



By Robert N. Stavins

## What is the Future of U.S. Coal?

Climate concerns have gone mainstream. If this was not obvious from last year's *Time* magazine cover story, it should be clear from the recent cover story in *Sports Illustrated*, not to mention the omnipresence of discussion about Al Gore's award-winning movie. Each of these were misleading from an economic and policy perspective, but each illustrates that concerns about global climate change are now mainstream and widespread. Such concerns have been reflected in U.S. policy debates, as well as the statements and actions of a number of business leaders, including calls for economy-wide climate regulation, the TXU buyout plan, and AEP's announcement in March to build coal plants with capacity for carbon capture and storage, also called CCS.

At the center of attention in the United States is "the future of coal," as demonstrated by a recent MIT study with that title, authored by John Deutch and Ernest Moniz, as well as several reports issued by the Energy Information Administration.

CO<sub>2</sub> emissions from coal consumption accounted for 30 percent of U.S. greenhouse gas emissions in 2005, and nearly all result from coal's use in generating electricity. According to EIA forecasts, the vast majority of coal demand over the coming decades will be from existing power plants, with the current fleet of plants still account-

ing for two thirds of total demand in 2030. Therefore, while much attention has been given to how climate policy and technological advances may affect new power plants, over the next two decades a policy that affects both existing and new coal-fired generators would have far greater impacts than a policy that affects only new ones.

Potential climate policies can be grouped into four major categories: standards, subsidies or credit-based programs, carbon taxes, and cap-and-trade. The cost of retrofitting existing plants to meet CO<sub>2</sub> emission standards would likely be so high that standards could be imposed only on new plants. While such standards may dampen investments in new coal-fired power plants — as they may require CCS at any new coal plant — standards would be unlikely to affect operations of existing plants.

In fact, by increasing the cost of new plants, such standards can encourage utilities to extend the life of existing plants. Hence, new source standards hold little promise in this domain. Likewise, while subsidies or credit-based programs — including renewable portfolio standards — may displace some new coal-fired generation with other types, they will have little, if any, effect on the operation of existing coal-fired plants. And carbon taxes are opposed by the regulated community because of the additional costs, and are opposed by environmentalists because of the political challenges.

A cap-and-trade system would cover both new and existing emission sources, and could have a more pervasive effect on coal use than standards, subsidies, or credit-based programs. For this and other reasons, most policy attention in the United States has been focused on potential cap-and-trade programs.

Coal combustion generates the most CO<sub>2</sub> emissions per unit of energy among common energy sources. As a

result, a cap-and-trade system's effect on the cost of coal use would be significantly greater than its effect on the cost of using gasoline or natural gas. For example, a \$100 per ton of CO<sub>2</sub> allowance price would increase the average cost of electricity generation from coal-fired power plants by 400 percent, the average cost of electricity generation from natural gas plants by 100 percent, and gasoline prices by \$1.00 per gallon.

The competitiveness of conventional coal-fired electricity generation relative to other technologies diminishes as the stringency of an emissions cap increases. Therefore, much attention is being given to opportunities to employ CCS. Three important caveats should be considered. First, it is likely that CCS will be economically practical only for new plants, and only when

CO<sub>2</sub> allowance prices reach the range of \$25–40 per ton. Second, there is significant uncertainty about the cost of CCS, because it has not yet been commercially demonstrated. And third, CCS significantly reduces, but does not eliminate, CO<sub>2</sub> emissions from coal-fired generation.

In light of the growing momentum toward a mandatory U.S. climate policy, the anticipated impacts of such policies on coal use are an important issue. But the remaining uncertainties are great. Impacts of a climate policy on coal use will depend upon the type of climate policy employed, the stringency of the policy, the future price of natural gas, the future cost and penetration of nuclear and renewable technologies, and the cost of coal-fired generation with carbon capture and storage technologies.

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