

Locating Data Centres efficiently in Britain – reformed transmission charging, energy subsidies or zonal pricing?

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Two megatrends are emerging – one global, that of the growth of Variable Renewable Electricity (VRE, wind and solar PV), the other initially confined to developed market economies in North America, Europe and China, that of rapidly growing power-hungry data centres. VRE expanded by 16% globally in 2025, with a projected annual global growth rate for data centres of 22%. For the US the figure is 66% p.a. while the UK anticipates a quadrupling of data centre electricity demand by 2030 to perhaps 6.3 GW. While this might seem a happy congruence of demand and supply growth, country-wide average growth rates ignore important spatial disparities – wind is typically located far from demand while data centres prefer to cluster round major conurbations, certainly in Britain.

Britain provides an excellent case study of the logic of locating data centres in high wind surplus regions. Surplus Scottish wind is a problem looking for a less costly solution than the proposed transmission investments while central data centres struggle to secure connection agreements. Scottish data centres would increase local demand and reduce the surplus to be exported across the congested English border. This would be quicker than building much-needed new transmission and much cheaper.

This paper compares the various policy options for reconciling these megatrends in Britain and deriving efficient locational signals for data centres. Locational pricing would make wind-surplus Scotland a cheaper source of electricity than London but has been ruled out by the Government. Efficient transmission charging could discourage further Scottish wind investment and make data centre connections cheaper there than in English urban centres but the current charges need reform. Finally, the UK Government's AI data centre policy targets data centre energy subsidies on northern locations but with inadequate incentives to reduce exports when congestion binds. This paper compares and evaluates these three options for Britain, although the comparisons have broader significance. As zonal pricing has been ruled out, Ofgem has consulted on alternatives including reforming locational transmission charging that could be the best long term solution.

Great Britain is unusual in Europe in having quite highly spatially differentiated Transmission Network Use of System (TNUoS) charges. These charges are based on the Long Run Incremental Cost of building transmission lines to deliver power from the injection point to delivery points.

The annual charge is levied per kW of Transmission Entry Capacity adjusted for capacity factors (CFs). Charges are high in Scotland and low (negative) in London. For a wind farms operating in windy Argyll in SW Scotland compared to one in East Anglia, the difference is £28.21/kWyr or, at a CF of 40%, £8.05/MWh, material compared to the 2026 auction strike price for onshore of £72.24/MWh.

Scotland projects rapid growth rate for wind from 10.4 GW in 2025 to 20 GW by 2030. Congestion on the B6 transmission boundary from Scotland to England seriously limits wind exports. In 2024-25 13% of potential mostly Scottish wind was curtailed up from 8% the previous year and will accelerate unless transmission is expanded. Recent wind farms have been constrained-off more than 50%.

Data centres typically have an almost continuous load. Large data centres (above 10 MW in Scotland) are connected to the high voltage transmission grid as are large wind farms. For guiding investment, the relevant charge is the locational Load L-TNUoS charge. Logic suggests that where G-TNUoS charges are high (Scotland) L-TNUoS charges should be negative, but instead they are set to zero with the remaining positive charges scaled to collect the required revenue. This discourages data centres from locating where there is surplus Scottish wind. Scottish data centres could reduce the demand made on the constrained B6 export boundary reducing the need to reinforce export capability.

Present plans to build subsea links to export Scottish wind are about 5-10 times the cost of the on-shore lines that drive current TNUoS charges. A 2.2 GW Scottish data centre would avoid the need to build a 2 GW subsea links costing £131,370/MWyr or £15/MWh saving £263 million/yr. A possible reform avoiding negative load charges would be to pay only if the data centre ran at full load during periods when the export constraint binds, easing the pressure on building extra transmission.

The UK Government's Delivering AI Growth Zones proposes reducing electricity costs by "up to £24/MWh in Scotland ...", larger than the £15/MWh subsea avoided cost. If the Government were to press for onshore lines instead the avoided cost would be considerably lower. The G-TNUoS charge from Argyll to the Midlands for 100% CF is £4.68/MWh. The benefit of locating data centres in Scotland would be comparable at about £5/MWh and well below the proposed £24/MWh discount. One drawback of this discount is providing no incentive to operate at full load when exports are constrained, so perhaps the discount should be conditional on operating at full load when exports are constrained.

The conclusion is that transmission charging for data centres based on the avoided cost of the most expensive reinforcement otherwise necessary, with suitable payments for maintaining contracted load in export hours to avoid negative charges, is the most appropriate solution and consistent with the proposed reform of transmission pricing. Zonal pricing might at some date become politically feasible with numerous other benefits, but future zonal price differences are hard to predict and understate the cost of the transmission needed to relax the price differences and so are less satisfactory.

Until these delayed desirable reforms take place and given the lengthy delays in expanding even on-shore transmission lines, the UK Government's proposed electricity subsidies in AI

Growth Zones in Scotland could be an efficient stop-gap, provided there is some incentive to operate at near full load when the boundary is export-constrained. The promise of the Government's Delivering AI Growth Zones of a locational discount/subsidy and a speedy connection is thus a simple solution to the complexity of market and transmission price reforms.

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