THE IMPACT OF THE CARBON PRICE SUPPORT IN CHANGING THE EMISSIONS INTENSITY OF WIND IN THE BRITISH ELECTRICITY MARKET

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Overview

Britain imposed a Carbon Price Support (CPS, an additional carbon tax) on electricity generation fuels in 2013, rising to £18 ($24)/tonne CO2 in 2015, now frozen. This paper examines the impact of the CPS on the fuel mix in generation, the merit order and hence the impact of wind in displacing coal and gas for different levels of residual demand as well as in peak and off-peak hours and with differing fuel and carbon prices, using econometrics and a dispatch model of GB. The resulting savings in tonnes CO2/MWh of additional wind vary with the cost difference between coal plant and efficient CCGTs and with the level of demand in a way that allows us to examine counter-factual fuel and carbon price scenarios.

Methods

We first use a dispatch model of the British electricity sector to compute the long-run impact of theCPS on the carbon benefits from wind, by raising wind capacity by 25%, leaving the plantmix and fuel prices constant, and varying the level of the CPS. The second method is tostudy the historical fuel mix econometrically over a period of varying fuel and CPS prices, picking up the very short-run impact on the fuel mix and CO2 emissions of variations in output of the existing wind capacity.

Results

Both the simulation and the econometrics confirm that the impact of wind depends quite sensitively on the state of the system—which plant are running and whether they are constrained by minimum loads, capacity, or ramping limits. That in turn depends on fuel and carbon prices and the levels of residual demand.

Conclusions

Different countries have very different plant mixes, and so the carbon benefits of additional renewables capacity will also vary, while over time, fuel and carbon prices as well as the plant mix will also vary. This paper shows how the emissions benefits can be measured for a given plant mix and set of fuel and carbon prices, implying that country level detailed modeling will be needed to understand their impacts.

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