

Potential Coal Plant Retirements: 2012 Update

Executive Summary

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In this study, we have revised our previous coal plant retirement analysis to reflect the most recent market and regulatory outlook facing coal plants, which have changed substantially since we last studied the potential for coal plant retirements in December 2010. The decrease in spot and forward gas prices combined with low demand for power have caused projected energy margins and the cost of replacement power to decrease, altering the economics for coal units towards retirement versus retrofit decisions. On the regulatory front, two of the major Environmental Protection Agency (EPA) rules (CSAPR and MATS) were finalized with less restrictive requirements on the compliance deadlines and equipment than previously predicted. More recently, a federal court order vacated the CSAPR, adding an increased level of uncertainty regarding the timing and requirements under a potential future proposal by the EPA. This recent ruling may increase the role of the EPA's existing Regional Haze Rule for coal-fired plants in the Eastern Interconnect. In addition, the EPA's proposed 316(b) rules on cooling water intake structures were less onerous than some predictions, with no universal requirement to install cooling towers.

As of July 2012, approximately 30 GW of coal plant capacity (roughly 10% of total coal capacity) had announced plans to retire by 2016. Some of these announcements may be reversed if market conditions improve for coal plants, but it appears more likely that about that much of capacity in additional units will join the retirement list if the currently foreseen market conditions persist over the next few years.

Key Findings:

- ◆ The current market outlook involves natural gas forward prices at Henry Hub reaching \$4.30/MMBtu (2012 dollars) by 2016. We analyze coal plant economics assuming gas prices grow from \$4-5/MMBtu in 2015 to \$6-8/MMBtu by 2025 in real terms.
- ◆ Recognizing ongoing environmental policy uncertainty, we consider two scenarios for required environmental control technology, which we refer to as "lenient" and "strict." They differ primarily in whether SNCRs or SCRs are needed. Both have an assumed compliance deadline of 2016. We find that 59 GW to 77 GW (for lenient versus strict scenarios, respectively) of coal plant capacity are likely to retire instead of retrofit with environmental equipment. These retirements occur absent any future regulations restricting carbon emissions.
- ◆ Retirement projections are very sensitive to future market conditions and potential future climate policy:
 - *Our range of projected retirements drop to 21-35 GW if there were a \$1/MMBtu increase in gas price (relative to current forwards) and increase to 115-141 GW with a \$1/MMBtu decrease in gas price. Note that this very substantial level of retirements corresponds to 36-45% of the existing coal fleet, enough to likely cause reliability issues if not countered by rapid development of replacement power (or by supplemental capacity revenues of some kind to sustain more of these coal plants).*

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- *In contrast, the strict versus lenient environmental rules scenarios only change our projection by 18 GW (59 GW in the lenient case versus 77 GW in the strict case that requires more SCRs). Thus, gas prices are a much more significant influence on retirements than the stringency of the remaining regulations.*
 - *With a flat \$30/ton CO₂ price starting in 2020, the base case projected retirements (under environmental regulations) increase to 127-149 GW.*
- ◆ Our base case retirements (under environmental regulations) induce enough change in regional supply curves that wholesale spot prices are likely to increase by a few dollars, for a few years. It is difficult to tell how much of this is already reflected in current forward prices, or anticipated in decisions for current entry plans. Assuming these market feedback effects are not yet fully reflected, we adjust power prices upwards in a scenario that includes a \$5/MWh price spike beginning in 2015, attenuating away by 2020. Despite this increase, there is almost no change in the timing or extent of projected retirements.
 - ◆ Our new analysis shows about 25 GW higher retirements than the levels we projected in December 2010 due mainly to lower expected gas prices — despite the somewhat more lenient environmental regulations we currently envision. As a result of the lower gas price projections, we now expect a larger portion of the retirements (about 80%) to come from regulated units: out of the 59-77 GW of total coal plant capacity at risk for retirement, we expect 49-57 GW would be regulated units. The results are summarized below.

Projected Coal Retirements and CapEx on Retrofits and Replacement Capacity (ranges due to lenient versus strict regulation scenarios)

	Market Scenario				
	Base (Recent Fwds)	Base Gas \$-1/MMBtu	Base Gas \$+1/MMBtu	Base \$+5/MWh in Power Prices	Base \$+30/ton CO ₂ in 2020
Retirements under EPA Regulations (GW)	59-77	115-141	21-35	61-77	127-149
CapEx on Retrofits and Replacement Capacity (\$ Billion)	\$126-144	\$142-158	\$112-139	\$130-150	\$156-169

As shown in this table, we have also estimated the total capital expenditures by 2016 to install the environmental control equipment and to build new generation capacity to replace the retiring coal plants owned by non-merchant (regulated) entities such as investor-owned and municipal electric utilities, cooperatives, and public power agencies. We find that the projected capital expenditures are \$126-144 billion, and these do not change proportionally by nearly as much as the changes in retirements across scenarios reflecting prices of gas, power, and CO₂ (\$112-169 billion). This relatively robust result is due to similarity of capital costs between new gas plants and multiple retrofits. For example, a small coal plant (200 MW) would need to spend about \$1,000/kW to install a dry FGD and a baghouse if it is retrofitted, while retiring and replacing the plant with a new gas CC would entail approximately the same capital expenditure. As a consequence, lower coal plant margins result in more gas plant replacements, at roughly the same cost as the avoided retrofits.