross-State Air Pollution Rule, with an even smaller change when both regulations are in place.

Producers, on the other hand, will experience significant effects from the regulations in the form of reduced revenue due to the decline in allowance value. Overall, we find producer profits at existing generation facilities fall in 2020 by \$3 billion to \$5 billion under the policy scenarios.

Market Trends

Whether one thinks these effects are significant or not, they pale in the context of trends in fuel prices and electricity demand that are already changing the power sector. A key element is the game-changing nature of newly accessible shale gas reserves. Recent technological innovations have enabled extraction of natural gas from shale formations that was formerly uneconomic and changed the economics of electricity generation, favoring natural gas and disadvantaging coal. Lower prices for natural gas also tend to reduce wholesale electricity prices, thereby lowering the profitability of electricity supply for non-gas generators, including coal generators.

These effects have already begun to be realized; the US Energy Information Administration has noted a 16 percent increase in daily consumption of natural gas by electricity generators in the summers between 2008 and 2010, and in March 2012, coal's share of total generation had fallen to 34 percent compared with just under 50 percent in 2009. Coincident with gas price declines, electricity demand projections also have been falling as a dual consequence of the recession and expected increases in

end-use energy-efficiency investments.

These trends have implications for present and future electricity generator revenues and profits. Our analysis shows that the changes between 2009 and 2011 in projections of natural gas supply and electricity demand have a much bigger effect on electricity prices, total generation, and generation mix than does the introduction of the Cross-State Air Pollution Rule or the Mercury and Air Toxics Standards. For electricity prices, these secular changes drive effects that are generally more than five times greater than the effects of new regulation. That multiple is even bigger when comparing the effects on electricity consumption and generation from coal. Industry, policymakers, and the public will want to distinguish these effects from those of environmental regulation when evaluating the consequences of regulation.

The one outcome these regulations affect more is emissions. Introducing the Cross-State Air Pollution Rule leads to a substantially larger reduction of SO₂ emissions than do the changes in demand and natural gas prices. Similarly, introducing the Mercury and Air Toxics Standards leads to a substantial reduction in mercury emissions from electricity producers. Emissions of mercury are expected to fall by almost 80 percent and emissions of SO₂ are expected to fall by 27 to 34 percent in 2020 under the different policies. These important reductions come with apparently little disruption to the sector, especially in comparison with the disruptions associated with a changing world resulting from trends in fuel prices and electricity demand. ●

FURTHER READING

- Burtraw, Dallas, Karen Palmer, Anthony Paul, Blair Beasley, and Matt Woerman. 2012. Reliability in the Electricity Sector under New Environmental Regulations. Discussion paper 12-18. Washington, DC: Resources for the Future.
- Burtraw, Dallas, Karen Palmer, Anthony Paul, and Matt Woerman. 2012. Secular Trends, Environmental Regulation, and Electricity Markets. *The Electricity Journal* 25(6): 35-47.