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Can Merchant Interconnectors Deliver Lower and More Stable Prices? The Case of NorNed

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The drive to reduce carbon dioxide emissions has led many countries to invest heavily in wind turbines. At the currently low level of penetration, fluctuations in wind power output that result from changing weather conditions can easily be managed using existing arrangements. However, as the share of wind power in the overall generation mix increases, variations in output of wind turbine generators are likely to cause large fluctuations in electricity prices and may compromise system stability.

One commonly suggested solution is to strengthen electrical connections between neighbouring regions, so that uncorrelated shocks in those regions can at least partly offset one another. The recently completed 700MW merchant interconnector between South Norway and the Netherlands, known as NorNed, is a particularly interesting case study in this regard. It connects a market characterised by price shocks due to changing demand and fuel prices to one which is dominated by reservoir generation, where generators arbitrage away significant price fluctuations. In theory, a reservoir system can act as a battery when connected to a system with a fluctuating electricity price, importing and storing electricity when the electricity price in the neighbouring system is low and running down its stocks when the price in the neighbouring system is high.

Much of the existing work on this topic seems to suggest that private investment in interconnector capacity is likely to be below the socially optimal level because of economies of scale in building transmission cables. It is claimed that the marginal investment decision is distorted by the effect of additional investment on profits from existing transmission capacity. The argument is equivalent to the explanation of why monopoly output is below the competitive level. Increasing transmission capacity reduces price differences between markets, driving down the profits of existing transmission capacity.

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Since economies of scale in transmission investment mean that it cannot be provided competitively, i.e. in small increments by different parties, the actual capacity built is likely to be below the socially optimum level.

This paper takes an empirical approach to examining the economic effects of NorNed. It concludes that arbitrage over the interconnector has had a low effect on prices in the Netherlands and South Norway. This implies that the majority of welfare gains resulting from trade across the interconnector are likely to be accrued to its owners, undermining the practical validity of the theoretical argument that economies of scale in transmission investment lead to a divergence between social and private benefits of transmission investment. On the scale of NorNed, there is little evidence to suggest that transmission capacity between different markets cannot be provided competitively.

The paper also estimates the effect of arbitrage over NorNed on price volatility in the Dutch day-ahead electricity market. It finds little support for the proposition that merchant interconnectors with capacity similar to that of NorNed can achieve a substantial reduction of price volatility in the connected markets. Given that NorNed connects the Dutch market to a reservoir system characterised by stable prices, NorNed represents an upper bound on such capability for interconnectors of its size. This suggests that the effectiveness of interconnectors in reducing price fluctuations caused by changing wind power output in a system otherwise dominated by thermal power generators may have been overstated and capacity considerably greater than that of NorNed may be required to achieve the desired effect.

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