Performance of the SEM Capacity Remuneration Mechanism

Reliance Restricted

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Capacity Remuneration Mechanism review

28 June 2022

Dear Barry,

In accordance with the terms of our contract signed on 04/01/2022, we have assisted you in reviewing the performance of the capacity remuneration mechanism in the SEM. Our role is to provide you with our review, covering analysis and findings in a report. We have not performed any management functions or made any management decisions.

Limitations of Scope
We have not, except to such extent as you requested and we agreed in writing, sought to verify the accuracy of any data, information and explanations provided by yourselves, and you are solely responsible for this data, information and explanations. We have therefore relied on any information provided by you to be accurate and complete in all material respects.

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We appreciate the opportunity to have provided EY's services to the CRU. Should you have any queries or comments regarding this report or if we may be of any further assistance, please do not hesitate to contact me on +353 1 221 2611.

Yours sincerely

Simon MacAllister
Partner

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1 Executive Summary

Our analysis identifies a number of findings on how the CRM design impacts the SEM security of supply requirement

The CRM has been successful against a range of metrics, including reducing the cost of capacity payments, meeting the target reliability standard to date, and attracting good participation in auctions. However in light of the SOs' projection of a growing capacity shortfall of 2 GW* by 2030, it is timely to review if the CRM could be strengthened to further deliver on its core objective of ensuring security of supply. This report highlights a number of areas where there is scope for improvement in the CRM and the wider market framework, and outlines some potential remedies to address issues identified. It should be noted that remedies outlined are not mutually exclusive and may also be beneficial in mitigating multiple issues identified.

1. Volume Procured in CRM Auctions

Key areas with scope for improvement

- The findings of recent GCS publications have not clearly signalled to the market the identification of a growing concern around a capacity deficit.
- The process by which the target volume to procure is set is opaque and does not clearly signal to developers the growing need for capacity.

Main remedies considered

- Process for external scrutiny of volume decisions.
- Procuring a contingency for projects that fail to delivery.

2. Participation in CRM Auctions

Key areas with scope for improvement

- Locational constraints are and challenges providing connections are making it harder to meet new build requirements.
- Projects without planning and environmental consents were qualified for the auction which were unlikely to be deliverable in time for the start of the capacity delivery year, absent significant coordinated action on the part of a range of state bodies.

Remedies considered

- Continued investment in addressing regional constraints within SEM
- Requiring consents as part of prequalification

3. Delivery of New Build Capacity

Key areas with scope for improvement

- The lead time in T-4 auctions in practice is < 3.5 years, which is particularly challenging to deliver new build that does not have required consents ahead of the auction.

Remedies considered

- Extending lead times for projects successful in auctions to get built

4. Value of Capacity Procured

Key areas with scope for improvement

- The reliability option provides insufficient incentives for providers to be available. This is principally due to the failure of the administrative scarcity pricing mechanism to set high prices at times of stress, as well as most stress events occurring on a localised basis.
- There are differences in how the energy provided by demand side units and generation technologies are measured and remunerated. These limit the incentives for DSUs to be available or to be deployed at greater scale.

Remedies considered

- Strengthening RO incentives for generators, including through amending the administrative scarcity price mechanism.
- Providing greater incentives for DSUs to participate in the energy market.

*Source: All-island Generation Capacity Statement 2021

We have considered potential remedies in line with identified issues with existing CRM operation (1/3)

Question	Sub-question	Impact	Potential Remedies	Benefit	Feasibility
1: Was sufficient capacity procured in capacity auctions?	1.1: Is the SEM reliability standard adequate?	3	▪ Move to tighter reliability standard in line with other European markets.	Medium	Very High
	1.2: Did TSO forecasts identify the growing capacity shortfall?	5	▪ Greater transparency of target setting through a panel of technical experts (PTE) assessment of EirGrid recommendations, with findings published, and explanation of process by which GCS forecasts are translated to Target Volume to procure in capacity auctions.	High	Medium
	1.3: Did the RAs make appropriate adjustments to TSOs recommendations?	5	▪ More explicit accounting of non-delivery in setting target, with two options for implementation: ▪ Introduce process to monitor progress reports for early indication of non delivery; OR ▪ Apply a standardised adjustment to capacity requirement to account for likelihood of non-delivery, review inputs to adjustment % on a periodic basis.	Very High	Very High
2: Did capacity auctions attract sufficient participation?	2.1: Did the auctions attract sufficient participation?	5	▪ Greater investment in infrastructure to enable more competitive all-island market and reducing pressure for new build to be situated in particular locations.	High	Medium
	2.2: Are bidding restrictions on existing plants prompting plants to close sooner?	1	▪ None required		
	2.3: Have new build projects been appropriately pre-qualified for auctions?	3	▪ Requirement of new prospective capacity to have all necessary consents to pre-qualify for auction. This remedy is potentially redundant if remedy 3.1 is taken forward (i.e. extending auction lead times).	Very High	High

We have considered potential remedies in line with identified issues with existing CRM operation (2/3)

Question	Sub-question	Impact	Potential Remedies	Benefit	Feasibility
3: Did new capacity procured in auctions get built?	3.1: Are T-4 timelines long enough to enable new build to deliver?	5	▪ Increase lead time to at least 4 years from announcement of auction results to start of capacity delivery year.	Very high	Medium
	3.2: Are the incentives for delivery too low to ensure new capacity procured is actually built?	3	▪ Increase performance securities following the auction.	Medium	Medium
	3.3: Is there sufficient monitoring of new build projects' progress against milestones?	3	▪ Require performance security to be lodged prior to auction.	High	Medium
	3.4: Have the RAs made appropriate decisions on requests for extensions by new build projects?	4	▪ More permissive approach to requests for extensions from new build projects (where likelihood of delivery is high).	Medium	Very High

We have considered potential remedies in line with identified issues with existing CRM operation (3/3)

Question	Sub-question	Impact	Potential Remedies	Benefit	Feasibility
4: Was the capacity procured of sufficient value?	4.1: Are there adequate incentives for generation to be reliable?	5	▪ Recalibrating the administrative scarcity pricing function so BM pricing better reflects market scarcity and causes a higher frequency of periods with prices above the RO strike price. ▪ Refining the principle of flagging interconnector actions from SEM BM prices to drive prices that are more likely to exceed the RO strike price are and more reflective of the value of generation. ▪ Greater monitoring of technology performance in stress events to inform future de-rating factor setting. ▪ Applying administrative penalties for non-delivery to plants in specific locations where an amber alert has been raised and a plant is unavailable. ▪ Implement additional physical checks on existing capacity providers in periods with no stress events.	High	High
	4.2: Are there adequate incentives for DSUs to be reliable?	4	▪ Implement baseline methodology for assessing the contribution of DSUs in reducing energy demand. ▪ Pay DSUs for negative generation up to the RO strike price. ▪ Determine energy-only stack within balancing market and compensate generators if instructed not to run for system reasons. ▪ Set single derating factor for DSUs regardless of size. ▪ Implement provision for secondary trading for capacity providers.	High	Very High
	4.3: Does the CRM adequately value efficient generation technologies?	3	▪ Allow 15 year contracts for the most capital-intensive new build (i.e. CCGTs, long duration storage). ▪ Making ancillary service contracts more accessible to new build by creating ancillary service contracts with a longer lead-time and duration in line with the CRM and by procuring the products in a single integrated auction process.	Medium	Low

2 Background

You have asked us to review the performance of the SEM Capacity Remuneration Mechanism

Objectives

The objective of this report is to review the performance of the Capacity Remuneration Mechanism (CRM) since its introduction as part of the revised Single Electricity Market ('SEM') arrangements in October 2018. This report covers a number of aspects of the performance of the capacity market in the delivery of new capacity in Ireland, including consideration of input parameters for each auction held to date, the outcome of each auction and the delivery of contracted capacity.

This review is a background study to help support the CRU's programme of security of supply measures, as set out in CRU21115 - CRU Information Paper: Security of Supply - Programme of Actions.

Scope

The following steps have been taken to assess the CRM:

- Development of key questions: we identified a number of questions to reflect a wide range of reasons which might explain why the CRM has been unable to procure enough capacity. This allows us to systematically test how different aspects of the CRM have performed and identify where further work may be appropriate.
- Data review: Data was reviewed from publicly available sources (for instance auction reports) as well as relevant data received from RAs and TSOs to test the identified questions.
- International review: Precedents from CRMs employed elsewhere were considered for their relevance to SEM and whether they provide indications of best practice that could be followed.
- Internal stakeholder engagement: Interviews were carried out with RAs, as well as officials from TSOs and DECC to understand decisions made by organisations involved in the development and operation of the CRM as well as how they viewed the CRM's performance.
- External stakeholder engagement: Meetings were held with trade bodies (Energy Association Ireland, DRAI) to seek industry views on the performance of the CRM and in particular the challenges that developers and plant operators had encountered in bringing new capacity to market or maintaining existing plant.
- Evaluation of mechanism effectiveness: Based on the quantitative and qualitative evidence gathered, theories of harm were identified and conclusions drawn about the factors that may have contributed to the existing shortfall in capacity, with factors qualitatively assessed around the potential scope for improvement.
- Identification and assessment of remedies: Remedies were considered that could address design areas identified as having scope for improvement. Advantages and disadvantages were considered for each remedy, and the remedy was qualitatively scored according to the size of the benefit from the change as well as the feasibility of implementing the change.

Capacity markets continue to form an important part of energy markets in other jurisdictions

Internationally, electricity markets are seeing growing power demand, increasing renewables penetration and increasing wholesale price volatility. These conditions make it difficult to finance the construction of reliable and flexible forms of generation on electricity wholesale market revenues alone, and place a growing importance on the existence of effective capacity support mechanisms which act as another necessary revenue stream supportive of financing. Indeed, internationally many markets have adapted to these challenges through implementation of CRMs.

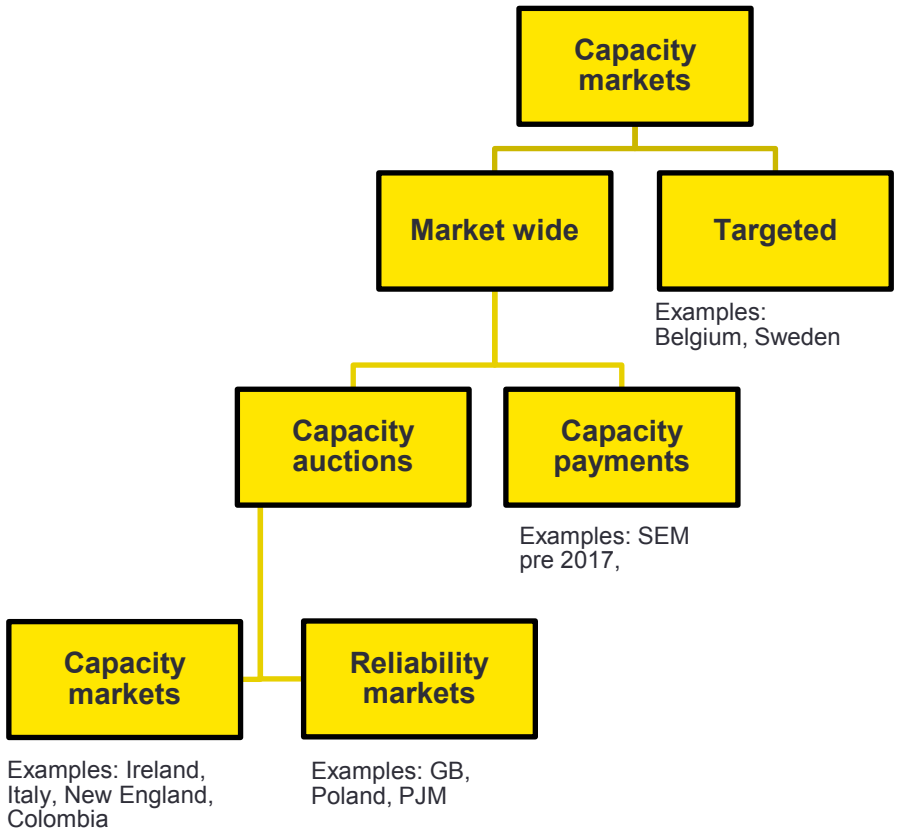
At EU level, there are changes underway to harmonise a range of features of capacity markets in Member States, to ensure that such markets are designed to support as far as possible the transition to a low-carbon system. In Ireland, the CRU's programme of actions for security of supply includes the intention to procure new capacity through forthcoming capacity auctions which is complementary to renewable electricity.

Capacity market design

The principal purpose of any capacity market is to ensure resource adequacy. Unlike an energy only market, where plants are only remunerated when they run, energy systems with capacity markets also remunerate plants for the capacity they deliver, regardless of how often they are dispatched. A target level of capacity is set, and prices can either be set administratively or through an auction process. Capacity is most often procured ahead of time.

In terms of structure, capacity markets can be targeted or market wide. In a targeted market, such as that in Belgium and Sweden, units can only qualify for capacity payments if not participating in the wholesale market, whereas with a market wide approach all generation units can receive capacity payments.

Figure 1: Capacity market type taxonomy



The current SEM capacity mechanism has been in operation since 2018

The SEM market aims to ensure the electricity supply in Ireland and Northern Ireland continues to meet demand, and that the regulatory approved generation adequacy standard is satisfied. The CRM replaced the SEM Capacity Payment Mechanism (CPM) in October 2018.

It is a competitive auction-based market-wide capacity market, where the most efficient and lowest cost capacity is most likely to be successful.

Only those units who are successful in the capacity auctions will receive capacity payments. Capacity providers that are successful in the capacity auction will be paid regular payments during the year for each MW of capacity they successfully sold to the market in the Auction. In return, capacity providers that have been successful in the Auction are required to deliver on their Capacity Market obligations. These include making available the awarded capacity and providing sufficient energy to satisfy their awarded capacity through participation in the day-ahead, intraday and balancing market and paying difference charges where the energy price exceeds the strike price. It should be noted that generators and other units operating in the SEM can also earn revenue from the energy market and system services.

The capacity auction process in the SEM is demonstrated below:

Initiation

- The SEM RAs determine the volume of capacity to procure with input from the All Island Generation Capacity Statement. The RA's also determine the technology de-rating factors based on TSO recommendations and then instructs the System Operator to initiate the auction.
- Most capacity is procured four years ahead (T-4) with supplementary auctions held a year ahead (T-1).

Pre-qualification

- Capacity providers register to participate in capacity auction
- Providers are "de-rated" based on their technology type and unit size so their capacity can be compared on comparable terms.

Auction

- Descending clock auction held to determine the lowest capacity price at which auction clears, also known as the Auction Clearing Price (ACP).
- Existing generators subject to price taker rules.
- Successful bidders to be paid the clearing price (unless bid is higher than ACP and unit is needed to satisfy a Local Capacity Constraint Area).

Delivery

- New build has to report progress against financial/technical milestones, however extensions can be applied for where delivery is delayed.
- Providers have to pass annual delivery tests.
- Providers subject to penalties if fail to generate in a stress event.

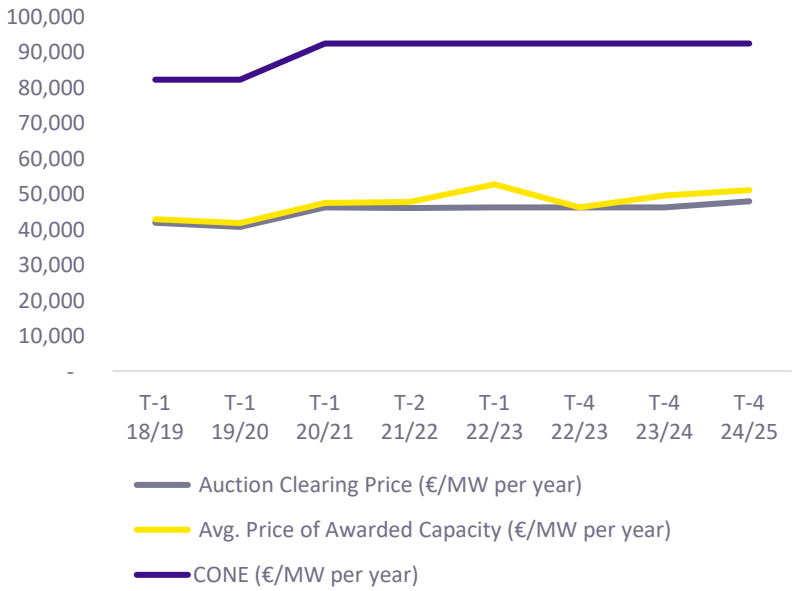
Secondary Trading

- Secondary Trading Arrangements are in place, whereby capacity providers can trade their capacity obligations with other providers who are pre-qualified and have spare capacity. Section M.12 of the Capacity Market Code dictates the governance for this. Only units with Awarded Existing Capacity can avail of the current Secondary Trading Arrangements.

CRM auctions have to date typically delivered lower costs for consumers and have been well subscribed

Capacity auction clearing prices

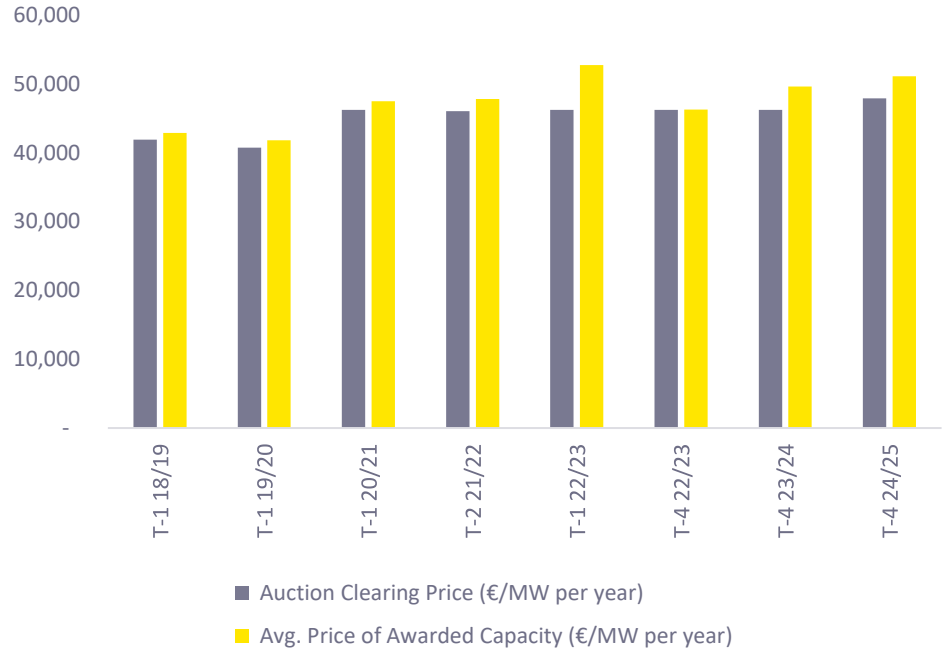
Auction prices* have cleared significantly lower than the level of previous administratively-set capacity prices, where price was set at BNE peaker cost. The volume-weighted average auction clearing price is €47,405/MW per year – well below the most recent BNE peaker of €92,300/MW per year.



as of the start of the study

Average price paid per auction

The average price of awarded capacity exceeds the auction clearing price in all but the T-3 24/25 auction, where prices were equal.



Load shedding

The CRM has outperformed the reliability standard of 8hrs/year, with no load-shedding occurring since the introduction of the SEM in November 2007.

Consumer price hedging

The market design and implementation of the CRM have hedged customers against the €500/MWh strike price. Although this threshold has increased in recent months (due to higher gas prices), the RO has continued to hedge consumers against these increases.

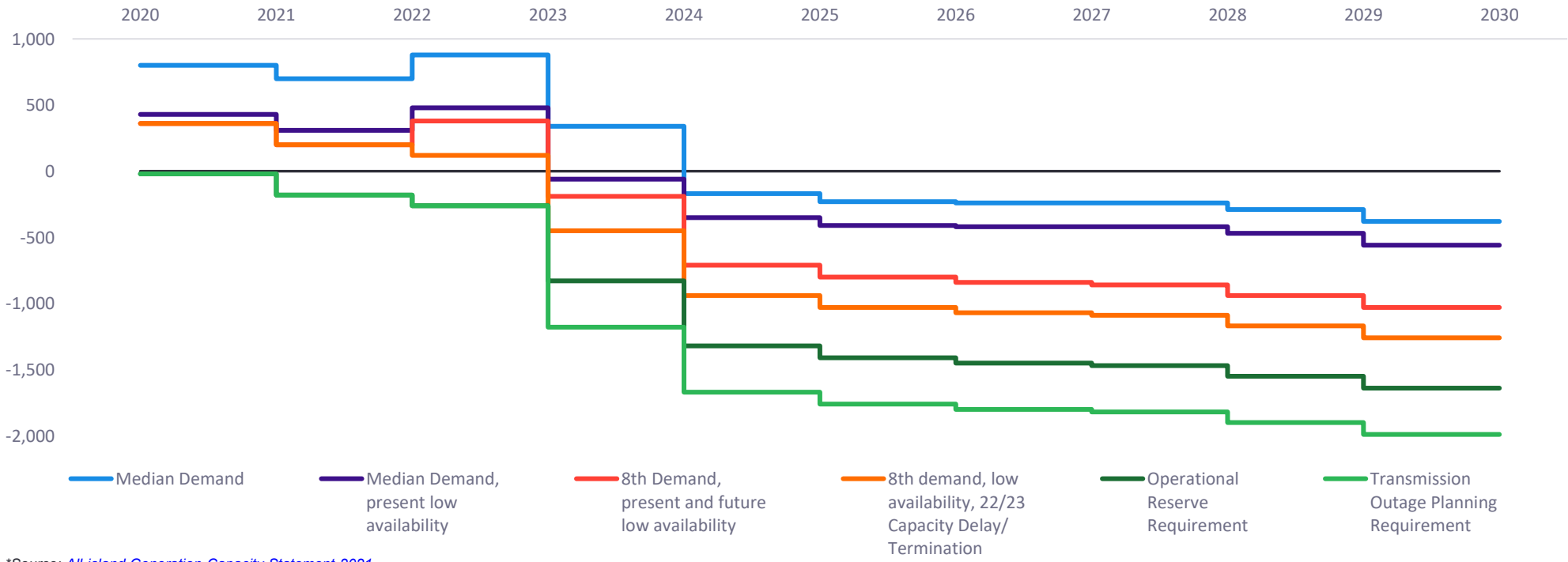
However, the TSOs are projecting a potential shortfall in generation capacity of 2 GW by 2030.

SEM capacity deficits*

The TSOs forecast capacity deficits in each of the years to 2030. The most recent All-island Generation Capacity Statement (GCS) published in 2021 projects a 2GW shortfall by 2030. This shortfall comes from the security of supply study, in which the TSO included additional sensitivities related to the risk of termination of new capacity. This 2GW reflects a more realistic scenario, as it takes into account the units which failed to deliver for the 2022/2023 capacity year, operational reserve requirement and transmission outage planning requirement.

The CRU Security of Supply programme is in response to the TSO's identification of a potential capacity shortfall, if no action is taken, for the following winter periods of 2022/23 to 2025/26, which is set out in the TSO's most up to date GCS 2021 as seen below. Revised figures, along with additional scenarios following the work in the Security of Supply programme and additional risks like run-hour limitations, etc., will be published in GCS 2022 in September 2022.

Sensitivity study adequacy results, surplus or deficit of plant (GCS 2021)

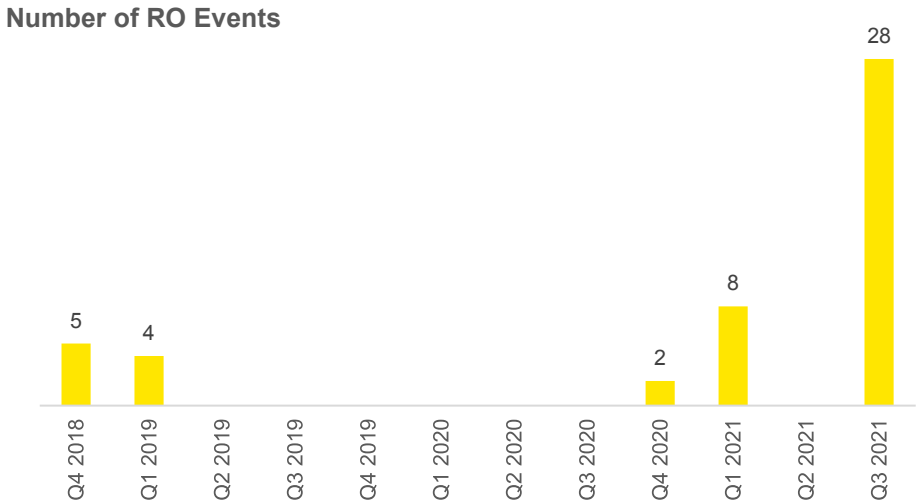


*Source: All-island Generation Capacity Statement 2021

Tight capacity margins are increasing concerns around security of supply risks

Rising frequency of stress events over time*

Analysis of CRU data suggests the frequency of stress events has increased over a 3-year period from 2018-2021. In particular, Q3 of 2021 alone saw a record high frequency of RO events – more than the sum of all other RO events in the time period. The rapid rise in such stress events reflects a rise in electricity demand and complications of connecting new generators and maintaining older units. Despite the strike price also increasing in Q3 2021, the significant number of RO events reflects the tighter margins.

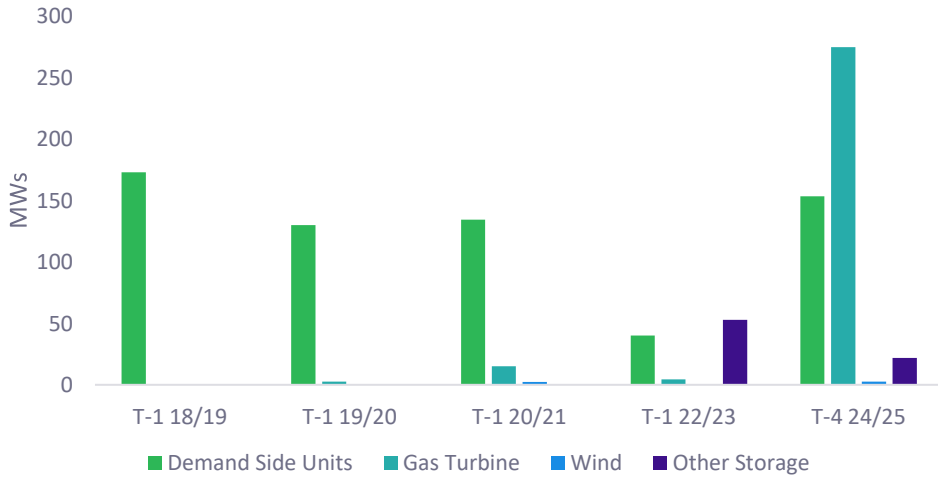


Technology mix

Technology information for all auctions to date is not readily available**, which may underrepresent some market participation below. However, the RAs have confirmed that no CCGTs have been successful in auctions. Concerns have been raised by the TSOs that this does not deliver any of the efficient new baseload generation needed.

The lack of new CCGT projects succeeding in CRM auctions to date may reflect regulatory or market barriers to investing in capital-intensive technologies such as CCGTs – for instance due to uncertainty of whether the CRM will remain in place beyond the initial contract period. However it may also reflect the market anticipating CCGTs having a low load factor in a decarbonised energy system and therefore that OCGTs are a more cost-efficient way of providing generating capacity.

New awarded capacity by technology type***



** Source: SEM-21-042 Discussion Paper on Scarcity Pricing and Demand Response & The Irish Times*
*** No Technology Data is publicly available for T-2 21/22, T-4 22/23, T-4 23/24*
**** Source: Final Capacity Auction Results*

There is a growing shortfall in generating capacity to 2030, particularly in constrained regions

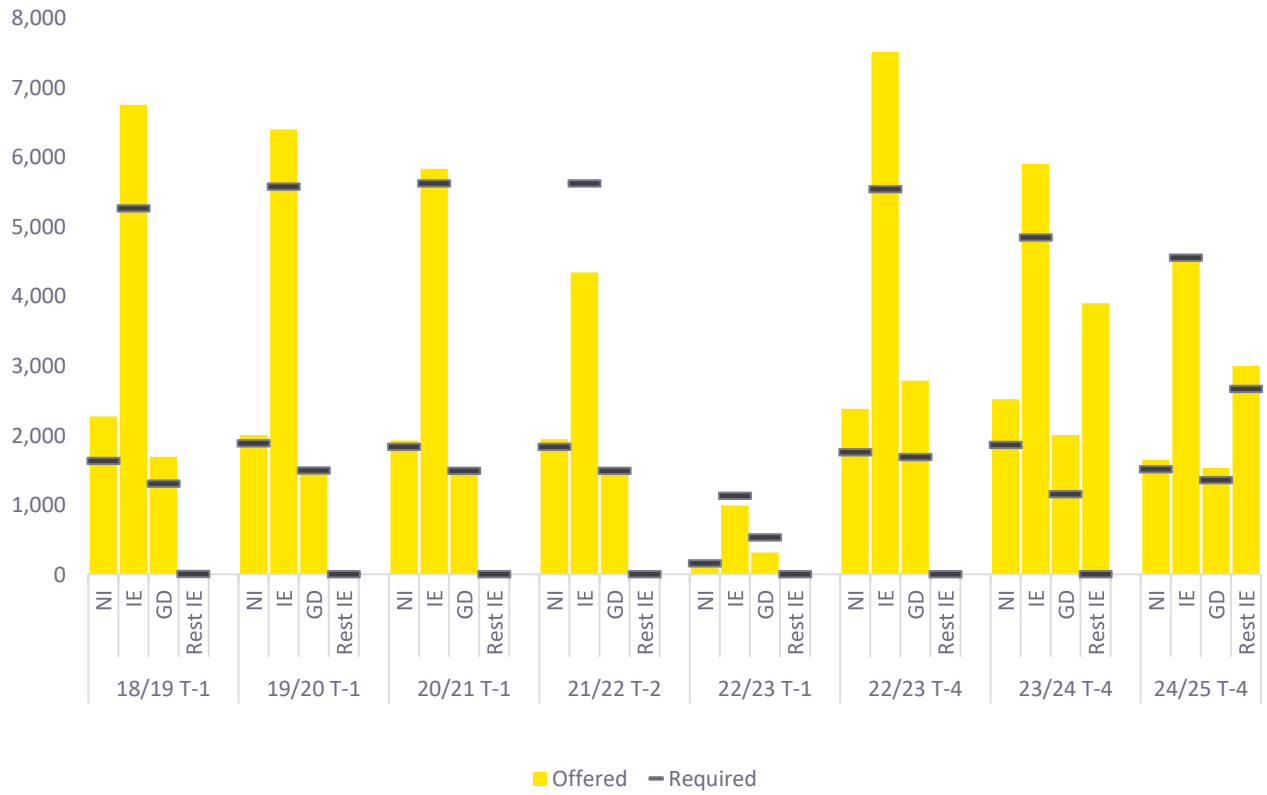
Plants have failed to commission

A significant contributing factor to the 2 GW shortfall is the fact many units that have been awarded new capacity in SEM auctions have failed to commission.

Auction	New capacity units won in auction	Total Units Terminated	Total Amount (MW) Terminated
2018/19 T-1	25	4	17
2019/20 T-1	25	3	5
2020/21 T-1	28	2	7
2021/22 T-2	31	2	4
2022/23 T-4	32	10	513
2023/24 T-4	37	6	41
2024/25 T-4	42	4	55

Auction participation

In a number of auctions to date, Quantity Offered (net of awarded capacity) has not met the LCCA requirements. The most recent two auctions (T-3 24/25 and T-4 25/26) saw LCCA in Dublin not being met.



Our approach focuses on four key questions to evaluate how the projected capacity shortfall could have arisen

Key Questions	Sub-questions
Question 1: Was sufficient capacity procured in capacity auctions?	1.1: Is the SEM reliability standard adequate?
	1.2: Did TSO forecasts identify the growing capacity shortfall?
	1.3: Did the RAs make appropriate adjustments to TSOs recommendations?
Question 2: Did capacity auctions attract sufficient participation?	2.1: Is the auction price cap high enough to attract sufficient participation?
	2.2: Are bidding restrictions on existing plants prompting plants to close sooner?
	2.3: Have new build projects been appropriately pre-qualified for auctions?
Question 3: Did new capacity procured in auctions get built?	3.1: Are T-4 timelines long enough to enable new build to deliver?
	3.2: Are the incentives for delivery too low to ensure new capacity procured is actually built?
	3.3: Does the extent of milestone monitoring affect the likelihood of new capacity being terminated?
	3.4: Have the RAs made appropriate decisions on requests for extensions by new build projects?
Question 4: Was the capacity procured of sufficient value?	4.1: Are there adequate incentives for generation to be reliable?
	4.2: Are there adequate incentives for DSUs to be reliable?
	4.3: Does the CRM adequately value efficient generation technologies?

Red/Amber/Green (RAG) ratings used in assessing mechanism and remedies

For each sub-hypothesis in this report, we have used a RAG rating system to visually highlight the extent to which that sub-hypothesis contributes to the capacity deficit observed in the SEM.
We have also used this rating system on the remedies slide at the end of each section to indicate the degree to which each proposed remedy is beneficial and feasible for solving the issue at hand.

	Impact	Remedy
1	No impact on capacity deficit	Very high benefit or feasibility
2	Immaterial impact on capacity deficit	High benefit or feasibility
3	Some impact on capacity deficit	Medium benefit or feasibility
4	Substantial impact on capacity deficit	Low benefit or feasibility
5	Major impact on capacity deficit	Very low benefit or feasibility

There is already action underway to address CRM challenges

As outlined below, a number of actions are currently in progress to address the security of supply situation in SEM by the TSOs, the Ras and policy makers. This review does not specifically address existing actions to reform the operation of the CRM or wider market framework but recognises that a number of the issues identified and remedies suggested in our report are already under consideration.

What immediate actions are being taken to address the shortfall?

The CRU's September 2021 paper* on security of supply highlights the key actions being taken to reduce the potentially severe impacts of tighter electricity supply and higher demand. The policies being implemented are coordinated with other key stakeholders in the energy industry (such as EirGrid and DECC) to ensure a coherent crisis management strategy.

The paper splits the CRU's plans for dealing with the supply deficit into 2 groups: short-term (winter 21/22) and medium-term (each winter from 2022/23 to 2025/26). The short term plan involved addressing the immediate issues of the Huntstown 2 and Whitegate 1 generators to make available additional supply.

The medium term plan aims to alleviate supply concerns by undertaking the following:

1. Procuring new capacity via a number of capacity market auctions, ensuring capacity commitments are honoured.
2. Enhancing the monitoring of project delivery.
3. Procuring temporary capacity in emergency situations, especially ahead of the coming winters.
4. Temporarily extending the lifetime of older generation units that would have otherwise been retired, via greater maintenance.
5. Developing measures to improve performance and availability of existing generators and DSUs, also increasing DSR.
6. Constructing a temporary system to plan for transmission outage, to be procured by EirGrid.

What are the proposed policy changes to improve CRM efficiency?

The Single Electricity Market Committee (SEMC) is the decision-making authority for the SEM and consists of members from the regulatory authorities (CRU and UR), and independent members appointed by the Department for Economy and DECC.

The SEMC's Forward Work Programme (FWP)** aims to efficiently deliver 38 projects between October 2021 and September 2022 to improve market operations. Some of the projects within this programme are intended to address the security of supply situation, including:

1. Penalties were increased last year.
2. A consultation on derating factors has been issued and a consultation on BNE will be issued ths year.
3. System Services Future Arrangements HLD also now published, clarifying the likely revenue stream for new SS providing units.
4. A paper on scarcity pricing and demand response was released in Q4 2021. It analysed temporary measures for dealing with the supply pressures in winter 21/22, assessing if price signals during scarcity could stimulate a demand response.
5. A demand side management project is underway and due for completion in Q3 2022. Its goal is to develop a more robust demand side management solution for energy market payments. This is in line with an EY remedy of paying DSUs for negative generation up to the RO strike price, thus incentivising greater DSU availability.
6. The Clean Energy Package (CEP) initiative includes adequacy work to be completed by Q2 2022. This project involves computing a new value of lost load (VoLL) and subsequently updating the reliability standard. This is consistent with EY's proposed remedy of aligning the Irish reliability standard with other European countries.

Source: CRU21115: CRU Information Paper on Security of Electricity Supply – Programme of Actions
**Source: SEM-21-096: SEM Committee Forward Work Programme October 2021 – September 2022*

3 Was sufficient capacity procured in capacity auctions?

We followed a defined approach to assessing the capacity procured

This section assesses whether sufficient capacity was procured through the capacity auctions or if a low target for the volume to procure could have contributed to a shortfall in committed capacity.

Overview of auction prequalification process

- The capacity requirement for each auction is set as follows:

1) TSOs forecast peak demand in the All-Island GCS → **2)** The TSOs recommend an auction requirement and de-rating factors to the RA's → **3)** CRM Team of SEM RAs submits TSOs' recommendation along with their own suggestions to SEMC → **4)** SEMC approves or amends the CR for the relevant capacity year

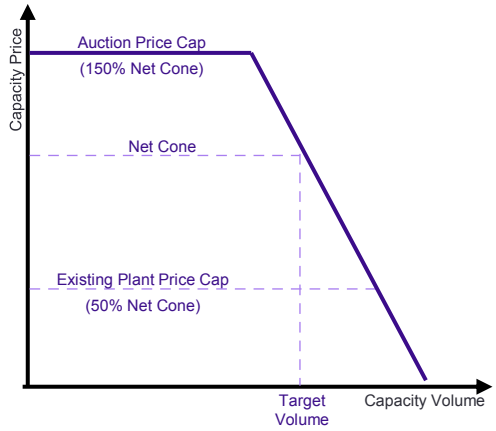
Auction demand curve

The auction demand curve is determined by the RAs, and represents the per MW value of each level of capacity that could be awarded in the auction.

It is based on the following principles:

1. The capacity requirement proposed by the TSOs
2. The Demand curve is determined around a target volume and an estimate of Net CONE (cost of new entrant). The CRM is designed to procure above the target capacity requirement if bids are offered at levels less than Net CONE, or less capacity if the price is above net CONE.
3. The price cap is 1.5 times Net Cone for new plant, and 0.5 times Net CONE for existing plant
4. A new capacity investment rate threshold is set (for example in 2024/25 for T-3 this was €300,000/ de-rated MW/ year)

Auction Demand Curve



Hypotheses to test

The CRM process for determining the volume to procure capacity mechanism has been evaluated according to the following criteria:

1. **Is the SEM reliability standard appropriate?**
   There are concerns that the SEM CRM is too demanding compared to equivalent mechanisms across Europe. Ireland's relatively higher loss of load expectation puts more pressure on the timely delivery of procured capacity.
2. **Did the TSOs accurately forecast future capacity requirements?**
   The decrease in the total capacity requirement in Ireland since 2019 has caused the TSOs to downward revise its forecasts of future capacity requirements. This is questionable given an estimated capacity deficit in 2026.
3. **Did the RAs make appropriate adjustments to TSOs recommendations?**
   RAs adjustments to the TSOs recommendations are not always clear to auction participants. Latest adjustments involved the RAs downward-revising the TSOs forecasts.

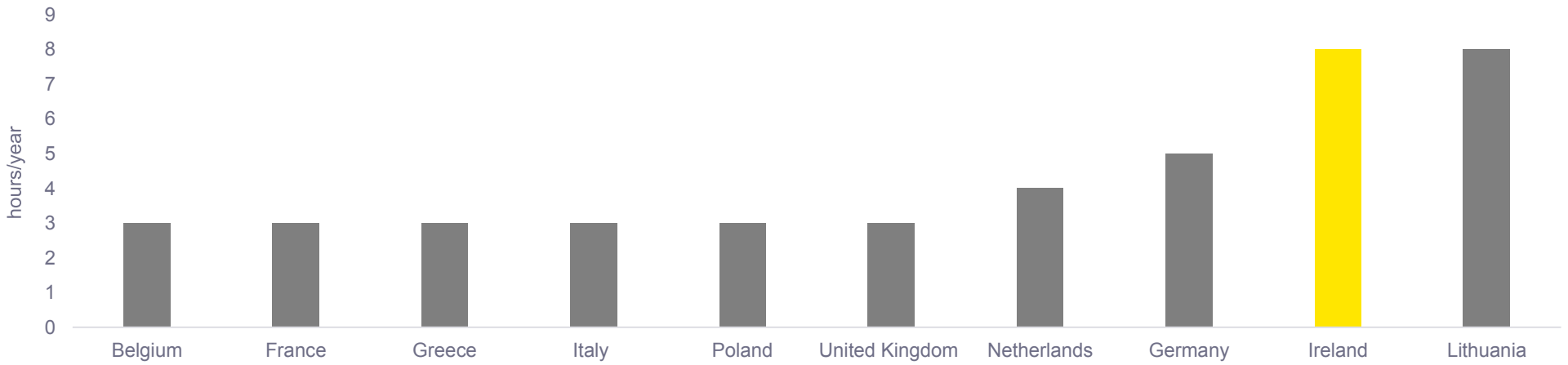
1.1 Is the SEM reliability standard adequate?

Reliability Standards are determined to establish the accepted trade off between the cost of increasing resource adequacy and risk of load shedding on an electricity system. Loss of Load Expectation (LoLE) is the probability that a systems available generation will not be able to meet expected load. This is calculated using a probability based method to compare supply and demand across each hour of a year. Regulatory bodies set this reliability standard as a maximum number of hours per year where expected load can exceed capacity. For example, a standard of 8 hours LoLE for a system means 8 hours total across the year could have demand exceeding supply.

Decisions around the volume of capacity to procure are to be informed by the market reliability standard, i.e. the target number of hours LoLE, noting that some degree of risk around security of supply is inevitable and should reflect the value to consumers of avoiding lost load (known as the value of lost load – VoLL) as well as the cost of procuring of additional capacity to further reduce the LoLE. The SEM market has a reliability standard of 8 hours LoLE per year. Among EU states with a reliability standard, SEM has the highest LoLE.

The practical effect of SEM having a relatively low reliability standard is arguable as decision makers may adopt a conservative approach in setting the target volume to procure regardless of the reliability standard – and that SEM has not experienced any hours of lost load since the introduction of the CRM. However it is noted that there is risk in targeting a relatively low reliability standard as the consequences of under-procuring capacity can rapidly outweigh the costs of under-procuring capacity if it leads to a high level of load shedding or tight market conditions.

EU Reliability Standards - 2019



Source: 2019 ACER Market Monitoring Report

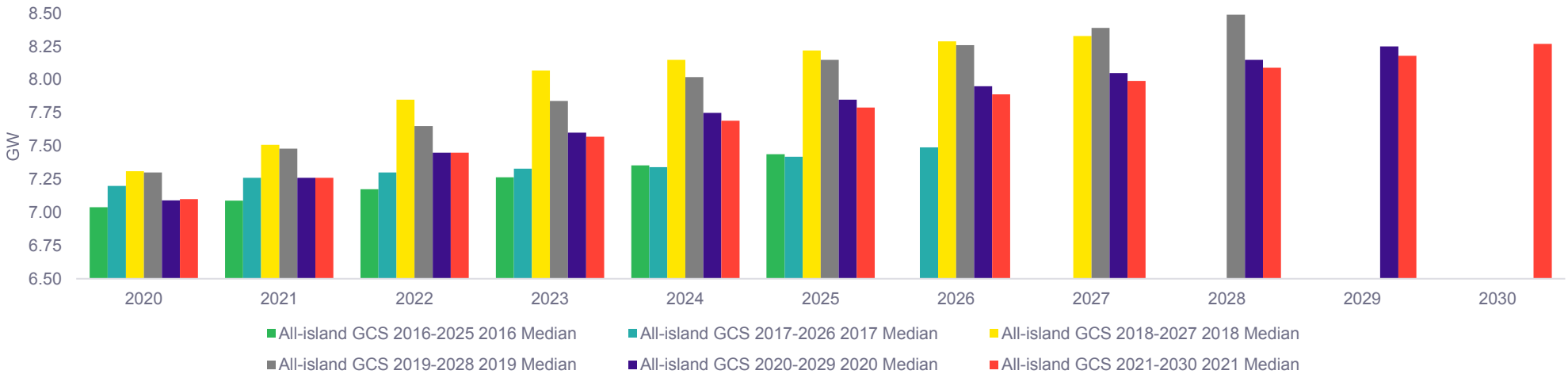
Ireland has one of the highest loss of load expectation (LoLE) of 8 hours per year. While this standard has been met to date, it leaves little room for error around the volume to procure - as the implications of errors are asymmetric.

1.2 Did TSO forecasts identify the growing capacity shortfall?

The All-Island Generation Capacity Statement (GCS) outlines the expected electricity demand and level of generation capacity that will be required on the island of Ireland over the next ten years. The annual GCS is published jointly by EirGrid and SONI, the TSOs for Ireland and Northern Ireland respectively. In each GCS, EirGrid and SONI carry out generation adequacy assessments analysing the balance between supply and demand for different scenarios. This is an important input into decisions around capacity auction procurement volumes, although the purpose of the GCS is to test the demand/generation against the adequacy standards. It differs from TSO capacity requirement recommendations as it does not account for elements such as operational requirements or transmission outage planning.

The below graph demonstrates the median electricity demand forecasts provided in the 2016, 2017, 2018, 2019, 2020, and 2021 GCS for the years 2020 to 2030. There was a notable *decrease* in forecasted peak demand in the 2020 and 2021 GCS. It is understood that some of this decrease is due to a methodological change in the calculation of the data centre ramp-rate. In GCS 2017 and 2018, a flat level of probability to a data centre was applied, resulting in an overstatement of demand in earlier years. The 2019 and 2020 GCS documents confirm that forecasted peak demand levels have been reduced "due to the different ramp out rate of demand of data centres and large energy users across Ireland." In the 2019 GCS, TSOs explains that as "they have received more details on the build out estimates from data centres, resulting in a reduction of the overall level of peak demand to be reduced by 200MW 2022-2024." Similarly, in the 2020 GCS, TSOs received further information and reduced overall level of peak demand by 150MW 2022-2024.

GCS All-Island Capacity median requirement



The GCS forecast total peak requirement for Ireland decreased significantly from 2019, due to a methodological change in forecasting of data centre demand as well as reduced generation assumed. Given the projected capacity deficit of 2GW in 2030, the GCS has not given a clear signal to the market of the scale of new capacity required.

1.3 Did the RAs make appropriate adjustments to TSOs recommendations for volumes to procure in auction?

The below table shows the recommendations of the LCCA capacity requirement at each stage of the recommendation process – the below figures are sums of the L1-1 (NI) and L1-2 (IE) LCCA requirements. The GCS forecasts peak demand. This peak demand forecast is then taken into account by the TSOs who then give their recommendation to the RAs who set the final de-rated capacity requirement for the relevant auction. The TSOs recommendation as well as the RAs' final de-rated capacity recommendation is provided to the SEM Committee. As seen below, the RAs diverged from TSO recommendations in the following ways:

- An average decrease of 127 MW in the first three auctions held from the level recommended by TSOs
- An average increase of 152 MW in the latter three auctions held from the level recommended by TSOs

There are varying reasons as to why the RAs revised down the derated net capacity requirement from the TSOs recommendation in early auctions. For example, for both the T-1 2020/21 and T-2 2021/22 auctions, TSOs recommended an increase to the capacity requirement to reflect the worsening outage statistics being seen. However, the RAs recommended to accept only 50% of the TSOs recommended increase as the amount the TSOs recommended was too large to be based on only one year of data.

Change in capacity requirement*

Auction**	Relevant GCS	GCS Median Total (GW)	TSO Net Required Quantity (GW)***	Net Required Quantity (GW)	Difference: TSO to RAs (GW)
20/21 T-1	2019	7.43	7.57	7.45	-0.13
21/22 T-2	2019	7.6	7.54	7.45	-0.09
22/23 T-4	2018	7.92	7.45	7.29	-0.16
23/24 T-4	2019	7.97	6.66	6.70	0.04
24/25 T-4	2020	7.82	5.76	6.06	0.30
22/23 T-1	2021	7.52	1.17	1.28	0.11

**Quantities in this table are sums of L1-1 (NI) and L1-2 (IE) requirements. For a full breakdown of LCCA requirements, please see table in appendices.*
***TSOs recommendation not provided for T-1 2018/19 and T-1 2019/2020 and therefore these auctions are not included in this analysis. T-3 24/25 and T-4 25/26 auctions not in scope.*
****TSOs recommendation adjusts GCS for capacity already contracted, non-market participation and any other relevant market changes.*

RAs adjustments to the TSOs recommendations are not always clear to auction participants. In the first three auctions held the regulator revised auction demand down by an average of 125MW, whereas in the three subsequent auctions the regulator revised demand upwards by an average of 152MW.

Conclusions on capacity volume to procure

Overview of findings from Question 1

Sub-question	Conclusions	Assessment
1.1: Is the SEM reliability standard adequate?	Ireland has one of the highest loss of load expectation (LOLE) of 8 hours per year, and consequently has a relatively low reliability standard when compared with other markets. While this standard has been met to date, it leaves little room for error around the volume to procure - as the implications of errors are asymmetric.	Some scope for improvement
1.2: Did TSO forecasts identify the growing capacity shortfall?	TSOs forecasts, which influence the final auction capacity requirement, are one of several factors that investors consider when building an investment case for new generation. The GCS forecast total peak requirement for Ireland has decreased significantly from levels published in 2019, however given a capacity deficit of 2GW in 2030 has been projected, it is unclear if the downward revision was appropriate.	Substantial scope for improvement
1.3: Did the RAs make appropriate adjustments to TSOs recommendations?	RAs adjustments to the TSOs recommendations are not always clear to auction participants. Insufficient contingency around new build delivery appears to have been incorporated.	Substantial scope for improvement

Remedies to improve volume setting for capacity procurement in auctions

Question 1 potential remedies

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
1.1	Move to tighter reliability standard in line with other European markets.	▪ Increased contingency factored in by TSOs in setting required capacity level	▪ Increased costs to consumers	Medium	V High*
1.2	Greater transparency of target setting through a panel of technical experts (PTE) assessment of EirGrid recommendations, with findings published, and explanation of process by which GCS forecasts are translated to Target Volume to procure in capacity auctions.	▪ Increased transparency of target setting ▪ Increase investor confidence in process ▪ Increase robustness in accountability of EirGrid forecasting	▪ Additional time required to finalise target capacity ▪ Additional TSO costs and workload ▪ Additional costs of PTE ▪ Identifying independent experts	High	Medium
1.3	More explicit accounting of non-delivery in setting target, with two options for implementation: a) Introduce process to monitor progress reports for early indication of non delivery; **OR** b) Apply a standardised adjustment to capacity requirement to account for likelihood of non-delivery, review inputs to adjustment % on a periodic basis.	▪ Increase likelihood of delivering required capacity through risk adjusted target capacity requirement	▪ Additional step in process/increased regulatory burden ▪ Risk that higher levels of capacity is procured in some periods	High	V High

**ACER Decision No. 23/2020 sets out the methodology of the calculation of loss load, cost of new entry, and the reliability standard. Moving to a tighter reliability standard may have some constraints as VOLL is still being calculated using this methodology. This gives the RAs' limited influence to set the reliability standard within the ACER framework.*

4 Did sufficient capacity participate in auctions?

We identified a number of hypotheses to test relating to auction participation

This section assesses whether sufficient participation was attracted to the capacity auctions and identifies what the key influencers of participation are.

Overview of auction participation

- The Capacity Market arrangements are governed by a set of rules described in the Capacity Market Code (CMC)
- **Step 1: Registration** Interested participants complete an application form from the TSOs' website, confirm their compliance with eligibility requirements, pay the accession fee and execute an accession deed to adhere to the capacity market framework and the code
- **Step 2: Qualification**
  - Once the candidate unit satisfies any of the criteria set out in E.2 of the CMC, a Participant can submit an application for qualification to the TSOs before the qualification application date specified in the applicable Capacity Auction Timetable.
  - The TSOs assess the Applications for qualification based on information provided in the Application for Qualification except to the extent that the CMC allows them to use other information. The TSOs may reject an application for qualification based on criteria listed in chapter E.7 of the CMC.
  - The TSOs prepares a set of Final Qualification Decisions that are submitted to the RAs for approval. The RAs may approve or reject one or more Final Qualification Decisions. The TSOs then publishes the qualification results on/before the Qualification Results Publication Date.
- **Step 3: Capacity auction** Qualified capacity market units can offer or bid for capacity. Capacity market unit receives awarded capacity for capacity year. New generation units can bid up to 1.5 times of net CONE. For existing plants, restrictions apply such that participation is mandatory, and bidding is subject to the Existing Capacity Price Cap (ECPC), which is a uniform cap which caps the price that existing generators and interconnectors can offer volume at. Note that an application can be made to the RAs for a higher Unit Specific Price Cap (USPC) through an exception application. (CMC E.5)

Hypotheses to test

The CRM process for determining sufficiency of participation has been evaluated according to the following criteria:

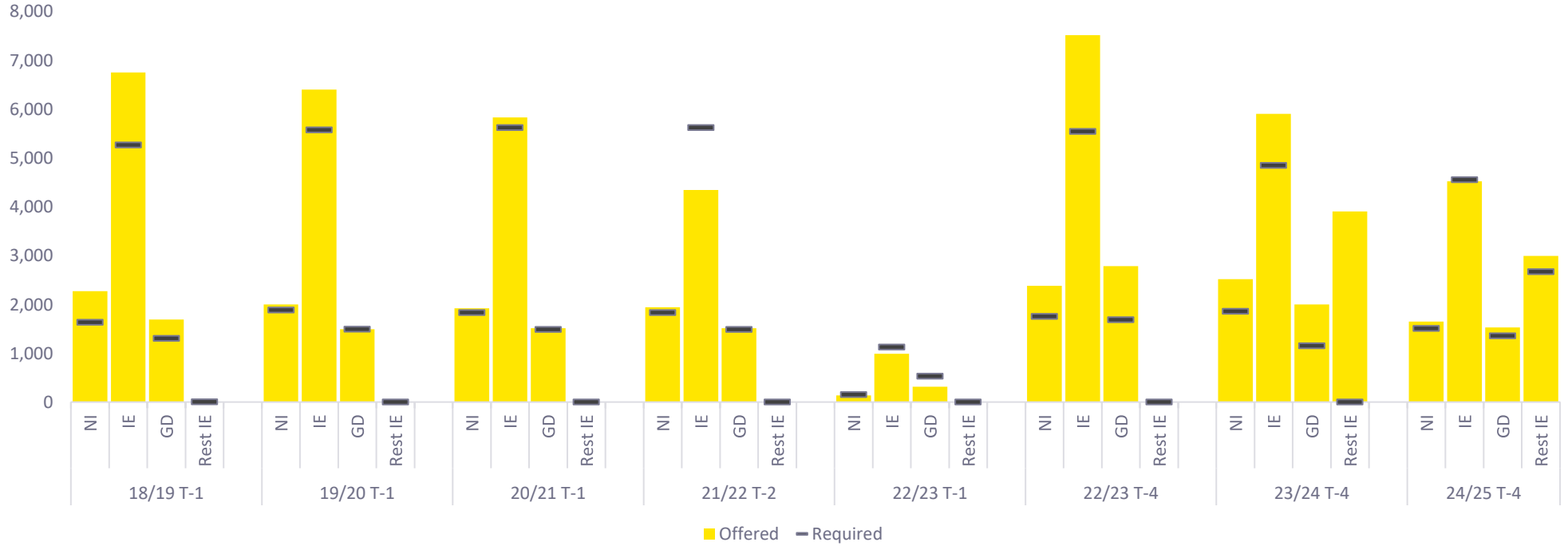
1. **Did the auctions attract sufficient participation?** Insufficient auction participation is one potential issue. Evidence across auctions suggests inadequate participation, with de-rated capacity requirements failing to be met in a number of auctions.
2. **Are bidding restrictions on existing plants prompting plants to close sooner?** The strictness of bidding rules will impact the capacity maintained by existing plants. Data highlights a certain extent to which pricing restrictions discourage existing and ageing plants from investing in capacity maintenance.
3. **Have new build projects been appropriately pre-qualified for auctions?** Numerous factors could be responsible for causing insufficient auction participation or less optimal auction outcomes such as project non-delivery. Research suggests that risks around capability to meet timelines and emissions requirements are the main barriers to pre-qualification – grid connection and capacity constraints do not have as much impact.

2.1 Did the auctions attract sufficient participation?

Quantity offered (net of awarded capacity) has not met the LCCA requirements on 5 occasions in previous auctions. Ireland is the most commonly insufficient, with offered capacity less than required in 3 of the auctions, while Northern Ireland has been mostly sufficient. Greater Dublin also had insufficient participation in the T-1 22/23 Auction, with offered capacity 41% lower than the required.

The most recent two auctions (T-3 24/25 and T-4 25/26) saw offered capacity in Ireland and Greater Dublin LCCAs significantly less than required. The significant deficit trend for Greater Dublin has continued in these auctions, with offered capacity falling short by 458MW across the two auctions.

In the T-4 24/25 auction, offered capacity was only c.10% higher than required in NI, Greater Dublin and Rest of Ireland and all offered capacity was procured, raising questions on competitiveness.



*Source: *Final Capacity Auction Results TSOs publication*

37.5% of auctions were undersubscribed in at least one constraint area whereby the de-rated capacity requirement was not achieved. In 16 of the 25 capacity constraint requirements above, the offered capacity was less than 15% above the requirement.

2.2 Are bidding restrictions on existing plants prompting plants to close sooner?

Given the small size of SEM, and the further limitations in auction liquidity caused by the presence of constraints (i.e. needing to contract capacity in specific regions within the island of Ireland), the regulatory authorities have been concerned about the potential for abuse of market power in the CRM auctions. The principal competition risk noted is that existing generation will have the capability to necessitate the contracting of new build if existing plant is withheld from the auction. The design of the CRM is intended to mitigate this risk by requiring existing plants to bid below the existing plant price cap (set at 50% of Net CONE), or else to seek approval from the relevant regulatory authority to set a higher price in the auction. The process adopted is a more interventionist one than that adopted in GB (where there is less concern over limited competition), as the existing plant needs ex ante approval for a price in SEM, rather than risking ex post investigation for abuse of market power in GB.

While these measures are important mitigants against market power, an adverse effect of these rules has to been to limit the potential for price discovery and to increase the risk that existing plants are unable to recover their ongoing fixed costs through the auction. This could ultimately lead to plant seeking to shut sooner than they would otherwise do even where they require less remuneration than alternative new build.

A more proportionate approach to mitigating market power – i.e. that does not foreclose potential for price discovery among existing plants – would seek to focus bidding restrictions on exceptional cases. This could be achieved through either raising the ECPC or through making USPC applications approved by default except where there is material evidence to support intervention.

It is also noted that addressing the regional constraints in the SEM market, for instance through greater interconnection between regions via the North South interconnector, could help to make capacity auctions more liquid by reducing the need to specify where capacity is required.

While CRM bidding rules on existing plant may inhibit price discovery, no evidence was found that pricing restrictions prompted existing plant to shut prematurely or contributed to the capacity deficit.

2.3 Have new build projects been appropriately pre-qualified for auctions?

When applying for participation in an auction, the participant must submit an application for qualification for each generation unit to the TSO. The TSOs assess the application and can accept and determine that the relevant candidate unit is qualified to be a capacity market unit. The TSOs also have the power to reject an application, with reasons for rejections outlined in section E.7 of the Capacity Market Code.

As seen in the below table, many units have been rejected because their qualification application does not provide sufficient evidence that assures the TSOs the capacity unit will be delivered in time. Another reasons units have been rejected is that qualification application does not contain evidence of securing a connection agreement or offer.

The proportion of applications rejected, as well the noted challenges successful new projects have faced in getting built, may reflect the significant challenges in attempting to build new generating stations within the T-4 delivery timescale, particularly where projects do not have required consents ahead of the auction.

Reasons for rejection of plant pre-qualification applications (T-4 Auction for 2024/25)

Reason	Total MW	Total Existing Capacity (MW)	Total New Capacity (MW)	# units
Substantial completion of the unit will not be achieved due to info in application	1,032	0	1,032	18
Unit does not meet emissions requirement i.e., has a carbon intensity of under than 550g of CO2 / kWh	975	973	2	5
Substantial completion will not be achieved due to amount new capacity in early negotiations	613	223	389	19
Information in application deficient/incorrect	380	0	380	4
Application does not contain evidence of securing a connection offer/agreement	309	0	309	6
Plant closure	228	228	0	2
Unit type does not meet criteria of Trading and Settlement Code (TSC)	100	0	100	2
Substantial completion of the unit not be achieved due to amount of new capacity associated with other existing unit	60	0	60	3
Unit registered under TSC to participant other than participant submitting the application	13	13	0	1
Grand Total	**3,709**	**1,437**	**2,272**	**60**

Source: SEMO

The most common reason for auction disqualification has been a project's inability to meet timelines and emissions requirements, which is consistent with the delivery challenges observed for successful new projects to commission in time.

Conclusions on auction participation

Overview of findings from Question 2

Sub-question	Conclusions	Assessment
2.1: Did the auctions attract sufficient participation?	Several auctions held to date were not sufficiently subscribed, with some auctions not achieving the de-rated capacity requirement in the Local Capacity Constraint Areas.	Major scope for improvement
2.2: Are bidding restrictions on existing plants prompting plants to close sooner?	No evidence was found that pricing restrictions prompted existing plant from shutting prematurely.	Limited scope for improvement
2.3: Have new build projects been appropriately pre-qualified for auctions?	No evidence of viable projects being disqualified from auction has been found. However the experience of new build projects awarded capacity suggests that the prequalification process did not sufficiently screen projects that could not realistically be built within the delivery timescale. This is primarily a reflection of the tight timescales allowed to new projects to gain required consents and get built.	Some scope for improvement

Remedies to improve CRM auction participation

Question 2 potential remedies

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
2.1	Greater investment in infrastructure to enable more competitive all-island market and reducing pressure for new build to be situated in particular locations.	▪ Greater competition in CRM auction and lower capacity prices ▪ Ability to allow greater price discovery in CRM auctions without risking abuse of market ▪ Reduced balancing costs and increased competition	▪ Increase in TUOS charges to recover infrastructure investment upfront cost	High	Medium
2.3	Requirement of new build to have all necessary consents to pre-qualify for auction	▪ Increases confidence that new build projects can be built ahead of start of delivery year	▪ Puts increased cost on developers ahead of knowing if their project is successful – potentially discouraging participation ▪ Strong likelihood that there is a limited pipeline of projects with planning or that could achieve planning in the short term	Medium	High

5 Did new capacity procured in auctions get built?

We identified 4 test hypotheses to assess the construction of new capacity

This section assesses the success of the mechanism in ensuring new capacity procured is delivered and what factors have prevented full delivery to date.

Overview of process for new build delivery

New build generation looking to participate in a capacity auction has to pre-qualify, including satisfying the TSOs that the project is deliverable by the start of the capacity delivery year.

Following the auction, successful new build projects must submit a performance security that is forfeited in the event that the agreement is terminated, with the size of the security required increasing over time.

New build projects must report on progress to demonstrate that they are achieving milestones i.e.:

- Substantial financial completion (SFC) within 18 months of the auction
- Minimum completion (MC) by the Long Stop Date, set at 6 month from the start of the delivery year for new build.

Prospective capacity providers may apply for an extension of the date of a milestone other than SFC to the TSO, and may apply for extension of the date for SFC to the RA. Applications must outline the reasons for the request, evidence, and details of any impact on other implementation dates.

Projects that complete later than the start of the relevant delivery year but ahead of the Long Stop Date achieve a shorter term for their capacity agreement (i.e. paid capacity payments for a shorter duration).

Outcomes for delivery of new build in CRM

Since the introduction of the CRM, 2,568MW of new capacity has won agreements in auctions, and 643MW of this capacity has subsequently been terminated*. Most of the capacity terminated (i.e. 476MW) has been new gas generation.

Just over half of capacity terminated to date (330MW) has been due to projects not achieving SFC, with the remainder of terminations being due to capacity not achieving or not being expected to achieve MC ahead of the Long Stop Date.

Hypotheses to test

The CRM process for determining the delivery of new build procured has been evaluated according to the following criteria:

1. **Are T-4 timelines long enough to enable new build to deliver?** New build projects have typically had under 3.5 years to get consents and to build following auction results.
2. **Are the incentives for delivery too low to ensure new capacity procured is actually built?** Would a higher termination charge have ensured realistic auction bids and timely deliver of new build?
3. **Is there sufficient monitoring of new build projects' progress against milestones?** Regular and thorough monitoring of project milestones would help identify and incorporate risks into future auctions.
4. **Have the RAs made appropriate decisions on requests for extensions by new build projects?** The denial of RAs of some extension requests may have led to new build terminations commissioning with likely adverse outcomes for consumers.

Amount does not include results from T-1 22/23, T-3 24/25 and T-4 25/26 as this data was not provided to us by the TSO

3.1 Are T-4 timelines long enough to enable new builds to deliver?

Most capacity within SEM is intended to be procured at the T-4 auction, i.e. to be held four years ahead of delivery. The intention is to ensure new build has sufficient time to get build ahead of the start of the delivery year, enabling new build to compete alongside existing plant in the auction.

It is noted however that the T-4 auctions held to date have provided less than a full four years to build, and has been identified by stakeholders as a barrier to new entry. For instance, ESB has noted that from submitting planning requests for its new build projects in Dublin, it had to wait a year to receive confirmation of approval (see case study on page 37 for further detail).

New build looking to participate must reflect on the level of delivery risk when choosing to bid – for instance noting the increased likelihood of either failing to achieve FID and forfeiting the collateral lodged, or commissioning late and seeing their the duration of their capacity agreement eroded (or terminated altogether if the project fails to achieve its longstop date for project completion).

The lead time for new build projects may be appropriate where a project has the required planning and environmental consents so as to be shovel ready. However this is not a requirement of the prequalification process and so may promote a "winner's curse" outcome to the auction – i.e. where winning projects are those that are most unrealistically optimistic about their project's ability to deliver on time.

Time between auction results and start of delivery year

Auction	FCAR Publish Date	Start of delivery year	Time between FCAR publish date and start of delivery year
T-4 22/23	07/05/2019	01/10/2022	3 years, 3 months
T-4 23/24	05/06/2020	01/10/2023	3 years, 2 months
T-4 24/25	12/03/2021	01/10/2024	3 years, 6 months

There was a maximum of 3.5 years between the FCAR publication date and the start of the auction capacity delivery year. Given the most common reason for disqualification is an unrealistic likelihood of meeting substantial completion, this timeline is likely to be too short for many new build plants to become operational, particularly if lacking planning or environmental consents at prequalification stage.

3.2 Are the incentives for delivery too low to ensure new capacity procured is actually built?

New capacity providers in SEM that have been successful in the auction need to lodge performance securities which increase as the plant progresses towards commissioning, with the securities serving as the termination charge if the capacity agreement is terminated for failure to meet relevant milestones.

The most significant failure to deliver new build capacity since the introduction of the CRM has been the failure of the ESB new build projects contracted in the T-4 auction for delivery in 2022/23. These projects faced delays in commencing construction owing to long lead times for getting required consents, and hence faced a €10,000/MW termination charge. However this charge was considerably outweighed by the gain in capacity value from re-contracting the failed projects into the subsequent auction at a capacity price of €100,000/MW. This could be seen as evidence that the performance security is too small to be adequately incentivise developers to bring projects to market. However there are a number of reasons why the failure to deliver these new projects may not be attributable to the size of the performance securities:

- Projects without planning consents are allowed to qualify for auctions despite the lead time of under 3.5 years being extremely challenging to build a new project within (including for reasons outside the developers' control, such as the processing time for planning applications).
- Developers face significant commercial incentives to deliver projects on time – i.e. they face erosion of the term of their 10-year capacity agreement if they are late.

Benchmarking this against comparable capacity mechanisms in Europe (GB, Italy and Poland) suggests that the level of credit cover is equivalent to other markets. Even applying the highest observed rate of €14,000/MW would not have ensured ESB made a loss in terminating capacity agreements on its T-4 2022/23 new build projects.

One notable difference is that credit cover in GB and Poland is required from all auction participants and must be lodged prior to the auction, to deter non-serious bids from disrupting the auction process (as had previously happened in GB with the failure of the Trafford CCGT project to be delivered, prompting an increase in performance securities in that market). However while SEM has seen significant failure of new build projects to deliver, this has principally been *after* the initial level of collateral has been lodged and would not have been prevented by requiring collateral to be lodged prior to the auction.

SEM performance security levels*

Date / Event	Performance Security / Termination Charge Rate
Auction completion to 24 months prior to the beginning of the capacity year	€10,000/MW per year
24-13 months prior to the beginning of the capacity year	€20,000/MW per year
From 13 months to the beginning of the capacity year	€30,000/MW per year
From beginning of capacity year	€40,000/MW per year

Source: SEM-21-079 Decision Paper

Benchmarks to European capacity auctions*

Country	Performance Security for New Build
GB	£10,000/MW for new build (~€12,000/MW) and £5,000/MW (~€6,000/MW) for unproven DSR, submitted at prequalification
Italy	€14,000/MW for new build and €7,000/MW for existing plant at T-4, submitted following auction
Poland	PLN 43,000/MW (~€9,000/MW) submitted at prequalification

SEM penalty levels for capacity termination are broadly in line with other European capacity auctions. They have not been high enough to prevent plants from profiting from terminating a contract but are not the principal reason projects have not delivered.

3.3 Is there sufficient monitoring of new build projects' progress against milestones?

The capacity market code (CMC) establishes monitoring of new capacity through the use of implementation progress reports and verification. However, the CMC also allows for extensions of the dates of all milestones including SFC, as well as changes in participant and technology class, which leaves room for awarded new capacity to retain its capacity agreement while being delayed in meeting milestones. Proactive and close monitoring of project progression is critical so that:

1. Barriers to project progress can be identified soon and, where possible, appropriate stakeholders (for instance involved in ensuring the project can receive grid connection, planning or environmental consents) involved in attempting to address the barriers and facilitate delivery.
2. Enabling a more robust assessment of the potential delivery risk associated with capacity that has been contracted to inform the decision on how much capacity to procure in subsequent auctions. Closer project monitoring would enable an adjustment to the volume to procure at each auction to be made to reflect the potential non-delivery of contracted new build based on up to date commercial intelligence on the project.

Capacity market code monitoring process

Capacity Market Code	Components	Description
J.4: Implementation Plan and Progress Reporting	Implementation Progress Reports	Submitted to TSOs at times specified in applicable reporting schedule. Reports must include: details of milestones achieved, details of progress against outstanding milestones, potential delays in achieving milestones, actions being taken to mitigate delays.
	Verification	Certificate addressed to the TSOs must be submitted verifying that SFC milestone, commencement of construction works milestone, and all other milestones or MC completed. The certificate for all other milestones must be from an independent certified engineer.
J.5: Remedial Actions	Extensions	Participant/enforcing party may apply for an extension of the date of a milestone outlined in the relevent implementation plan. Application must include reasons for the request, supporting evidence, and details of any impact on other implementation plan dates. TSOs approve.
	Extension of date for SFC	Participant/enforcing party may apply for an extension of the date for SFC. Application must include reasons for the request with supporting evidence, details of actions being taken to rectify issues causing delay, plan to rectify issues, and details of any impact on other implementation plan dates. TSOs and RAs approve.
	Change in participant	Where required to avoid/minimise delays in completion of new capacity, an enforcing party may seek a transfer of the participant's interest to either the TSOs or the RAs. The TSOs and RAs must notify each other if they receive a request and consult each other on the request.
	Change in tech class	In cases where it is needed to avoid delays, an insolvency event, or a material breach by EPC contractor, a participant may apply for change to the tech class of the new capacity. Application must include reasons for request, supporting evidence, and details of impact on other dates. TSOs approves.

Improved prequalification requirements, more timely monitoring of project milestones and appropriate adjustment to the de-rated capacity target volume could ensure that any risk to delivery is incorporated into demand-setting for future auctions. This is principally important as long as auction lead times are insufficient for new build projects to get consented and built in.

3.4 Have the RAs made appropriate decisions on requests for extensions by new build projects?

Prospective capacity providers may apply for an extension of the date of the SFC to the RA. Applications must outline the reasons for the request, evidence, and details of any impact on other implementation dates.

In doing so the RAs will look to balance the importance of helping new build projects to remain viable, particularly where they have encountered delays outside their control, with the risk of weakening incentives for projects to progress against their milestones (particularly where they are unlikely to be deliverable against the long stop date). RAs will also be conscious of the need for clarity as to whether and when a project will commission in order to determine future capacity auction volume requirements.

Page 39 sets out a case study of new build capacity being developed by ESB that sought repeated delays to milestones, and where some of the capacity agreements were terminated after the RAs granted a shorter extension than requested and required an increased level of performance security. This termination decision was made out of concern that there was a particular capacity shortage emerging in the Dublin area, that the projects were progressing slowly and the developers' commitment to bringing the projects to market was in doubt, and that letting the projects continue to get extensions would preclude buying replacement capacity in upcoming auctions.

However this case study also illustrates how a decision to not allow a full extension requested may in hindsight have led to adverse impacts for consumers – in this case by further delaying the construction of new capacity and by prompting the project to re-contract in a subsequent auction at a significantly higher price.

The case study underlines the importance of setting the volume to procure include a contingency for failed delivery of pipeline new build projects. A decision to terminate the capacity agreements in this case allowed the RAs to set an auction target capacity volume with greater clarity (i.e. knowing that replacement capacity was definitely needed), but this did not necessarily make it easier to ensure capacity requirements were met as auctions for the regions were undersubscribed.

The case study also demonstrates the challenges for an unconsented project to achieve consents and construction within the delivery timescale of under 3.5 years. The RAs can afford to take a stricter approach to insisting progress is made against milestones if projects have a delivery timescale that is more achievable. While some parties have noted a greater performance bond would have been beneficial in preventing unviable projects from taking contracts, it would likely have further limited developer interest in bringing projects to auction, and would not have addressed the principal delivery challenges – which were the unrealistically tight timescales allocated for developers to both gain consents and complete construction of new generation projects.

Restrictions on extension requests could have contributed towards new build contracts getting terminated with adverse impacts for consumers.

3.4 Have the RAs made appropriate decisions on requests for extensions by new build projects?

Case Study: ESB new build in the 2022/23 T-4 Capacity Auction

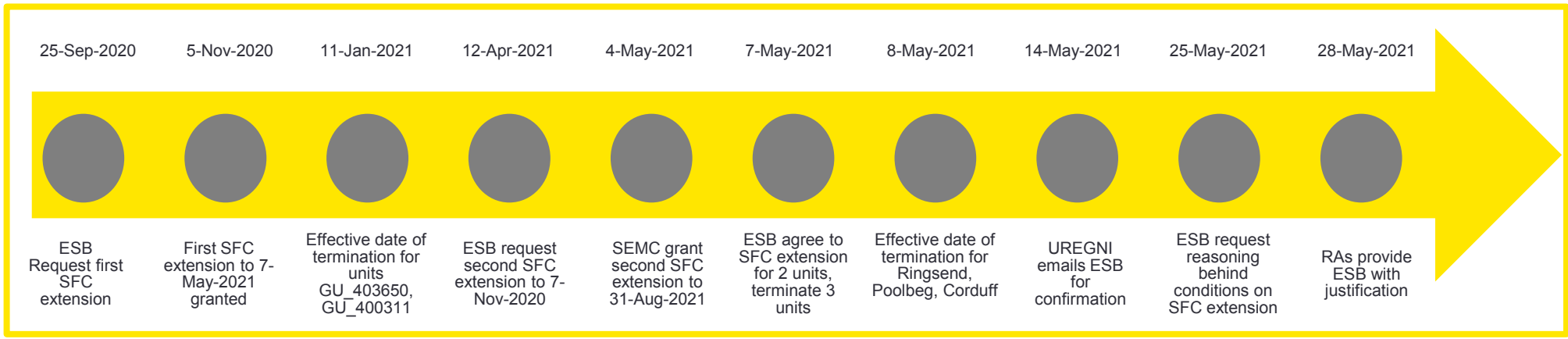
ESB had 9 new build offers accepted in the T-4 auction for delivery in 2022/23 with an aggregate derated capacity of 490MW and at a clearing price of €46,000/MW per year.

- Four Battery Energy Storage Systems (BESS) at Aghada (7 MW), Poolbeg (64 MW), Ringsend (17 MW) and Inchicore (17 MW).
- Two open cycle gas turbines in North Wall Station to replace plant being decommissioned – total 215 MW.
- Three 64 MW aero derivative gas turbines located at three Dublin locations (Corduff, Ringsend & Poolbeg), totalling 192 MW.

- The OCGT projects at North Wall were terminated after the equipment manufacturer selected through public tender advised that the plants could not be guaranteed to comply with new regulations in the IED and CEP.
- The projects in Dublin faced lengthy delays associated with getting planning consents and environmental licenses – including waits of over a year following submission of applications. ESB requested two extensions for these plants. The RAs granted the first extension as requested, and offered a shorter second extension subject to ESB accepting increased termination charges to €30,000/MW per year. ESB chose to terminate their capacity contracts and to rebid projects on those sites (though with a different technology) into the T-3 2024/25 auction and re-contracted at prices that were over €100,000/MW per year greater than the original price.

Potential conclusions from Case Study

- €10,000/MW per year bid bond was insufficient to deter "Winner's Curse" in auction.
- Planning processes in Ireland can be lengthy and can make it difficult to build new projects at speed.
- Achieving consents and building project in the 3.5 year lead time from auction results to start of capacity delivery year is unrealistic.
- A more permissive approach to extension applications could have secured capacity sooner and at lower cost to consumers than allowing the plant to participate in a fresh auction.



Conclusions on delivery failures

Overview of findings from Question 3

Sub-question	Conclusions	Assessment
3.1: Are T-4 timelines long enough to enable new build to deliver?	There was a maximum of 3.5 years between FCAR publication date and the start of the auction capacity delivery year. Given the most common reason for disqualification is an unrealistic likelihood of meeting substantial completion, this timeline is too short.	Major scope for improvement
3.2: Are the incentives for delivery too low to ensure new capacity procured is actually built?	Performance securities were not high enough to prevent ESB from making a financial gain from terminating their new-build capacity agreements and then re-contracting at a higher price for a subsequent delivery year. Securities are also not required prior to the capacity auction, increasing the risk of winner's curse. However incentives are in line with other European capacity markets reviewed, and developers face other commercial incentives alongside the termination charge to bring projects to market on a timely basis. The principal cause of delivery failures to date has been the required time for new unconsented projects to get built exceeding the delivery lead time, and increased delivery incentives would not have addressed this barrier.	Some scope for improvement
3.3: Is there sufficient monitoring of new build projects' progress against milestones?	More timely monitoring of project milestones and appropriate adjustment to the de-rated capacity target volume could ensure that any risk to delivery is incorporated into demand-setting for future auctions. This is principally important as long as auction lead times are insufficient for new build projects to get consented and built in.	Some scope for improvement
3.4: Have the RAs made appropriate decisions on requests for extensions by new build projects?	Restrictions on extension requests may have contributed towards new build contracts getting terminated, with adverse impacts for consumers.	Some scope for improvement

Remedies to improve incentives for new build projects to be delivered on a timely basis

Question 3 potential remedies

The principal challenge identified for the timely delivery of projects has been that auction lead times are too short to enable unconsented projects to get consented and built ahead of the start of the delivery year. The most direct and important remedy to address this is to either increase the lead time or to require project consents as a prequalification requirement (as addressing the reasons for delays in consenting is outside the scope of this report). However the other remedies noted below provide some ancillary benefits in terms of increasing confidence that new build projects will be delivered in time.

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
3.1	Increase lead time to at least 4 years from announcement of auction results to start of capacity delivery year.	▪ Greater participation in auction ▪ Greater likelihood of delivery of projects that are contracted	▪ Having to set targets further ahead which could increase uncertainty ▪ Implementation challenges – would have to run 2 auctions immediately after each other (one T-4, one T-5)	Very high	Medium*
3.2	Increase performance securities following the auction.	▪ Increased incentive to meet targets ▪ Reducing risk of winners curse ▪ Reducing perverse incentive to terminate contract and rebid in future auction at higher price	▪ Greater collateral costs may increase capacity price bids ▪ Barrier to entry for new entrants who may have less recourse to finance ▪ Projects may be discouraged from qualifying if facing high delivery risk	Medium	Medium
	Require performance security to be lodged prior to auction.	▪ Increased incentive to meet targets ▪ Reducing risk of winners curse	▪ Greater collateral costs may increase capacity price bids ▪ Barrier to entry for new entrants who may have less recourse to finance ▪ Projects may be discouraged from qualifying if facing high delivery risk	Medium	Medium
3.3	Increased monitoring, with a taskforce involving RAs, TSOs and Govt departments to flag issues and take action to address barriers.	▪ Earlier identification of delivery risk ▪ Opportunity for coordinated intervention to address barriers	▪ Admin costs and time requirement by each entity	High	Medium

**This assessment does not consider whether the remedy would require an amendment to the CRM state aid approval or the likelihood of this being approved.*

Remedies to improve incentives for new build projects to get delivered on timely basis

Question 3 potential remedies

3.4	More permissive approach to requests for extensions from new build projects.	▪ Reduces risk that otherwise viable projects do not get built due to tight lead time between auction and start of delivery year.	▪ Prolonged uncertainty around likelihood and timescales of new build projects commissioning ▪ Increased likelihood of auction bidders to bring projects to auction with unrealistic timetables in expectation of extensions being granted.	Medium	Very High

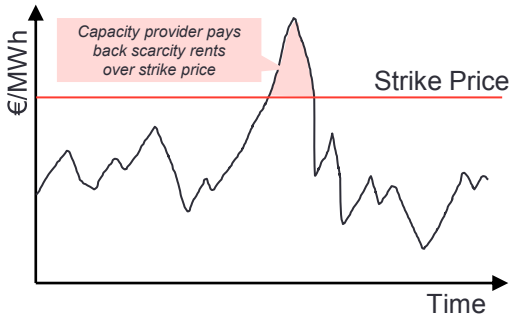
6 Was the capacity procured of sufficient value?

We have assessed the capacity procured against 3 criteria

This section tests the question of whether the CRM incentive regime and wider electricity market framework provided sufficient incentives for capacity providers to be reliable and whether they incentivised an appropriate technology mix of capacity coming through the auction.

Overview of Reliability Option Mechanism

The CRM has a reliability option mechanism, by which capacity providers are required to pay the difference between the market reference price and a strike price (initially set at €500/MWh but indexed to the short run marginal costs of peaking plants) for their contracted volume of derated reliability obligations. This imposes an incentive to be generating and earning the market price at times of high prices.



The CRM adopts a technology-neutral principle, leaving the market to determine the most cost-effective mix of new capacity to meet requirements. The dynamics that are assumed to impact on the outcome include:

- **Derating factors**: Technologies are de-rated according to their expected contribution to security of supply at times, enabling a level playing field in the capacity auction.
- **Capital-cost intensity**: Technologies that have the lowest capital cost per MW have a cost advantage in the auction.
- **Non-CRM revenues**: Providers that may expect to earn greater revenue outside the CRM can afford to lower price in the capacity auction. For instance a CCGT, which has a higher efficiency than an OCGT, can expect to earn greater inframarginal rent when selling their power.
- **Regulatory barriers**: Plants may be subject to regulatory interventions to affect the capacity mix – for instance the EU Industrial Emissions Directives imposes running hour restrictions on the most carbon intensive plants, accelerating retirements.

Hypotheses to test

The CRM incentive mechanism has been evaluated according to the following criteria:

1. **Adequacy of incentives for generation to be reliable**: Stakeholder engagement identified concerns that the RO mechanism was failing to properly test and incentivise some ageing plant with limited reliability and undergoing extensive outages. We have assessed whether the RO incentives are operating as intended in prompting generators to be available and reliable.
2. **Adequacy of incentives for DSUs to be reliable**: There are differences between how demand side units (DSUs) and generators are incentivised in the CRM, as well as how they participate in the wholesale market. We have assessed whether these have further limited incentives for DSUs to provide reliable capacity, as well as whether the playing fields between DSUs and generation is level.
3. **Whether the CRM appropriately values efficient generation technologies**: Stakeholder engagement has identified concerns that the CRM is bringing forward too much relatively inefficient cycle gas generation (OCGT) and no combined cycle gas turbines (CCGTs). We have assessed whether the capacity auction structure and wider market framework distorts the playing field away from relatively capital-intensive and efficient technologies.

4.1 Are there adequate incentives for generation to be reliable?

The Reliability Option feature within the Irish CRM was designed to ensure generators are subject to performance incentives to be available when needed.

Capacity providers face having to pay the difference between the strike price (initially €500/MWh) and the balancing market price in circumstances when there is market scarcity (i.e. prices exceeding the strike price) and where the generator has either not sold energy or has sold energy but not delivered it.

This incentive mechanism relies on the wholesale market to effectively signal scarcity in the market such that generators with poor reliability face significant risk as a result of holding a RO and can expect on average to return a significant proportion of their annual capacity payments.

However analysis of RO difference payments paid suggests that capacity providers have faced low levels of penalties – with RO difference payments paid accounting for less than 3% of annual capacity payments in recent delivery years. (The size of RO difference payments would have been over 7.5% in 2019/20 if not for a number of periods in which high prices occurred being disqualified from triggering the RO – as explored further on page 46).

Auction	Dates covered by auction	Total Capacity Payments (€m)**	Non-performance charges due (€m)*	RO payments due (% of capacity payments)	Non-performance charges paid (€m)	RO payments paid (% of capacity payments
T-1 18/19	01/10/2018 - 30/09/2019	332.5	8.3	2.5%	8.3	2.5%
T-1 19/20	01/10/2019 - 30/09/2020	344.8	0	0%	0	0%
T-1 20/21	01/10/2020 - 30/09/2021	360.3	27.1	7.5%	2.4	0.67%

**Source: Analysis of CRU data*

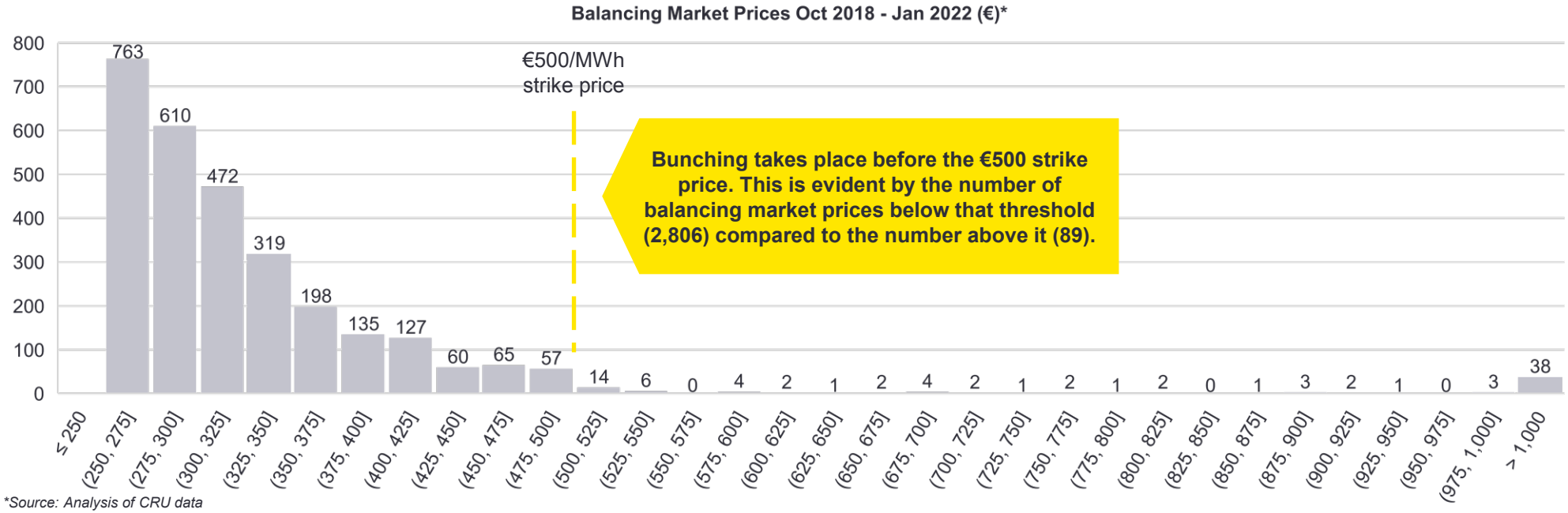
***Source: FCARs by EirGrid & SONI (Total Capacity Payments = Average Price of Awarded Capacity x Total Awarded Capacity)*

Generators currently face very limited incentives for reliability through the RO – standing to lose less than 3% of annual capacity payments if unavailable throughout the delivery year.

4.1 Are there adequate incentives for generation to be reliable?

RO incentives have been limited since the introduction of the CRM in that there have been few periods in which balancing market prices have exceeded the strike price. A major contributing factor is that the presence of an RO has created incentives for capacity providers not to bid above the RO strike price to avoid triggering the issue of RO payments. In a competitive market, the RO should not create an incentive to only bid up to the strike price as generators would still expect to earn scarcity rents on the proportion of their capacity that is not covered by a capacity agreement (noting that de-rating factors for providers is less than 100%). However in a concentrated market, capacity providers may face a perverse incentive to not bid above the strike price if they are part of a portfolio that includes unavailable capacity that would face a significant penalty if the RO were called.

It is also noted that an Administrative Scarcity Pricing mechanism was implemented in SEM to ensure that BM prices would reflect scarcity conditions even where market participants did not bid high into the BM, and that the SEM Committee has noted that this mechanism has been ineffective, with tight system conditions in 2020/21 not being reflecting in high BM prices over this period.



Source: Analysis of CRU data

The RO has incentivised generators to price up to the strike price – potentially reflecting a high degree of market concentration. This reduces the frequency of events in which the RO is called, limiting incentives for generators to be reliable. A higher level of RO payments would create a more robust incentive to be available and give greater confidence in the reliability of capacity that has been contracted.

4.1 Are there adequate incentives for generation to be reliable?

Since the introduction of the CRM there has been a significant number of “amber alerts” – i.e. events in which the TSOs signalled market scarcity – where the degree of scarcity was not reflected in the balancing mechanism price.

As noted on the previous slide, a contributing factor to this may be the incentive capacity providers face to not bid in excess of the RO strike price, as well as the failure of the Administrative Scarcity Pricing mechanism to ensure prices reflect scarcity conditions.

However, a significant further factor (reflected in analysis below of amber alert events in 2020/21) is that amber alerts have tended not to occur on an all-island basis, so have not factored into BM prices (with high-cost BM bids removed from determination of the BM market price where used for resolving localised congestion issues). The lack of correlation between the issue of amber alerts and the level of BM price suggests a missed opportunity to test whether providers in the region under amber alert are available.

Amber alerts in 2020/21*

Date	Time	Location	Max 30 min BM Price (€)
08/01/2021	13:15-18:25	NI	444.36
06/01/2021	16:00-18:05	All Island	520.87
09/12/2020	16:45-18:18	All Island	494.63
26/11/2020	16:00-19:00	NI	691.57
24/11/2020	18:30-22:00	NI	290.71
19/11/2020	16:45-19:00	NI	206.85
06/11/2020	16:30-19:10	NI	491.75
15/09/2020	16:18-19:05	Ireland	359.08
06/08/2020	10:50-15:00	Ireland	101.27
11/03/2020	16:30-20:53	NI	51.54
21/01/2020	10:15-18:00	NI	65.46

**Source: SEM-21-042 Discussion Paper on Scarcity Pricing and Demand Response*

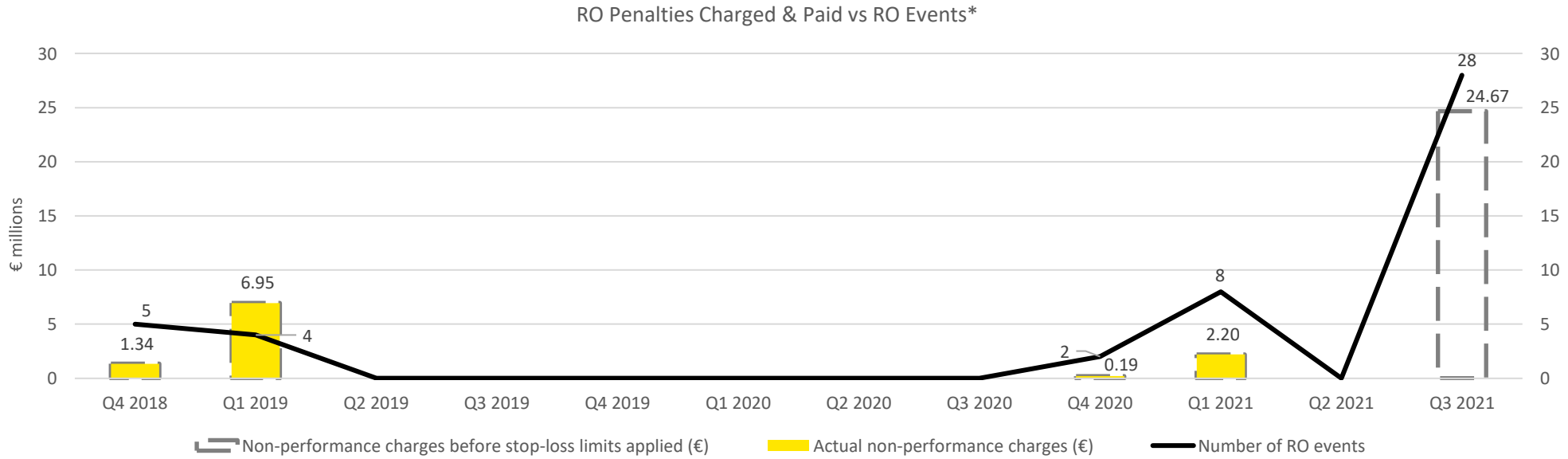
The most effective opportunity to assess providers’ reliability is whether they are generating when the system is under stress. The CRM incentivises providers in periods when BM prices exceed the strike price, but BM prices do not correlate well with issue of amber alerts – with BM prices only reflecting all island energy actions.

4.1 Are there adequate incentives for generation to be reliable?

In Q3 2021, the frequency of periods in which BM prices exceeded the strike price significantly, driven principally by market scarcity in the GB market and the increased level of power exports from SEM to GB. This would have prompted a significant increase in RO difference payments. However a modification proposal was raised to flag SO actions involving interconnector bids to prevent such trades triggering the RO. This was justified on the basis that the SOs' flagging process was not able to adequately distinguish between energy and system actions in real time.

The effect of Mod-02-21 was to further limit the frequency of events in which capacity providers are evaluated on their reliability and may be penalised if they fail to generate or be available. RO difference payments in the 2020/21 delivery year were less than 1% of annual capacity payments, despite increasing concern over system scarcity, whereas difference payments would have been equivalent to 7.5% of annual capacity payments if the decision to flag interconnector actions had not been taken.

However it is noted that the impact of MOD-02-21 on the frequency of RO events is likely to have been less than other factors identified in this section – namely the perverse incentives on generators to bid below the strike price, the failure of the administrative scarcity pricing mechanism to set high prices, and the locational nature of most stress events observed to date. It is also noted that a range of companies had indicated to CRU that they could leave the market if the change had not been made, further exacerbating capacity shortages. Nevertheless, the impact of this change to further reduce RO payments underscores the importance of ensuring the incentive regime provides more robust incentives for availability.



Source: Analysis of CRU data

Recent modification change MOD-02-21 further limited volatility in BM prices and therefore reduced the frequency of events in which capacity providers can be effectively evaluated for their performance.

4.2 Are there adequate incentives for DSUs to be reliable?

Overview of DSU participation in CRM and wholesale market

Ireland is considered to have one of the most open and accessible markets for demand side flexibility in Europe. However there are a number of barriers to the deployment of demand side units (DSUs) as well as to maximising the capacity of existing DSUs.

DSUs in SEM are subject to a different regime for assessing and incentivising performance. To comply with state aid requirements, the SEM CRM sets out a long term intention to implement a baseline methodology, enabling DSUs to offer negative demand to the wholesale and capacity markets equivalent to generation, but also sets out a transitional solution until issues around metering and data systems are resolved. Under this transitional arrangement:

- DSUs self-report their achieved reduction in demand through the SCADA system.
- DSUs are not directly remunerated within the wholesale market for generation. However they are compensated for RO difference payments through a levy on suppliers.
- The System Operator provides an evaluation of DSU performance at a sector level on a quarterly basis to DSUs.

Implications for DSU performance incentives

- The lack of remuneration for DSUs within the wholesale market creates perverse incentives for DSUs to not offer capacity below the strike price. This severely limits the value they are able to provide to the market.
- DSUs are not subject to meaningful performance incentives once operational:
  - There is no consistent agreed methodology for defining the size of energy reduction a DSU has provided.
  - The SO is reliant on DSU self-declaration of demand reduction delivered with limited and non-transparent scrutiny of declared reductions ex-post.

Implications for CRM technology neutrality

- DSUs face a number of significant barriers to competing in CRM auctions alongside generation:
  - The lack of a baseline methodology for achieved demand reduction means that DSUs are unable to achieve revenue aside from mitigating RO difference payments.
  - DSUs are also exposed to RO difference payments when not chosen in the BM for system reasons (e.g. to ensure there is sufficient reserve available).
  - No secondary market has been established for capacity providers. This is particularly disadvantageous to DSUs, where each typically includes a portfolio of assets and can benefit from reallocating assets between portfolios to optimise how they can be dispatched.
  - De-rating factors are set at higher rates for smaller size capacity units. While this has a logic in the context of generating units (where a large generator carries a greater risk of a sudden loss in power on the network), it is not relevant for DSUs (where larger units are a portfolio of smaller assets are accordingly more likely to be reliable than smaller units).
- The disadvantages faced by demand response constrains the ability of the technology to offer a low-cost and quick-to-build alternative to new generation to mitigate capacity adequacy concerns.

DSUs face significant barriers to competing against generation in the CRM, limiting its potential to provide low-cost capacity. The lack of a baseline methodology for assessing DSU performance also limits performance incentives within the mechanism and undermines confidence in demand response as being equivalent to generating capacity.

4.3 Does the CRM adequately value efficient generation technologies?

Most new build generation contracted through the CRM to date has been new open cycle gas turbines (OCGT). However the TSOs have identified a need for 1GW of new combined cycle gas turbines (CCGT) by 2026 that is multi-shaft and renewable gas ready, and expressed a concern that the CRM (which operates as a technology-neutral mechanism) is failing to incentivise CCGTs due to higher capital intensivity.

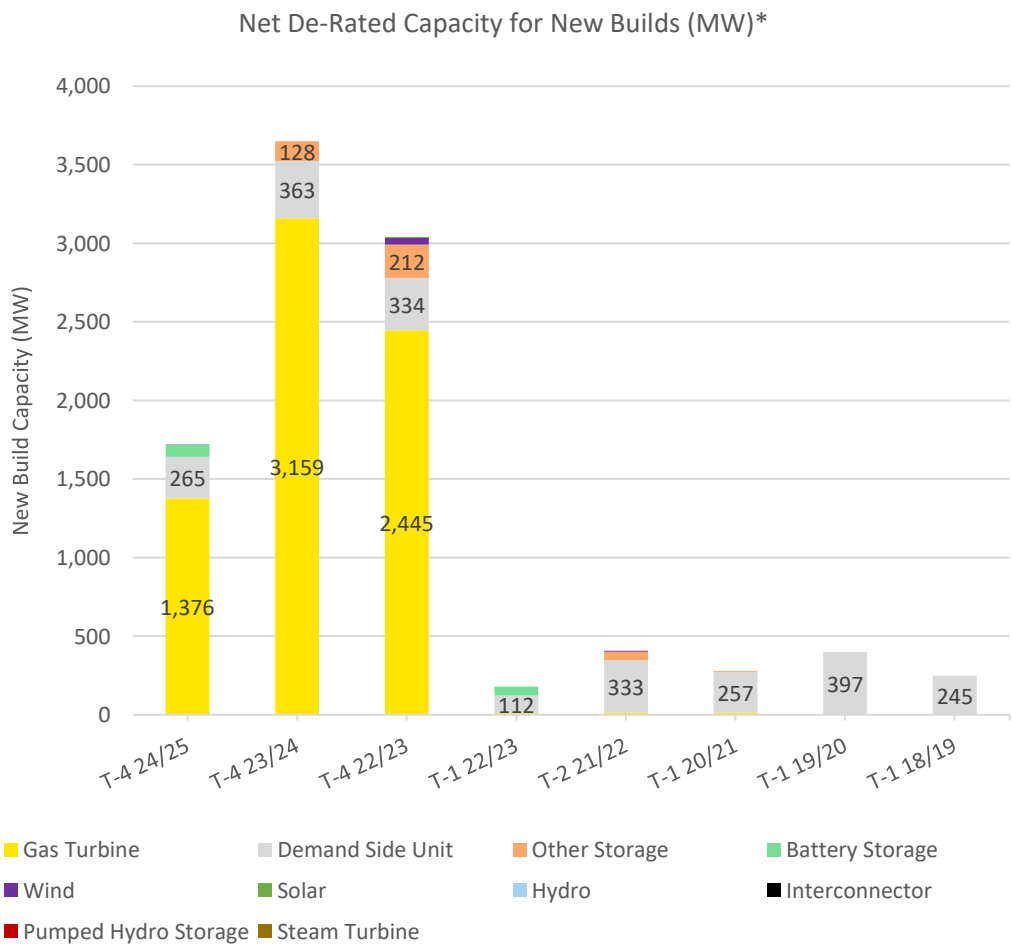
The CRM is only one element of the investment decision in new generation technologies. While CCGTs may not earn a higher capacity payment than OCGTs with lower capital costs, they should still not be disadvantaged in a CRM auction as they can expect to earn additional revenue (inframarginal rent) in the wholesale market owing to having a lower operating cost than the marginal price-setting plant.

If operating efficiently, the CRM should optimally determine the mix of CCGT and OCGT as investors respond to signals in the wholesale market. Moreover, while CCGT is more efficient and less carbon-intensive to run than OCGT, the higher capital costs associated with CCGT may mean it is the less appropriate option in a system with increasing renewables penetration where gas generation is increasingly running only as peaking plant and needing to be able to ramp up and down flexibly in response to intermittent technologies.

However it is recognised that CCGTs may face particular financing challenges, with industry stakeholders noting uncertainty around the future of the CRM beyond 2025 (when the CRM's existing state aid requires renewal), as well as the expected load factor of a CCGT in a power market that is expected to rapidly decarbonise.

The presence of policy and regulatory risk around the CRM means that capacity revenues beyond the initial contract length will be heavily discounted, potentially tilting the market towards favouring less capital intensive technologies whose costs can be recovered over a shorter period.

**Source: FCAR papers by EirGrid & SONI*



The CRM is a technology-neutral mechanism, allowing the market to determine the appropriate balance of higher-cost efficient generation (e.g. CCGTs) and lower-cost less efficient generation (e.g. OCGTs). However providing longer-term revenue certainty to the most capital intensive projects could help ensure a more level playing field between technologies.

Conclusions on capacity procurement

Overview of findings from Question 4:

Sub-question	Conclusions	Assessment
4.1: Are there adequate incentives for generation to be reliable?	The SEM Reliability Option sets an annual fixed payment to plants for their capacity and claws back a part of that payment from plants that are unavailable to generate at times of stress – defined as periods of high power prices. (This differs from the SEM CPM, which only paid plants in hours in which they were available). The effectiveness of the RO mechanism relies on there being sufficient frequency of stress events and severity of penalties for plant that is unavailable. However there are a number of factors that mean that the existing RO mechanism is an insufficient incentive for reliability, undermining confidence in the value of capacity being procured through the SEM CRM: ▪ Generators face perverse incentives not to bid into the balancing market above the RO strike price even at times of stress; ▪ The administrative scarcity pricing mechanism has not been calibrated effectively to ensure increased price volatility at times of stress; ▪ Many stress events occur in a particular region and are flagged out for not being an all-island event; and ▪ Interconnector actions are flagged out when determining BM prices, further reducing the frequency of events when the RO is called.	Major scope for improvement
4.2: Are there adequate incentives for DSUs to be reliable?	A number of barriers were identified to DSUs being able to participate effectively alongside generation within the CRM and wider energy market: ▪ The absence of a baseline methodology for assessing DSU performance; ▪ The lack of remuneration for DSUs to provide energy in the balancing market up to the RO strike price; ▪ The lack of an energy-only dispatch optimisation within the balancing market that would compensate units that are instructed not to run for system reasons; ▪ The lack of a secondary capacity market preventing reallocation of assets between units; and ▪ De-rating factors that decline with unit size. These factors may both limit confidence in the reliability of the contribution that DSUs make to generation adequacy and also tilt the playing field towards generation – making the capacity auction less competitive and less able to respond to increasing capacity requirements.	Substantial scope for improvement
4.3: Does the CRM adequately value efficient generation technologies?	The CRM is a technology-neutral mechanism, allowing the market to determine the appropriate balance of higher-cost efficient generation (e.g. CCGTs) and lower-cost less efficient generation (e.g. OCGTs). However providing longer-term revenue certainty to the most capital intensive projects could help ensure a more level playing field between technologies.	Some scope for improvement

Remedies to improve reliability of capacity procured

Question 4 potential remedies: Generator incentives

The following remedies have been identified for addressing the finding that the RO provides insufficient incentives for generating capacity to be reliable. Remedies have been assessed according to the size of benefit associated with the remedy as well as the feasibility of implementation.

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
4.1	Recalibrating the administrative scarcity pricing function so BM pricing better reflects market scarcity and causes a higher frequency of periods with prices above the RO strike price.	▪ More robust testing regime/penalties for unreliable plants ▪ Greater incentives for generator availability	▪ Higher wholesale market prices	Very high	Very high
	Refining the principle of flagging interconnector actions from SEM BM prices to drive prices that are more likely to exceed the RO strike price are and more reflective of the value of generation.	▪ More robust testing regime/penalties for unreliable plants ▪ Greater incentives for generator availability	▪ Higher wholesale market prices ▪ Higher collateral requirements on suppliers ▪ Requires improved ability to distinguish energy / system actions in real time	High	High
	Greater monitoring of technology performance in stress events to inform future de-rating factor setting.	▪ More robust setting of de-rating factors ▪ More accurate procurement of correct level of capacity ▪ Level playing field between technologies	▪ Additional (small) administrative cost	High	Very high
	Applying administrative penalties for non-delivery to plants in specific locations where an amber alert has been raised and a plant is unavailable.	▪ More robust testing regime/penalties for unreliable plants ▪ Greater incentives for generator availability	▪ Administrative cost ▪ Feasibility of designing new incentive mechanism	Medium	High
	Implement additional physical checks on existing capacity providers in periods with no stress events.	▪ More robust testing regime/penalties for unreliable plants ▪ Greater incentives for generator availability	▪ Administrative cost ▪ Feasibility of designing new incentive mechanism	Low	Medium

Conclusions on capacity procurement

Question 4 potential remedies: DSU incentives

The following remedies have been identified for addressing the finding that the CRM design limits the value of DSUs and puts barriers to DSU participation. Remedies have been assessed according to the size of benefit associated with the remedy as well as the feasibility of implementation.

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
4.2	Implement baseline methodology for assessing the contribution of DSUs in reducing energy demand.	▪ More robust testing regime/ penalties for unreliable providers ▪ Level playing field between DSUs and generation	▪ Feasibility in implementing metering requirements and monitoring framework	Very high	Very high
	Pay DSUs for negative generation up to the RO strike price.	▪ Greater incentives for DSUs to be available ▪ Greater competition and reduced costs in the balancing market	▪ Need for robust baseline methodology to be implemented	Very high	Very high
	Determine energy-only stack within balancing market and compensate energy providers (including DSUs) if instructed not to run for system reasons.	▪ Reduce risk to DSUs of unmanageable RO liability ▪ Remove barrier to demand response participation in CRM	▪ Need to identify and flag system actions in balancing market context ▪ Cost of compensation to units in merit but not dispatched for system reasons	Very high	High
	Set single derating factor for DSUs regardless of size.	▪ Remove barrier to demand response participation in CRM	▪ N/A	Medium	Very high
	Implement provision for secondary trading for capacity providers.	▪ Support optimisation of DSU capacity and remove barrier to demand response participation in CRM	▪ Feasibility and cost associated with implementation	Medium	Medium

Conclusions on capacity procurement

Question 4 potential remedies: Level playing field for more efficient generators

The following remedies have been identified for addressing the finding that the CRM design, and the regulatory uncertainty around the future of the mechanism beyond its existing state aid provision, may act as a barrier to the development of new CCGTs within the CRM. Remedies have been assessed according to the size of benefit associated with the remedy as well as the feasibility of implementation.

#	Remedy	Advantages	Disadvantages	Benefit	Feasibility
4.3	Allow 15 year contracts for the most capital-intensive new build (i.e. CCGTs, long duration storage).	▪ Helps address identified shortfall in CCGT generation within SEM ▪ Reduced capacity prices ▪ Market-based approach to promoting CCGTs	▪ Longer lock in to gas generation capacity agreements	Medium	Medium*
	Making ancillary service contracts more accessible to new build by creating ancillary service contracts with a longer lead-time and duration in line with the CRM and by procuring the products in a single integrated auction process.	▪ Gives greater certainty to investors in new build projects that have higher ancillary service benefits such as CCGTs or pumped storage ▪ Reduced capacity prices as ancillary service revenues will be less heavily discounted when investors are pricing projects into the CRM auction	▪ Requires locking in to ancillary service contracts further ahead and for longer ▪ Feasibility of joint procurement process	Medium	Low

**This assessment does not consider whether the change would require a change to the existing state aid approval or the likelihood of this being granted.*

Appendices

Change in capacity requirement - LCCA quantities

Change in capacity requirement by LCCA

Auction	LCCA	Relevant GCS	GCS Median Total (GW)	TSO Net Required Quantity (GW)	Net Required Quantity (GW)	Difference: TSO to RAs (GW)
20/21 T-1	Northern Ireland	2019	1.75	1.84	1.83	-0.005
	Ireland		5.68	5.74	5.62	-0.120
	Greater Dublin			1.48	1.48	0.000
21/22 T-2	Northern Ireland	2019	1.76	1.83	1.83	-0.002
	Ireland		5.84	5.70	5.62	-0.088
	Greater Dublin			1.48	1.48	0.000
22/23 T-4	Northern Ireland	2018	1.8	1.69	1.75	0.064
	Ireland		6.12	5.76	5.54	-0.223
	Greater Dublin			1.9	1.68	-0.218
23/24 T-4	Northern Ireland	2019	1.79	1.57	1.86	0.286
	Ireland		6.18	5.09	4.84	-0.244
	Greater Dublin			1.41	1.15	-0.263
24/25 T-4	Northern Ireland	2020	1.79	1.24	1.51	0.272
	Ireland		6.03	4.52	4.55	0.030
	Greater Dublin			0.74	1.35	0.614
	Rest of Ireland			3.24	2.67	-0.577
22/23 T-1	Northern Ireland	2021	1.68	-0.08	0.15	0.237
	Ireland		5.84	1.25	1.12	-0.125
	Greater Dublin			0.60	0.53	-0.075

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