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Minimising system costs: reforming transmission charges and renewable electricity contracts

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Liberalised electricity markets in Europe have ambitious National Energy and Climate Plans to increase the share of electricity generated by Variable Renewable Electricity (VRE, on and offshore wind and solar PV). This article considers the role that locational transmission pricing can play in delivering an efficient transition to a low-carbon electricity market, how best to support VRE under efficient locational transmission pricing, and what alternative support systems and market design options are available if locational transmission pricing is ruled out. Many countries are contemplating major reforms to the wholesale market and VRE support, although reforms to transmission charging appear to be lagging. Governments and European System Operators have investigated locational pricing to improve dispatch with the rapidly changing location of new power sources, and investing in more transmission to accommodate the expansion of VRE. Surprisingly little European attention has been paid to improving locational transmission pricing to guide investment decisions.

The resource (wind, sun) for VRE varies considerably across space within countries with the best resource often far from demand centres and located very differently from the conventional power stations for which transmission was designed. As VRE reaches high penetration levels, existing transmission will prove inadequate. Congestion and the need to curtail VRE will rise sharply until transmission investment catches up. There is urgency in providing better location signals to guide new VRE investment to more appropriate locations and for better managing their delivery. Policy reform is needed to better minimise total system cost, including transmission investment and dispatch management, rather than just maximising VRE penetration.

Policy reappraisal is also needed to keep revenue risk low enough for cheap (debt) finance for VRE investment and to prevent windfall gains from energy price spikes while delivering sensible spot market responses to avoid the costly turning-down of conventional generation. This article addresses various solutions to the related problems of efficient dispatch, location choice, and low-risk VRE support design, taking examples from the liberalised markets of Europe, LMP markets in America, and the special case of the UK and Ireland. Some countries have zonal pricing to signal transmission constraints, but others are reluctant to move away from country-wide pricing. Britain has ruled out both nodal and zonal pricing, and instead announced its intention to reform transmission charging to send an effective signal about where new

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investment should be located. This article considers reforms that deliver, or at least improve on, the desired aim of minimising the total system cost of decarbonising electricity.

Its key point is that there are often a range of solutions that, if carefully coordinated, combine to give a reasonably efficient solution to minimising the transition costs to the low-carbon electricity system. It follows that it is the whole mix of policies, such as grid access priority, curtailment compensation rules and contract design that matter. Choosing single elements that may seem attractive in isolation may be undermined rather than amplified by other policy choices. Conversely, if one option, such as nodal or zonal pricing, is ruled out, other alternative levers, specifically transmission pricing and/or VRE support design, may at least partly compensate for such policy restrictions. These options become increasingly important as the delays in consenting and then building transmission lines appear to grow ever more serious.

The article considers two main cases: the first where transmission pricing is ruled out (most EU countries) for which changes to two-way Contracts for Difference for VRE can provide some help together with recent proposals from the European Commission, the second where locational transmission charging is possible and for which suitable pricing principles are developed and illustrated for Britain.

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