UK network charges: A lesson in unintended consequences

The UK's energy regulator is being taken to court over its decision to change the network charging regime for smaller, distribution network-connected generators. The case is a cautionary tale of how even well-intentioned network charges have the potential for serious unintended consequences. The existing UK tariff regime provided overly powerful incentives to grid users to reduce net consumption at peak. Among its many side-effects, the current charging regime is estimated to have added hundreds of millions of pounds to annual consumer costs and triggered the construction of significant quantities of diesel-fired generation capacity. As Norway and others consider the future of their own network tariff regimes, they would do well to learn from the UK's mistakes by making sure that price signals accurately reflect network cost impacts and that any wider market impacts are fully considered.

The UK's energy regulator, Ofgem, is being taken to court following a controversial decision to reduce the effective benefits received by small, distribution network-connected generators – so-called 'embedded benefits'. These benefits have historically been justified on the grounds that generation located on the distribution network can reduce the need for transmission flows, and should therefore be shielded from the costs of the transmission network. Ofgem's decision implies reducing the effective future income of dispatchable 'embedded' generators by £50-60/kW. Critically, this reduction is likely to undermine the financial viability of some of the new-build generation projects that won capacity contracts in the UK's capacity auction. These projects will now face financial penalties if they fail to build. The case is a cautionary tale of how easily seemingly innocuous decisions on network charging can go badly wrong, and a powerful reminder to reformers of network tariffs to think carefully about the incentive effects of changes.

What are embedded benefits?

Under the current network charging arrangements in the UK, sub-100 MW generators connected to the distribution network can effectively use their output to offset consumers' transmission network charges. The thinking behind this charging mechanism was that, if the generation occurs on the distribution network, then, as seen from the perspective of the transmission network, it effectively nets off consumption. As a result, this type of generation can help to avoid transmission network costs.

By far the largest component of transmission network charges in the UK is the so-called 'residual', a charge levied solely to make up the regulated returns to the network that are allowed by the income cap regulation. This charge is completely unrelated to the network user's actual impact on costs – it is best thought of as a tax, levied to ensure that enough revenue is collected to fund the network. It is levied alongside a separate locational charge designed to reflect the wider network cost impacts of marginal changes in the level of consumption. In the UK, both the 'residual', tax-like charge and the 'locational', cost-reflective charge are linked to consumers' metered net consumption during the three highest system peaks of each year. By linking network charges to consumption at peak, consumers face powerful incentives to reduce consumption at these times, and should therefore help to keep network costs low.

What's the problem?

All this may sound like sensible tariff design, until you see what happens in practice. In the UK, suppliers pay transmission network charges in aggregate on behalf of consumers. Individual suppliers realised that if distribution network-connected generators could be made to generate during system peaks, this would lower the supplier's metered net consumption and therefore their network charges. As a result, they offered to pass on part of any potential reduction in their network charges to these generators in order to incentivise them to generate during the system peak. This charge avoidance behaviour did not affect the historic costs of the network however, or the revenue allowance granted to the transmission network, and so when total net consumption at peak fell as a result, National Grid simply increased the level of its residual charge to raise the money it needed. Suppliers could still alter their share of the total bill by lowering their net metered consumption relative to that of other suppliers, but never the total amount paid.

As a result of this activity, consumers ended up paying both for the transmission network, the historic costs of which were unchanged, and for embedded generation at peak. Ofgem estimates that under

the current system, consumers are making payments to embedded generators of around £370m/year, a figure that was forecast to rise to around £700m/year by 2010/21 as network investments and charges rise.

The additional incentive to generate during likely peaks did have the effect of reducing these peaks, and may have saved some longer-term network costs. However, because the network charges included a very large tax-like component – unrelated to the size of these potential network savings – it provided an overly strong price signal, massively over incentivising this seemingly positive behaviour, and created further knock-on distortions throughout the system.

Most obviously, the dispatch behaviour of these small distributed generators became very inefficient. At the system peak, the financial rewards to generating were so high for diesel embedded generators that it made sense for them to start-up and sell energy, displacing far more efficient thermal generators.

However, it was the impact on the capacity market that captured the greatest political attention and triggered the sequence of events leading to the current legal challenge.

One of the surprising results of the UK's first capacity market auction was just how low the price cleared. A payment of just £19.40/kW/year (2012 prices) appeared to secure more than 2.6 GW of new de-rated generation capacity. At first glance, this looks like a great deal for consumers, until you see what they were paying for. 1.66 GW of this capacity was a large-scale CCGT project (which has since been cancelled). The remaining 965 MW was made up of 75 distribution-connected projects, many of which were so-called diesel farms.

These sites consist of rows of shipping container-like diesel generators, of the type used to provide backup power, placed in fields and connected to the distribution network. Developers had realised that by combining the charge-avoidance revenue described above with a modest income from the capacity market, they could easily finance the relatively low capital cost needed to construct such sites and the CO_2 cost of their emissions under the carbon price floor.

Concerned that these sites were not providing the sustainable generation capacity that the country needed and were preventing more appropriate projects from securing capacity contracts, the UK's energy department asked Ofgem to investigate.

What happens now?

In June, Ofgem announced its decision to significantly reduce the payments embedded generators will receive for generating at peak, from around £47/kW currently (the size of the residual charge) to about £3-7/kW, with the change to be phased in over three years. The remaining £3-7/kW benefit reflects Ofgem's judgement as to the actual size of the avoided transmission network costs resulting from higher distribution network generation at peak. The difference between the old and revised benefits shows just how much the previous scheme appears to have over-incentivised embedded generation.

Importantly, Ofgem rejected calls to allow existing generators, or those that had already been awarded capacity market contracts, from continuing to benefit from the higher rates. As a result, some of the new-build projects that secured capacity market contracts for delivery in the next few years are now unlikely to be built. Ofgem expects year-ahead capacity auctions to make-up the resultant capacity shortfall. This should limit the impacts on security of supply, but is expected to push up the costs of securing capacity in the near-term.

Overall, Ofgem's decision significantly reduced the revenue potential of embedded generators' projects, and so the current legal challenge comes as little surprise. The court's decision will hinge on whether Ofgem failed to follow due process in reaching its judgement. Those opposed to the decision have claimed that the consultation process was rushed, and that the industry processes used to formulate policy options failed to give sufficient weight to smaller industry players. Even a postponement of the current decision could make the case lucrative for the owners of existing assets. Ofgem estimate that delaying reform by just one year will cost consumers around £500m.

More widely, the case seems to have triggered a radical rethink of network charging in the UK. Ofgem recently proposed shifting the entire residual charge to suppliers, a move that, if completed, would shift the UK from having some of the highest generator network tariffs in Europe, to having among the lowest.

The morale of the story

Ofgem's current predicament is a lesson in how even well-intentioned network tariff designs can go badly wrong when one gets the price signals wrong and fails to account for market participants' response. Although electricity suppliers' fruitless struggle to shift allowed network costs onto one another through the periodic activation of diesel farms looks wasteful when seen from above, when looked at in terms of these firms' desire to maximise their profits, it is entirely rational.

Norway is currently embarking on its own programme to reform network tariffs, again with the goal of driving efficient use of the network and thereby minimising network costs. As the UK's experience shows, if these reforms are to prove efficient, they need to be built on a solid understanding of how market participants will or will not respond to the incentives that are created. Let's hope they are paying attention.

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