

Impacts of Environmental Controls on Coal Generating Units

Market-Based Simulation of Coal Unit Operations, Modifications and Revenues

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Abstract

This study examines the potential market-based impacts of installing environmental controls on coal units. In a series of before and after simulations, impacts on generation unit operations and revenues were obtained for five environmental control cases where the flexibility of coal unit operations was reduced. In all cases, the minimum operating level of coal units was raised by 50%, for example, units that normally could turn down to 40% were restricted to reaching only 60%. Such a restriction was assumed to occur from the installation and operation of environmental controls for NO_x and / or SO₂. Costs associated with emissions were altered in three successive simulations in which they were reduced by 90% for NO_x, SO₂, and then both. The fourth case, a modification of the combination case, examined the impacts of an additional constraint on flexibility – a reduction in coal units' ramp rates (the speed with which they can adjust output to higher or lower levels) by 10%. The way the composition of a generating portfolio could itself influence results was also examined. The first four simulations were developed for an example company with 14,000 MW of capacity, over one half coal, one third nuclear, and the remainder natural gas, oil and pumped storage (hydro). The fifth simulation was developed for a nearly identical company in which over half the nuclear capacity was replaced by natural gas and in which only the largest, rather than all, coal units were assumed to install environmental controls. Results of all the simulations include changes in emissions, operating hours, generation (GWh), operating costs, prices, revenue and net income for the coal units, for the other units, and for the portfolios as a whole.

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