Energy for generations

Generation & Wholesale Markets

ESB GWM Response:

Integrated Single Electricity Market

(I-SEM)

Capacity Remuneration Mechanism

Capacity Requirement and De-rating factor Methodology

Consultation Paper

SEM-16-051

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Contents

EXECUTIVE SUMMARY

The methodology to de-rate I-SEM capacity units and determine the capacity requirement for the CRM auctions is a critically important component of the CRM, one that is critical to its success and to securing the supply of electricity on the island of Ireland as we transition to the new market arrangements. A highly reliable electricity supply is vitally important to attract foreign direct investment in Ireland and Northern Ireland, and to ongoing economic prosperity. ESB GWM believes there are a number of material issues in the Consultation (SEM-16-051) that warrant consideration and or re-evaluation.

From an overarching perspective four observations stand out to ESB GWM.

- Firstly, the TSOs' and ESP's respective papers set out their chosen methodologies but do not describe the rationale through which they were selected. This would help understand the reasoning for the choices made and allow a better evaluation of the proposals.

- Secondly, the work in progress status of the methodologies and indicative nature of the results published to date necessitates a new quality assurance role to cover key auction inputs alongside the auction auditor and auction monitor roles.

- Thirdly, a description of the enduring governance framework is a notable gap in the Consultation noting that the Capacity Market Code (CMC) doesn't fully capture this either. Each methodology will need to evolve as the generation mix in I-SEM continues to change, to embrace learning and to incorporate advancements to generation adequacy techniques. ESB GWM believes that at a minimum this framework should specify the recurring procedural timeline to review, consult and update each methodology, establish an independent advisory board to provide constructive scrutiny and peer review and set out the information the TSOs and SEM Committee will commit to exchange, publish or request from participants.

- Lastly, ESB GWM is concerned by the mounting implementation challenge facing the I-SEM programme, and that the first CRM auction is now flagged as "a milestone at risk" in the latest planning documents.[1] The implementation timeline is already under considerable strain and delays to the Parameters consultation and CMC only exacerbate this. We have previously stressed the importance of a comprehensive review of the programme's deliverability before any further decisions are taken and we are pleased this has been undertaken and reported to the SEM Committee.

The capacity requirement is the key determinant of capacity necessary to secure electricity supply in I-SEM. The CRM Decision 1 to retain the 8 hours Loss of Load Expectation (LOLE) reliability standard may put this at risk. SONI and EirGrid, the competent authorities in this area, favoured a 3 hour standard and their analysis suggested the benefits of moving to a higher standard outweighed the costs. A higher standard in this range would move I-SEM closer to the equivalent standard of our neighbouring countries; where GB, France and Belgium have 3 hour standard and the Netherlands has a 4 hour standard. This is also a broader reflection of the general drive towards more harmonised arrangements under I-SEM. ESB GWM remains of the view that the I-SEM reliability standard should be set at 3 hours LOLE, especially now that more is known about the new scheme's design.

A 'least worst' regrets approach to set the capacity requirement is consistent with the CRM 1 decision on this point. ESB GWM suggests refining this approach on two fronts. First, take account of the benefits of reduced costs of capacity when security is lower. This should be outweighed by the cost of extra unserved

[1] I-SEM Level 2 Plan version 15 dated 16 September 2016.

energy. And second, take account of the benefits of reduced costs of expected unserved energy when security is higher, which should be outweighed by the cost of extra capacity.

ESB GWM broadly supports the TSOs' proposed methodology to de-rate I-SEM capacity units. We have a number of remarks in specific areas, especially the marginal approach to de-rating I-SEM capacity units.

- The Generation and Capacity Statement (GCS) is the best available data source to use as an input to determine de-rating factors and calculate the capacity requirement. We suggest a number of improvements to the TSOs' approach.

- The proposal to include the reserve requirement for the single largest infeed loss is prudent. The single largest infeed loss in I-SEM is in fact the East West Interconnector (EWIC) as it has the highest Maximum Export Capacity of 500MW.

- ESB GWM supports the concept of de-rating capacity providers on a technology basis. The approach taken by the TSOs bundles unit types in the 'gas turbine' and 'steam turbine' technology categories. This may blur the technical variation among the unit types that make up these technology categories and we therefore ask the TSOs to provide a unit type breakdown of the outages rates and de-rating factors for comparative evaluation. We anticipate the TSOs have already conducted this analysis and hence it would be efficient to publish this, rather than require individual participants to repeat this.

ESB GWM has a number of reservations about the marginal approach to de-rate I-SEM capacity units.

- The choice of notional units and their size is not sufficiently described for market participants to fully understand the rationale for their selection or the impact the selected unit sizes has. It is therefore unclear how sensitive the indicative de-rating factors are to unit size or whether one technology category is more sensitive than another.

- It is unclear how the inclusion of unit size is compatible with a marginal de-rating approach.

- The use of capacity divisions creates a material variation between the indicative de-rating factors within each technology category. We are not convinced this accurately reflects an individual capacity units' contribution to security of supply. This also provides supporting evidence that tolerance bands should be set above zero.
- A breakdown of the number of capacity units that fall into the technology category and capacity division shows the prosed approach more closely resembles the a unit based approach.

ESB GWM considers there is a strong case for a more conservative approach to de-rating interconnectors and the cross-border contribution to security of supply. We believe the below points provide an overwhelming body of evidence to support this view.

- De-rating interconnectors is a complex undertaking. Interconnector flows are uncertain and there are a number of obstacles to securing flows across them. There is a tendency for outages to be long term, as highlighted by the recently announced outage on the EWIC. There is no standard methodology or approach to do this, only one precedent and numerous analytical challenges to overcome.

- ESP's proposed methodology only explores a single approach to de-rate interconnectors and dismisses any fundamental dispatch modelling. This fails to recognise or make any assumption about prices, which will determine interconnector flows between the I-SEM and GB bidding zones under I-SEM.

- The proposed single methodology should build on the substantial amount of analysis that has been put into de-rating interconnectors in GB, including the consideration of different approaches and data sources. ESB GWM would encourage greater coordination between the I-SEM and GB regulators and TSOs as this reflects the general direction of travel from Europe. Starting from a point of reciprocity will ensure there are no perverse incentives that drive prices and interconnector flows that could cost the consumer.

- ESB GWM would also like to see greater consistency between the methodology to de-rate I-SEM capacity units and interconnectors to form a coherent view of security of supply in I-SEM. While there are legitimate concerns about the TSOs conflicts of interest, the TSOs at a minimum should provide the key input data to the RAs to align the input assumptions.

The minded to position to set tolerance bands to zero is not supported by any analysis or evidence. Tolerance bands are important and there is strong indications of legitimate technical variations within technology categories. ESB GWM does not support this position and insists the SEM Committee undertakes this analysis and provides the relevant evidence prior to making its final decision.

1. INTRODUCTION

ESB Generation and Wholesale Markets (GWM) welcomes the opportunity to respond to the SEM Committee's Capacity Remuneration Mechanism (CRM) Capacity Requirement and De-rating Methodology Consultation (SEM-16-051). Our submission has the following structure:

- Section 2 sets out overarching comments in relation to this Consultation
- Section 3 explains our positions on the approach to determine the capacity requirement
- Section 4 provides our views on the proposed methodology to de-rate I-SEM capacity units
- Section 5 addresses the proposed methodology to de-rate interconnectors
- Section 6 contains our response to tolerance bands

ESB GWM would be happy to discuss our views on both methodologies further with the SEM Committee, the RAs and TSOs.

2. OVERARCHING POINTS

The methodology to de-rate capacity units and the determination of the capacity requirement for the CRM auctions is a critically important part of the I-SEM CRM. ESB GWM has a number of overarching observations relating to the two proposed methodologies.

2.1 Rationale for the chosen methodologies

There are number of approaches to de-rate different capacity providing units and to determine the capacity requirement for a CRM. The TSOs' and ESP's respective papers set out their chosen methodologies but do not describe why they were selected. We note that TSOs in other markets have included this level of detail.[2] This additional commentary would have been helpful to understand the reasons for the choices made in a number of areas and why these were favoured over others as well as helping ESB GWM to evaluate the proposals. The inclusion of this commentary would also have improved transparency.

In the subsequent sections of this submission we point out a number of instances where this is important in relation to specific aspects of each methodology.

2.2 Implementation challenges

The Consultation documents readily acknowledge the proposed methodologies are still a work in progress and require further refinement in a number of areas. It is positive this is duly recognised, however, as the CRM is likely to send a strong exit signal to capacity providers that are unsuccessful in the T-4 and transitional auctions it is critically important the methodologies are fit for purpose.

The work in progress status of the methodologies and indicative nature of the results published to date necessitates the adoption of a quality assurance process ahead of the decision on the de-rating factors and capacity requirement. ESB GWM suggests a new quality assurance role of the key inputs to the auction should be added alongside the auction auditor and auction monitor roles.

[2] National Grid Electricity Capacity Report 2016.

The latest I-SEM status report lists the publication date for a decision on this Consultation on 8 December 2016 while the latest I-SEM Level 2 plan flags the first CRM auction, scheduled for June 2017, as "a milestone at risk".[3]

The SEM Committee has also delayed the publication of the CRM Parameters consultation. An initial view of the CRM Parameter values (e.g. shape of the demand curve) would have been beneficial in responding to this Consultation. It is an imperative that all of the markets are considered in relation to each other and evidence of the interrelated impact set out. It is difficult to see how the drafting of the Capacity Market Code (CMC) can progress in parallel when these decisions and the decision on locational issues is unlikely to be known until shortly before the full CMC consultation, which is now scheduled for December 2016.

The implementation timeline is already under considerable strain and these delays only adds to that and increases delivery risk for the CRM ahead of the first scheduled auction in June 2017 (there is also no published date for the first T-4 auction). We have previously stressed the importance of a comprehensive review of the programme's deliverability before any further decisions are taken and we are pleased this review has now been undertaken and reported to the SEM Committee.

2.3 The enduring governance framework

A notable absence from the Consultation is any detail of the enduring governance framework to support the de-rating methodologies or the capacity requirement. Each methodology will need to evolve as the generation mix in I-SEM continues to change, to embrace learning and to incorporate advancements to generation adequacy assessment techniques. This information would have improved the Consultation.

Clarity on the enduring governance framework is an important aspect to the CRM. The CRM Decision 1 gave an indication of the way forward and the CMC has developed the details further. After reviewing the latest version of the CMC ESB GWM believes there are a number of gaps in this framework.[4] CMC chapter 5 addresses the methodological approach to the de-rating methodologies and the procedural aspects that relate to the methodologies and determining the capacity requirement do not feature in chapter 2. At a high level we consider it is prudent to integrate the below processes into the CMC governance framework:

- The recurring procedural timeline to review, consult and update each de-rating methodology, including the frequency of the review, the responsible parties for conducting those reviews and the form of engagement foreseen with market participants. This could be part of an end to end CRM timetable, which could be added to chapter 2 of the CMC.

- The process to approve the capacity requirement for the T-4, T-1 and transitional auctions, which we believe the SEM Committee should be responsible for.

- Establishing an independent advisory board would be a helpful addition. A form of constructive scrutiny and peer review of the TSOs' and SEM Committee's analysis will help improve the robustness of the methodologies and market participants' confidence in them. The development of a suitable terms of reference could, for example, be based on that of the Panel of Technical Experts active in GB.[5]

[3] I-SEM Level 2 Plan version 15 dated 16 September 2016.
[4] Capacity Market Code, Initial Legal Draft, 22 September 2016.
[5] https://www.gov.uk/government/groups/electricity-market-reform-panel-of-technical-experts

- What information the TSOs and SEM Committee will commit to publish and what information (if any) may be required from market participants. This will improve transparency and market participants' understanding and confidence in the CRM.

3. CAPACITY REQUIREMENT

The capacity requirement is the key determinant of capacity necessary to secure electricity supply in I-SEM.

3.1 Interaction with reliability standard

ESB GWM remains concerned by the SEM Committee's CRM Decision 1 to choose 8 hour LOLE as the reliability standard, especially as much more is now known about the detailed design of the new scheme.

Ireland and Northern Ireland are open economies and rely greatly on foreign direct investment. Undoubtedly there are many reasons why investors might choose to locate in Ireland or Northern Ireland but the cost and reliability of energy supply are contributing factors. ESB GWM recognises the concerns of the SEM Committee around the cost of energy and the potential for limiting competitiveness and increasing fuel poverty. However, at the same time, the SEM Committee must balance the perceived increased costs against the increased level of security of supply that affords. We are concerned that the SEM Committee has tipped the scales too far from security of supply and has taken a very short term view that costs need to be as low as possible.

The move from a price based capacity mechanism to a volume based one is significant. The current price based scheme has a very flat demand curve inherent in it, and therefore the 8 hour standard was likely to be exceeded (that is, a better level of reliability).

However, with the move to a volume based scheme, the SEM Committee is explicitly saying that consumers will not pay for any capacity above the 8 hour standard. This is a significant statement. GB, France and Belgium have a 3 hour standard and the Netherlands has a 4 hour standard.[6] This of itself has a distortive effect where Ireland and Northern Ireland could be seen to piggy back on the fact that GB procured more capacity and decided to procure less on the back of their decision. In CRM Decision 1, the SEM Committee rightly stated that they have the right to set reliability standards different to neighbouring markets; this does not mean it was the right thing to do.

The SEM Committee in making the decision on 8 hours ignored the advice of the competent authority on the matter, namely the TSOs. SONI and EirGrid in their CRM 1 response suggested that the optimal range was 2-4 hours and favoured the 3 hour standard. SONI and EirGrid also stated in their response that the costs of a tighter standard are out-weighted by the benefits of a more reliable system. This analysis has been discounted by the SEM Committee.

The recent CRM locational issues consultation indicates the possibility that 2,600MW of capacity will fail to get a contract under the new CRM. These plants will receive a strong signal to close. While there is a Grid Code requirement to give three years' notice, this would be in a business as usual basis and requiring such plant to remain without any reasonable prospect of recovering their net going forward costs would fail to pass any level of reasonableness test. Therefore the reality is that in late 2017, Ireland and Northern Ireland could be faced with the loss of more than 2.5GWs of capacity. This will be combined with a declaration from the SEM Committee through the reliability standard that I-SEM consumers are willing to accept close to three times the loss of load annually that GB, Belgium or France is willing for their consumers to accept.

[6] All these reliability standards are expressed in hours Loss of Load Expectation.

The SEM Committee's decision on the reliability standard combined with the outputs of the CRM auction could affect the foreign direct investment environment. In particular, it will make the jobs of Invest NI and the IDA much more difficult in an era when high-tech industries who require a high quality electricity supply are investing in Western European economies. While CRM Decision 1 suggests that foreign direct investment brings its own back-up generation, this is far from universally true.

3.2 Least worst regrets

We note that a 'least worst' regrets approach to setting the capacity requirement is consistent with the CRM 1 Decision on this point. However, a careful reading of the methodology suggests that the implementation requires one crucial refinement.

As written, the methodology considers the costs of extra unserved energy (when security turns out to be lower than expected) and the extra cost of capacity (when security turns out to be higher than expected) as shown in Figures 14 and 15 of the TSOs' report.

The methodology should also take account of the benefit of reduced costs of capacity when security is lower than expected. This would be shown as negative numbers in the green section of Figure 14 of the TSOs' report. This should be outweighed by the cost of extra unserved energy (if the security standard is correct) but should be included.

Similarly, the methodology should also take account of the benefit of reduced costs of unserved energy when security is higher than expected. This would be shown as negative numbers in the green section of Figure 15 of the TSOs' report. This should be outweighed by the cost of extra capacity (if the security standard is correct) but should be included.

This is the approach taken by National Grid and described in its Electricity Capacity Report[7].

3.3 The need to recalculate the capacity requirement

The TSOs' proposed methodology to determine the capacity requirement randomly selects capacity adequate portfolios from the capacity units currently installed on the system. Since capacity providers can opt out of the CRM in the qualification phase it is possible that a different subset of capacity providers elect to participate in the auction. After taking account of capacity providers that opt out, the remaining capacity to be procured through the auction could potentially be sourced from a different mix of capacity providers. It is important the random selection of the capacity adequate portfolios is made from this subset of capacity providers. As such, ESB GWM believes there is sound rationale for the TSOs to recalculate the capacity requirement after the qualification stage. This does not require a complete re-run of the analysis as the de-rating factors from the pre-qualification phase would be held constant.

4. METHODOLOGY TO DE-RATE I-SEM CAPACITY UNITS

This section sets out our views on the TSOs' proposed methodology to de-rate I-SEM capacity units. ESB GWM considers the overall approach is reasonable although we have a number of comments on specific issues.

4.1 The generation and capacity statement

The TSOs' propose to use the GCS as a key data input into the de-rating methodology and ultimately the determination of the capacity requirement. ESB GWM consider the GCS is the best available data source

[7] https://www.emrdeliverybody.com/Lists/Latest%20News/Attachments/47/Electricity%20Capacity%20Report%202016_Final_080716.pdf

to use. We would however suggest a number of improvements to it as it now plays an elevated role in securing the electricity supply in the all island market.

- Review of the Demand forecasting approach: it is widely recognised across Europe that GDP and GNP are not linked with electricity demand growth. The role of the ESRI and the medium term review should be examined. The latest GCS (Mar 2016) uses the MTR (July 2013) for its longer term trends and high low scenarios. For the CRM an annual long term review and scenarios – that are not economically driven – is more appropriate, and this should be subject to a public consultation.

- Timeliness: the GCS has regularly been delayed in recent years. Historically, it was published in December so it had to use indicative data for November and December. It is now published in March but still uses indicative data for November and December. ESB GWM would like clear agreement of publication dates and what actual and forecast data will be used, and that it is communicated to market participants well in advance of the CRM timetables.

- Audit: the GCP and its data and vary wildly from year to year, which could have major implications for the CRM. As the results will be used in the CRM there should be greater transparency and audit requirements on the TSOs, as well as the requirement to validate data.

- Governance: the timing of the GSC publication and data required from capacity providers should form part of the wider CRM governance framework and CRM timetable mentioned in section 2.3.

4.2 Single largest infeed loss

ESB GWM supports the inclusion of the reserve requirement to cover the single largest infeed loss. This is a sensible inclusion as it reflects the design of the CRM where only capacity providers that clear the auction will receive a RO and is consistent with the approach taken in GB.

We question whether the single largest infeed loss in I-SEM should be a generator as the Consultation seems to imply. From the broader perspective of capacity providers the single largest infeed loss is the EWIC, which has Maximum Export Capacity to the transmission system of 500 MW, and not a generator at 444 MW.[8]

4.3 Technology categories

ESB GWM supports the approach to de-rate capacity providers on a technology basis rather than on a plant-specific basis.[9]

Table 2 of the TSOs' paper proposes the technology categories to apply in I-SEM. The choice of technology categories is an important input into the subsequent multi-scenario analysis to determine the marginal de-rating factors. The 'gas turbine' and 'steam turbine' technology categories each bundle a number of unit types together. ESB GWM acknowledges a trade-off between homogeneity and sample size is important in a small market like I-SEM. However, based on the information in the TSOs' paper we are concerned about the impact this bundling may have on the proposed forced outage rates, scheduled outage rates and the resulting de-rating factors as it may blur the technical variation among the unit types that make up these technology categories.

To that end, ESB GWM asks the TSOs to provide a unit type breakdown of the forced outage rates, scheduled outages rates and de-rating factors for comparative evaluation of the technical variation among

[8] http://www.eirgridgroup.com/site-files/library/EirGrid/Connected-TSO-(Non-Wind)-Generators-1th-Sept-2016.pdf
[9] SEM-15-075m, p. 1.

unit types. The TSOs' paper also notes they considered alternative technology categories but the paper does not describe these. This would also improve the transparency of the proposed methodology. We anticipate the TSOs have already conducted this analysis and hence it would be efficient to publish this, rather than individual participants repeating this. The de-rating factors determined by National Grid for the GB capacity mechanism illustrate a material variation between these unit types, for example, the de-rating factors range from 87.60% to 94.17% in the 'gas turbine' technology category.[10]

When considered alongside the minded to position to set tolerance bands to zero, ESB GWM is concerned the de-rating factors may not reflect legitimate technical variation. This, as noted in the TSOs' paper, may be disadvantageous to more efficient plant and advantageous to less efficient plant. This creates a risk that less reliable plant is forced to offer more capacity than they may be confident in delivering and could be exposed to material penalties.

4.4 Marginal de-rating process and capacity divisions

The CRM Decision 1 chose a marginal de-rating approach on the basis that diversification effects could make a material difference to the capacity contribution of different capacity units with the same forced outage rate.[11] This decision appears to have been largely made on the back of EirGrid's submission. As a result, an I-SEM capacity unit's de-rating factor seeks to capture its marginal contribution at times of system stress. The TSOs' paper describes a multi-stage process to do this, which is briefly summarised below.[12]

1) Demand scenarios are constructed from demand forecasts and demand profiles (figure 8 from the TSOs' report).

2) For each demand scenario, random portfolios of actual capacity units are tested to assess if that portfolio achieves the reliability standard using the adequacy calculator (figure 9).

3) The random portfolios that pass this test form a set of capacity adequate portfolios for that demand scenario. The approach produces five capacity adequacy portfolios per demand scenario.

4) The adequacy calculator schedules ambient and scheduled outages determining a set of generating units available in each hour.[13] The adequacy calculator then simulates forced outages of capacity market units independently for each hour to assess the level and probability of unserved load in that hour.[14] The loss of load probability and expected energy unserved for that hour can then be calculated.

5) The marginal de-rating process then adds a notional unit to a capacity adequate portfolio for a given demand scenario to determine the de-rating factor of the notional unit, which is defined by the ratio of the increased demand (so the new portfolio equals the 8 hour LOLE reliability standard) over the notional units size. The notional unit will have the outage characteristics of one technology category.

6) To build a curve of de-rating factors as a function of unit size for one technology category this process must be repeated with notional units of different sizes and then repeated for each

[10] National Grid Electricity Capacity Report 2016.
As peat fired unit types feature in the 'steam turbine' technology category it is not possible to draw a comparison with GB, which has technology categories for oil fired and oil burning plant and coal and biomass.
[11] SEM-15-103, p. 127-130.
[12] SEM-16-051a, p. 24-29.
[13] Ambient outages based on historic patterns and scheduled outages at the time of the greatest surplus of available generation over demand.
[14] This determines the level of unserved energy for every permutation of forced outages that occur in an hour.

technology category. This process determines a set de-rating factors for any unit of any size belonging to a technology category (figure 11).

7) The de-rating factors can be calculated by applying the de-rating curves to each unit within a capacity adequacy portfolio. The de-rated capacity requirement is then set to the sum of those de-rated capacity units.

8) For each demand scenario this results in:

   a) a different de-rated capacity requirement for each capacity adequacy portfolio

   b) a different set of de-rating curves for each capacity adequacy portfolio.

   c) a single set of de-rating curves for each demand scenario, with the de-rating factor for a unit of a given MW size and technology being the average de-rating across all capacity adequacy portfolios for that demand scenario for a unit of that size and technology.

ESB GWM has a number of reservations about the proposed approach.

- The choice of notional units and their size is not sufficiently described for stakeholders to fully understand the rationale for their selection, the impact the selected unit sizes has or the unit sizes applied to each technology category. Without this visibility it is unclear how sensitive the marginal de-rating factors are to unit size or whether one technology category is more sensitive than another. It would be helpful if the TSOs could publish the modelling that sits behind this approach.

- The underlying rationale for using capacity divisions and their selected size is not sufficiently explained or justified. It is also unclear how the inclusion of unit size is compatible with a marginal de-rating approach. “Marginal” means the change at the margin (which is often equated to the change for a 1 MW increase, but in theory should be the incremental change) so adding a 100 MW cannot generate a marginal de-rating factor.

- Table 4 of the TSOs’ paper divides capacity units within a technology category into 100MW capacity divisions. As a result, there is a material variation between the indicative de-rating factors within each technology category. We are not convinced this accurately reflects individual capacity units’ contribution to security of supply. This also provides supporting evidence for including tolerance bands counter to the minded to decision to set them to zero.

- A breakdown of the number of capacity units that fall into the technology category and capacity division is set out in Table 1. The CRM Decision 1 was for de-rating to be based on technology categories yet the indicative de-rating factors more closely resembles a unit based approach. It is also slightly odd the indicative de-rating factors include capacity divisions that contain no actual capacity units and while we recognise this caters for new entrants of various sizes we would question the appropriateness of including notional units of this scale if this did form part of the analysis.

- The resulting marginal de-rating factors appear to be a function of the overall generation mix as well as individual capacity units’ technical availability. The marginal de-rating factors will presumably change year on year. Consideration should therefore be given to if and how de-rating factor of any capacity provider that receives a long term contracts is adjusted each year.

Table 1: capacity units' nameplate capacity per proposed capacity divisions

Nameplate capacity	Gas Turbine	Steam Turbine	Hydro	Storage	Interconnectors
0-100	7	14	15	4	0
101-200	4	3	0	0	0
201-300	5	7	0	0	0
301-400	3	0	0	0	0
401-500	5	0	0	0	2
Total	24	24	15	4	2

5. METHODOLOGY TO DE-RATE INTERCONNECTORS

There is no standard approach to de-rating interconnector capacity, and there is very little precedent and experience of de-rating interconnectors in European power markets. GB is the only Member State to develop interconnector de-rating factors to date. The Department of Energy and Climate Change (DECC, now BEIS) and the GB System Operator (National Grid) have developed approaches to de-rate interconnector capacity which should be part of the SEM Committee's considerations.[15]

There are a number of analytical challenges to overcome in de-rating cross-border capacity.

- Historical data and experience predates market coupling, where it is in place, and is therefore not a good indicator of future interconnector flows.
- The most appropriate modelling approach would involve running many iterations of a probabilistic pan-European dispatch model using forecast demand and supply to develop a robust probability distribution in the context of full market coupling. However, limited historical data complicates backward calibration and testing.
- To develop the 'country de-rating factor' for each interconnected market requires a detailed assessment of security of supply of that market. Ideally this should involve the relevant TSOs that operate in that market.

The SEM Committee's consultants, ESP, have focussed on one particular approach based on simulation of coincident system stress. Alternative approaches have not been explored, and in particular ESP dismiss the option of fundamental dispatch modelling but do not explicitly recognise the assumptions being made regarding prices. Although it is not clearly set out, the methodology as proposed makes the assumption that if GB is under stress, I-SEM will export to GB. This is equivalent to saying that GB prices will always be higher than I-SEM prices at times of stress in both markets.

5.1 Why interconnectors are different

5.1.1 Challenges to secure flows

Interconnector flows are uncertain and there are a number of challenges to secure flows.

- Under I-SEM, the day-ahead and intraday markets will be coupled with the rest of Europe as part of the IEM, meaning that prices and interconnector flows will be the result of common price formation processes. This gives participants confidence that interconnector flows will flow in the

[15] National Grid Electricity Transmission plc.

right direction. However, it is still uncertain how the interim intraday market will work and how the Balancing Market will operate in I-SEM and under the Network Code for Balancing. At the present time the RAs and market participants do not have this certainty.

- Different security of supply parameters exist between I-SEM and the GB electricity markets. This includes different security standards (hours of LOLE), Values of Lost Load (VoLL) and the scarcity pricing functions in the Balancing Mechanism/Market. It is difficult to envisage how these will interact together. This challenge is magnified further by the above mentioned uncertainty about the operation of the short-term trading markets in I-SEM.

- The potential for coincidental stress events across the I-SEM and GB electricity markets is another challenge to secure interconnector flows. These would likely occur during correlated weather events. While weather correlations can be analysed and simulated such events potentially impact the flows across interconnectors as market operations may be in a fallback or administered situation. An administered situation is an event when the operational state of the transmission network moves away from a normal system state.

All these points support a conservative approach to de-rating the cross-border contribution to security of supply.

The ESP methodology assumes that the agreements in place for the interconnectors will ensure that power will always flow between the GB and I-SEM markets so long as there are not coincidental peaks. However, this should be tested further:

- At a previous generator forum, the TSOs indicated that there is a 200MW facility on each interconnector for system security reasons. This implies that each TSO always has access to 200MW of capacity on each IC. If this is the case, it is not clear that this 200MW can be truly relied upon as firm capacity.

- During the development of TSC Modification 21_12 Amendment to Available Transfer Capacity (ATC) definition, the TSOs informed the Mods Committee of reasons why the interconnector might need to be curtailed. In particular, the Final Recommendation Report for 21_12 suggests that National Grid can apply restrictions to I-SEM interconnector capacity due to GB limitations. This position appears to be supported in Paragraph 5.42 and 5.43 of the TSC which mentions relevant agreements as being grounds for reducing transfer capacity. It is not at all clear that this is limited to coincidental peaks.

- The March 2015 National Grid Methodology Statements for Determination of System to System Flow for Moyle and EWIC suggests that the scheduled interconnector reference program is subject to Intraday Trading Limits. This appears to further suggest that National Grid has an ability to reduce cross border capacity where it sees the need and that the I-SEM TSOs cannot contractually say no to this. The ramp rates for the interconnectors may also constrain their ability to fully respond to a system stress event.

Before applying final derating factors, of the magnitude proposed, to Moyle and EWIC, the SEM Committee should clarify the contractual relationship between the National Grid and the I-SEM interconnectors. If National Grid has the power to reduce transfer capacity, this needs to be taken into account. The question is not about whether they would ever invoke this but about them having such a power. If National Grid does have and retain the ability to reduce the transfer capacity then the de-rated capacity of the interconnectors should be significantly lower than the values proposed in the ESP report.

5.1.2 The nature of the Reliability Option

If the RO reference price exceeds the Strike Price in a trading period, all RO holders with a position in that market will need to pay back the difference between the strike and reference price. This difference payment has no financial cap (other than the monthly and annual stop loss). As such, all RO holders collectively face a considerable risk.

However, as a result of the CRM 2 decision, interconnectors will only be exposed to availability risk. Interconnectors are therefore not held to the same standard as domestic I-SEM capacity units, which is a tacit recognition of the lower ability of interconnectors to provide security of supply. This should be reflected in de-rating factors.

5.1.3 Consistency and alignment between interconnected markets

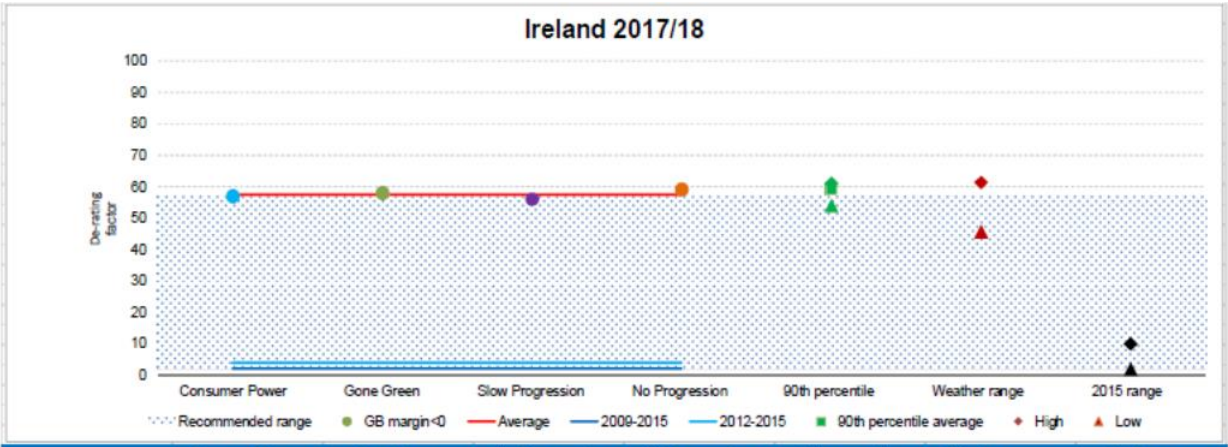
EWIC and Moyle will be participants in both the GB CM and the I-SEM CRM. Therefore, it is instructive to consider the approach taken in GB, and we are surprised that this has not been explicitly considered in the Consultation.

The GB approach to IC de-rating is complex with National Grid relying on multiple analysis sources (historical flow analysis, historical net demand peak correlation analysis, and forward looking fundamental modelling of flows in an economic dispatch model). The summary of analysis for Ireland for the 2016 capacity report is shown in Figure 1 and Table 2 below[16].

- National Grid carried out a review of historic flows at peak demand.
- Poyry carried out historic analysis which looked at the top 5% of tightest margins each year since 2008, rather than periods of highest demand to establish what contribution interconnectors make to security of supply at the tightest periods of stress.
- Baringa Partners carried out forward looking analysis (using Plexos) to forecast expected future interconnector flows at times of system stress,

[16] National Grid Electricity Capacity Report 2016, p. 70.

Figure 1: National Grid's Irish interconnector de-rating factors 2017/18



	Consumer Power	Gone Green	Slow Progression	No Progression	90th percentile	Weather range	2015 range
GB margin<0	57	58	56	59			
Average	58	58	58	58			
2009-2015	2	2	2	2			
2012-2015	4	4	4	4			
90th percentile average					59		
High					61	61	10
Low					54	46	2
Recommended High	58	58	58	58	58	58	
Recommended Low	2	2	2	2	2	2	

This demonstrates that National Grid has looked at a number of approaches which give a wide range of outcomes. In the I-SEM to GB direction, it turns out that for 2017-18 the historic flows provide the lowest estimate, with economic modelling the highest estimate.

National Gird has reflected this uncertainty in proposed de-rating factors. ESB GWM would have ideally liked to see the approach for I-SEM build on this foundation. We also note that with National Grid's cooperation, it might be possible to re-interpret the GB approach to generate de-rating factors for I-SEM for comparison.

This creates a range of estimates which is passed to DECC (now BEIS) to review. The Panel of Technical Experts (PTE) and Ofgem also provide comment, with the Secretary of State making the final decision. We do not suggest that an exactly analogous process should be followed in I-SEM (see Section 2.3 for our comments on governance).

Ofgem, in their advice to Secretary of State suggested that EWIC and Moyle should have a 25% derating factor. In the Appendix of their letter to the Minister they say that I-SEM and GB have strongly correlated fundamentals implying higher likelihood of tight margins coinciding. ESB GWM suggests that the I-SEM RAs engage further with the relevant GB authorities on this point. It would appear that GB has decided not to place the risk of limited interconnector imports due to coincidental scarcity on GB customers.

Table 2: National Grid's Irish interconnector de-rating factors 2017/18

	2015 T-4 (2019-20)	2016 T-1 (2017-18)	2016 T-4 (2020-21)
National Grid range	2-10%	2-58%	25-50%
Panel of Technical experts	25% is a reasonable upper limit	Technical perspective – upper end of NG range. But recognises national strategic interests	Technical perspective – upper end of NG range. But recognises national strategic interests
Ofgem	25%	25%	25%
DECC (final)	6%	30%	26%

Security of supply and adequacy assessment

We have noted above that the I-SEM and GB markets have different security of supply parameters. There is merit in the progressive convergence of these parameters although the SEM Committee has not chosen to do this in the context of the reliability standard to date.

The European transition to greater cooperation and coordination seeks that TSOs should work closer together and even perform a joint assessment. This need is magnified by the TSOs proposal for the capacity calculation regions that will apply to the forward, day-ahead and intraday timeframes, which proposes that Ireland and the UK be a separate region. Cooperation and coordination on this level should be relatively straightforward given the limited number of TSOs involved. This coordination could bring numerous benefits to both markets and would certainly improve the proposed approach to de-rating capacity on the I-SEM and GB bidding zone border.

ENTSO-E has developed a vision[17] for adequacy assessment forecasting which should form the basis for any methodology developed. It is not clear that ENTSO-E's vision and methodologies have been taken into account when developing the interconnector methodology.

5.1.4 Interconnector Participation in CRM Auctions

Although not directly discussed in this Consultation Paper, ESB GWM would welcome further discussion on the form of participation of the interconnectors in the capacity auction. If the interconnectors can participate and pass any costs associated with that participation back through the TUoS customer then there is a potential market distortion where non-supported players cannot compete on a level playing field. While the same argument might be levelled against supported generation, they are a much lower capacity than the interconnectors and our participation has been mandated by the SEM Committee taking the decision out of our hands.

In addition, consideration needs to be given to the interaction between the interconnector owners' participation in the CRM auction and their issuance of FTRs. In particular, does their participation in both create a risk of double pay-out during an outage and is there a possibility that down the line there might be a push to dilute the FTR pay-out to mitigate the risk?

We would welcome more discussion on the underlying risk sharing arrangements between the interconnector owners and the TUoS customer ahead of the CRM auction given the level of capacity being

[17] http://vision.entsoe.eu/security/adequacy-assessment-forecasting-sos/

credited to the ICs and the potential for distortion that brings. In addition, we would welcome further discussion on the potential interactions between FTRs issued by the interconnector owners and the holding of an FTR during an interconnector outage.

5.2 Alignment of generator, demand side and interconnector de-rating methodologies

The methodologies to de-rate I-SEM capacity units and interconnectors should align as far possible to form a coherent view of security of supply in I-SEM. There are a number of difference in the methodologies and assumptions employed.

We note the following inconsistencies in approach in Table 3. We recognise that the SEM Committee has taken account of market participants' concerns regarding the TSOs' conflict of interest by taking direct responsibility for developing the interconnector de-rating methodology. However, there is a still a need to align the methodologies and data to ensure equitable treatment and a secure system. To this end, the selection of input assumptions should be aligned, and the TSOs should provide the key data to the RAs.

Table 3: Inconsistencies between de-rating methodologies

Area	Interconnectors	I-SEM capacity units	ESB GWM recommendation
Time of year	Winter work day only	Year round	Year round. The only recent demand control events in GB occurred in May (2008) and a winter weekend (Feb 2012). Also at odds with ENTSO-E year round approach
I-SEM Demand	1. Normal distribution of temperature derived from historic temperature data 2. Linear regression to historic demand (2010 to 2015) to generate demand 3. Bivariate normal sampling of distribution 4. Average daily profile applied to peak demand value	1. 10 peak demand forecast between GCS High and GCS Low 2. Historic demand profiles 2007-2014 3. Combine to generate large number of demand series	Compare outturn demand variation. Use I-SEM capacity units approach
I-SEM Wind distribution	1. Forecast of installed capacity from GCS 2. Develop histogram from 2010-2015 historic half hourly data (aggregated to days) 3. In "base case", no correlation between wind output and demand (recognised in sensitivity)	Metered data (2007-2014)	Use the approach proposed in the TSOs' report
Operating reserve	450 MW	444 MW	Use EWIC capacity as largest loss
Installed capacity	Output of TSOs' work	Randomly drawn from current GCS	Ensure installed capacity portfolios are credible (i.e. includes all wind, hydro, pumped storage since v. unlikely to exit)

Thermal outage rate	7% for all units	5 years (2011-2015) of EDIL data (average run-weighted by category)	Use the approach proposed in the TSOs' report
Thermal distribution	Monte Carlo simulation	Formulaically generated as a distribution (probability outage table)	Use the approach proposed in the TSOs' report

We recommend that the interconnector approach to these points is modified to align to the TSOs' approach for I-SEM capacity units.

5.3 Methodological comments

Notwithstanding ESB GWM's view that the interconnector methodology should be aligned to the I-SEM domestic methodology, we have the following comments on specific elements of the methodology.

5.3.1 Demand forecasting

In section 3.3.2, daily temperature is defined to be a normally distributed variable but no justification is provided and it is not clear if this refers to mean temperature on a randomly chosen day, or temperature on each day individually.

The treatment of non-market demand should be checked with the TSOs.

The statement in 3.2.6 on GB/SEM capacity year mapping for demand forecasts appears to be incorrect. GB ETYS April year Y/Y+1 should map to SEM Oct year Y/Y+1 (since these contain the same winters), rather than Y+1/Y+2.

5.3.2 Wind forecasting

The approach of generating a wind output histogram may be problematic if the bins are too large, particularly at the low output end that is of most interest. According to Figure 3 in ESP's report, there is a 0% chance of zero output, and a 10% chance of 5% output. In other words, wind output can never be zero. It would appear to be important to understand how the distribution changes between 0 and 5% output.

A fixed wind level for the day as set out in 4.1.3 may not be appropriate as it would seem prudent to capture within day variation.

Further detail is required on the assumed correlation between GB and I-SEM wind (4.1.4). Is perfect correlation assumed?

Offshore wind is significant for GB and should be considered via a separate profile (4.3.5)

5.3.3 Operating reserve

ESP appear to be assuming between 3.6 and 9.1 GW of operating reserve in GB, based on NG's OPMR data. ESB GWM is not convinced OPMR is the right metric, and nor is it comparable to the ~450MW largest infeed loss reserve assumed for I-SEM. National Grid assumes approximately 1 GW of reserve to cover largest infeed loss in its 2016 capacity report (0.9 GW in 2017/18 rising to 1 GW then 1.3 from 2020/21).

5.3.4 Determining effective capacity

The methodology for determining the effective capacity of the interconnectors appears to work as follows. The following parameters are determined:

1. The probability of scarcity in I-SEM assuming no flow from GB
2. The probability of scarcity in I-SEM if the interconnectors are fully exporting.
3. The probability of scarcity in GB assuming no flow from I-SEM.
4. The probability of scarcity in I-SEM given scarcity in GB is the product of (2) and (3).
5. The total probability of scarcity in I-SEM is (1) + (4)
6. Proportion of time ineffective is (2) / (5)

In ESB GWM's interpretation, this does not appear to take account of the possibility that the interconnectors may be importing in (1) thereby reducing I-SEM scarcity. Therefore (5) is overstated and the proportion of time ineffective (6) should be higher.

More generally, the methodology seems to use binary variables for whether there is a shortfall in each market, rather than recognising that it is the continuous variables representing margin in each system which determine whether I-SEM has a shortfall. A more refined approach for considering two-area scarcity was implemented for Ofgem's Capacity Assessment 2012 for consideration of the Cheviot boundary between England and Scotland.[18]

5.3.5 Interconnector technical availability: treatment of long term outages

There is a history of significant outages on the both of the Irish interconnectors. The methodology to de-rate I-SEM capacity units and interconnectors should treat long term outages consistently. In the methodology as currently proposed, this does not appear to be the case.

One half of Moyle (250 MW) has been on long term outage from spring 2013 until later 2015. This outage has been discounted from the analysis of forced outage rates. However, in the TSO paper, the long term outage of Turlough Hill in 2011-12 has been included in the analysis. In ESB GWM's view, the Moyle outage cannot be excluded if the Turlough Hill outage is included. We are firmly of the view that the SEM Committee is taking a significant risk with the security of supply, particularly in Northern Ireland by assuming that the Moyle interconnector will be back to full capacity for I-SEM and will stay at that level (at least until a period of operation at full capacity has been demonstrated).

In addition, EWIC recently announced a significant outage until February 2017[19] which should be included in this analysis.

6. TOLERANCE BANDS

The CRM Decision 1 raised an expectation that there would be a tolerance band greater than zero and that the SEM Committee's analysis would underpin that decision.[20] The minded to decision in this Consultation is to set tolerance bands within de-rating factors to zero. ESB GWM would have expected to see some detailed analysis supporting this proposal but this does not feature in the Consultation. Evidence based decision making is a key regulatory principle and is essential to support any minded to position.

We outline the importance of tolerance bands and reasoning for legitimate technical variation within a technology category. For these reasons we think the tolerance bands should be set with reference to the

[18] https://www.ofgem.gov.uk/ofgem-publications/40203/electricity-capacity-assessment-2012.pdf
[19] http://www.eirgridgroup.com/customer-and-industry/interconnection/
[20] SEM-15-103, p. 12, 14, 131 and 138.

technical variation within the chosen technology categories and after considering the interaction with the high level of stop loss mooted or else the level of stop loss should be reduced.

6.1 The importance of tolerance bands

The importance of being able to avail of a tolerance on a de-rating factor in the CRM auction appears to have been overlooked by the SEM Committee. The I-SEM CRM has a very different risk profile to other comparable incentive mechanisms. The most important distinction lies around the stop loss being implemented. CRM Decision 2 indicated that the stop loss will initially be set at 1.5 times the annual option fee.[21] A generator receiving €10m in option fees in one year may have to pay back up to €15m if they are not available at times of scarcity. This is in contrast to the GB scheme where the stop-loss is 1.0 which in the example above sees the capacity provider with a very lean year but without the same financial risk.

The only way an existing capacity provider can express its risk appetite for the CRM is through a tolerance band within the applicable technology category de-rating factor.

ESB GWM is strongly of the view that there should be tolerance bands on the de-rating factors. The extremely high stop loss provides a very strong incentive to capacity providers to be precise on their own de-rating factor and they should have discretion to do this. The SEM Committee may be concerned that all capacity providers will qualify an amount of capacity at the upper end of the range but given the stop loss of 1.5 this is unlikely. If capacity providers bid at the lower end the SEM Committee should be concerned that they are placing unmanageable risks on the capacity providers. Such unmanageable risks will ultimately return to the consumer through inefficient or under investment. However, if the SEM Committee are convinced that tolerance bands are not appropriate they should give further consideration to lowering the annual stop loss limit. This should continue to be greater than 1x of the option fee.

6.2 Legitimate technical variation

The Consultation suggests that there would be limited legitimate technical variation between plants within each technology category proposed by the TSOs.[22] However, it's not clear if this is the case or not. The TSOs' paper does not provide the technical variation of the individual unit types that make up the 'gas turbine', 'steam turbine' and 'demand side units' technology categories. Publishing the forced outage rates, scheduled outage rates and the marginal de-rating factors at this disaggregated level would be helpful. Without this level of granularity it is not possible to analyse whether there is or isn't any technical variation with these technology categories, let alone assess if this is material. ESB GWM therefore considers it unreasonable to set tolerance bands to zero in the absence of such evidence and analysis.

Further, the SEM Committee and the TSOs acknowledge that de-rating plant on a technology basis may unfairly disadvantage more efficient plant while benefiting less efficient plant.[23] This is more pronounced given the proposal to include a capacity providers' size in addition to technology categories as per Table 4 in the Consultation. On these two points alone it suggests there is a sound rationale for including a tolerance band in the I-SEM CRM.

[21] SEM-16-022, p. 79.
[22] SEM-16-051, p. 10.
[23] SEM-16-051a, p. 19.