



Department
of Energy &
Climate Change

Electricity Market Reform

Announcement of de-rating
methodology for interconnectors in
the Capacity Market

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Executive summary

As a follow up to the Government response to the consultation on Capacity Market Supplementary Design proposals and Transitional Arrangements that was published in January, we are now publishing further details on the de-rating methodology for interconnectors. We will implement a “hybrid” de-rating approach for interconnectors which will utilise both historical and forecasting methodologies. This will enable a minimum de-rating factor to be derived from historical evidence, subject to there not being any publically reported concerns about the security of supply outlook in the connected market for the relevant Delivery Year. This methodology will be formalised in the Capacity Market Rules in March.

Announcement of de-rating methodology for interconnectors in the Capacity Market

Electricity Interconnectors in the Capacity Market:

Electricity interconnectors make an important contribution to our security of supply which we will value through their inclusion in the Capacity Market from the T-4 auction in 2015. The level of their obligation will be the de-rated capacity of the interconnector – the realistic long-run expectation of imports at times of system stress.

The de-rating factors determine the level of capacity agreement that can be secured in the Capacity Auction by a given resource. Setting an expected level of contribution from participants both ensures energy is available when needed and the cost-effectiveness of the Capacity Market for consumers.

As set out in the Government response to the consultation on Capacity Market Supplementary Design proposals and Transitional Arrangements that was published in January, the Secretary of State will determine a de-rating factor individually for each interconnector, based on a range of inputs. This will reflect the differing characteristics of the technologies used and the markets to which GB is connected. The de-rating methodology will be outlined in the Capacity Market Rules in March 2015 and the final de-rating factors in the Auction Guidelines in June.

In the consultation response, we committed to providing further details on the de-rating methodology for interconnectors in mid-February (in advance of the formal Capacity Market Rules). We outlined that DECC was considering a “hybrid” de-rating approach for interconnectors which would utilise both historical and forecasting methodologies. This methodology would enable a minimum de-rating factor to be derived from historical evidence, subject to there not being any publically reported concerns about the security of supply outlook in the connected market for the relevant Delivery Year.

Assessment of Interconnection in the Capacity Market:

The Government recognises that determining a methodology for de-rating interconnectors is challenging. Relying purely on historical data is unlikely to best reflect future flows, given the introduction of increased efficiencies in the operation of cross-border markets (market coupling), as well as changes to other market rules (such as Cash-Out reform) which mean that we can expect interconnector flows to better reflect relative differences in scarcity (and hence prices) in future. We have not yet experienced a full year of market coupling or do not have, as yet, intraday market coupling. As data about the effectiveness of implemented changes to the electricity market increases, we expect our methodology for de-rating interconnectors to improve.

The EMR delivery body, National Grid, is currently developing a methodology to forecast expected future interconnector flows at times of system stress, which will inform analysis in the Electricity Capacity Report on the amount to procure in the Capacity Auction. In turn, this information will be used to support the Secretary of State in determining de-rating factors for individual interconnectors.

Recognising the importance of robust de-rating factors for interconnectors for the 2015 auction, National Grid has commissioned Baringa Partners to use their well-established European power market model to produce more accurate forecasted estimates, which will be considered alongside other evidence including historic interconnector behaviour at times of system stress by the Secretary of State.

Baringa's model is a pan-European energy market economic dispatch model that can provide probabilistic modelling of system stress periods (and which uses "PLEXOS for PowerSystems", a highly regarded power market simulation software used globally by system operators, utilities and commodity traders). Baringa have used this model extensively to provide advice to market participants, planners, investors and regulators. The model was used previously to provide advice to DECC on the impacts of new interconnection on GB¹². It should therefore provide a transparent and statistically robust means to forecast interconnector de-rating factors for the 2015 auction.

Baringa will be using its own scenarios as a starting point for its inputs such as generation capacity mix and demand. These scenarios provide a good map to National Grid's Future Energy Scenarios (FES) which will be further enhanced by using National Grid's commodity prices. Technical availability assumptions for existing interconnectors will come from historically reported outage data and, for new interconnectors, from the best available evidence on technical reliability for new interconnector technologies (such as analysis conducted by SKM for Ofgem³). The model will estimate individual interconnector flows under each of the FES scenarios as well as a number of simulations around these that vary individual parameters (such as wind output, demand and generation availability). From these scenarios and simulations, the model will create estimates of the proportion of time individual interconnectors will import at times of system stress.

National Grid will publish the outputs of this modelling in the Electricity Capacity Report on 1st June 2015. The Secretary of State for Energy will draw on this evidence and the advice from the EMR delivery partners and DECC's EMR Panel of Technical Experts to announce the forecasted de-rating factors for interconnectors alongside the informal auction guidelines, later in June.

Existing analysis on forecasted de-rating factors

Recent analysis for DECC conducted by Baringa "New electricity interconnection to GB – operation and revenues" Baringa⁴ (2014) shows that, across all scenarios, a positive contribution from potential new interconnectors is projected. Interconnectors to systems where

¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266307/DECC_Impacts_of_further_electricity_interconnection_for_GB_Redpoint_Report_Final.pdf

²https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322005/new_electricity_interconnection_to_gb_operation_and_revenues_baringa.pdf

³<https://www.ofgem.gov.uk/ofgem-publications/59247/skm-report-calculating-target-availability-figures-hvdc-interconnectors.pdf>

⁴https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/322005/new_electricity_interconnection_to_gb_operation_and_revenues_baringa.pdf

the generation mix is significantly different from our own – for example Norway, which is dominated by hydropower and has systematically lower prices than GB – can be expected to provide greater value in terms of security of supply:

Border	Range of projected de-rating factors across all 4 Baringa (2014) scenarios
GB – Belgium	64-94%
GB – France	63-94%
GB – Ireland	26-56%
GB - Norway	82-93%

This demonstrates the important contribution to security of supply that future interconnectors can play, particularly when looking at the tightest periods of stress. Indeed, additional analysis commissioned from Poyry (2015) – which looked at the top 5% of tightest margins each year since 2008, rather than periods of highest demand – shows that, based on price differentials, the contribution of new interconnectors is towards the top end of this range (93% for Norway, and 81% for Belgium).

Hybrid Methodology

The Government has decided to implement a hybrid methodology, with the approach that was outlined in the consultation response. Subject to there not being any publically reported concerns about the security of supply outlook in the connected market for the relevant Delivery Year, the interconnector will be guaranteed a minimum de-rating factor derived from historical evidence as described below. Given current changes with market coupling and subject to potential changes in the generation mixes of interconnected countries, we expect a historical approach to produce conservative de-rating factors for interconnectors, appropriate for a ‘floor’ assumption.

It should be emphasised that this historically-derived factor only applies where there are no publically reported concerns about the security of supply outlook in the connected market for the relevant Delivery Year. There are currently reported concerns on continental Europe for some countries to which we are connected or are likely to be connected to in the relevant Delivery Year. We are monitoring these closely and the final de-rating factors will need to take the latest market intelligence into account.

We believe that publishing the methodology now will enable interconnectors and all Capacity Market participants to take a view on the potential de-rating factors before they are announced in the Auction Guidelines in June. DECC will be happy to talk to stakeholders about the methodology set out below and how this may apply.

Based on analysis and advice from Poyry (2015), we have constructed a historically-based methodology to provide conservative de-rating factors as follows:

1) **Data requirements:**

- a) Price differentials between interconnected countries for the last 6 years (or greatest number of years of historic data available, if less than 6 years)⁵.
- b) A subset over these past 6 years will then need to be selected to calculate the minimum de-rating factor. In order to provide a minimum level, the selected period will comprise the highest 50% of GB Winter peak demand (business days 7am-7pm). While this also captures periods when the system is unlikely to be subject to significant stress from a security of supply perspective, this is designed to provide a basis for a conservative estimate.
- c) Information on GB peak demand periods and interconnector flows (for existing interconnectors), which can be found at National Grid and National Grid UK respectively⁶.
- d) Any existing interconnectors that has less than 6 years of data available should be treated as a new interconnector, as set out below⁷.

2) **Price differential analysis:** Within this sub-set of 50% of the highest GB Winter peak demand periods, it is necessary to identify periods in which the interconnected country experienced lower electricity prices than GB (and hence in which we might expect price-responsive interconnector flows to contribute to GB security of supply).

3) **Technical adjustments:** A downward adjustment is necessary to the purely price-based approach above, to account for actual historic contribution to GB security of supply (for existing interconnectors) and future likely contribution (for new interconnectors). This is because a price-based approach does not take into account factors such as transmission losses, technical availability and interconnector 'ramp rates', which are significant for the expected contribution to GB security of supply:

- a) For existing interconnectors, this means that periods with a positive price differential should then be overlaid with a constraint reflecting whether the interconnector was actually importing to GB in that period. This will produce a smaller group of periods, which should then be expressed as a percentage of the total periods being considered (i.e. highest 50% of GB Winter peak demand).
- b) For new interconnectors, as historic information on flows is not available, factors such as technical availability, ramp rates and transmission losses⁸⁹ need to be applied. We will base this on Ofgem's SKM analysis, or best available evidence.

4) **Averaging:** Annual de-rating factors should then be averaged over the number of years included in the calculation, to produce the final de-rating factor.

⁵ Next year this will increase to 7 years (2008-2014) as the data availability improves to align it with the approach taken for GB generation.

⁶ Demand: <http://www2.nationalgrid.com/UK/Industry-information/Electricity-transmission-operational-data/Data-explorer/>

Imports: <https://www.elexonportal.co.uk/article/view/216?cachebust=icp49t6lh3>

⁷ This will affect newer interconnectors that do not have an adequate history of import flows to utilise in the calculation of the de-rating factor. These interconnectors will have account for factors such as technical availability, ramp rates and transmission losses (as set out in 3b).

⁸ Transmission loss may be accounted for by imposing a positive price threshold as a proxy during step 3). This would entail assigning a value to this price differential, which would proxy for the hurdle necessary to overcome transmission losses along a given interconnector.

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Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc
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