nationalgridESO

Summary Briefing Note

Modelling de-rating factors for interconnected countries in the 2021 Electricity Capacity Report

Context

As part of its role as EMR Delivery Body, National Grid ESO is required to make recommendations to the Secretary of State on the target capacity for upcoming Capacity Market (CM) auctions and de-rating factors for technologies that may participate in the CM. These recommendations are provided annually in the Electricity Capacity Report (ECR).

In recent years, a growing number of stakeholders have provided feedback that they would like greater visibility of the methodology for modelling interconnector de-rating factors before the ECR is published. This is because, unlike other technologies such as conventional generation, demand side response (DSR), renewables and storage, the modelling methodology for interconnectors is much less prescriptive. It has also changed from year to year as we have enhanced our modelling capability.

For the first time in April 2020, we published a briefing to provide more information on the interconnector modelling ahead of the ECR being published. This early view was broadly welcomed, and we also gave stakeholders an opportunity to provide feedback directly to BEIS' independent Panel of Technical Experts (PTE), which they could consider in (a) scrutinising our modelling and (b) their recommendations to the Secretary of State.

This briefing provides an early view of the interconnector modelling that we intend to undertake as part of the upcoming 2021 ECR. The methodology is expected to be broadly similar to last year. While this briefing does not represent an industry consultation, feedback can be provided directly to the PTE. We are particularly keen to receive evidence on potential risks and opportunities relating to the supply and demand outlook in Europe that may influence the sensitivities included in the modelling that could determine the de-rating factor ranges. Where credible evidence is provided that influences the de-rating factor range, we would seek to include this evidence in either the 2021 ECR or the PTE's report for transparency.

We request that feedback is directly provided to the PTE by 14th May 2021 such that it can be considered by them in this year's process. The PTE can be contacted directly at: pte@beis.gov.uk. Feedback can also be provided directly to National Grid ESO's EMR modelling team at: emrmodelling@nationalgrid.com. However, as the team are now in the process of producing the 2021 ECR, we are unable to respond directly to questions until early June onwards once the 2021 ECR has been submitted to BEIS.

Overview of the interconnector modelling methodology for the 2021 ECR

Last year's methodology was a significant change compared to the approach in previous versions of the ECR. In particular, we implemented two changes that:

(a) Only included stress periods that strictly met the condition where expected energy unserved is greater than zero

(b) Included more comprehensive modelling of stress periods to better reflect the uncertainty of available generation in Europe via outage patterns; and sensitivity analysis to better assess the potential impact of changes to the supply and demand outlook in Europe. This change was enabled by developments to our pan-European market model, BID3, through a new 'LOLE' (Loss of Load Expectation) module, reported in the 2020 ECR and subsequent industry webinars in July 2020.

The impact of implementing the first change means that we only consider periods in Great Britain where we have loss of load after interconnector imports have been considered. In this case, we would expect the price in Great Britain to be set by the Value of Lost Load with interconnector imports reflecting all the capacity in Europe that is available to

provide imports to Great Britain. In essence, this is a capacity assessment at this point, rather than an economic dispatch, so factors like market pricing are not relevant. This also means that modelling doesn't distinguish between imports that are provided via the markets or through ESO trading actions – the assessment is simply one of how much capacity is available to provide imports to Great Britain during a stress period.

This second change allowed us to simulate the periods of interest with much higher granularity than we had previously done to improve the robustness of the outcome by accounting for much more of the potential uncertainty in Europe at these critical times. In the 2020 ECR, this was achieved by identifying the 93 tightest hours (3 hours LOLE * 31 years historic weather). We then increase demand in Great Britain to a point where we guarantee that these 93 hours are always going to have unserved energy, no matter what is happening in Europe. We then carry out detailed simulations of Europe, with ~1000 plant outage patterns and 31 years' historic weather for each scenario and sensitivity, calculating the average level of imports in these same 93 hours.

The methodology for the 2021 ECR will be broadly similar to last year with some smaller changes outlined below that represent an evolution from last year. This also means that, we are approaching the 2021 ECR on the basis that interconnectors will be participating directly in the next round of CM auctions rather than direct cross-border participation.

Data sources

Since last year we have procured a new core BID3 data set from Afry. This includes three additional weather years that allow us to simulate correlated wind, solar and demand across Europe for the period 1985 – 2018 inclusive (in the 2020 ECR, we modelled weather years 1985 – 2015). The additional weather years will help us capture more variety in weather patterns across Europe and should improve the robustness of the modelling. The data set from Afry also includes updated supply and demand projections for Europe.

In the 2020 ECR, our supply and demand projections for Europe were based on ENTSO-E's scenarios in the 2018 Ten Year Network Development Plan (TYNDP). We had intended to update our supply and demand projections for Europe based on ENTSO-E's 2020 TYNDP scenarios. We have encountered some technical difficulties such that we have not been able to produce reliable simulations in BID3 with this data set. Therefore, we are intending to use the data we have procured from Afry to also inform our supply and demand projections in European countries for the 2021 ECR. We consider this to be preferable to retaining the previous ENTSO-E assumptions based on the 2018 TYNDP that are likely to be out-of-date by now. This approach means we will have a single scenario for Europe in the 2021 ECR modelling, although our extensive use of sensitivities enables us to cover the credible supply and demand uncertainties in Europe. Assumptions for Great Britain will be based on the 2021 Future Energy Scenarios (FES).

In response to recommendation 55 of the 2020 PTE Report, we are intending to include more detail on the underlying assumptions used in our interconnector modelling. This will likely be included in the Annex of the 2021 ECR.

Methodology and sensitivities

The interconnector de-rating factor methodology in the 2021 ECR will be very similar to that described in the 2020 ECR. One change that we have made is small technical one relating to how we scaled thermal capacity in neighbouring markets to bring the supply-demand balance closer to what may be expected based on their current / assumed reliability standards. This was justified on the basis that the supply outlook in Europe was delivering more capacity than necessary to meet their reliability standards. In the 2020 ECR, we simulated a range of sensitivity levels (e.g. 90% scaling, 80% scaling,...). We then used an assumed security of supply level in the market that the sensitivity affected to determine which scaling level was credible and therefore included in the ECR. We intend to use a similar process for ECR 2021, however the methodology used to determine the security of supply level has been refined to align more closely with the methodology proposed by ENTSO-E for allowing foreign participation in capacity markets. The new methodology involves scaling thermal plant by varying levels in all modelled European markets to determine what level of thermal capacity reduction results in the market in question meeting the assumed security of supply standard. The methodology used for ECR 2020 scaled thermal plant in all European markets by the same percentage. The new methodology allows us to get all modelled European markets to their assumed security standard by varying the thermal scaling in each market.

Since last year, we have invested significant effort in improving the efficiency of the process through automation, to reduce simulation run-time and reduce the risk of human error in the process. An important benefit of reduced simulation run-time is that we have an opportunity to increase the number of simulations through a greater range of sensitivities. Table 1 provides a list of the European sensitivities that we intend to model in the 2021 ECR. The sensitivities are intended to reflect uncertainty in Europe not covered through the underlying demand and supply assumptions in the scenarios. They are not necessarily designed to provide a symmetric range around the Base Case

and scenarios. For example, if the scenario assumptions present a very positive outlook for adequacy in Europe, then the likelihood of additional upside will be lower on the basis that European countries already have more than enough capacity to meet demand, such that the sensitivities will cover more downside risks (e.g. as in the 2020 ECR analysis). Conversely, if the scenario assumptions present significant adequacy concerns in Europe, then we would expect the sensitivities to reflect more upside that would improve the outlook.

The list is not intended to be exhaustive – we may add some additional ones, particularly if supported by evidence from stakeholder feedback. In addition, while all sensitivities listed will likely be modelled, the results may not be used to inform the final range of de-rating factors in the 2021 ECR (e.g. there may be some sensitivities that have no material impact on the outcome). We expect to apply the European sensitivities one at a time to each of the scenarios in FES 2021 for Great Britain for both T-1 and T-4 CM auctions.

Table 1: Proposed European sensitivities in the 2021 ECR

European sensitivity	Rationale
Ireland thermal plant capacity	The current supply outlook in Europe generally indicates more capacity than is necessary to meet national reliability standards. This could mean that some thermal generation is operating at very low load factors; not economically viable; at risk of closure if it is unsuccessful in obtaining capacity mechanism contracts. Decarbonisation policies of member states could also lead to higher risk of this generation closing earlier than forecast.
France thermal plant capacity	
Belgium thermal plant capacity	
Netherlands thermal plant capacity	
Denmark thermal plant capacity	
France nuclear plant availability	Availability of the French nuclear has a significant impact on the supply-demand balance in Europe. Moreover, changes in the availability of French nuclear can be driven by a single event (e.g. type fault). The fleet is aging and there have been several winters in recent history in which concerns on the French nuclear fleet have resulted in reduced nuclear availability.
Belgium nuclear plant capacity	All nuclear stations in Belgium are expected to close by 2025 in line with current policy. There is a risk that stations could close earlier e.g. should a station develop a fault that the operator deems too costly to resolve given the relatively short remaining life of the plant.
Germany coal plant capacity	Germany has a large coal / lignite fleet which is currently scheduled to close at a slower pace than other European markets. There is a risk that changes to decarbonisation policy could lead this process being accelerated resulting in lower coal capacity.
Norway hydro plant reduction	Norway is well supplied through domestic hydro which is available to export to Great Britain and other countries in Europe. In most of our simulations this has led to high de-rating factors for Norway. However, there is a risk that the amount of hydro generation available could be reduced in dry weather conditions. This sensitivity is intended to simulate the impact of a year with low hydro inflow.
European demand	There is significant uncertainty in the demand outlook across Europe. On one hand, peak demand could increase faster than forecast as electrification of transport and heat drives the net zero ambition. On the other hand, decarbonisation targets could be missed and events in Europe (e.g. slow recovery from the COVID-19 pandemic) could see slower growth and lower peak demand than forecast. This sensitivity would explore both higher and lower European demand.
European wind capacity	Renewable plant capacity, particularly wind, could be deployed much faster than currently forecast as European countries decarbonise. This sensitivity considers faster growth of wind generation in Europe.