Now or Later? Trading Wind Power Closer to Real Time

And How Poorly Designed Subsidies Lead to Higher Balancing Costs

In the Nordic electricity market, along with several other markets around the world, much of the trade is organised a day ahead of delivery. But this can be problematic when large amounts of wind power are installed. The reason is that wind power can only be forecasted approximately and the predictions tend to get better closer to the time of delivery. Trade on markets that operate closer to the time of delivery have the potential to increase the efficiency and reduce balancing costs of electricity systems.

Simulation studies have shown that trading wind power closer to real time can save substantial amounts in balancing costs, yet little empirical work on the relationship between short-term trading and intermittent generation exists. Using Danish data I provide evidence that short-term markets, like the Nordic hour-ahead market Elbas, can serve a useful role in dealing with wind power forecasting errors. However I also show how subsidies and regulations can inadvertently get in the way of this market mechanism.

Under normal operation of the Elbas market, both positive and negative wind forecasting errors would be expected to lead to an increased probability of trade on the market. A producer with a shortfall of wind electricity will be more likely to go on the Elbas market to make up for the deficit in order to avoid added balancing costs. Likewise a producer with more wind power than expected will wish to sell their surplus electricity.

However, an analysis of data between 2010 and 2012 shows an unexpected result. While shortfalls in wind power do lead to a higher probability of trade on the short-term Elbas market, surpluses of wind power lead to a lower probability of trade on the market.

A likely explanation for this pattern is that non-utility owned Danish wind turbines built before 2003 received a purchase guarantee for a period of 10 years. In other words turbine owners covered by the subsidy are guaranteed a fixed price per kilowatt-hour for all the electricity they generate. In turn, they have little incentive to use the short-term markets when they have excess wind power production.

This explanation has a testable implication. A large jump in installations happened prior to the subsidy change in 2003. Since the purchase obligation expires after 10 years, we would then expect the relationship between positive wind forecast errors and trade on the Elbas market to change approaching 2013 as a large portion of the turbines lose the guarantee. Updating the data and re-running the regressions for a set

of rolling windows shows that as more data from late 2012 and 2013 is included, surpluses of wind power begin to increase rather than decrease the probability of trade on Elbas, as initially expected.

This research shows evidence that short-term markets can reduce the balancing costs associated with the introduction of large amounts of wind power. However, care must be taken so that subsidies that often accompany the introduction of such energy sources do not obstruct the incentives to use these short-term markets.