New study highlights challenges for security of supply in Britain as interconnection increases

- Great Britain (GB) is becoming increasingly dependent on electricity imports from other European markets with forecasts of up to 18GW of power interconnectors by the mid-2020s, representing 30% of peak demand.
- With advice from the System Operator (i.e. National Grid), the Secretary of State decides how much capacity is needed to keep the lights on based on a range of assumptions, including how much power interconnectors are likely to supply via imports during system stress events. As such, accurately assessing interconnector flows during very tight periods is critical.
- Aurora finds that historically, interconnectors have often delivered less power than the system operator assumed they would when demand is close to exceeding supply (i.e., they have provided less power than their Capacity Market de-rating factor during tight periods). On some occasions, they have even undermined system security in Britain by exporting to neighbouring countries during peak demand periods.
- Further interconnection to Europe implies GB security of supply may be subject to European policy decisions. Rapid technological change both in GB and interconnected markets, combined with European-wide policy uncertainty, makes it extremely challenging to accurately predict whether interconnectors will provide power to Britain when needed.
- In this context, a more cautious approach to de-rating by regulators would enhance security of supply by ensuring sufficient back-up capacity is built in GB in case interconnectors don’t deliver when they are most needed.

A new cross-industry study, ‘Energy security in an interconnected Europe’ published this week by Aurora Energy Research, focuses on interconnectors and their current and future contributions to security of supply in Great Britain.

With the right policy framework in place, electricity interconnection with the rest of Europe has the potential to provide a range of benefits to British electricity consumers. First, to the extent that flows respond to system stress events, interconnectors could provide an additional layer of security to the GB energy system. Second, they have the potential to reduce emissions by facilitating the integration of more wind and solar power. Third, if electricity can be generated more competitively abroad, interconnection can help reduce the cost of electricity for domestic consumers.

The central question which the Aurora study addresses is not whether interconnectors should be built, but rather how much GB policymakers and consumers can rely on them to help “keep the lights on” during a system stress event.
Interconnectors connect the GB market to the rest of Europe, adding an additional layer of uncertainty for policy-makers to understand and manage. Interconnector performance – for example, whether electricity will be imported or exported at a critical point in time is determined by changes in neighbouring markets, driven by factors such as policy, technology, demand, and increasingly weather as the level of electricity generation by both wind and solar grows throughout North-West Europe.

The extent to which GB relies on interconnectors is reflected in the “de-rating factor” they are given in the annual Capacity Market auction. This de-rating factor reflects the amount of electricity that GB can expect to import on average during a system stress event via each interconnector.

Aurora’s study highlights a number of challenges when setting de-rating factors for interconnectors:

- Historic interconnector performance during periods of peak demand is generally inadequate to justify the current de-rating factors. For example, during winter peaks (as defined by National Grid) from 2015 to 2018, individual interconnectors underperformed their de-rating factors between 30% and 99% of the time.

- Interconnectors can also make a negative contribution to security of supply, exacerbating peak demand in GB by exporting power when the GB system is already tight if prices are higher elsewhere. This happened in Winter 2016 when nuclear outages created prices of £629 per MWh in France, which drove power to flow from GB to France, and in turn contributed to GB power market prices rising to high levels at £399 per MWh (well above the average baseload price of £40 per MWh). This potential negative contribution to security of supply is not adequately accounted for in the current derating methodology.

- Finally, because genuine system stress events occur only infrequently – perhaps less than once per decade – it is very difficult to accurately forecast future interconnector reliability. There is very limited data on the historical performance of interconnectors during genuine system stress events. A lack of historical data on which to base de-rating factors is ample cause for a very high degree of prudence, especially given the speed at which both technology and policy is changing in Europe.

When modelling future de-rating factors for interconnectors, Aurora’s analysis highlights a series of risks that emphasise the need for a degree of caution in setting de-rating factors:

**Technology risks:** The energy system is rapidly evolving, both here and in the rest of Europe. Increased deployment of renewable electricity generation exacerbates the impact of correlated low-wind periods across Europe. As such, relying on interconnection to markets with high levels of correlated renewables generation could compromise security of supply.
**Policy risks:** Policy developments in GB and other European countries have the potential to fundamentally alter the underlying economics on which current de-rating factors are based. For example, the introduction of a Capacity Market in other European countries meant that interconnectors could be “over-committed” in two different markets. Furthermore, the differences in capacity market penalty regimes has the potential to distort interconnector behaviour during a stress event.

**Saturation risk:** As the amount of interconnection rises, each additional interconnector contributes progressively less to security of supply and should therefore be given a lower de-rating.

**Compound risks:** Uncertainty surrounding interconnector performance is further compounded by the potential that other technologies may also not deliver as expected. For example, there is little current data on the performance of unproved Demand Side Response projects, to justify the de-rating factor they are given in the Capacity Market.

Properly accounting for such risks in interconnector de-rating is critical to security of supply and the consequences of error are high. Aurora analysis, based on both historical data analysis and forward-looking modelling, suggests Government should reduce the reliance placed on interconnectors to keep the lights on. Energy security is a topic that understandably strikes a chord with consumers. This is especially the case in the current political climate in which Brexit raises the prospect of new political sensitivities around relying on European electricity generators to “keep the lights on” in Britain.

John Feddersen, CEO of Aurora says:

“Many new Interconnectors will be built in the next 5-10 years, vastly expanding our ability to trade electricity with our neighbours. These should enable a more flexible, lower-carbon electricity system. However, the contribution of interconnectors to security of supply is unknown, and, to a significant extent, unknowable. Government has so far overlooked this inconvenient fact.”

“The pace of change in domestic and neighbouring energy markets – driven largely by policy shifts and rapid technology evolution – means that determining the future contribution of interconnectors to security of supply is incredibly difficult to gauge. Reducing the reliance placed on interconnectors for security of supply would enable GB to retain the benefits of freer flow of electricity with Europe, while ensuring sufficient domestic back-up capacity exists in the event that interconnectors prove to be less reliable than Government currently assumes”.

- ENDS -

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Notes to editors

1. Current interconnector capacity
Britain has 4GW of interconnector capacity providing direct links to France, Ireland and the Netherlands. The first and largest interconnector was established with France in 1986. At 2GW, IFA accounts for half of existing interconnector capacity between the GB market and its neighbours. Another quarter of existing capacity is with Ireland, made up 0.5GW each from Moyle (2002) and the East-West interconnector (EWIC), which came online in 2012. The remaining 1GW is supplied by BritNED, which has connected GB with the Netherlands since 2011.

2. Future interconnector capacity
In GB’s 2018 T-4 Capacity Market, 3GW of new build projects secured contracts for delivery by 2021- two of these connecting GB with France (IFA2 and Eleclink), and one (NEMO) connecting GB with Belgium. If all projects were built to according to the dates suggested by Ofgem, including both Window 1 and 2 in addition to Aquind, this would bring GB interconnector capacity to 17.9GW by the mid-2020s. In its reference scenario, BEIS sees 18GW of interconnection with the rest of Europe as soon as 2024, more than four times today’s capacity.

3. De-rating
Capacity Market de-rating reflects the fact that not all technologies make an equal contribution to security of supply. In general, conventional dispatchable technologies like CCGT have higher de-ratings than storage technologies like batteries or transmission assets like interconnectors since they are better able to produce power on demand for the duration of a system stress event. Even dispatchable assets are de-rated at less than 100% to reflect the possibility of outages during periods of system tightness.

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About Aurora
Aurora Energy Research is a leading independent European energy market analytics company founded in 2013 by University of Oxford professors and economists. Aurora provides deep insights into European and global energy markets supported by cutting edge models and data driven analytics to support project development and investment decisions. Services include subscription-based forecasts, reports, forums and bespoke consultancy services. Aurora Energy Research has offices in Oxford and Berlin.
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