

Natural Gas Combined Cycle Utilization: An Empirical Analysis of the Impact of Environmental Policies and Prices

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Executive Summary

Recent climate regulations include increased utilization of natural gas-fired combined cycle (NGCC) generators as a means for offsetting coal generation to reduce carbon emissions. There have already been substantial increases in NGCC utilization in the last ten years for some plants in particular parts of the country. However, on average these plants are running at below baseload levels, leaving potential for further NGCC generation from existing sources. This paper examines the factors that have driven NGCC utilization from 2003-2014. It builds upon prior work on the relationship between low natural gas prices and natural gas generation by also considering the impact of environmental policies.

I run difference-in-difference models to evaluate the relationships between environmental policies and natural gas prices on NGCC utilization. Two main factors are associated with increases in capacity factors: (1) the Clean Air Interstate Rule (CAIR), and (2) low natural gas prices. In addition to these factors, plant and area characteristics such as the age of the generators, fuel mix in the region, and meteorological conditions play a role in NGCC utilization responses. An interaction between the age of the generator and CAIR reveals that the impact of the policy declines in older plants, as older technology may not be as economically advantageous to run under new environmental regulations. Thus, the cost of compliance with an NGCC utilization target may be higher for areas with older generators. Similarly, utilization is at its highest in anomalously warm years; compliance may be more difficult to reach in a particularly cold year.

Second, I use the estimates from this model for a counterfactual analysis to determine the relative contribution of CAIR versus the decrease in natural gas prices on NGCC utilization. This analysis shows CAIR had nearly double the effect of low natural gas prices from 2008-2014 on NGCC utilization. This study illustrates how environmental policies can be applied or enhanced to increase utilization from existing NGCCs, but cautions against uniform utilization targets that may be costly for particular plants to achieve.