DCCAE

Implementation Plan for Ireland

To meet the requirements of the recast Electricity Market Regulation 2019/943

Prepared for DG ENER Opinion

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Contents

Section 1: Introduction

This paper should be considered as the Implementation Plan for Ireland, submitted in fulfillment of the objective set out in Chapter IV of the recast Electricity Market Regulation 2019/943, part of the Clean Energy Package (CEP).

This introductory chapter provides the initial context for the substance of Ireland's plan by outlining and articulating the following matters:

- How the Articles frame the Member State objective to have an Implementation Plan in place, if and when a resource adequacy concern has been identified, and the high level content of such a plan sought and set out in the Articles (Section 1.1).
- The recent comprehensive reform of the Ireland's wholesale electricity market carried out under the Integrated Single Electricity Market (I-SEM) project, including ongoing and further planned future measures, and the manner in which this relates to the requirement for an Implementation Plan (Section 1.2).
- In the light of all the above factors and context including the stage of development of reforms and measures in the Irish wholesale market, the approach taken towards substantive content in this Plan is outlined (Section 1.3).
- The concluding section (Section 1.4) sets out the structure and broad content of the remainder of this Implementation Plan.

Given the fact that Ireland's and Northern Ireland's wholesale electricity markets were joined in 2007, the relationship between Ireland's Implementation Plan and Northern Ireland's Implementation Plan about the same market is also described in this Section for clarity.

Ongoing reporting requirements are also noted here.

Note: Content on market and grid measures in the succeeding sections has been sourced variously from CRU, Eirgrid, SONI and SEMC papers and documents in the public domain and where relevant Government Policy documents and Oireachtas material.

1.1: Requirements

Chapter 4 of Regulation 2019/943 is focused on resource adequacy, including the design and application of capacity mechanisms, within the internal market for electricity, and individual Member State wholesale markets. The immediate context for this paper is a requirement contained within Article 20 of the Regulation.

When addressing resource adequacy concerns, the Regulation requires that Member States shall take into account the principles of wholesale market operation and design set out in Articles 3 and 20. Article 20 also states that Member States with identified resource adequacy concerns identify regulatory distortions and market failures that may have caused or contributed to the adequacy concern. It further provides that member states with identified electricity resource adequacy concerns develop and publish an annual Implementation Plan. The Implementation Plan is required to contain "a timeline for adopting measures to eliminate any identified regulatory distortions or market failures as a part of the State aid process." The principles in Article 3 relate to the operation of electricity markets and are quite wide ranging and high level, covering issues such as market rules, energy storage, cross border flows, regional cooperation, customer empowerment, free price formation and appropriate incentives for long term investment in generation. Articles 3 and 20.3 in this manner provide pointers for the content of an Implementation Plan as regards market requirements for which measures may need to be adopted.

As regards process, the Member States are to submit the plan to the Commission for review. The Commission then issues an opinion on whether the measures are sufficient to eliminate the regulatory distortions or market failures that were identified as causing or contributing to the resource adequacy concern. As regards timing, the Regulation provides that this Commission opinion is to be issued within four months. The opinion from the European Commission will be as to whether the measures are sufficient to eliminate any identified regulatory distortion or market failures that were identified and may contain an invitation to the Member States to amend their Implementation Plans. The Article also sets out that the Member State shall monitor the application of their Implementation Plans and shall publish the results of the monitoring in an annual report to be submitted to the Commission. It further provides that the Member State shall continue to adhere to the Implementation Plan after the identified resource adequacy concern has been resolved.

Article 21 states that a Member State shall not introduce a capacity mechanism until the Commission opinion referred to above has been received. In the case of a Member State with an existing capacity mechanism, the process appears more convoluted, with a restriction sought to be placed on the conclusion of new contracts in that mechanism in certain circumstances, basically either until a resource adequacy concern has been identified or the Commission opinion referred to above has been received. For Member States with existing State Aid compliant CRMs, no new

capacity contracts may be concluded or commitments entered into from January 2020 pending an opinion by the European Commission on the Implementation Plan.

Before outlining how all these provisions can be applied in the Irish situation, it is necessary to describe the recent process of fundamental wholesale electricity market redesign in Ireland. This redesigned market involved a comprehensive programme of measures and has as an integral component a state aid approved capacity mechanism. That redesign was focused on ensuring compliance with internal electricity market provisions from the Third Package and related network codes and guidelines, as well as with meeting Irish energy policy requirements and objectives. These included security of supply and generation adequacy, which effectively equates with the Regulation concept of resource adequacy.

1.2: Irish Wholesale Electricity Market reform measures: from SEM in 2007 to I-SEM in 2018

The Single Electricity market (SEM) is the wholesale electricity market for the island of Ireland. By combining what were two separate jurisdictional electricity markets (for Ireland and Northern Ireland), the SEM became one of the first of its kind in Europe when it went live on 1 November 2007. The governance and structure of the all-island electricity market is based on legislation in Ireland and Northern Ireland and is supported by the 2006 Memorandum of Understanding between the Governments of Ireland and the United Kingdom. The legislation provides for Irish and Northern Ireland Regulators [1] along with an Independent Member, to regulate the Single Electricity Market in a cooperative manner, sitting as the Single Electricity Market Committee.

Regarding its cross-jurisdictional design, the SEM may be considered a model of what will ultimately be achieved through successive packages of legislative reform within the wider EU Internal Energy Market (IEM). Since its establishment in 2007, the SEM has delivered competition in the wholesale market, ensured security of supply, facilitated the significant development of renewable-generated electricity in the market and provided an efficient, competitive and secure market for customers in Ireland and Northern Ireland. The market has subsequently proven a highly successful example of effective cross-border cooperation between two Member States and the respective Regulatory Authorities (RAs).

I-SEM Project and its Capacity Remuneration Mechanism (CRM)

In order to comply with the 2009 Third Energy Package, to secure Ireland's effective participation in the EU Internal Energy Market and mindful of the anticipated requirements of the forthcoming CEP, an entirely new set of wholesale market trading arrangements for the SEM have recently been

[1] in Ireland, the Commission for Regulation of Utilities (CRU), and its counterpart in Northern Ireland, the Utility Regulator (UR)

introduced under the I-SEM design project. The project commenced in 2012 and the new market arrangements went live on 1 October 2018, and included the introduction of new day-ahead, intra-day and balancing markets

The new market design included the introduction of a new competitive State-Aid compliant CRM for the SEM replacing the previous administratively determined Capacity Payment Scheme. The new CRM is a central and integral feature of the new market, and is necessary to ensure adequate levels of generation and long term security of supply, which can be particularly problematic for isolated island markets with large volumes of intermittent generation, such as the SEM.

The introduction of a new CRM, to take effect in conjunction with other components of the I-SEM market redesign, received State Aid approval from the European Commission in November 2017. It should be noted that the Commission has already expressly recognised that the Irish CRM is "designed to support and complement the ongoing reform of the market ('I-SEM') the goal of which is to ensure compatibility with the EU internal energy market legislation".[2]

1.3 Further planned reforms in the wholesale electricity market

Notwithstanding the extent of the wholesale market reforms and measures introduced under the I-SEM project at time of go-live, the launch of the new market and the associated capacity mechanism in 2017-2018 do not represent the end stage of measures and reforms to the market. In this regard, there is a series of further related reforms, ongoing and scheduled for future implementation that were not part of the programme introduced at time of go-live. Proposed future reforms and measures, to be discussed in greater detail in this document include, but are not limited to, the following:

- A greater role for Demand Side Units in both the wholesale market and CRM;
- The phased introduction of smart meters;
- Electricity grid infrastructure development;
- New interconnection with member states of the Internal Energy Market;
- The next phase of the System Services programme

This Implementation Plan provides a welcome opportunity to highlight these planned future reforms and measures, including an envisaged timeline for implementation. The Plan is also a useful vehicle to maintain the ongoing constructive dialogue with the European Commission regarding the SEM and the significant ongoing reform programme of regulatory measures taking place under the Integrated Single Electricity Market (I-SEM) project, within the context of Ireland's continued commitment to the objectives of the Energy Union.

[2] https://ec.europa.eu/competition/state_aid/cases/267880/267880_1948214_166_2.pdf

1.3.1 Ireland's Renewed Climate Policy Ambition

The implementation of the measures involved in the new redesigned wholesale electricity market, and of an EU State Aid-compliant CRM have taken place against a backdrop of renewed energy and climate policy ambition by the Irish Government, culminating in the all of Government Climate Action Plan (CAP), published in June 2019.[3] The framework of Irish energy policy over the coming decade had earlier been expressed in the Irish Government White Paper *Ireland's Transition to a Low Carbon Energy Future, 2015-2030,* published in December 2015.[4] More recently, renewed Irish energy and climate ambition had been expressed in the National Mitigation Plan, Project Ireland 2040 and draft National Energy and Climate Plan (NECP).

The CAP contains the ambitious target that 70% of Ireland's electricity requirement will be sourced from renewables by 2030. The policies and related measures that will bring about this transformation include the continued promotion of energy efficiency measures, further deployment of renewable electricity generation, the promotion of new technologies in generation , heating and transport, the facilitation of demand management for commercial and domestic customers, the promotion of electricity storage..

The ambitious measures in the CAP related to the wholesale electricity market form part of the suite of measures to be implemented over future years and are be included in this Plan, where relevant. It should be noted that transformation of the Irish energy sector will take place within increasingly competitive and integrated regional and European electricity and gas markets, as envisaged in the EU CEP.

1.4: Approach to the Implementation Plan

Turning now to the substantive content (i.e. measures) of this Implementation Plan, it will become clear from this Plan that there is an ongoing programme of measures for implementation in the SEM associated with, but not exclusively related to, the I-SEM redesign project. As previously stated, the launch of the new market and the associated capacity mechanism in 2018 did not represent the end point of the all the I-SEM related measures.

The well signalled ongoing and future reform measures can be structured to fall in to four categories as follows:

1) I-SEM project related measures always envisaged for implementation post-launch,

[3] https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx

[4] http://www.dcenr.gov.ie/energy/SiteCollectionDocuments/Energy-Initiatives/Energy%20White%20Paper%20-%20Dec%202015.pdf

2) Measures required in the SEM CRM State Aid approval from the EU in November 2017.
3) Measures flowing from various CEP obligations, in particular the recast Electricity Regulation
4) Measures and policy commitments associated with the CAP.

Given the scale and depth of wholesale market reforms implemented over the last several years and yet to be implemented under the I-SEM design project, the position, to be further articulated in this paper, is that the SEM is at present largely compliant with the principles regarding the operation of electricity markets outlined in regulation Article 3 and Article 20 of the Regulation. This is further outlined in Section 4 of this document.

Given the comparatively recent launch of the new SEM design, an insufficient time period has passed for a full appraisal of the effectiveness of these reforms and measures. However, initial signals have been broadly positive and early indications are that the new market is delivering more competition and more efficient prices than would be the case under the old market rules.[5]

This Plan accordingly sets out in detail the measures adopted, or being adopted, in the SEM, in the four categories set out above: The I-SEM project; requirements in the EU's state aid approval for the SEM capacity mechanism; CEP implementation; and CAP implementation. Many, if not all, of these measures are accordingly outlined in published documents, whether by Government, the Regulatory Authority, or the Transmission System Operator. Accordingly, this Implementation Plan does not present any new policies or measures, or associated new analysis, market metrics or related data relating to the all-island SEM. Nonetheless, a process of industry dialogue on the Implementation Plan process and content has been initiated as of late November with further communications planned for early 2020.

Section 2 of this Plan outlines the All Island market characteristics, detailing significant concerns over future generation adequacy and security of supply in the Single Energy Market (SEM) prior to the recent redesign.

Section 3 details the reforms carried out under the I-SEM project, highlighting the compliance of the Irish electricity markets – wholesale and retail - with the principles and pillars of market design.

Section 4 notes that redesign of the Irish wholesale market is far from complete. Further ambitious measures are planned over the coming decade and beyond alongside Ireland's more recent CEP obligations. The Climate Action Plan and NECP are also referenced here highlighting that Ireland's path to decarbonisation will not end at 2020, and the ambitious target of achieving 70% RES-E by 2030.

[5] https://www.semcommittee.com/sites/semc/files/media-files/SEM-19-035%20Single%20Electricity%20Market%20Performance%201%20April%202019%20-%2030%20June%202019.pdf

Relationship between Ireland's and Northern Ireland's Implementation Plans:

Separate Member State Implementation Plans for the United Kingdom (Northern Ireland) and Ireland have been produced for the cross-jurisdictional SEM. Given the cross-jurisdictional composition of the SEM, it is important to note that some of the reforms and measures contained in both Plans may be common given that they relate to the same wholesale market. However, the policy context is different in certain respects, with the positions on Government climate targets and measures at different stages of policy development. Both Plans highlight the continued necessity for the SEM CRM that received State Aid approval for a period of ten years from the European Commission in November 2017.

Ongoing Reporting Requirements:

In line with the requirements of the Regulation the application of this Implementation Plan will be monitored and reported annually to the Commission.

Section 2: Resource Adequacy Assessment and I-SEM Project Market Reforms

2.1 Resource Adequacy Assessment

The State Aid Notification for a new CRM, which received Commission approval in November 2017, included a comprehensive resource adequacy assessment carried out by EirGrid and SONI detailing significant concerns over future generation adequacy and security of supply in the SEM. This resource concern within the SEM (requiring a capacity mechanism for at least ten years) was explicitly recognised by the European Commission in its November 2017 State Aid decision. According to the Commission, "it is reasonable to expect that generation adequacy issues will arise (in the SEM) absent a capacity mechanism".[6]

As has been well established, energy-only markets are prone to market failures that can render it difficult for such a market to adequately value reliability and hence deliver the security of supply that electricity consumers require. These failures can prevent the energy price from providing sufficient long term investment (energy and exit) signals. These market failures are magnified in the case of the SEM due to its position as a small island synchronous system, with high penetration of variable renewable generation policy, the relative size of generation plants compared to system demand, and the fact that the island system is relatively lightly interconnected to the nearest (island) market (Great Britain) via two HVDC interconnections. In this regard, the National Policy Statement on Electricity Interconnection was published by the DCCAE in July 2018, outlining the Government's official position on the development of new electricity interconnectors.[7]

Going forward, concerns over the ability of the energy only market in the SEM, even in conjunction with an additional market for system services, to provide the necessary commercial incentives for the type of long term investment on which the energy sector is reliant will persist. This largely reflects the impact of rising renewables output on the commercial viability of dispatchable generation required to complement intermittent technologies. The long term investment decisions required to drive decarbonisation in Ireland will in turn require regulatory certainty, including about future investor returns

As part of the successful and ongoing reform of the all-island wholesale market since 2017, seen within the overall context of the SEM, a CRM is an essential ingredient in ensuring continued resource adequacy in the SEM. Additionally, a capacity mechanism will remain necessary to facilitate achievement of the ambitious decarbonisation objectives on the island of Ireland in a cost effective

[6] https://ec.europa.eu/competition/state_aid/cases/267880/267880_1948214_166_2.pdf

[7] https://www.dccae.gov.ie/en-ie/energy/publications/Pages/National-Policy-Statement-on-Electricity-Interconnection.aspx

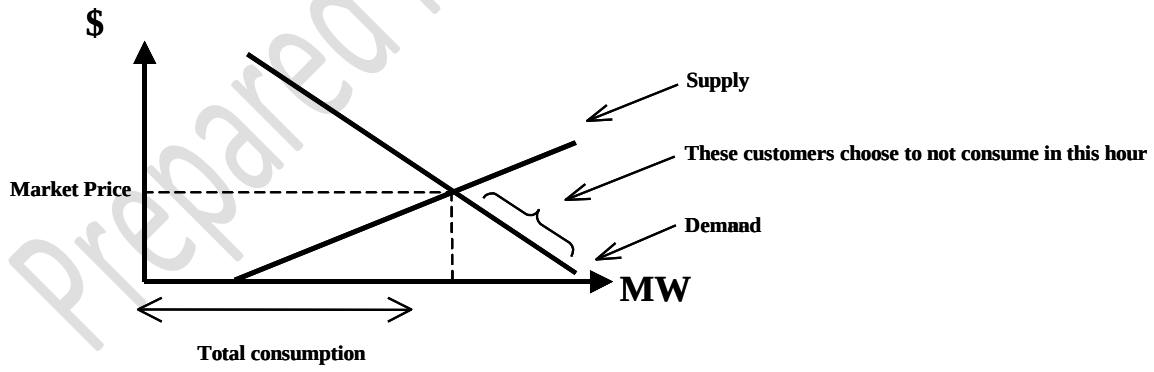
and efficient manner. This need arises from the increased risks to generation adequacy resulting from 'market failures', such as 'missing money' and the notion of reliability as a public good in electricity markets, exacerbated in the context of an isolated geographical location, small island market, with high and rising levels of intermittent renewable generation

Market Failures

The economics of electricity markets are complex due to the real-time nature of electricity supply and demand, very limited storage possibilities, lack of large-scale demand response to allow consumers to react to scarcity conditions and the need for long run and short run reliability. While the provisions for storage of electricity may improve in the future, at present electricity must be generated and transmitted as it is consumed and electricity systems and markets must strike a balance between generation and demand. An efficient electricity system would provide an excess of usable capacity at all times to ensure that reliability standards are maintained. There has been a longstanding international debate about whether or not energy-only markets can provide sufficient incentives to ensure sustained generation adequacy in the long-term[8].

These factors all interact but the lack of very significant price-responsiveness (elasticity) from consumers is at the heart of the reason for the market failure in energy-only electricity markets. This elasticity of demand is measured by the variation in consumption of electricity in response to a unit variation in its price. In well-functioning markets for other commodities the concept of reliability is entirely different to that in the electricity industry. As a commodity becomes scarce, prices rise and the "low-value" customers low on the demand curve choose not to consume. This is illustrated in the following simple supply and demand curve.

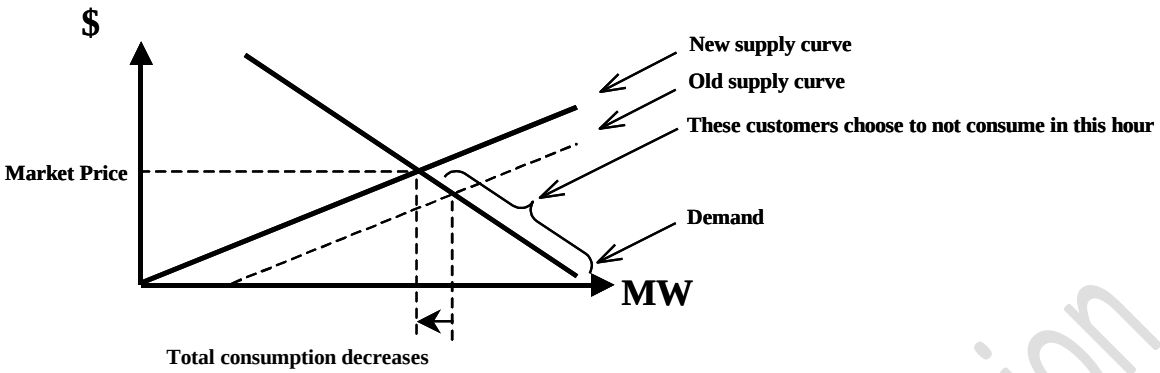
Figure 1- Simple Supply and Demand Chart – High Supply Hour



When supply of the commodity falls, prices rise and more customers chose not to consume.

[8] See Pérez-Arriaga, 2001, Stoft, 2002, Hogan, 2005, Joskow, 2007 or Finon and Pignon, 2008.

Figure 2- Simple Supply and Demand Chart – Low Supply Hour



In well-functioning markets for other commodities, prices always settle at a level where supply equals demand – at the intersection of the supply and demand curves. There is never a situation in which a price is posted at a level that a customer is prepared to pay, but the customer is told that it cannot buy because of lack of supply.

In reality, electricity consumers buy electricity whenever they turn on a light switch. Rarely does anyone but the most sophisticated industrial consumer continually check the price and make the consumption decision conditional on that price. As long as there are large volumes of consumers unwilling or unable to specify the trade-off between the quantities they are willing to buy in a given hour and the prices at which they are willing to buy, then regulated (and socialised) solutions are necessary to ensure reliability of supply. While smart meters will play a role in shifting some demand away from peak times, this alone will not provide a sufficient level of price elasticity to resolve the missing money problem set out below.

In summary, a market failure occurs when demand doesn't respond to underlying price changes and consumers and therefore policy-makers are not prepared to accept the reliability consequence of this that could come from a wholesale marketplace for electricity where generators rely on receiving competitive market prices.

This concept of "capacity adequacy" has been discussed internationally for decades and a key element of this discussion has been the conditions under which, and the extent to which, energy-only markets could deliver sustained capacity adequacy (and thus reliability) in the long-term. While it appears from the Recast Regulation that the underlying position is that capacity adequacy concerns are regarded primarily to be a *result* of market failures and regulatory barriers, another view is that in a system with very significant levels of zero-marginal cost generation, an energy only market would not ensure capacity adequacy.

The lack of price responsiveness from demand can lead to a failure of the energy market to remunerate capacity sufficiently to meet the target reliability standard and ensure capacity adequacy, this is known as 'the missing money problem'.

2.1.1 'Missing Money' Problem

In order to invest in the market, a plant must expect to be able to recover its investment costs including both its variable and fixed costs. To remain in the market, a generator needs to recover its avoidable fixed costs on top of its variable costs of production. In an energy-only market, the net revenue required to ensure that investment costs and avoidable fixed costs are covered come from two sources:

- Infra-marginal rent (IMR), which is captured by operating at greater cost efficiency than the price-setting (marginal) plant, which is relatively predictable in other countries. In Ireland however, increasing levels of zero marginal cost renewable generation are leading to downward pressure on infra-marginal rent and making it less predictable.
- 'Scarcity rent', which is captured through price spikes at times of relative system scarcity, which may be relatively unpredictable.

This means that in an energy-only market, energy prices must be allowed to rise at times to levels that allow for sufficient amounts of scarcity rent to be recovered to ensure that enough plants are on the system to deliver the required level of reliability. These price levels will be significantly above the short run marginal cost of the least efficient plant on the system at the time, and arguably can go as high as the value of lost load.

Control Measures

In order to give the market the best opportunity to reflect the real-time value of electricity, Regulators need to ensure that there are no administrative price caps. Price caps should only be put in place for technical reasons and this should be justified and explained. The new market does include a generator price cap reflecting Europe wide caps in Euphemia, which is currently 3,000 EUR/MWh for the SEM Day Ahead and 9,999 EUR/MWh for the Intra-Day Markets (IDM). There are price floors of -500 EUR/MWh in the Day Ahead Market (DAM) and -9,999 EUR/MWh in the Intra-Day Market. These price caps are largely for practical system reasons and are set as part of an All Regulatory Authority process.

The balancing market operates with a technical price cap based on value of lost load and is just over 11,000 EUR/MWh (based on 10,000 €/MWh set in 2007 and adjusted for inflation), which has never been reached, and a floor of -1,000 EUR/MWh. This is required for reasons related to the Balancing Market Operator's systems.

As the real-time scarcity value of electricity is best reflected in the balancing market, having a PCAP that represents the value of lost load (VOLL) to consumers, the SEM has chosen to set its PCAP to VOLL in the Balancing Market.

In the DAM and IDM there are no bidding controls at all. 96% of total traded volumes are transacted through these markets. In the Balancing Market, there are some rules around mitigating local market power issues which arise due to the constrained nature of the system. All generators must submit a set of commercial offer data that is reflective of their short-run marginal cost. This pricing information is only used for settlement purposes when a generator is deemed to have been needed for 'system' reasons. As per the CEP Recast Regulation and European Balancing Guidelines, these prices are not used to set the energy balancing price.

In addition to this measure, the SEM RAs have, as part of the introduction of the CRM, introduced an Administered Scarcity Pricing (ASP) approach which ensures that the price is a minimum of 3,000EUR/MWh at times when there is a shortage of reserve scarcity. Importantly, this is a price floor so there is no obstacle to the price increasing above this level should generators with prices above this price get dispatched to provide balancing energy.

In addition to these measures, the SEM RAs will be implementing the Balancing Guideline in the coming years, making changes both to how the balancing energy price is calculated, and how cross-border balancing services are procured. The SEM RAs will also be implementing the measures required by DG COMP in the State Aid decision designed to minimise or remove as far as possible, including increasing Demand Response participation in energy markets by normalising their participation in line with other forms of generation and facilitating cross-border participation in the capacity mechanism.

A lack of a sufficiently active demand side means that market prices are more likely to rise to higher levels at times of scarcity. This can make the energy-only market more prone to regulatory/political intervention. In addition, the inelasticity of electricity demand can encourage gaming in the energy market and difficulties in differentiation. The potential for gaming increases the possibility of regulatory or political intervention. The SEM RAs are working to maximise the role of demand response in the energy market by implementing a number of measures to ensure DSUs are treated on an equal and transparent basis with other technology types and through the rollout of the Smart Metering Programme in Ireland.

These market failures illustrate why energy-only markets fail to deliver an optimal level of generation adequacy. However, there is not a generally applicable 'best' method to solve this issue. The optimal solution to this problem depends on many factors such as the past, current and future scenarios of the relevant electricity market, social and economic development status of the country or region concerned.

Based on evidence from the SEMC, the state aid notification contains the view that these market failures are more acute for a small island system with high penetration of variable renewable generation. The high penetration of renewable energy sources magnifies the 'missing money' problem. This coupled with the size of the generating units on the island mean that Ireland is in a unique position in Europe, and although other measures addressing these problems are being pursued to address these issues (such as smart metering, DSU, storage), they are not expected to ensure an adequate level of generation capacity in the short or medium term. A competitive and

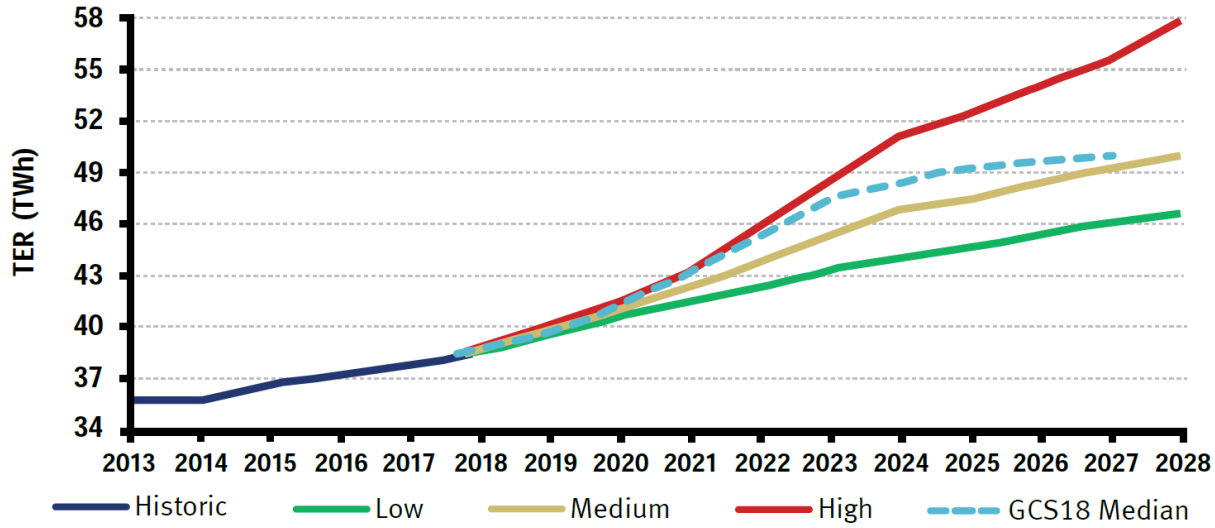
non-distortionary CRM is required in conjunction with those other measures identified in *the Guidelines on State aid for environmental protection and energy 2014-2020*[9] to ensure Ireland has adequate generation in the future.

2.1.2 Projected Load Growth

Generation adequacy is generally set at that level of electricity that must be supplied in order to both satisfy demand, and maintain a satisfactory reserve margin. In this regard, EirGrid and SONI (the TSOs for the SEM) publish an annual All Island Generation Capacity Statement (GCS), examining a number of demand and supply scenarios. The latest statement covers the period 2019 to 2028.[10] This analysis forecasts that the level of generation adequacy will go into deficit from the mid-2020s for Ireland and the all-island system. This is based on known plant closures and contracted generation and identifies that there will be a need for new generation investment over that already contracted. It is also important to note that the GCS forecast includes an assumption that the current CRM remains in place for the duration of the adequacy assessment.

As highlighted in figure 3 below, the 2019 GCS projects rapid load growth in the SEM, with Total Electricity Requirement (TER) forecast to rise from 38.8 TWh in 2018 to 50.2 TWh by 2028, under the TSOs median demand scenario. The TSO's high demand scenario would see demand rise to 56.4 TWh by 2028. In this regard, the SEM can be separated from much of Europe, where load growth is anticipated to flatline or decline over the forecast horizon.

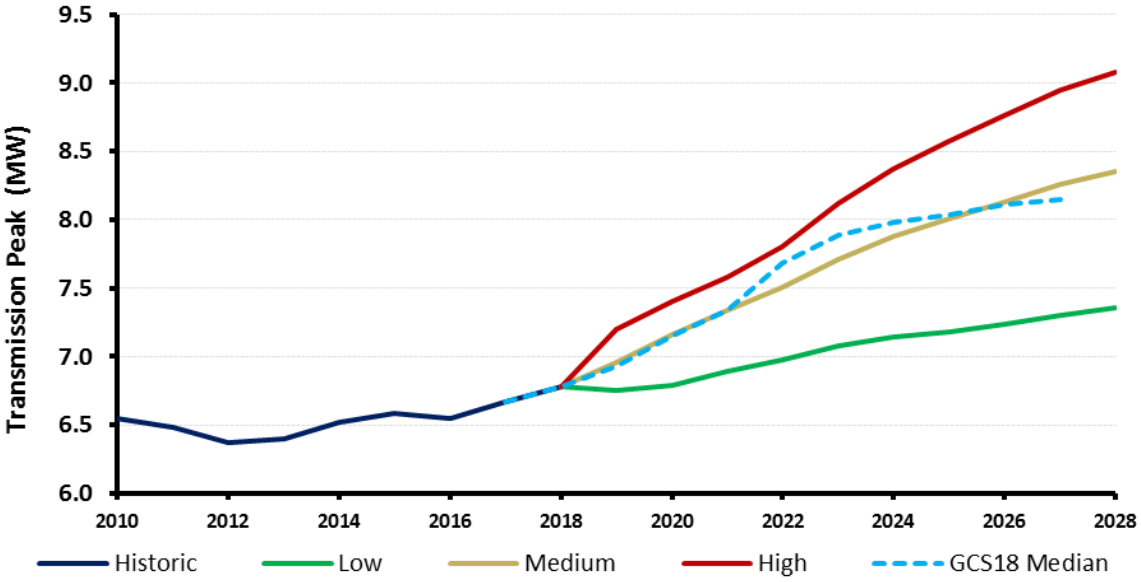
Figure 3: The combined TER forecast for the All-Island system



[9] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0628(01)&from=EN

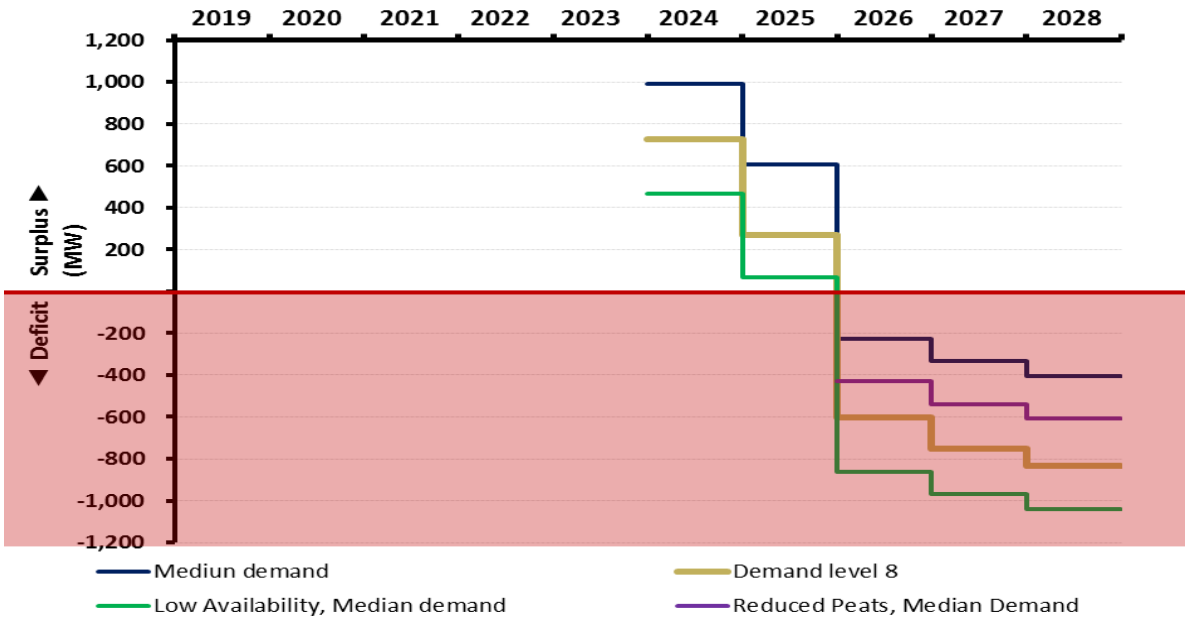
[10] http://www.eirgridgroup.com/site-files/library/EirGrid/Generation_Capacity_Statement_2018.pdf

Figure 4: The Transmission Peak forecast for the combined All-Island forecast



The GCS also includes a comprehensive assessment of generation capacity to assess the likelihood of this meeting anticipated customer demand over the forthcoming decade. In light of strong load growth, the 2019 GCS currently forecasts that surplus plant under a median demand scenario will decline from 990 MW in 2024 to -230 MW in 2026.[11] It is important to note that the assumptions underpinning these TSO forecasts include the continued existence of a continued CRM in the SEM.

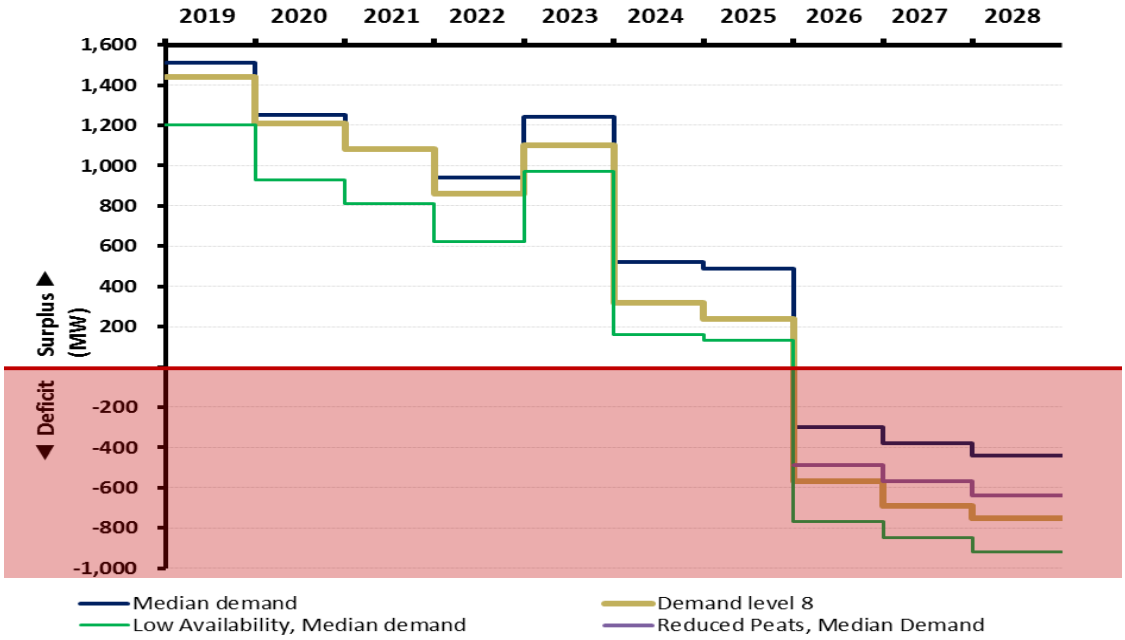
Figure 5: Adequacy results for the All-Island system



[11] http://www.eirgridgroup.com/site-files/library/EirGrid/EirGrid-Group-All-Island-Generation-Capacity-Statement-2019-2028.pdf

The generation adequacy deficits occur in Ireland, Northern Ireland and for the all-island system and occur for all scenarios except low demand. The position on the closure of two of the peat stations was not incorporated into the GCS forecasts (as these were announced post production of this report). These closures occurring earlier than anticipated for the purposes of the above generation adequacy assessment will therefore have to be factored into future analyses of Ireland's electricity generation capacity.

Figure 6: Adequacy results for Ireland, in terms of surplus or deficit of plant. Results are given for the Median and 8th level demand scenarios. Also shown are the scenarios of Low Availability and Reduced Peats



2.2 I-SEM Overview

As highlighted in Section 1, in order to comply with the 2009 Third Energy Package and secure Ireland's effective and compliant participation in the EU Internal Energy Market and also anticipate the regulatory requirements of the Electricity Regulation, an entirely new set of wholesale market trading arrangements for the SEM have been introduced under the I-SEM design project. The project commenced in 2012 and the new market arrangements went live on 1st October 2018.

Primarily consisting of a suite of new wholesale market rules, including the establishment of new day ahead, intra-day and balancing markets, I-SEM was a Regulator-led project, with oversight provided by the Irish Department of Communications, Climate Action and Environment (DCCAE) and the Department for the Economy Northern Ireland (DfE) to ensure legal and policy compliance.

Legislation was amended in Ireland and Northern Ireland to allow the Regulators make the necessary changes to the electricity market rules.

The new market design looked to generate maximum competition and efficiency by concentrating trading in day-ahead and intra-day markets. These markets are now directly linked to similar markets across Europe, providing efficient and transparent pricing in the short term markets and also supporting trading in the forwards financial markets. Benefits of the new market structure include more competitive wholesale electricity prices for consumers through more efficient market trading; efficient dispatch of interconnection to other markets; and increased security of supply for the island of Ireland. With I-SEM market rules having gone live on 1 October 2018, SEM is also now market-coupled with the other EU countries via Great Britain using Single Day Ahead market coupling.

Further details on reforms introduced under the I-SEM project, including how the SEM now complies with the principles of wholesale market design and operation set out in Regulation Articles 3 and 20 is contained in Section 3.

2.2.1 CRM and Impacts

The SEM's new CRM has placed increased obligations on capacity providers to improve operational reliability at times of system stress and provide for cross border participation thereby increasing long run security of supply. In addition, greater emphasis is placed on the regional assessment of generation adequacy.[12]

The I-SEM CRM is based around Reliability Options (ROs) with market participants receiving a capacity payment in return for providing capacity when demand is high, prices are rising and the system becomes tight. The CRM pays for the capacity to produce electrical energy through the option fee on a "per MW" basis. Capacity Providers can receive two payments – one for providing capacity and the other for the energy they actually produce.

As of mid-2019, three auctions had taken place under the new CRM: a T-1 auction in December 2017 and December 2018, which successfully secured sufficient capacity for the following October-September 12 month period; and a T-4 auction in March 2019, which secured capacity for October 2022–September 2023.

In addition to successfully securing the desired volume of capacity, the three auctions that have taken place under the new CRM have:

[12].

https://www.cru.ie/wp-content/uploads/2018/11/CRU18122-Electricity-Security-of-Supply-Report-2018.pdf)

1. **Falling Consumer Costs**: a legitimate concern with capacity mechanisms is that this additional income stream rewarding generation reliability may further burden electricity consumers and reduce economic competitiveness, while prolonging the lifespan of economically inefficient generation. It is therefore important to note that the initial auctions that have taken place under the new CRM have resulted in a significant costs of the scheme, with T-1 auction capacity secured at a total cost of €333M in December 2017, €345M in December 2018 and €360M in November 2019 compared to the annual payment in 2017 of almost €520M under the SEM's former capacity payment mechanism.

2. **Decarbonisation:** the Guidelines on State aid for environmental protection and energy 2014-2020 highlight a concern that capacity mechanisms "may contradict the objective of phasing out environmentally harmful subsidies including for fossil fuels." The EEAG states that EU MS Member States should therefore "consider alternative ways of achieving generation adequacy which do not have a negative impact on the objective of phasing out environmentally or economically harmful subsidies."[13] It is important to note that the initial auctions under the new CRM have not impinged on Ireland's decarbonisation agenda, nor precluded the development of new market entrants and flexible generation that are required to complement Ireland's high and rising volume of intermittent wind generation.

   In this regard the results of the T-4 auction that took place in March 2019 are particularly notable, with a number of new, small gas peaking plants in the constrained Dublin area, as well as battery storage units, successfully gaining ten year capacity contracts. Further, the T-4 auction also saw a 500 MW offshore wind farm gain a ten year contract, while demand side units also secured significant contracts.

3. **New Flexible Generation:** Criticism of capacity mechanisms has focused on the possibility that they may prolong the lifespan of economically and environmentally inefficient generators, and preclude the development of new, cleaner technologies. This point is raised in the European Commission's Guidelines on State aid for environmental protection and energy 2014-2020 (EEAG), which contends that a CRM "may contradict the objective of phasing out environmentally harmful subsidies including for fossil fuels."[14]

   Given these concerns, it is important to note the results of the T-4 auction held in March 2019 securing capacity for 2022/23, which facilitated the advent of the new investment in the flexible generation, demand side management and energy storage required to complement the high and rising volume of intermittent renewable generation in the SEM.[15] The advent of these technologies, which are rapidly respondent to changing environmental conditions which impact intermittent generation, is considered crucial in achieving EirGrid's ambitious 75% SNSP target

[13] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0628%2801%29

[14] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52014XC0628(01)&from=EN

[15] Results of the March 2019 T-4 Auction securing capacity for 2022-23 can be found at: https://www.sem-o.com/documents/general-publications/T-4-2022-2023-Final-Capacity-Market-Auction-Overview.pdf

by 2020, and also the Government's ambitious goal of 70% electricity sourced from renewables by 2030.

Regarding decarbonisation of the Irish power system, it should also be noted that some of the heaviest emitting generating plants in Ireland failed to secure capacity contracts in the March 2019 T-4 auction. In particular, one of the three coal fired units at the Moneypoint plant, Ireland's only major oil fired plant, and one of three surviving peat plants all failed to secure capacity contracts for 2022/23. Failure to clear in a capacity auction does not necessarily signal future plant closure but it therefore cannot be contended that the new CRM has not provided entry and exit signals aligned with decarbonisation of the all-island SEM.

4. **DSU Participation:** Evidence suggests that the advent of the new CRM in the SEM, and in particular the T-4 auction procuring capacity for four years hence, has successfully spurred development of demand side response. In terms of demand side response on the island of Ireland, 426 MW of DSU capacity successfully cleared in the 2019/20 T-1 Capacity Auction held in December 2019, comprising 359 MW in Ireland and 68 MW in Northern Ireland. 600 MW of DSU capacity successfully cleared in the first T-4 auction to take place under the SEM's new CRM procuring capacity for 2022/23, 334 MW of which was new capacity.[16] These levels of demand side response highlight the level of investment that has taken place under the new I-SEM design, with only 41 MW of DSU capacity registered in the SEM in 2012. It is anticipated that continued participation of DSUs in future capacity auctions (to be accompanied by the planned reform to the manner in which they participate in the auctions) will lead to increased development of these technologies in the SEM. To be updated with latest t-1 results from 6/12/19

2.2.2 DS3: Facilitation of rising Renewable Energy Source - Electricity (RES-E)

Due to Ireland's isolated island status and the dramatic increase in wind penetration levels in recent years, the level of non-synchronous power on the SEM system has also risen at a faster rate than in any other region in Europe over this timeframe.

In order to address some of the potential problems resulting from these unprecedented levels of variable renewables, the DS3 Programme was established by the SEM Committee, to ensure a safe and secure energy system, while also facilitating increased levels of non-synchronous generation (primarily renewables).[17] One aspect of the programme is the introduction of a number of new system services by the TSOs, EirGrid and SONI. To date, the DS3 Programme has enabled EirGrid and

[16] https://www.sem-o.com/documents/general-publications/T-4-2022-2023-Final-Capacity-Auction-Results-Report.pdf

[17] http://www.eirgridgroup.com/how-the-grid-works/ds3-programme/

SONI to increase levels of instantaneous system non-synchronous penetration (SNSP) from 50% to 65%, with the aim of increasing this incrementally to 75% in 2020.[18] Two further System Services, Fast Post Fault Active Power Recovery (FPFAPR) and Dynamic Reactive Response (DRR), will complement the existing procured System Services, along with the control centre tools outlined in section 4.1, to achieve 75% SNSP. It is important to highlight the overwhelming success of the DS3 programme in facilitating the integration of renewables on the SEM system, which in terms of SNSP penetration is unprecedented.

Through the DS3 programme the TSOs on the island of Ireland have developed a unique range of System Services, details of which are illustrated in Table 1 below. These new System Services offer an enhanced portfolio of options available to the TSO, and encourage new entrants onto the System.

Table 1: System Services under DS3 programme

Service Name	Abbreviation	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs^2h	(Stored kinetic energy)*(SIR Factor – 15)
Fast Frequency Response	FFR	MWh	MW delivered between 150 ms and 10 seconds
Primary Operating Reserve	POR	MWh	MW delivered between 5 and 15 seconds
Secondary Operating Reserve	SOR	MWh	MW delivered between 15 to 90 seconds
Tertiary Operating Reserve 1	TOR1	MWh	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Reserve 2	TOR2	MWh	MW delivered between 5 minutes to 20 minutes
Replacement Reserve – Synchronised	RRS	MWh	MW delivered between 20 minutes to 1 hour
Replacement Reserve – Desynchronised	RRD	MWh	MW delivered between 20 minutes to 1 hour
Ramping Margin 1	RM1	MWh	The increased MW output that can be delivered with a good
Ramping Margin 3	RM3	MWh	

[18] http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-Programme-Transition-Plan-Q4-2018-Q4-2020-Final.pdf

Ramping Margin 8	RM8	MWh	degree of certainty for the given time horizon.
Steady State Reactive Power	SSRP	Mvarh	(Mvar capability)*(% of capacity that Mvar capability is achievable)

The procurement process for DS3 is non-discriminatory, with any service provider that can prove its ability to provide these services able to secure a contract for payment. Payment is based on availability of service provision, with a fixed tariff in place for each service, and payments adjusted by scalars based on enhanced technical delivery or scarcity due to high levels of RES. Competitive procurement has also taken place for a specific subset of service combinations. In addition, the TSOs are currently designing the next stage of System Service procurement, which will be consistent with market principles in order to ensure the efficacy of procurement.

The full list of proven technologies, including those which can be provided by Demand Side Units, renewable generators and energy storage are located on the DS3 website.[21]. New technologies, or an existing technology who wishes to prove capability for an additional service, can do so through ongoing Qualification Trials Process. These services are more detailed than the standard balancing products laid out in Regulation 2017/2195, establishing a guideline on electricity balancing, and are specifically tailored to suit the needs and issues that have been identified on the all-island system.

[21] http://www.eirgridgroup.com/site-files/library/EirGrid/DS3-System-Services-Proven-Technology-Types.pdf

Section 3: I-SEM reform measures - consistency with principles in CEP Regulation Articles 3 and 20

The new CEP recast electricity Regulation lays out, inter alia, updated and new rules for the design and operation of European wholesale electricity markets, including the set of principles regarding the operation of electricity markets in Article 3. In addition, in Article 20 the regulation highlights a shorter list of market design principles that should be implemented by Member States with identified resource adequacy concerns.

Following the reforms carried out under the I-SEM project, the SEM is now largely compliant with these principles and rules, or will be compliant within the prescribed deadlines for various rules set out in the regulation as detailed in Appendix 1. In particular, Ireland wishes to highlight the compliance of the Irish electricity markets – wholesale and retail - with the following principles and pillars of market design (as highlighted in the Regulation Article 20).

3.1 Removing Price Caps

The removal of price caps is a central pillar of EU energy regulation policy as it applies to electricity markets. Indeed, the existence of explicit price caps or bidding restrictions is one of the most commonly reasons cited for the 'missing money' problem that may lead to the required application of an additional capacity mechanism generator revenue stream.

The removal of price caps is explicitly required under the recast regulation. Article 7 – *Day-ahead and intraday markets* – stipulates that markets shall "provide prices that reflect market fundamentals, including the real time value of energy". Article 3 – *Principles regarding the operation of electricity markets* – sets out that "market rules shall encourage free price formation", and that "prices shall be formed on the basis of demand and supply". While Article 10 – Technical bidding limits – further requires that "there shall be neither a maximum nor a minimum limit to the wholesale electricity price", notwithstanding that a Nominated Electricity Market Operator (NEMO) may apply a ceiling and floor price limit for the DAM and IDM, provided that they do not "unnecessarily restrict trade" and take into account the value of lost load.

Under the original SEM wholesale pool market design in situ prior to October 2018, generators were required to bid short-run marginal costs for half hour periods the following day, mostly comprising fuel-related operating costs. Accordingly, this system implied limits on the ability of prices to rise above the short run marginal cost of the most-expensive generator operating on the system, precluding the ability of prices to adequately reflect resource scarcity.

The new market design introduced under the I-SEM project has led to the removal of price caps and restrictions imposed on the offers made by generators in the SEM. The new market does include a generator price cap reflecting the Europe wide caps in Euphemia, which is currently 3,000 EUR/MWh for the SEM Day Ahead and 1,500 EUR/MWh for the Intra-Day Markets. There are price floors of -500 EUR/MWh in the Day Ahead Market and -150 EUR/MWh in the Intra-Day Market. These price caps are largely for practical system reasons, with a second auction triggered in situations where prices exceed 1,500 EUR/MWh, allowing for upward revision of prices.

The balancing market operates with a price cap based on value of lost load and is around 11,000 EUR/MWh, which has never been reached, and a floor of -1,000 EUR/MWh. On 24 January 2019 the imbalance price rose to 3,774 EUR/MWh, the highest since I-SEM Go-Live and a level that would not have been permitted under the pre-ISEM market.

3.2 Increasing interconnection efficiency and internal grid capacity

Increasing interconnector capacity can be seen as having two elements: increasing the efficiency of existing capacity and increasing the amount of interconnection. The following paragraphs outline the impact of new I-SEM arrangements on the former, while detail on the latter is provided in the Section 4, where the positon on the three interconnector projects in the Irish jurisdiction is set out.

A particularly positive aspect of the new SEM design has been the impact of the new market structure on trade between the SEM and GB across the Moyle Interconnector and East West Interconnector (EWIC), which has highlighted the benefits of directly linking the two markets through Single Day Ahead Coupling (SDAC). The benefits and efficiency gains of increased competition that has resulted from SDAC (noting that the SEM and GB markets are also coupled across the intra-day timeframe) are highlighted through comparison of pre and post I-SEM interconnector flows in Figure 7 and Figure 8 below. These charts clearly illustrate that market coupling has resulted in price driven trade flows, in contrast to the pattern of interconnector trade under the old SEM model.

Figure 7: Pre-ISEM XB Flow

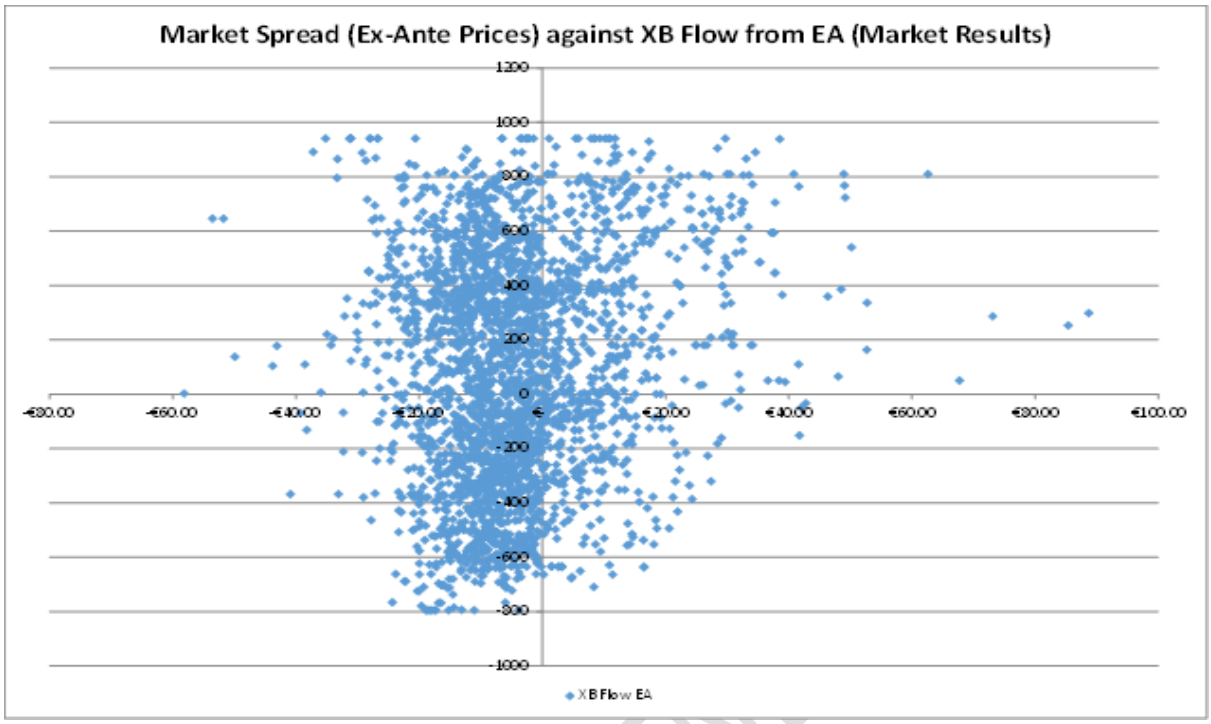
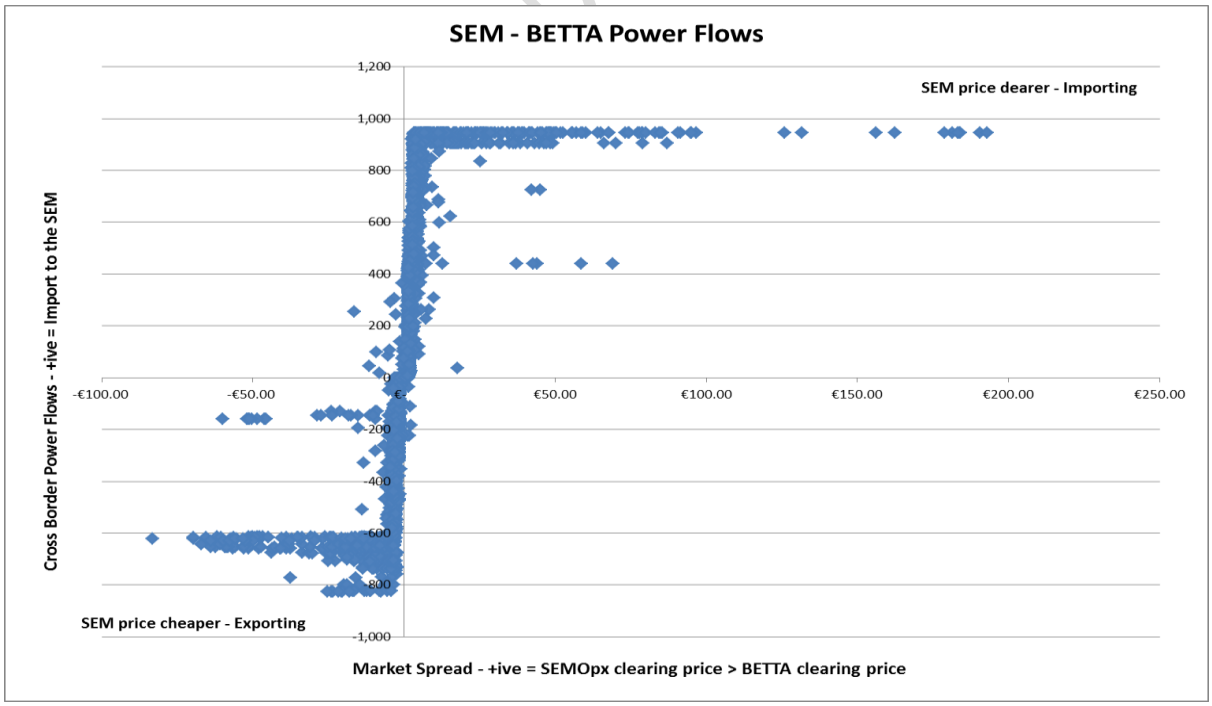


Figure 8: Post ISEM XB Flow



3.3 Market based procurement of balancing and ancillary services and shortage pricing function for balancing energy

The regulation provides for the compulsory establishment of transparent balancing markets, prescribing balance responsibility for all market participants. Consistent with the Balancing Market Regulation[23], 2017, Article 6 of the recast regulation also stipulates that market imbalances "shall be settled at a price that reflects the real-time value of energy".

The new market design places no restrictions on the offers submitted to the balancing market for balancing energy other than a price cap and floor. Participants submit both cost reflective complex three part offers including start, no-load and incremental costs and simple price quantity offers that are not subject to any bidding controls. Where offers are accepted for the purposes other than for energy balancing, they are settled on the basis of complex offers. This is due to the fact that units in such a position often have high levels of market power.

Where a unit is dispatched by the TSOs for the purposes of balancing the system closer to real time, it is their simple offer (where submitted) that feeds into the setting of the balancing and imbalance price. In this way, the SEM enables unrestricted price formation for balancing energy up to the value of lost load. Where actions are taken for reasons other than energy balancing, e.g. for the positioning of units for system services, which is done dynamically based on the prevailing energy market outcomes, these actions are identified using an objective automated flagging process based on binding constraints in the real time indicative operations scheduling system.

To ensure that prices reflect scarcity, administrative scarcity pricing has been implemented. In the instance where the levels of operating reserve are less than required to meet operational security standards, the price floor increases gradually from 500 EUR/MWh to 3000 EUR/MWh as short term operating reserves approach 0 MW. Instances of automatic or manual involuntary load shedding or voltage control (in the presence of system wide reserve scarcity) result in a price floor being set at 3000 EUR/MWh. This represents the minimum that imbalance prices can rise to in these periods. It does not limit the price, which on 24 January for instance, rose to 3,774 EUR/MWh based on submitted offers and not on administered scarcity pricing.

The implementation of a new balancing market with imbalance settlement, no offer/bid caps on energy bids/offers (but with bidding controls), and an 'administrative scarcity pricing' (ASP) function to ensure prices rise when electricity is scarce, represents one of the key market reforms introduced under the ISEM project. This compares to the old market design, under which participants were not accountable for imbalances, ultimately leading to higher consumer costs through TSO actions required to maintain system balance and security.

Under the new market design, the ASP establishes a floor on the Balancing Market Price at times when available capacity is less that that required, covering electricity demand plus the associated reserve requirements. If prices do rise to reflect scarcity, market determined outcomes will not be

[23] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2195&from=GA

affected by the introduction of ASP, since the ASP is a floor price. The introduction of ASP in the energy market promotes the following key SEM objectives:

- **System Security** - By giving capacity providers strong marginal incentives to deliver at times of system stress, and giving all suppliers strong incentives to reduce load at times of system stress.

- **Efficiency** - By making sure that generators and suppliers face the marginal cost of their actions (i.e. the value of lost load, if load shedding occurs). Administrative Scarcity Pricing also promotes economic efficiency.

- **Environment** - By strongly promoting demand response from all suppliers, ASP strongly supports environmental objectives by reducing demand;

- **Internal Electricity Market** - The all-island electricity market is interconnected with the wholesale market in Great Britain, which has also introduced ASP. Introducing ASP in the I-SEM helps to facilitate consistency of price signals with the GB market at times of scarcity.

The ASP applies as soon as available capacity is less than that required to cover electricity demand plus the associated reserve requirement. Triggering ASP before full load shedding occurs gives capacity providers and suppliers earlier incentives to react to scarcity, reducing the likelihood that load shedding will occur. A simplified piece-wise linear approximation is applied to calculate the ASP during a period in which there is insufficient capacity to maintain target operating reserves, but load is not being shed.

3.4 Demand Side Response

The recast regulation envisages an important role to be played by demand side response in facilitating the integration of renewable sources of generation. According to the set of principles laid out in Article 3, wholesale market rules are required to facilitate the development of, and investment of, more flexible generation, including demand response. As established in regulation Chapter II – General Rules for the Electricity Market - this should include the ability of demand side units (DSU) to freely participate and be dispatched in all available energy markets at all available timeframes. Additionally, Chapter IV – Resource Adequacy - provides for the non-discriminatory participation of DSUs in competitive capacity markets.

In large part due to the small proportion of heavy industry in the domestic economy compared to other European economies, Ireland has historically witnessed a relatively inflexible electricity demand profile. However, the SEM has continually promoted demand side participation in the market, with the TSO, EirGrid, operating various schemes such as the winter peak demand reduction scheme (WPDRS); the Interruptible Load / Short Term Active Response (STAR) and Powersave schemes on behalf of the CRU. These schemes were designed to improve system security at times of high demand The WPDRS scheme alone delivered between 100 MW and 150 MW of demand reduction from November to February from 5-7pm on an annual basis.

The WPDRS scheme has now been phased out to encourage more market-based demand side participation in the SEM itself, where an aggregated group of demand sites can register as a demand side unit (DSU). Demand Side Participation can lead to the more efficient provision of capacity, where the opportunity cost of reducing consumption is less than the cost of new generation capacity provision. Additionally, the lack of effective demand side participation could lead to a greater price volatility (as prices in a competitive market jump from the short run marginal cost of the peaking plant to value of lost load) and reduce market competitiveness.

Auction results show that the advent of the new CRM in the SEM has seen much development of demand side response highlighting the continued level of investment that has taken place under the new I-SEM design. For instance, 415 MW of DSU de-rated capacity successfully cleared in the first T-4 auction to take place under the SEM's new CRM procuring capacity for 2022/23, 334 MW of which was new capacity.[24] This compares to just 41 MW of DSU capacity registered in the SEM in 2012.

While there is no analysis yet available from SEM C and the TSOs, it would be reasonable to assume this growth in DSU capacity is largely due to the investment certainty arising from the CRM. In the previous market, DSUs were set up as generator units that essentially bought their energy and resold it back to the wholesale market. Thus, their energy revenue was net zero. Capacity payments served to provide this fledgling industry with a stable set of payments to fund the investment in making flexible demand dispatchable. Now that the penetration of DSU capacity approaches 10% of peak capacity, the challenge SEMC is now addressing is to ensure that DSU capacity faces the same performance incentives as other more conventional forms of generation. The new CRM arrangements feature greater levels of performance incentives than the previous mechanism. These include: delivery based obligations, energy price based charges for non-performance at times of high price, requirement of new capacity to submit implementation plans and post performance securities to ensure delivery.

Of the 693 MW de-rated capacity that qualified for the 2019/2020 T-1 Capacity Auction, only 426 MW cleared. Of the 600 MW of de-rated capacity that qualified for the 2022/2023 T-4 Capacity Auction, only 415 MW cleared. The fact that only some of the qualified capacity is clearing may be evidence that DSU providers are only submitting offers for capacity that they consider to be deliverable and also that can deliver the necessary reliability / are commercially viable.

Due to the particular way that DSUs are represented in the SEM, their treatment in respect of charges that apply in the case of non-delivery differs from other units. The reason for this is that currently DSUs only receive limited energy revenue due to need to buy the energy from the wholesale market in order to sell it back. DSUs can trade in the DAM, IDM and BM through the combination of a physical trading unit and a virtual trading unit.

As part of the State Aid approval process, the RAs committed to the development of the DSU model such that the different treatment for non-delivery charges is removed. This work is underway to be completed by October 2020 as required and is further addressed in Section 4. .

[24] https://www.sem-o.com/documents/general-publications/T-4-2022-2023-Final-Capacity-Auction-Results-Report.pdf

3.5 Removing regulated retail market prices

Article 5 of the recast internal electricity market Directive, within the wider CEP, provides that "suppliers shall be free to determine the price at which they supply electricity to customers", notwithstanding the availability of derogations subject to certain conditionality. Even prior to the CEP, the removal of retail market price controls has long represented a core feature of energy regulators policy promoted by the Commission, with the presence of transparent and cost reflective prices considered a key driver of wider electricity sector investment.

Consistent with the thrust of EU energy policy, the electricity retail market in Ireland is commercial, liberalised, and competitive. The position of successive Governments has been that competitive energy markets result in greater choice for consumers and businesses, in terms of suppliers, products and prices.[25] The regulation of retail market prices for electricity in Ireland ended in 2011. The removal of price controls in Ireland should be seen in conjunction with wider retail market development, which also provides for customer protection and consumer rights through Ireland's independent regulator, the Commission for Regulation of Utilities.

The competitiveness of the Irish electricity retail market is illustrated by pan-EU switching data, which highlights that Ireland has consistently enjoyed amongst the highest regional switching rates. For instance, the most recent Retail Market Monitoring Report published by CEER/ACER in December 2019 highlighted that Ireland had the fifth highest household sector external switching rate in the EU during 2018 and third highest rate during 2013-2017.[27] Also regarding market competition, it is important to note the number of new suppliers that have entered the Irish market since the end of price controls and incumbent utility unbundling, with twelve electricity suppliers operating in the Irish market at the end of 2018.[28]

As part of its statutory functions, including under SI 630/2011, the CRU carries out various market monitoring and reporting functions in association with its responsibility to ensure that the market operates competitively for the benefit of the consumer. Under the SI, the CRU may take actions that it considers necessary to ensure that final customers benefit from competition in the supply of electricity and gas.

[25] Dáil parliamentary question 40678/19 on competition

[27] https://www.ceer.eu/documents/104400/-/-/5c492f87-c88f-6c78-5852-43f1f13c89e4

[28] https://mk0cruiefjep6wj7niq.kinstacdn.com/wp-content/uploads/2019/07/CRU19084-2018-Electricity-and-Gas-Retail-Markets-Annual-Report.pdf

Section 4: Ongoing / Future Market Reforms and Measures

The radical overhaul of the all-island SEM under the I-SEM redesign project is illustrative of Ireland's commitment to competitive energy market outcomes, decarbonisation, and the wider strategic objective of the Internal Energy Market (IEM). As highlighted in Sections 2 and 3, the market reforms implemented through the I-SEM project have delivered the Irish wholesale electricity market into early compliance with the vast majority of its requirements under the CEP recast electricity regulation.

Notwithstanding the extent of reforms already introduced, it is important to note that redesign of the Irish wholesale market is far from complete. Further ambitious measures are envisaged over the coming decade, and beyond. Indeed, alongside Ireland's more recent CEP obligations, there are further electricity market reforms planned as detailed in this section.

As highlighted by the Climate Action Plan and NECP, Ireland's path to decarbonisation will not end at 2020, with Ireland's ambitious target of achieving 70% RES-E by 2030 also providing a host of new challenges for the all-island electricity system.

4.1 DS3 / Competitive System Services procurement

It is important to highlight that the nature of System Services on the Irish system is continuously evolving. The original aim of the DS3 programme was to ensure the power system can be operated securely with increasing amounts of variable non-synchronous renewable generation over the coming years, to meet renewable electricity targets by 2020. The existing arrangements give service providers a good estimate of revenues out to 2023, with the possibility to extend to 2026.

As highlighted by the Climate Action Plan and NECP, Ireland's path to decarbonisation will not end at 2020, with Ireland's ambitious target of achieving 70% RES-E by 2030 providing a host of new challenges for our all-island electricity system. In this regard, the next phase of the TSO System Services programme will be critical in meeting these challenges.

Outstanding DS3 Works

There are two major areas of work to be completed by the end of 2020.[31] The first is Rate of Change of Frequency (RoCoF) and the second is in regards to Control Centre Tools.

- *Rate of Change of Frequency (RoCoF)*

[31] Drawn from Eirgrid's work programmes and documents.

The rate of change of frequency project recognises that with more wind the system will become lighter and will move more following a disturbance (loss of largest infeed or outfeed). To allow for an increase from 0.5 Hz/s to 1 Hz/s it was necessary to perform simulations and tests on all large conventional plant in Ireland and Northern Ireland as well as change protection settings on all distribution connected generators. To date over 9000 MW of large scale plant have been RoCoF approved. Similarly over 4000 MW of large wind farms have had their network protection adjusted to these higher settings. Finally over 800 MW of embedded generation has had their protection adjusted. There remains additional protection settings to be adjusted before RoCoF trialling starts in April 2020 (where we operate the system where the loss of the largest infeed/outfeed would result in RoCoF greater than 0.5 Hz/s).

- *Control Centre Tools*

To make consistent use of the higher RoCoF capability it will be necessary to operate the power system in new configurations of increasing high RES-E. This operation will require decision support tools in the control centre to help identify the route into and out of these new configurations as well as identify ahead of moving to these configurations that the new state will be resilient. Effectively EirGrid has to construct a look ahead stability assessment tool (like radar for power systems), voltage trajectory tool (to suggest and identify necessary reactive power actions to move securely into and out of these new configurations) and a ramping tool to assess and suggest short term dispatch and scheduling decisions. None of these tools are off the shelf and require bespoke development. At this time look ahead stability assessment will be available early in 2020 and the raming and voltage trajectory towards the end of the year.

Work has also commenced in designing this next phase of DS3 focussing on the following elements:

- Ensuring a secure and stable electricity system to accommodate penetration levels of non-synchronous generation of 90% and beyond.
- Delivering a procurement process that is appropriate to public policy, consistent to market principles, and provides value to energy consumers
- Implementation of the Electricity Balancing Guidelines (EBGL) and other Network Codes to open up markets to cross-border service provision
- Enhancing the existing suite of services and attracting new service providers to deal with any new technical challenges identified.

Challenges for 70% Annual RES-E from wind

The key policy target of 70% electricity from wind in the Climate Action Plan involves key challenges that have to be addressed, including:

-
- To design and implement an appropriate connection process and renewable support scheme to facilitate the connection of another 10,000 MW of wind in the next decade;
- To design and implement novel approaches to mitigate the technical scarcities identified in operating the whole power system of Ireland and Northern Ireland at times up to 100% RES-

E in real time. By 2030 it is estimated that we will need to be able to operate at this level for 40% of the total hours in the year. What is the energy price at these times? How can you operate a power system with no synchronous generation?

- To facilitate/design and implement new interconnection to GB and mainland Europe.

The programme to address the second point is a development of the original DS3 programme. This DS3+ programme envisions that DS3 System Services will need to be augmented with new products to manage oscillations, low electromagnetism and network congestion. Furthermore barriers to the integration of a range of new technologies providing these services will need to be found. The interaction with the DSOs in this regard will be critical and significant engagement between ESBN and EirGrid has already occurred on this. Further control centre tools will also be required to implement these approaches.

4.2 Demand Side Participation

In order to comply with the European Commission's State Aid ruling of November 2017, it is intended to modify the participation of DSU's in the SEM CRM.[33] When establishing the new CRM, the SEM Committee determined that DSUs, although able to participate in the CRM auctions, would be exempt from Reliability option (RO) payments where the contracted demand is delivered. RO difference payments would be applied to DSUs only when the demand reduction was not delivered and the Strike Price was exceeded by the Market Reference Price (MRP). This decision recognised the fact that DSUs do not have offsetting energy payments, unlike other auction participants.

The Commission's November 2017 State Aid approval facilitated this different treatment to apply to DSUs, but only as a temporary measure, with the Regulatory Authorities obliged to end the exemption from payback obligations for DSUs from the delivery period starting October 2020. To this end in March 2019 the SEM Committee published "DSU Compliance with State aid Consultation Paper" to provide stakeholders with an opportunity to comment on the proposals for achieving compliance with State aid, following which a formal decision paper was published in July 2019.[34]

Due to the timescales involved in making system changes and developing the profiles and code changes required to determine the actual delivered quantity of an Individual Demand Site (IDS) and therefore a DSU and to avoid double-counting of energy, the SEM Committee have proposed an interim solution, with an enduring solution to follow.

[33] https://www.semcommittee.com/sites/semc/files/media-files/SEM-19-029%20-%20DSU%20State%20aid%20compliance%20-%20Decision%20paper_0.pdf)

[34] https://www.semcommittee.com/sites/semc/files/media-files/SEM-19-029%20-%20DSU%20State%20aid%20compliance%20-%20Decision%20paper_0.pdf

Recognising the current issues surrounding the assumption that dispatched quantity is a suitable proxy for metered quantity, the SEM Committee decided that initially energy payments for DSUs, arising from dispatch in the balancing market above ex-ante position, will only be made at times when DSUs are required to pay difference charges. It is the intention of the SEM Committee to move to a situation of making full energy payments to DSUs at all times, once it has been determined to the satisfaction of the RAs that;

- Performance monitoring by the TSOs indicates that dispatched quantity is an effective proxy for metered quantity; and
- The socialisation mechanism is operating effectively to ensure that DSUs are paid energy payments and that the costs are socialised as per the principles set out above.

Given that, initially, energy payments are only made to DSUs when the payment of difference charges is triggered, there is a continued need for DSU energy payments to be cancelled when difference charges are not triggered. The SEM Committee note that this can be most readily accomplished using the existing, cancelling volume associated with the Trading Site Supplier Unit (TSSU). In consequence, in a change from the proposal set out in the consultation paper, the SEM Committee consider that the TSSU associated with each DSU should be retained and, initially, its energy volume set to cancel the energy volume associated with the DSU when difference charges are not triggered.

The SEM Committee requested that RAs engage with the TSOs to generate a Modification Proposal to enable the TSC Modifications Committee to implement this Decision within the TSC. The SEM Committee have decided that this solution for DSUs will apply from the start of Capacity Year 2020/21, i.e. from October 2020 in line with the State aid approval for the CRM. A modification to the Trading and Settlement Code on the basis of this Decision has been developed and was voted for approval by Modifications Committee Members on 5 December 2019[35]

4.3 Enhanced Interconnection

Ireland's existing electricity interconnection is reflective of its isolated and peripheral geographical location, with only two 500MW High Voltage Direct Current (HVDC) interconnectors currently linking the SEM to Great Britain through the Moyle and East West Interconnectors. Within the SEM there also exists a 300MW tie-line crossing the jurisdictional border between Ireland and Northern Ireland. While there are no administrative restrictions on export or import of electricity on the EWIC interconnector to GB, due to constraints on the transmission networks at either end of the

[35] Mod_17_19, available here; https://www.sem-o.com/rules-and-modifications/balancing-market-modifications/

interconnector, the export capacity of Moyle is currently limited to 300MW and subject to change during different times of year.

In 2014, the European Commission committed to working with Member States to ensure speedy implementation of PCI's and other measures to meet the target of achieving interconnection of at least 10% of installed electricity production capacity for all Member States by 2020 and 15% by 2030. Ireland is actively further integrating its electricity market to comply with the European Target Model as exemplified by the I-SEM project to update the rules for the Single Electricity Market, making it compatible with cross-border trading. In light of the UK's decision to leave the EU, it is particularly pertinent that Ireland looks to pursue interconnection with at least one EU Member State so that Ireland can participate fully and directly in the delivery of a fully-integrated common electricity market and the Energy Union, meet its European commitments in that regard, as well as its 2030 renewable energy targets and continue to pursue efficient use of the energy infrastructure available.

In this regard, the National Policy Statement on Electricity Interconnection was published by the DCCAE in July 2018, outlining the Government's official position on the development of new electricity interconnectors.[37] The statement emerged following a public consultation in early 2018, and should be seen in the context of the increasing importance of interconnection within national policy and the wider EU objective of creating a genuine European energy union and single market for electricity. This policy statement outlines the many drivers and benefits of interconnection, as well as the potential impact of electricity interconnection on the wider energy market. It was stated at the time that it would help to guide potential developer's comprehension of the range of national policy drivers. Also highlighted was that it would assist the CRU to determine a regulatory approach to electricity interconnection, by drawing attention to key policy parameters for consideration in its evaluation of interconnection applications from project promoters. Consistent with wider energy sector development, a stable regulatory environment is crucial to ensuring appropriate levels of future infrastructure investment.

The national policy is clearly supportive of additional interconnection and has provided an important backdrop for the regulator to follow up with its own regulatory approach. This approach has already been activated in two key papers published by the Regulator:

- Interconnector Assessment Criteria https://www.cru.ie/wp-content/uploads/2017/10/CRU17299-Information-Note-Direction-to-EirGrid-on-Grid-Connection-for-Electricity-IC-with-PCI-status.pdf[38]
- Grid Connection Direction for PCI projects[39]

[37] https://www.dccae.gov.ie/en-ie/energy/publications/Pages/National-Policy-Statement-on-Electricity-Interconnection.aspx

[38] https://www.cru.ie/wp-content/uploads/2017/10/CRU17299-Information-Note-Direction-to-EirGrid-on-Grid-Connection-for-Electricity-IC-with-PCI-status.pdf

There are three proposed interconnector projects for the island of Ireland. All are on the 4th Projects of Common Interest (PCI) list and are steadily maturing towards construction. Two will connect with the UK(NI) and the third with France. . [40]

PCI Number	Project Promoter	Project Title
1.6	EirGrid & Réseau de Transport d'Electricité (RTE)	France - Ireland interconnection (known as Celtic Interconnector)
1.9.1	Third party	Ireland – United Kingdom interconnection (known as Greenlink)
2.13.1	EirGrid & SONI	Ireland – United Kingdom interconnection (known as North-South Interconnector)
2.13.2	EirGrid & SONI	Ireland – United Kingdom interconnection (known as Renewable Integration Development Project, RIDP)

- **Second North-South Interconnector**: See Section 4.4 Grid Development below

- The **Celtic Interconnector** is a proposed sub-sea electricity cable linking the electricity grids of Ireland and France. The project is being jointly progressed by EirGrid and its French counterpart, Réseau de Transport d'Electricité (RTE). The planned Celtic Interconnector promoted by the Irish and French TSOs, is an investment of approximately €930m that will connect Ireland's electricity network to France via an underwater connection. Once built, its 700 megawatts capacity will power 450,000 households, and help Ireland achieve its climate and energy goals. As well as the clear benefits in terms of improved security and diversification of electricity supply, the Celtic Interconnector will also facilitate the further development of renewable energy, helping us meet Ireland to meet its 70% target. Celtic will provide a direct electricity link with mainland Europe, and therefore a connection with the EU's Internal Energy Market post UK exit**.**

- The **Greenlink interconnector** to Wales is a €400m proposed subsea and underground electricity interconnector linking the power markets in Ireland and Great Britain. The project is now at an advanced stage of development and is expected to receive full regulatory approval by early 2020.[42]

[39] https://www.cru.ie/wp-content/uploads/2017/10/CRU17299-Information-Note-Direction-to-EirGrid-on-Grid-Connection-for-Electricity-IC-with-PCI-status.pdf

[42] In line with expected content of NECP

Timelines:

- Second North-South Interconnector – tba. Earliest possible date for construction to commence is 2020.

- Celtic Interconnector – 2025/26
- The Greenlink interconnector – 2023 (next step here is that the Regulator will consult on a proposed cap and floor regulatory treatment for the project early next year).

4.4 Grid Development

Eirgrid's Transmission Development Plan1 (TDP) 2018-2027 is the plan for the development of the Irish transmission network and interconnection over the ten years from 2018. This ten year plan presents projects that are needed for the operation of the transmission network.

The development of the Irish electricity sector is guided by a number of national and European Union (EU) rules and strategic objectives. These objectives guide investment in the Irish transmission network and are summarised as follows:

- Ensuring the security of electricity supply;
- Ensuring the competitiveness of the national economy; and
- Ensuring the long-term sustainability of electricity supply in the country.

Drivers of investment include:

- Securing transmission network supplies;
- Promoting market integration; and
- Promoting the integration of Renewable Energy Sources (RES) and complementary thermal generation.

The all-island transmission system currently includes capacity constraints limiting the ability to transfer power between the two jurisdictions which comprise the SEM. This poses a potential risk to security of supply and creates a sub optimum outcome regarding the integration of renewable generation on the island of Ireland, notwithstanding the work of the TSOs, EirGrid and SONI, in achieving a Synchronous Non-Synchronous Penetration rate of 65%, which will be raised to 75% in the coming years. There is an additional constraint in the greater Dublin area which has been exacerbated by the increase in large energy users in this region along with general economic growth during recent years.

The above capacity constraints in the SEM are currently mitigated by ensuring the availability of generation in proximity to the constraint to influence the flow of power. In this regard, the competitive CRM introduced under the I-SEM design project is performing a crucial ongoing role, with locational constraints incorporated in the Capacity Market to ensure minimum levels of

generation capacity are maintained in the constrained areas to ensure appropriate levels of security of supply. This was highlighted by the first T-4 auction held in March 2019 for capacity year 2022-23, in which three locational capacity areas were identified; Northern Ireland, Ireland, and Greater Dublin. In particular, the Greater Dublin minimum generation capacity requirement indicated that new generation would be required in the area. The T-4 auction was successful in procuring 1,082 MW (i.e. 526 MW de-rated capacity) of new generation capacity in the Greater Dublin area.

It is important to note that significant ongoing investments are currently taking place or are scheduled to take place in coming years within the all-island market grid infrastructure to ensure security of supply and mitigate the locational capacity constraints in the Dublin area and Northern Ireland in the most efficient manner possible, and to facilitate higher integration of renewables generation in the SEM. Reducing longer term constraints in the SEM, and within the wider Dublin region in particular, are considered vital by EirGrid to reduce the need to incorporate locational constraints with future CRM auctions, as well as a reduced level of curtailment to facilitate a swifter pace of decarbonisation on the island of Ireland.

In this regard, there are a number of major upgrades or extensions to the Irish electricity transmission system currently planned by EirGrid, or in which progress has already commenced. These projects include:

- **North South Interconnector Project**:

  This project comprises the addition of a new 138km 400 kV overhead line connecting the electricity grids of Ireland and Northern Ireland. Currently there is only one interconnector, or tie line, between the two jurisdictions. The introduction of a second interconnector will improve the security of electricity supply across the island of Ireland, and improve the capacity and reliability of both grids. It will help to improve the efficiency of the electricity system, reducing costs and ultimately saving money for the end user, the electricity consumer. The North South Interconnector has been designated as an EU Project of Common Interest (PCI). The project has full planning approval in Ireland following the conclusion of a number of legal proceedings. In Northern Ireland, following legal challenges there, the project has yet to conclude the planning process for the section of the project that lies in Armagh and Tyrone.

Estimated Completion date: tba. Earliest possible date for construction to commence is 2020.

- **West Dublin Project**: This project is in response to a significant local increase in the demand for electricity. This increase is associated with major multinational customers at Grange Castle Business Park. A 220/110 kV gas insulation switchgear substation is being installed and this will connect into an existing 220 kV double circuit line. This line runs from Inchicore to Maynooth. This improved infrastructure will meet current demand for electricity in the area and it will also create the potential for future growth. The decommissioning of the existing overhead line between Adamstown and Kishoge is scheduled for Q2 / Q3 2020.[49]

Estimated Completion date: 2020

[49] http://www.eirgridgroup.com/the-grid/projects/west-dublin/whats-happening-now/

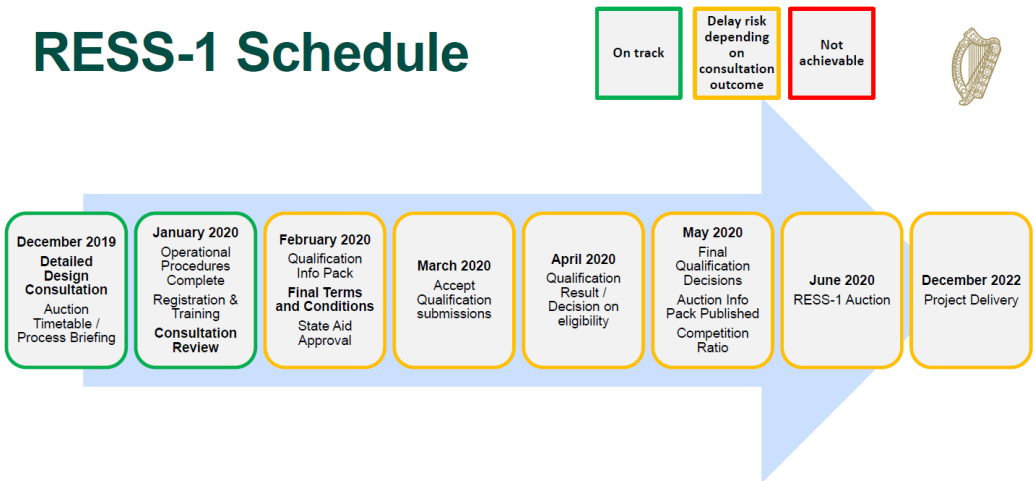
Timelines: As above

4.5 RESS High Level Design / Competitive Auction

The new Renewable Electricity Support Scheme (RESS) will help deliver Ireland's contribution to the EU-wide renewable energy target of 32% RES out to 2030The RESS is an auction based scheme which invites renewable electricity projects to bid for capacity and receive a guaranteed price for the electricity they generate. The first auction is set to open early next year, subject to State Aid approval and will deliver up to a 3.000GWh increase in renewable electricity generation by the end of 2022. It is envisaged that a minimum of four auctions will occur between 2020 and 2027 to deliver on 2030 targets. This will provide pathways for renewable developers including offshore wind projects as it sets out the indicative timelines and volumes for auctions over the coming decades and provides clarity for developers in relation to when they need to have their projects "auction ready". It will also allow Ireland to take advantage of new technologies as they emerge.

The proposed elements of the Scheme (subject to State Aid approval) are listed below:
Increasing Technology Diversity – the scheme will be open to a range of technologies that will broaden the renewable energy mix and enhance security of supply
Solar – the inclusion of a solar category, which would represent approximately 10% of the overall auction
Community led category – the inclusion of a community category within the auction up to 30GWh
Community Participation – an obligatory community benefit find scheme to provide opportunities for communities to play their part in Ireland's renewable energy transition. [50]

Timeline: The first RESS auction is to open for applications early 2020 as per the diagram below.[51]



[50] RESS Press Release 02/12/19

[51] https://www.dccae.gov.ie/documents/RESS-1_Auction_Stakeholder_briefing-Presentation.pdf

4.6 Smart Metering

The National Smart Metering Programme (NSMP) is a multi-year investment project including the roll out of new digital electricity (and gas) meters, a communications network to support them, and investment in new IT systems. The Commission for Regulation of Utilities (CRU) is responsible for the overall coordination of the NSMP in the electricity (and gas) sectors.

In September 2017, the CRU announced its delivery plan for smart meters in Ireland. The plan provides for the phased rollout of smart meters to every home and business in the country over a six year period from 2019. Smart Meters are the next generation of electricity and gas meter and are being rolled out across Europe and internationally. This new technology will replace older, mechanical meters, bringing benefits to Irish consumers, the economy and the environment.

This is a very significant energy infrastructure project. It will involve the installation of new meters for some 2.25 million customers nationwide. The rollout will occur in a structured and phased basis, commencing with an initial delivery of 250,000 meters across 2019-2020 and approximately 500,000 meters in each of the four subsequent years. The initial priority is to replace older meters which are approaching the end of their life expectancy and to facilitate those consumers who request a smart meter.

The delivery plan will phase in smart services from 2021, with services such as time-of-use tariffs and smart bills giving consumers more choice and information, enabling them to be more proactive in their use of electricity and save money. The CRU has completed a Cost-Benefit Analysis on the plan and is satisfied that the investment involved represents value for money.

The national installation of smart meters is a key enabler for transition to a decarbonised energy system. Smart services that would benefit both the consumer and the state are dependent on the availability of smart meters. The day-to-day rollout of the delivery plan is the responsibility of ESB Networks and is subject to oversight by a Steering Group consisting of CRU, DCCAE, ESB Networks, SEAI and industry representation.

While the introduction of Smart Metering in Ireland will make a significant change to consumer behaviour, we do not believe that this change will be of sufficient scale in the short to medium term to correct the demand side market failure that the CRM is designed to address, or therefore to preclude the SEM's ongoing capacity market requirement.

Timeline: initial delivery of 250,000 meters across 2019-2020 and approximately 500,000 meters in each of the four subsequent years.

4.7 North Sea Design / Offshore Renewable Energy

Ireland plans to develop an offshore electricity grid, in tandem with new interconnection to allow Ireland to balance its significant renewables potential with security of electricity supply and develop long-term ambitions to export offshore renewable resources.

Ireland's Offshore Renewable Energy Development Plan (OREDP) has identified Ireland's coast as one of the most energy productive in Europe, with a long-term potential of 70 GW of ocean energy opportunity (wind, wave and tidal) within 100 km of the Irish coastline. The development of offshore renewables will be plan-led and aligned with the National Marine Planning Framework.[52]

The North Seas Energy Cooperation (NSEC) is a voluntary market-oriented, regional cooperation initiative established in 2016, which seeks to create synergies and to reduce incompatibilities between national policies and to share knowledge on international best practices and foster joint strategies where possible and mutually beneficial. The aim is to coordinate and facilitate further cost-effective deployment of offshore renewable energy, in particular wind, ensuring a sustainable, secure and affordable energy supply in the North Seas countries through increased and better coordinated offshore wind deployment as well as potential joint projects or cluster projects. The NSEC focuses on working together with the perspective of developing further integration and increased efficiency of wholesale electricity markets in the longer term, while contributing to a reduction of greenhouse gas emissions, in average wholesale electricity price spreads and enhancing overall security of supply in the region.

The North Seas Energy Cooperation consists of 10 countries with participation from the European Commission: Belgium, the Netherlands, Luxembourg, France, Germany, UK, Ireland, Norway, Sweden and Denmark.

At the Ministerial meeting in Esbjerg in June 2019, North Seas countries agreed to work together to achieve an indicative aggregated installed offshore wind capacity of Member States of the NSEC of at least 70 GW by 2030 based on national planning. The indicative contribution of Ireland to this aggregate capacity in 2030 is at least 3.5 GW (see also section 2.1.2). In order to reflect the dynamics of offshore wind deployment in the region, this aggregate planned capacity of at least 70 GW for 2030 can be translated into an overall trajectory with indicative milestones for the region of approximately 25 GW in 2020 and 54 GW in 2025.

In the NSEC, Ireland also contributes to the work of analysing and developing options for further mobilisation of investment capital for joint projects, for instance through EU funds such as European Fund for Strategic Investments (EFSI) and Connecting Europe Facility (CEF) as well as institutional investors. Such future joint projects could be cross-border projects for renewable energy in accordance with the CEF proposal. [53]

The NSEC also serves as a platform to jointly work on concepts for potential joint wind offshore projects and for coordinated electricity infrastructure including transmission infrastructure.

[52] https://dccae.gov.ie/documents/Climate%20Action%20Plan%202019.pdf

[53] In line with expected content of the NECP.

Ireland works together with the other North Seas Energy Cooperation countries on the possibilities for concrete cooperation projects. Besides joint offshore wind projects that would be connected to and supported by several Member States, this includes the work on possible 'hybrid' solutions that would use cross-border solutions for connecting offshore wind farms to the grid and seek synergies with interconnection capacity between countries, and on the corresponding market arrangements.

Ireland is therefore contributing to the development of policies for cooperation on hybrid projects and identifying and addressing possible legal, regulatory and commercial barriers. By coordinating on increased interconnection among the countries in the NSEC, an increasing amount of excess production of energy could flow across borders to meet demand in a well-functioning internal energy market.

The NSEC has identified a list of potential areas and projects in the region, where joint projects could be particularly beneficial. These include: (1) IJmuiden Ver offshore wind farm to UK, (2) CGS IJmuiden Ver – Norfolk, (3) COBRA Cable, (4) DE offshore wind farm connected to NL and (5) North Sea Wind Power Hub.

The NSEC is working on developing concrete concepts for the implementation of selected projects from the above list.[54]

Timeline: The Irish component is for connection of at least 3.5GW of offshore wind, based on competitive auctions to the grid by 2030.

4.8 Further planned reforms

In addition to the major projects and measures listed above Ireland is in the process of developing / implementing further planned measures and reforms listed below.

4.8.1 Outstanding commitments from SA Notification SA44464

See Section 4.2 Demand Side Participation.

[54] https://www.dccae.gov.ie/en-ie/energy/consultations/Pages/Ireland%E2%80%99s-Draft-National-Energy-and-Climate-Plan-2021-2030.aspx

[60] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-16-024%20I-SEM%20Market%20Power%20Decision%20Paper.pdf

4.8.2 Market Parameters

The Regulatory Authorities will be recalculating VoLL as part of the implementation of the Clean Energy Package (under Article 11) following the ACER Opinion on the ENTSOE proposal on VoLL calculation methodology under Article 23(6).

As set out in SEM-19-054, the SEM Committee intends to review its decisions in relation to balancing market pricing in quarter 2 of 2020 following a review of outturn prices in the winter of 2019/20.

Work is also ongoing between the TSOs and SEM Regulatory Authorities to develop a conceptual approach for the conversion of SEM bids into standard products for balancing energy platforms and to ensure the approach to imbalance pricing and settlement in the SEM is compliant with all aspects of the Electricity Balancing Guideline[55]. See; https://www.sem-o.com/documents/general-publications/Note-on-Converting-SEM-Bids-to-EB-GL-Standard-Products.pdf

Timeline: It is expected that the recalculation of VoLL and review of balancing market pricing will be carried out in Q2/3 of 2020.

4.8.3 All-of-Government Climate Action Plan 2019 (CAP)

The Climate Action Plan identifies how Ireland will achieve its 2030 targets for greenhouse gas emissions. The Plan sets out over 180 actions, together with hundreds of sub-actions that need to be taken and embraces every relevant sector: electricity, enterprise, housing, heating, transport, agriculture, waste, and the public sector.

A Climate Action Delivery Board has been established to ensure coordination and accountability across Government on the various actions and to focus effectively on timely implementation.

Some of the key actions for the Electricity Generation sector include:

- Increase electricity generated from renewable sources to 70%, underpinned by the Renewable Electricity Support Scheme
- Streamline consenting and connection arrangements
- Phase-out of coal and peat-fired electricity generation
- Introduce a support scheme for micro-generation
- Facilitate community participation in renewable generation under the Renewable Electricity Support Scheme
- Provide funding supports for new technologies onshore and off-shore
- Ensure that 15% of electricity demand is met by renewable sources contracted under Corporate PPAs
- Deliver Smart Metering Programme in line with current timelines

[60] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-16-024%20I-SEM%20Market%20Power%20Decision%20Paper.pdf

- Support the ocean energy research, development and demonstration pathway for emerging marine technologies and associated test infrastructure[57]

Targets to meet the required level of emissions reduction, by 2030 have been set as below:

- Reduce CO2 eq. emissions from the sector by 50–55% relative to 2030 Pre-NDP projections
- Deliver an early and complete phase-out of coal- and peat-fired electricity generation
- Increase electricity generated from renewable sources to 70%, indicatively* comprised of:
  - at least 3.5 GW of offshore renewable energy
  - up to 1.5 GW of grid-scale solar energy
  - up to 8.2 GW total of increased onshore wind capacity
- Meet 15% of electricity demand by renewable sources contracted under Corporate PPAs

Eighteen specific actions have been developed to deliver these targets, with owners, leaders, timelines and responsibilities identified. These have been translated into steps (sub actions) necessary to deliver each action in the Annex of Actions.

> The aim of the Climate Action Plan is to make Ireland a leader in responding to climate disruption. The Plan will be monitored quarterly and updated annually, with Climate Action Plan 2020 to be published in early 2020. This will ensure that the plan is a living document, with new actions being added each year

4.8.4 National Energy and Climate Plan (NECP)

In accordance with the Governance of the Energy Union and Climate Action Regulation, Ireland's first Draft National Energy & Climate Plan (NECP) 2021-2030 was submitted to the European Commission by 31/12/2018. A final version of the NECP will be submitted in due course after this Plan has been submitted and before the opinion on it has been received.

Areas in the NECP relevant to the electricity market include:

- Reform of the wholesale electricity market and decarbonising the electricity system
- National objectives with regard to increasing the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems
- National objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

[60] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-16-024%20I-SEM%20Market%20Power%20Decision%20Paper.pdf

- National objectives with regard to increasing the flexibility of the national energy system, in particular by means of deploying domestic energy sources, demand response and energy storage
- Measures relating to all above.

Section 5: Conclusion

This is the Implementation Plan for Ireland as per the requirements of Chapter IV of the recast Electricity Market Regulation 2019/943, part of the Clean Energy Package (CEP).

A description of resource adequacy concerns, along with an outline of the regulatory distortions and market failures that may have caused or contributed to these concerns, is contained in Section 2. A review of the wholesale market on the island (the SEM – see below) against the principles of operation and design as set out in Articles 3 and 20 of the Regulation has also been conducted and is detailed in Section 3. This section contains the main measures in the I-SEM market redesign project already implemented at go-live date. Following on from these measures already adopted, a description of the comprehensive programme of ongoing and planned reform measures, both in the SEM and related to Irish policy specific initiatives, is documented in Section 4.

The wholesale electricity market on the island is a tangible example of the benefits of regional cooperation in electricity market operation and regulation, underpinned by aligned legislation in two jurisdictions. The SEM (Single Electricity Market) was established in 2007 and combined two separate wholesale markets into one cross-jurisdictional and jointly governed, dual-currency wholesale entity.

Full implementation of the EU Third Energy Package required fundamental change and a complex and difficult redesign of the SEM was initiated in 2012, involving a comprehensive set of reform measures and changes to the market. Mindful of Ireland's commitment to implementation of the Clean Energy Package, including the electricity regulation dealing with the design and operation of wholesale markets, the I-SEM redesign project anticipated and factored in the market design elements to the extent possible given the negotiation timelines for the regulation. The redesign project and associated measures are detailed in Section 2. As highlighted in Section 3 of this paper, the SEM is already largely compliant with the market design elements of this regulation following introduction of the I-SEM project and 'Go-Live' of the new market design in October 2018.

The launch of the new market and the associated capacity mechanism in October 2018 did not mark the end of the entire suite of measures to be implemented in the SEM. Ongoing and future reform measures as detailed in this paper fall into four categories as follows:

1) I-SEM project related measures always envisaged for implementation post-launch,
2) Measures required in the SEM CRM State Aid approval from the EU in November 2017.
3) Measures flowing from various CEP obligations, in particular the recast Electricity Regulation
4) Measures and policy commitments associated with the CAP.

This Plan contains a non-exhaustive account of the comprehensive programme of change in the SEM in recent years. Given the scale and depth of the measures already adopted in the SEM, being implemented, and yet to be implemented, sufficient time needs to elapse for credible impact appraisals or evaluations to be undertaken.

As previously stated, the application of this Implementation Plan will be monitored and the results of this monitoring published in annual reports to be submitted to the Commission. These annual reports will also reflect appraisals or evaluations carried out on the impact of relevant SEM reforms and measures.

Appendix 1: Questionnaire on Possible Regulatory Distortions and Market Failures

Section 1 - General wholesale market conditions

1. **With regards to day-ahead and intraday electricity prices, are there any formal or informal price limits other than those currently applied within European single day-ahead and intraday coupling as set out in Article 41(1) and 54(1) of Regulation 2015/12225 (CACM)?**

The new market does include a generator price cap reflecting the Europe wide caps in Euphemia, which is currently 3,000 EUR/MWh for the SEM Day Ahead (DA) and 9,999 EUR/MWh for the Intra-Day Markets (IDM). There are price floors of -500 EUR/MWh in the Day Ahead Market and -9,999 EUR/MWh in the Intra-Day Market. These price caps are largely for practical system reasons and are set as part of an All Regulatory Authority process. In future, decisions on such caps will be made by ACER as part of the revised process provided for by the recast Electricity Regulation 943/2019.

The balancing market operates with a technical price cap based on value of lost load and is just over 11,000 EUR/MWh (based on 10,000 €/MWh set in 2007 and adjusted for inflation), which has never been reached, and a floor of -1,000 EUR/MWh. This is required for reasons related to the Balancing Market Operator's systems. On 24 January 2019 the imbalance price rose to 3,774 EUR/MWh, the highest since I-SEM Go-Live and a level that would not have been permitted in the SEM prior to the reform of the market design implemented under the I-SEMI-SEM project.

2. **Are there any formal or informal rules or requirements that limit generators' ability to freely price their offers in wholesale markets?**

In addition to the technical caps set out in Q1, there is a system of local market power mitigation rules in place. These rules apply only when there is a lack of competition in the balancing market for specific TSO actions. Such actions occur in parts of the system where generators know they are needed to keep the electricity system in balance – referred to as being 'constrained on' or 'constrained off'. Local market power exists in electricity markets when only a subset of available units, and in some cases only a single unit, can meet certain operational constraints and so the TSOs' choices in dispatch are limited. Such units may, or in some cases must, be dispatched by the TSO even if their bid-offers are out-of-merit.

In these circumstances, generators are paid based on short-run marginal cost bids that all generators are required to submit to the Balancing Market Operator. The Balancing Market rules are designed also to ensure that the actions taken on these generators does not set the imbalance price.

The SEM Committee's I-SEM Market Power Mitigation decision paper outlined that the Flagging and Tagging Approach combined with the application of bidding controls to units' complex 3-part offers would mitigate local market power in the Balancing Market. This was considered to be the case as any action taken out-of-merit to meet operational constraints would be flagged as a non-energy action, would not set the imbalance price, and would be settled at the unit's complex 3-part offer (or the imbalance price).

Bidding controls are applied to units' complex 3-part offer to mitigate local market power in the Balancing Market (as decided in SEM-16-024)[60]. Where any action is flagged as a non-energy action and does not set the imbalance price, it is settled at either the unit's complex 3 part offer or the imbalance price.

Complex offers comprise;

a. A start up cost (€) for committing a unit;
b. A no-load cost (€) for each trading period that the unit is committed;
c. An incremental offer curve (MWh, €/MWh) for increasing energy supplied at each level of output, and a decremental bid curve (MWh, €/MWh) for decreasing energy supplied at each level of output.

3. Are there any rules or provisions which require the TSO to release generation reserves to the market when market prices rise above certain thresholds?

There are no rules which require the TSO to release generation reserves to the market when prices exceed a certain level. All generators are required to participate in the Balancing Market, and the TSO currently has no contracts with generators that hold capacity outside the ex-ante markets.

As an overview, the TSOs (EirGrid and SONI) source Regulating Reserve from Synchronised Generating Units in Ireland in Northern Ireland and Non/Partially Regulating Reserve from Turlough Hill, DSUs and EWIC Interconnector in Ireland and batteries, DSUs and the Moyle Interconnector in Northern Ireland.

The tables below from the TSOs' Operational Constraints Update provide an overview of the operating reserve requirements in each jurisdiction and on an all-island basis.

Category	All Island Requirement % Largest In-Feed	Ireland Minimum[1] (MW)	Northern Ireland Minimum (MW)
POR[2]	75%[3] (S_PRM_TOT)	135/ 75 (S_PRM_ROI)	49 (S_PRM_NI)
SOR	75%[4] (S_SEC_TOT)	135/ 75 (S_SEC_ROI)	49 (S_SEC_NI)
TOR1	100% (S_TR1_TOT)	135/ 75 (S_TR1_ROI)	49 (S_TR1_NI)
TOR2	100% (S_TR2_TOT)	135/ 75 (S_TR2_ROI)	49 (S_TR2_NI)

1. Ireland Lower values apply from 00:00 - 07:00 inclusive
2. Minimum values of POR in each jurisdiction must be supplied from regulating sources
3. At times more than 75% POR is held All Island (up to 80%) in order to maintain system security standards based on transient security analysis (this will remain under review by the TSOs).
4. At times more than 75% SOR is held All Island (up to 100%) in order to maintain system security standards based on real-time transient security analysis (this will remain under review by the TSOs).

[60] https://www.semcommittee.com/sites/semcommittee.com/files/media-files/SEM-16-024%20I-SEM%20Market%20Power%20Decision%20Paper.pdf

Category	Delivered By	Maintained Until
Primary (POR)	5 seconds	15 seconds
Secondary (SOR)	15 seconds	90 seconds
Tertiary 1 (TOR1)	90 seconds	5 minutes
Tertiary 2 (TOR2)	5 minutes	20 minutes

4. Are there currently any capacity mechanisms (i.e. in the form of reserves)? If yes, please elaborate on how they work?

Yes. The SEM Capacity Mechanism, which received State Aid approval from the European Commission in November 2017[61], is based around Reliability Options (ROs), with market participants receiving a capacity payment in return for providing capacity when demand is high, prices are rising and the system becomes tight. Capacity Providers can receive two payments – one for providing capacity and the other for the energy they actually produce.

Capacity providers sell qualified capacity to the market based on generation capacity required in a future capacity year. If successful in the auction, capacity providers receive a payment to assist with funding generation capacity and have an obligation to generate when the system is stressed.

The cost of the Capacity Mechanism is funded by suppliers via the Capacity Charge Tariff which is paid on a monthly basis based on their demand profile. Suppliers are protected from high energy prices through the strike price, which is set, based on a consideration of fuel prices, unit efficiency and DSU running costs. If the energy price exceeds the strike price, suppliers are paid the difference between the energy price and the strike price.

To fund this, generators are required to pay difference charges for capacity which is not delivered based on the difference between the strike price and the reference price (which reflects the price at which the capacity provider traded in the DAM, IDM and BM). Where the reference price exceeds the strike price, the capacity provider pays a difference charge for the relevant volume.

Capacity providers are expected to provide energy at times of system stress, defined as times when the imbalance settlement price exceeds the strike price. The capacity provider meets this obligation by being contracted in the DAM or IDM or scheduled in the BM (even if subsequently traded or scheduled to a lower level).

Capacity providers are most exposed to the strike price if they fail to maintain adequate availability during periods of peak demand. They therefore have a strong incentive to be on at times that the reference price goes above the strike price because they must pay capacity difference charges whether they are scheduled on or not.

For further information on the design of the SEM capacity mechanism, please see State aid No. SA.44464 (2017/N):

https://ec.europa.eu/competition/state_aid/cases/267880/267880_1948214_166_2.pdf

[61] https://ec.europa.eu/competition/state_aid/cases/267880/267880_1948214_166_2.pdf

Section 2 – Balancing markets

Sub-section 2.1: Imbalance settlement

5. What incentives do balancing responsible parties have to reduce their imbalances (or help the overall system to be in balance)?

The Imbalance Settlement Price is the primary price used for settlement in the Balancing Market and provides an important signal for implementation of 'balance responsibility'. Under the market rules, participants are financially responsible for differences between their traded volumes and actual consumption or generation, and the Imbalance Settlement Price is applied to this difference.

Units are incentivised to reduce imbalances through potential exposure to the imbalance settlement price, with any imbalance not attributable to balancing actions settled at the imbalance settlement price. The actual generation or consumption position of a unit less the traded position is settled at the imbalance settlement price. This compares to pre-October 2018 old market design, under which participants were not accountable for imbalances, leading to higher consumer costs through the TSO actions required to maintain system balance and security.

Under the current market design, dispatchable units (i.e. can follow MW set-point instructions issued by the TSO) with a capacity exceeding the de minimis threshold of 10MW (soon to be 400 kW) are required to participate in the balancing market. Non-dispatchable but controllable units (i.e. can limit its output to MW set-point instructions issued by the TSO) with a capacity exceeding the de minimis threshold are also required to participate in the balancing market. Interconnectors are also required to participate in the balancing market.

6. Are all market participants exposed to the TSO's imbalance settlement rules? Are the terms/rules of the imbalance settlement the same for all balance responsible parties?

Yes. The rules of imbalance settlement are the same for all balance responsible parties. All market participants are exposed to the TSO imbalance settlement rules and are settled the same way regardless of their technology type.

The new market design places no restrictions on the offers submitted to the balancing market for balancing energy. Participants submit both cost reflective complex three part offers including start, no-load and incremental costs and simple price quantity offers that are not subject to any bidding controls.

Where offers are accepted for purposes other than for energy balancing, they are settled on the basis of complex offers as described in response to Question 2 above. This is due to the fact that units in such a position often have high levels of market power.

7. How are the costs for procuring balancing services translated in imbalance settlement prices?

The cost to the TSOs in relation to the procurement of energy needed to keep overall supply and demand in balance is reflected in the imbalance prices, through an automated process of flagging and tagging to ensure that only energy balancing bids set the balancing market price.

A rules-based, flagging-and-tagging process is used to determine the initial imbalance price in each five minute imbalance pricing period. The flagging-and-tagging process prevents bids and offers that are scheduled due to system constraint, or where units are operating at a unit constraint, from influencing the imbalance price.

Constrained actions – those actions which are for local issues and who may not be in merit balancing market actions – do not set the price.

8. Are the full costs of balancing actions attributed to the balance responsible parties though the imbalance settlement price?

The majority of balancing action costs are recovered through the balancing market price. There are some costs which are not recovered through energy balancing costs; specifically, those actions which are out of merit and were taken for system reasons. As these actions are by definition more expensive than the balancing market price, there is a level of 'missing money'. This missing money is recovered through a tariff from all suppliers, referred to as the Imperfections tariff. This tariff also covers the cost of managing constraints and curtailment caused by the high level of RES-E currently connected in the SEM.

The TSOs continuously issue dispatch instructions both to maintain system security and to keep supply and demand in balance, choosing the least cost solution for the deviation based on generator and supplier Complex Offer Data. A rules-based, flagging-and-tagging process is used to determine the initial imbalance price in each five minute imbalance pricing period. The flagging-and-tagging process prevents bids and offers that are scheduled due to system constraint or where units are operating at a unit constraint from influencing the imbalance price.

The imbalance price of an imbalance pricing period is the greater of the initial imbalance price and the administered scarcity price. The administered scarcity price (ASP) may be applied during periods of depleted operating reserve if the operating reserve cannot be restored within one hour. The ASP increases in response to the depletion of the operating reserve, ranging from the capacity strike price (see Section 4.6) up to the EUPHEMIA day-ahead price cap.

Any imbalance which is not due to a balancing action is settled at the imbalance settlement price. And any imbalance which is due to a balancing action is settled at the better of the imbalance settlement price and the bid offer price. The difference between the ex ante quantity and the metered quantity (which covers all imbalances and all delivered, non-biased balancing actions) is settled first at the imbalance settlement price. A premium (for offers with a higher price) or discount (for bids with a lower price) is then calculated for other quantities.

9. Has the Member State considered introducing an administrative scarcity pricing mechanism as referred to in Article 44(3) of EBGL?

An Administered Scarcity Pricing mechanism was introduced to the Imbalance Price which sets the Price Floor at times of system stress to a much higher price than would normally be expected in the balancing market. This is intended to incentivise Generator Units to be available in the Balancing Market, Capacity Market Units to ensure they are available and for Supplier Units to reduce their consumption.

The times that the functionality is triggered is related to stress on the system, in particular when load shedding occurs or where shortfall in short term reserves occurs.

The main input for determining the price at times that the functionality is triggered is an RA determined Reserve Scarcity Curve, which reflects what the price should be at different levels of reserve scarcity. Reserve scarcity is where the volume of short-term reserves actually being provided is less than the volume required for them.

10. How is the imbalance settlement price calculated for a balancing period in which the TSO has to disconnect one or more consumers involuntarily?

When the TSO is required to shed load locally, the Balancing Market price is set under the normal flagging and tagging, marginal-pricing rules. As noted, generators, DSUs and storage units may bid energy prices up to VOLL.

When there is a system-wide reserve scarcity event, Administered Scarcity Pricing is triggered. When this occurs, a price floor of 3,000EUR\MWh applies. As this is a price floor, the price may continue to rise above the ASP.

11. What is the estimated value of lost load in the Member State? Please provide a copy of any study providing a basis for this estimate

VOLL was estimated at 10,000EUR\MWh in 2007 and a decision on this was published in SEM-07-484. This decision acknowledged that the definition of VOLL in the Trading and Settlement Code (the value an end customer would willingly pay to avoid having his or her supply interrupted) should theoretically be measured using customer surveys and that a value for VOLL derived from the fixed and variable costs of a peaking plant and the generation security standard was not strictly an estimate of the value of energy at the margin to customers, but an estimate of the cost required to reduce load shedding to eight hours a year.

VOLL was set based on the fixed and variable costs of the Best New Entrant Peaking Plant and the generation security standard of eight hours used in the calculation of the capacity payment mechanism sums for 2007 and 2008. It was decided that its value in subsequent calendar years would be determined by taking its value in the preceding year and uprating it by applying the weighted average of the year-on-year increases in the Irish Harmonised Index of Consumer Prices (HCIP) (using a weight of two-thirds) and the UK HICP (using a weight of one third) in the July of the preceding year by comparison with that a year earlier.

Sub-section 2.2: Procurement of ancillary services

12. Are balancing reserves procured through a competitive process? Does the TSO procure (a portion of) its balancing reserves close to real time (day-ahead)?

The DS3 Programme (Delivering a Secure, Sustainable Electricity System) is made up of eleven workstreams, which fall under the three pillars of System Performance, System Policies and System Tools. The programme brings together many different strands, including development of financial incentives for better plant performance, and the development of new operational policies and system tools to use the portfolio to the best of its capabilities.

A central aspect of the DS3 Programme is the System Services review. System services are products, other than energy, that are required for the continuous, secure operation of the power system. For example, reactive power is required to enable the system operators to manage voltages across the system. The System Services Review was carried out to identify the new products that are needed to complement the transition towards a power system with high levels of wind generation.

The programme is now divided into two separate procurement streams – Fixed Contracts and Regulated Arrangements. The DS3 Fixed Contracts relate to the mandatory availability of five fast-acting reserve services: (Fast Frequency Response, Primary Operating Reserve, Secondary Operating Reserve and Tertiary Operating Reserve Services 1 & 2). The procurement of these contracts is divided into two stages; a pre-qualification stage and an auction stage. The auction stage of this process took place in 2019 and resulted in 110MW of the above services being made available by three units. These contracts for availability will go-live on 1 September 2021 and have a duration of six years. More information can be found on the SEM website.

The Regulated Arrangements procurement process applies to a wider range of technical system services from those procured under the Fixed Contracts process and is open to any party seeking to provide one of the relevant services and for which they are a proven technology. The procurement process involves a qualification system which requires interested parties to submit a response to the TSOs demonstrating technical capability, before being considered for the provision of the relevant services. These contracts cover the vast majority of providers and are based on a tariff model, where contracted parties are all paid the same regulated rate for service availability. This process operates over a number of "gates" which occur every six months. At these gates new providers can obtain a contract to make services available, and existing providers can alter their contracted volume.

13. Can demand side participants provide balancing services?

Demand Side Units are required to have the technical and operational capability to deliver Demand Reduction in response to Dispatch Instructions from the relevant System Operator (EirGrid or SONI). DSUs are required to have appropriate equipment in place to permit real-time monitoring of delivery by the relevant System Operator.

14. Are there any formal or informal rules or requirements that limit generators' ability to freely price their offers in balancing markets?

Not in addition to those set out above.

Section 3 - Demand-side response

15. Are all types of demand-side response eligible to participate in the wholesale electricity markets (including day-ahead and intraday) as well as the balancing/ ancillary services markets?

Yes. DSUs are able to participate in all the wholesale electricity markets, albeit there are some minor differences between the settlement of DSUs and other units.

Due to the particular way that DSUs are represented in the SEM, their treatment in respect of charges that apply in the case of non-delivery for the purpose of the balancing market differs from other units. The reason for this is that currently DSUs only receive limited energy revenue due to the need to buy the energy from the wholesale market in order to sell it back. DSUs can trade in the DAM, IDM and BM through the combination of a physical trading unit and a virtual trading unit.

When establishing the Capacity Remuneration Mechanism (CRM), the SEM Committee determined that Demand Side Units (DSUs) while able to participate in CRM auctions would be exempt from Reliability option (RO) payments where the contracted demand is delivered. RO difference payments would be applied to DSUs only when the demand reduction is not delivered and the Strike Price is exceeded by the Market Reference Price (MRP). This recognised the fact that DSUs do not have offsetting energy payments. State Aid approval from the European Commission for the CRM allowed this different treatment to apply to DSUs as a temporary measure but obliged the RAs to end the exemption from payback obligations for DSUs from the delivery period starting October 2020.

As part of the State Aid approval process, the RAs committed to the development of the DSU model such that the different treatment for non-delivery charges is removed. This work is underway and will be completed by 1 October 2020 as required. Work has already progressed on this, and the SEM Committee published a Decision on the implementation of an interim solution to the DSU state aid requirements (SEM-19-029) in the past months. This interim solution is now being implemented through a change to the Trading and Settlement Code.

16. Can demand-side response participate in markets both via individual players and via aggregators?

Yes. A single Demand Side Unit may be associated with a number of Demand Sites provided that those Demand Sites are within the same Currency Zone and that each Demand Site contributes no greater than 10MW to the Demand Side Unit MW Capacity. The combined Demand Side Unit is then treated as a single unit under the Trading and Settlement Code. Demand Sites with a capacity greater than 10MW must register as a single unit. This de minimis applies to all unit types at present, but is scheduled to change in line with requirements of the Clean Energy Package.

17. Are there any exemptions from network or energy-related costs as well as surcharges (RES, CHP, capacity mechanisms, etc.) for specific classes of consumers which might affect demand response incentives?

There are no exemptions from costs or surcharges for classes of consumers which might affect demand response incentives.

18. What percentage of customers is provided with smart meters (please specify it separately for the following groups of customers: a) households, b) business customers, c) industrial users)

(e.) less than 20% of customers overall.

The rollout of smart meters began in 2019 and will continue until the end of 2024. Between 2019 and the end of 2020, ESB Networks (the DSO) will install 250,000 smart meters. An additional 2,000,000 meters will then be installed through Phase 2 and 3 of the programme, with 500,000 installations each year. The meter replacement programme will result in the upgrade of 2.4 million meters overall with installation to all domestic and business premises by 2024.

90%+ of household and small business will receive a smart meter

As industrial customers already have interval meters – they are not included in the programme.

19. Are all the smart meters capable of metering and transmitting at least hourly metering values and do data management systems enable suppliers to settle customers on the basis of at least hourly metering values (i.e. against at least hourly spot market prices, for the purpose of dynamic pricing)?

The National Smart Metering Programme (NSMP) is a multi-year investment project including the roll out of new digital electricity (and gas) meters, a communications network to support them, and investment in new IT systems. The Commission for Regulation of Utilities (CRU) is responsible for the overall coordination of the NSMP in the electricity (and gas) sectors.

The smart meters are capable of recoding import-export energy usage on a 30-minute interval basis and this data will be collected remotely every 24 hours from Q4 2020. Information on usage every thirty minutes will only be shared with suppliers if allowed for by the customer. The meter will collect detailed breakdown of electricity consumed e.g. usage every 30 minutes.

When smart meters are fully operational, customers will have a choice to be provided with more accurate information about energy usage across the day to allow them to better manage bills with greater accuracy than at present. This information can also help customers make more informed choices about consumption and tariff.

The CRU anticipates that by 2021 new products and services will enable customers to shift some consumption to off peak times when electricity is cheaper.

20. Do customers in the retail market have access to a dynamic price contract linked to wholesale spot market prices?

Not yet, however it is expected that by 2021 new products and services will be offered by suppliers which will enable customers to shift some of their consumption to off peak times of day when electricity is cheaper.

In 2021 customers will be able to available of a Standard Smart Tariff based on their usage during three time bands – day, night, peak. All suppliers are obliged to offer this tariff. Supplier may offer customers 'dynamic price contracts' based on more granular data if the customers consents to their data being used for this purpose.

Section 4 - Retail Markets: Regulated prices

21. What is the percentage of total demand supplied under regulated prices?

The regulation of retail market prices for electricity in Ireland ended in 2011. The removal of price controls in Ireland should be seen in conjunction with wider retail market development, which also provides for customer protection and consumer rights through Ireland's independent regulator, the Commission for Regulation of Utilities.

Q22. – 29. N/a

Section 5 – Interconnection

30. Has the Member State developed interconnection with the view to reaching at least its interconnection targets as referred in point (d) of Article 4 of Regulation (EU) 2018/1999?

Ireland's existing electricity interconnection is reflective of its isolated and peripheral geographical location. A particularly positive aspect of the new I-SEMI-SEM design has been the impact of the new market structure on trade between the SEM and GB across the Moyle Interconnector and East West Interconnector (EWIC), which has highlighted the benefits of directly linking the two markets through Single Day Ahead Coupling (SDAC).

The benefits and efficiency gains of increased competition that has resulted from SDAC (noting that the SEM and GB markets are also coupled across the intra-day timeframe through the interim intraday solution) are highlighted through comparison of pre and post I-SEMI-SEM interconnector flows which illustrate that market coupling has resulted in price driven trade flows, rather than the pattern of interconnector trade which was not reflective of price signals under the old SEM model. The flow of electricity between the SEM and GB now mirrors the price differential between the two markets.

Under Article 4 of Regulation 2018/1999, Member States are required to implement an electricity interconnection target for 2030 of at least 15% and a target of 10% for 2020. The indicators related to this concern the price differential in the wholesale market, nominal transmission capacity of interconnectors in relation to peak load and installed renewable generation capacity. The SEM currently has approximately 9.8GW of dispatchable generation and interconnection capacity and approximately 4.4GW of installed renewable generation. Interconnection capacity accounts for approximately 1000MW however there are technical limits on this which are described below.

31. Please describe the amount of interconnection capacities available for trading from and to the Member State and their current utilization

Two 500MW High Voltage Direct Current (HVDC) interconnectors currently link the SEM to Great Britain through the Moyle and East West Interconnectors. The East West Interconnector between Ireland and Wales, GB is capable of providing a capacity of 500MW flowing in both directions. The Moyle interconnector between Northern Ireland and Scotland (GB) also has a capacity of 500MW.

Long term transmission rights in the form of Financial Transmission Rights Options are offered to the market for each interconnector. While Moyle is technically able to transport 500MW between the two markets, due to constraints on the transmission networks at either end of the interconnector, the commercial capacity of the interconnector is lower than this. From 1 April 2022 the firm capacity available for flows from Northern Ireland to Scotland will be 500MW and from 1 November 2019 the firm capacity available for flows from Scotland to Northern Ireland will be 410MW.

Recent analysis undertaken by ACER as part of the Wholesale Chapter of the ACER Market Monitoring Report indicates that the margin available for cross zonal trade on the interconnectors between GB and the SEM is above 70%.

32. Are there currently administrative import and/or export restrictions on interconnectors limiting trade with neighbouring countries? If yes, please explain what is the impact of such restrictions on the market.

There are no administrative restrictions on export or import of electricity on the EWIC interconnector to GB. However, due to constraints on the transmission networks at either end of the interconnector, the export capacity of Moyle is currently limited and subject to change during different times of year. Commercially available capacity in the Northern Ireland to Scotland direction varies day to day, depending on conditions in the GB transmission system. There is a minimum 'firm' export capacity which is then 'topped-up' by additional capacity released two days ahead of delivery by National Grid.

33. Are there any internal network congestions? What is the annual cost of redispatching/ countertrading in the Member State? Are there planned or ongoing network reinforcement measures?

The all-island transmission system currently includes capacity constraints limiting the ability to transfer power between the two jurisdictions which comprise the SEM. Within the SEM there is an internal 300MW tie-line crossing the jurisdictional border between Ireland and Northern Ireland. Prior to the completion of the second North-South Interconnector project, the existing interconnector arrangement between the two regions creates a physical constraint that affects the level of support that can be provided by each system to the other.

This poses a potential risk to security of supply and creates a sub optimum outcome regarding the integration of renewable generation on the island of Ireland, notwithstanding the outstanding performance by TSOs, EirGrid and SONI, in achieving a Synchronous Non Synchronous Penetration rate of 65%, which will be raised to 75% in the coming years. There is an additional constraint in the

greater Dublin area, which has been exacerbated by the increase in large energy users, in particular data centres, in this region during recent years.

The above internal capacity constraints in the SEM are currently mitigated by ensuring the availability of generation in proximity to the constraint to influence the flow of power. In this regard, the competitive CRM introduced under the I-SEM design project is performing a crucial ongoing role, with locational constraints incorporated in the Capacity Market to ensure minimum levels of generation capacity are maintained in the constrained areas to ensure appropriate levels of security of supply. This was highlighted by the first T-4 auction held in March 2019 for capacity year 2022-23, in which three locational capacity areas were identified; Northern Ireland, Ireland, and Greater Dublin. In particular, the Greater Dublin minimum generation capacity requirement indicated that new generation would be required in the area. The T-4 auction was successful in procuring 1,082 MW (i.e., 526 MW de-rated capacity) of new generation capacity in the Greater Dublin area.

It is important to note that significant ongoing investments are currently taking place, or are scheduled to take place in coming years, within the all-island market grid infrastructure to ensure security of supply and mitigate the locational capacity constraints in the Dublin area and Northern Ireland in the most efficient manner possible, and to facilitate higher integration of renewables generation in the SEM. Reducing longer term constraints in the SEM, and within the wider Dublin region in particular, are considered vital by EirGrid and SONI to reduce the need to incorporate locational constraints with future CRM auctions, as well as a reduced level of curtailment to facilitate a swifter pace of decarbonisation on the island of Ireland.

There are a number of major upgrades or extensions to the Irish electricity transmission system currently planned by EirGrid, or in which progress has already commenced.

These projects include:

- North South Interconnector Project.
- West Dublin Project.