Department for Energy Security & Net Zero

Evaluation of the Capacity Market Scheme

Final Evaluation Report

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Contents

Executive Summary

The Capacity Market was launched in 2014 as part of the government's policy of Electricity Market Reform (EMR) to manage security of electricity supply by ensuring adequate investment into reliable capacity on both the supply and demand side. The scheme's objectives are to: (1) incentivise sufficient investment in capacity to ensure security of electricity supply; (2) ensure the most efficient level of capacity is secured at minimum cost to consumers; and (3) avoid unintended consequences by minimising design risks and complementing the decarbonisation agenda.

This report comprises a process and impact evaluation of the Capacity Market scheme, commissioned by the Department for Energy Security & Net Zero (DESNZ, formally the Department for Business, Energy and Industrial Strategy)[1] in September 2021 and carried out by Technopolis Ltd. This report is the final deliverable and presents findings which will be used to support the Ten-year review of the Capacity Market scheme. The evaluation aims to: (1) determine whether and how the Capacity Market has historically met its objectives; (2) provide evidence on the potential need for future market intervention to ensure the security of supply and how it compares to the current scheme design; and (3) provide learning about how the individual components of the scheme could be included in any future market interventions.

The evaluation uses a mixed-methods, theory-based approach using a Process Tracing framework to assess the strength of evidence that exists to judge whether 'programme theories' are true or not. Data collection consisted of an assessment of secondary information, a survey of small number of CMA holders and a semi-structured interview programme with 41 semi-structured interviews.

The evaluation findings should be contextualised with several factors to consider. Fieldwork for this report was conducted in 2022 following the pandemic and during inflationary pressures on UK energy costs which may affect stakeholder views. The scheme was not intended to deliver decarbonisation targets and instead was designed to ensure the security of electricity supply. However, the scheme is nested within a policy landscape which is increasingly prioritising the transition to Net Zero and the evaluation's design has evolved to reflect this growing need.

A comprehensive Review of Electricity Market Arrangements (REMA) in Great Britain launched as part of the British energy security strategy (BESS) prior to the start of fieldwork for this report. This review considers options for the reform of the current electricity market and trading options for a future electricity system and any changes to the Capacity Market scheme recommended in this report will need to align with the outcome of REMA.

[1] Please note that references to BEIS throughout this report, for example in stakeholder interviews, should be read as the Department for Energy Security & Net Zero. Further information available at: www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy

Key findings

The Capacity Market has broadly delivered against its stated objectives. The Capacity Market, together with the Contracts for Difference scheme is a flagship element of the EMR and has weathered several shocks to the energy system since its introduction including unexpected electricity usage patterns during the disruptions of the COVID-19 pandemic and rising energy costs associated with Russia's invasion of Ukraine.

The evaluation found that the rationale for a mechanism to ensure the security of electricity supply is increasing in relevance and there is broad support for the continued use of the Capacity Market scheme.

The Capacity Market is functioning as expected though there remain significant areas of improvement to strengthen the efficacy of the scheme's impacts on investment and to improve the experience for scheme participants.

Process evaluation

The Capacity Market scheme is broadly functional and delivering the expected results. Stakeholders are mostly satisfied with the auction design and parameters. There are clear operational and process improvements which can be made to the Capacity Market scheme which will significantly improve the experience for scheme participants. The set of mechanisms to incentivise delivery are functioning but can be strengthened to improve their efficacy and ease of use.

- **The Capacity Market's overall auction design is satisfactory in delivering the expected results.** Pay as clear auction design was found to be simple to understand, enabling fair competition and encouraging low auction bid prices. There is strong support for introducing a split auction design to better align the scheme with the Net Zero transition. **The Capacity Market parameters vary in their suitability**. The price cap has historically been appropriately calculated, despite recent T-1 high clearing prices and the reliability standard setting has avoided System Stress Events (SSEs) though this may indicate over procurement. There is no consensus on the correct Target Capacity as there have been no SSEs, though the evaluation found concerns that the Capacity Market has not adequately considered the context of older plants going offline, suggesting a historical under-procurement of capacity. De-rating factors were perceived to be subjective and posing barriers to entry for certain technologies.
- **The penalty regime, termination fees and Secondary Trading require incremental changes to strengthen their efficacy.** Together, the three incentivise and are intended to enable delivery during an SSE without disincentivising participation in the scheme but are not functioning optimally as a cohesive package. **The current penalty regime requires adjustments to sufficiently incentivise delivery during an SSE** and there is some evidence to suggest that low penalties may have increased speculative bids into Capacity Market auctions. In contrast, termination fees and risk of termination are a strong deterrent for non-delivery and considered a disproportionately significant area for

risk mitigation by Capacity Market Agreement (CMA) holders. Uncertainty over termination fees (for example, between new builds and existing Capacity Market Units, CMUs) can potentially act as a barrier to entry. Low levels of Secondary Trading suggest that paying penalties is an acceptable risk to CMA holders instead of engaging in Secondary Trading, which is perceived to be time consuming and inefficient. Secondary Trading volumes peaked shortly after auctions began and declined with consistently low volumes and the evaluation did not find clear evidence that Secondary Trading will encourage future participation. When Secondary Trading does occur, it is between portfolios of existing CMUs which favours large scale organisations as it allows CMUs to transfer obligations within an existing portfolio with adequate visibility over which CMUs have capacity to take on the obligations. Secondary Trading levels outside portfolios is low due to low liquidity in the market and difficulties in finding counterparties to trade obligations.

- **There are clear areas for improvement in the prequalification and application processes.** The process was perceived to be onerous and difficult to navigate with a high administrative burden for applications and severe consequences for minor errors. There was some evidence of applicants giving as little information as possible to reduce opportunity for error. However, there is evidence that pre-application training materials were considered useful. Once applicants secured a CMA, agreement management was simple and time efficient as stakeholders understood their obligations and experienced little to no problems. **There was no consensus achieved on the governance regime and helpfulness of delivery partners.** The evaluation found a significant number of instances whereby the responsiveness and communication were viewed favourably and similar numbers of instances of poor communication and levels of responsiveness. The Capacity Market Rules and Regulations are complex and open to interpretation with significant bureaucracy. Many CMA holders did not know who to contact in which circumstances. Feedback mechanisms are effective, though opaque for users.

Impact evaluation

The Capacity Market has met its core objective of maintaining the security of electricity supply. Low auction clearing prices have supported the delivery of long-term system security in a cost-effective manner. Recent increasing clearing prices indicate a likely persistent tightening of margins and uncertainty remains over whether the Capacity Market has sufficiently incentivised the future security of electricity supply. The evaluation did not identify a need for a Net Zero specific objective, however there is widespread agreement over the Capacity Market's growing importance as a mechanism for ensuring resource adequacy in a Net Zero world as larger generators are phased out.

- **There have been no SSEs recorded since its inception indicating that resource adequacy has supplied the forecasted demand.** Instances of non-zero loss of load probabilities (LOLPs) and relatively low derated margins suggest that the system has avoided over procurement. However, stakeholder challenge to target capacity indicates continued need for appropriate checks and balances. The rising instances of non-zero LOLP and Capacity Market Notices (CMNs) indicate the need for continued monitoring.

- **There is evidence that the scheme has been delivered in a cost-effective manner thus far**. The scheme has stimulated the necessary level of competition to deliver adequate new build and refurbishment of existing capacity to support the security of electricity supply at or below the price cap. CMA holders participate in the scheme to stay operational, meet fixed costs and attract investment, though the scheme is neither necessary nor sufficient to incentivise investment in isolation. More widely, the Capacity Market revenue is seen as 'firm revenue' and reduces exposure to more volatile merchant revenue. These findings cannot be solely attributable to the Capacity Market scheme. The Capacity Market operates in a wider ecosystem of government policies which together have incentivised investment and delivered the security of electricity supply. The Capacity Market takes a long-term view and therefore the scheme's early years cannot be used in isolation to indicate future cost-effectiveness.
- **The value of Capacity Market revenues to investors is in their availability, and Capacity Market revenues do not typically form the bulk of an asset's revenue stream.** The evaluation found that other private and public revenue streams including Power Purchase Agreements and Arbitrage are significant contributors that have also incentivised the investment required to maintain security of electricity supply. Investors typically base investment cases on fully merchant financing in the wholesale market. Therefore, it is not possible to claim the Capacity Market is the sole driver of investment needed to ensure the security of electricity supply. The extent to which Capacity Market revenues are necessary to incentivise investment is dependent on technology type. Low carbon generators and low carbon-enabling technologies (e.g., battery storage) engaging in 'revenue stacking' require CM revenues to attract investment though they are insufficient in isolation. Capacity Market revenues are rarely a deciding factor on whether to invest in a high-carbon asset as they are neither necessary nor sufficient to attract investment.
- **The evaluation found a disconnect between the Capacity Market and the transition to a Net Zero energy system.** This disconnect was identified as a significant consequence which has not been avoided. The scheme continues to provide long-term agreements for high-carbon emitting plant. The transition to Net Zero has been driven by a series of increasingly strict emissions targets which has resulted in rapid change to market dynamics within the electricity system which the original Capacity Market scheme was not designed for. The scheme's misalignment with Net Zero has resulted in stakeholder confusion over government priorities. Meanwhile, investors are increasingly moving their assets into Net Zero portfolios. Stakeholders strongly agreed that the scheme must adapt to the changing energy policy landscape, though opinions on how to achieve this varied between the introduction of split auctions, altering de-rating factors or the continued use of Emissions Performance Limits.
- **The Capacity Market has avoided and dealt with other unintended consequences.** The Capacity Market has not had a detrimental effect on network operability, despite integration of intermittent generation, The scheme has adapted well to some external shocks such as COVID but has remained rigid in structural changes which can affect the energy market, including the current crisis in Ukraine. The evaluation found evidence of positive spill over effects from participating in the Capacity Market scheme, including

improved investment cases for demand-side response (DSR) and batteries which have secured CMAs every delivery year since 2017 and positive outcomes on jobs and local investment. A final benefit of the Capacity Market is that the scheme reduces volatility and mitigates risks; therefore, the removal of the Capacity Market could lead to increased uncertainty on the ability to maintain security of supply at least cost to consumers.

Suggestions for improvement

The evaluation has captured several suggestions for scheme improvement which can feed into the Ten-year review and the ongoing consultation as part of REMA:

- **Review the prequalification process with the intention of reducing administrative burden.** Options include gentler judgement of minor errors; updating the portal; allowing an 'evergreen' prequalification process; allow dialogue over amendments to minor errors; and altering the timing
- **Explore use of split auctions to better incentivise low carbon and low carbon enabling capacity**, either with a low or zero carbon auction followed by a second auction for all capacity. A split auction would allow for the scheme to reach the target capacity while prioritising resource which aligns with Net Zero.
- **Explore options for a Secondary Trading marketplace** which helps CMA holders identify appropriate partners for transferring all or part of their agreement. CMUs can advertise their wish to trade or their availability to take on more capacity, reducing risk of penalties and removing administrative burden.
- **Assess the balance of incentives (penalties, termination, Secondary Trading) to meet SSE obligations**. The penalty regime should be strengthened while reducing risks of termination which can discourage non-delivery and remove a barrier to entry.

Introduction

The Department for Energy Security & Net Zero (DESNZ), formally the Department for Business, Energy and Industrial Strategy (BEIS),[2] commissioned Technopolis Ltd to undertake a process and impact evaluation of the Capacity Market scheme. This report presents findings from Phase 1 and 2 of the evaluation that will be used to support the Ten-year Review of the Capacity Market.

This chapter summarises the Capacity Market and its objectives, the evaluation and its objectives and methods, plus the emerging policy context of REMA.

Overview of the Capacity Market

The Capacity Market (CM)[3] was launched in 2014 as part of the government's policy of Electricity Market Reform (EMR) through four pieces of legislation: the Energy Act 2013, the Electricity Capacity Regulations 2014, the Electricity Capacity (Supplier Payment etc.) Regulations 2014 and the Capacity Market Rules ("The Act, the Regulations, and the Rules").

The Capacity Market was introduced by the UK government to manage security of electricity supply by ensuring adequate investment into reliable capacity (on both the supply and demand side). The Capacity Market scheme has three main objectives:

- **Security of supply:** to incentivise sufficient investment in capacity to ensure security of electricity supply
- **Cost-effectiveness**: to ensure the most efficient level of capacity is secured at minimum cost to consumers
- **Avoiding unintended consequences**: to minimise design risks and complement the decarbonisation agenda.

The scheme operates by providing Capacity Providers with steady, monthly payment to ensure there is enough capacity to meet demand, and issues penalties if Capacity Providers fail to deliver the agreed volume of energy when it is needed. Capacity Providers are required to deliver on their obligation to provide capacity after a Capacity Market Notice is issued and it is determined that a System Stress Event has occurred[4].

Capacity Market Agreements (CMAs) are awarded through competitive, technology-neutral auctions. There are two capacity auctions each year: T-1 and T-4 auctions[5]. T-4 is the main

[2] Please note that references to BEIS throughout this report, for example in stakeholder interviews, should be read as the Department for Energy Security & Net Zero. Further information available at: www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy
[3] A detailed description of the Capacity Market is set out here: www.gov.uk/government/collections/electricity-market-reform-capacity-market
[4] An event can only be considered an SSE if three conditions are met: (1) it last for longer than 15 minutes; (2) volume of demand control instructed was greater than volume of generation curtailed by National Grid ESO in the same Settlement Periods; and (3) demand control event was not a result from faults on the transmission or distribution networks.
[5] Other than for CM Delivery Year 2022-23 when a T-3 auction was held due to a delay to the T-4 auction.

auction; it buys most of the capacity needed for delivery in four years' time. T-1 auctions are top-up auctions just ahead of each delivery year. The agreement length available is dependent on the type of unit – new build can secure 15-year agreements, refurbishing can secure 3-year agreements and existing plant can secure 1-year agreements. Prior to the auction, the Secretary of State decide the targets and parameters for the auctions. This decision is informed by advice from National Grid ESO, the electricity system operator, on the amount of capacity required to meet security of electricity supply standards set in legislation, as detailed in the annual Electricity Capacity Report, and scrutinised by a panel of independent experts (the Panel of Technical Experts).

The Act, the Regulations and the Rules require the government to carry out reviews of the CM every five years. This study is independent from these reviews but the emerging insights and findings from will feed into the upcoming Capacity Market 2024 Ten-year review. The evaluation assesses: whether the objectives of the Capacity Market and its implementing legislation remain appropriate; the extent to which those objectives are being met; and whether the objectives can be achieved in the future in a way that imposes less regulation.

Overview of the Capacity Market Evaluation

The evaluation aims to:

- Determine **whether and how** the Capacity Market has **historically met its objectives**
- Provide evidence on the **potential need for future market intervention to ensure security of supply** and how it compares to the current Capacity Market design
- Provide learning about how the **individual components** of the Capacity Market could be included in any future market interventions.

The Capacity Market evaluation comprises two phases:

Phase 1 aims to:

- develop a detailed evaluation plan for Phase 2
- provide emerging findings to answer the high-level scoping question and five scoping evaluation sub questions.

The second phase of the evaluation (culminating in this Final Evaluation Report) aims to address three high-level evaluation questions (HLEQs):

- HLEQ 1: To what extent, how and why has the CM been contributing to its intended objectives?
- HLEQ 2: Is the scheme being delivered as intended?
- HLEQ 3: To what extent does the current CM design minimise costs to costumers?

Overview of Evaluation Methods

The evaluation comprises a Process Evaluation and an Impact Evaluation.

The Process Evaluation assessed the delivery of the scheme using a Process Map framework that guides the assessment of each step of participation in the Capacity Market.

The Impact Evaluation used a Process Tracing (PT) method using a Process Tracing framework to assess the strength of evidence that exists to judge whether 'programme theories' are true or not. Developing a PT framework provides transparency, in advance of fieldwork, of what criteria will be used and how conclusions will be drawn. Process Tracing tests are referenced in this report using a Test Number (e.g. "PT 1") together with a short explanation of the test in an accompanying footnote. Details of the Process Tracing methodology are found in Annex E and details of all Process Tracing tests are found in the Process Tracing Framework which is provided as an Addendum to this report.

Phase 2 of the evaluation involved three main streams of data collection a) an assessment of secondary information, b) a survey with CMA holders and c) an interview programme with CM stakeholders including: i) CMA holders, ii) Capacity Market Units (CMUs) that are eligible but do not currently hold a CMA, iii) investors, and iv) wider sector stakeholders.

Further details of data collection and analysis methods are included in an Annex B, C and D.

REMA

The British energy security strategy (BESS) launched in April 2022[6]. The strategy document contained a commitment to undertake a comprehensive Review of Electricity Market Arrangements (REMA) in Great Britain.

REMA aims to assess, identify, and implement options for reform of the current electricity market and trading arrangements required for an electricity system of the future. The review is considering options for reforming the electricity markets and policies to promote investment in and operation of electricity generation assets (including the Capacity Market).

[6] www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

Purpose of this document

This report is a product of the evaluation of the Capacity Market scheme. It focuses on high-level evaluation questions in both the Process and the Impact Evaluation. The findings in this report will be used to support ongoing assessment of the Capacity Market.

The report is structured as follows:

Chapter 1 – Introduces the report and provides an overview of the Capacity Market scheme. This section also presents the high-level evaluation questions.

Chapter 2 – Presents the Process Evaluation findings.

Chapter 3 – Presents the Impact Evaluation findings.

Chapter 4 – Presents conclusions from both the Process and Impact Evaluations.

Chapter 5 – Presents suggestions for future amendments to the scheme based on these findings.

Annexes – Provides supplementary material (e.g., methodologies) including a **Glossary of Terms** (Annex A)

Process Evaluation

This chapter summarises the findings from the Process Evaluation of the Capacity Market. It sets out a Process Map that describes processes associated with delivery of the scheme. The chapter provides evidence to answer the key process evaluation questions on HLEQ 2: Is the scheme being delivered as intended?

This section will answer the following sub-questions:

HLEQ 2.1:	*How do the different mechanisms of the Capacity Market work in practice, and can they be improved? (e.g. auction design, agreement management, penalty system and termination fees, Secondary Trading)*
HLEQ 2.2	*Is the current governance regime appropriate?*

Summary Assessment of Process Evaluation findings (HLEQ 2)

- The evaluation found that overall auction design has been functional in delivering the expected results. However, it was found that the Capacity Market does not sufficiently incentivise low-carbon technologies (but it also does not currently aim to do so).
- There were strong views on the need to improve the prequalification and application processes which were perceived as being very difficult to navigate. However, while the prequalification and application process are perceived to be onerous, process-related challenges are minimal for CMA holders during the agreement management stage.
- There were mixed views on the Capacity Market parameters. The price cap and reliability standards were perceived to have been calculated in an appropriate way, however there were some concerns over the recent T-1 high clearing prices. Stakeholders expressed concerns over the way derating factors are calculated which could pose barriers to entry for certain technologies.
- The evaluation found that the penalty, termination and Secondary Trading regimes would benefit from incremental changes to strengthen their efficacy to ensure obligations are met in case of an SSE without disincentivising participation in the scheme.
- Finally, in terms of the governance regime there were contrasting opinions about its efficiency and the support received from delivery partners. In particular, the evaluation found a widespread dissatisfaction with the Capacity Market Rules and Regulations which are perceived as overly complex and open to interpretation with too much associated bureaucracy.

Capacity Market process map

A process map for the Capacity Market is shown in Figure 1. It aims to show the flow of activities that occur before and during a Capacity Market auction in addition to activities that occur during the delivery phase of Capacity Market Agreements. The process map acts as a framework for gathering insight on the extent to which each step in the delivery process has been delivered as intended.

The target capacity is determined by the Secretary of State and informed by analysis from the annual National Grid ESO Electricity Capacity Report[7] and scrutinised by a Panel of Technical Experts[8]. Ahead of the auctions, companies must apply to prequalify their units for which they are seeking a CMA[9]. Prequalification involves registering their unit, setting up an account in the EMR Delivery Body Portal and completing an application form which is evaluated by the EMR Delivery Body. Prequalified applicants must confirm entry to the auction.

The EMR Delivery Body publishes derating factors and confirms parameters prior to auction[10] including the net-CONE[11], price cap, target capacity and price taker threshold. Providers can ask the Delivery Body to check their prequalification applications before they submit it to the Delivery Body for assessment, in order to check their application will meet all the eligibility criteria.

The auction is run using a descending clock format with multiple rounds. The Capacity Auction clears when the level of supply offered by bidders is less than or equal to the demand at the Bidding Round Price Floor. Provisional results of awarded agreements are released within 24 hours of the auction clearing and official results are published on Auction Results Day. Capacity Agreement Notices are released after 20 days from the Auction Results Day and Capacity Providers receive their Capacity Agreement.

The Capacity Agreements comes into effect once they are published in the Capacity Market Registers. Prospective CMUs[12] are also required to meet agreement milestones which are checked by the Delivery Body[13]. Capacity Providers are required to demonstrate that they can meet their capacity obligation through Satisfactory Performance Days. Following a Capacity Market Notice, Capacity Providers must deliver against their capacity obligation during a System Stress Event (SSE) or face a financial penalty.

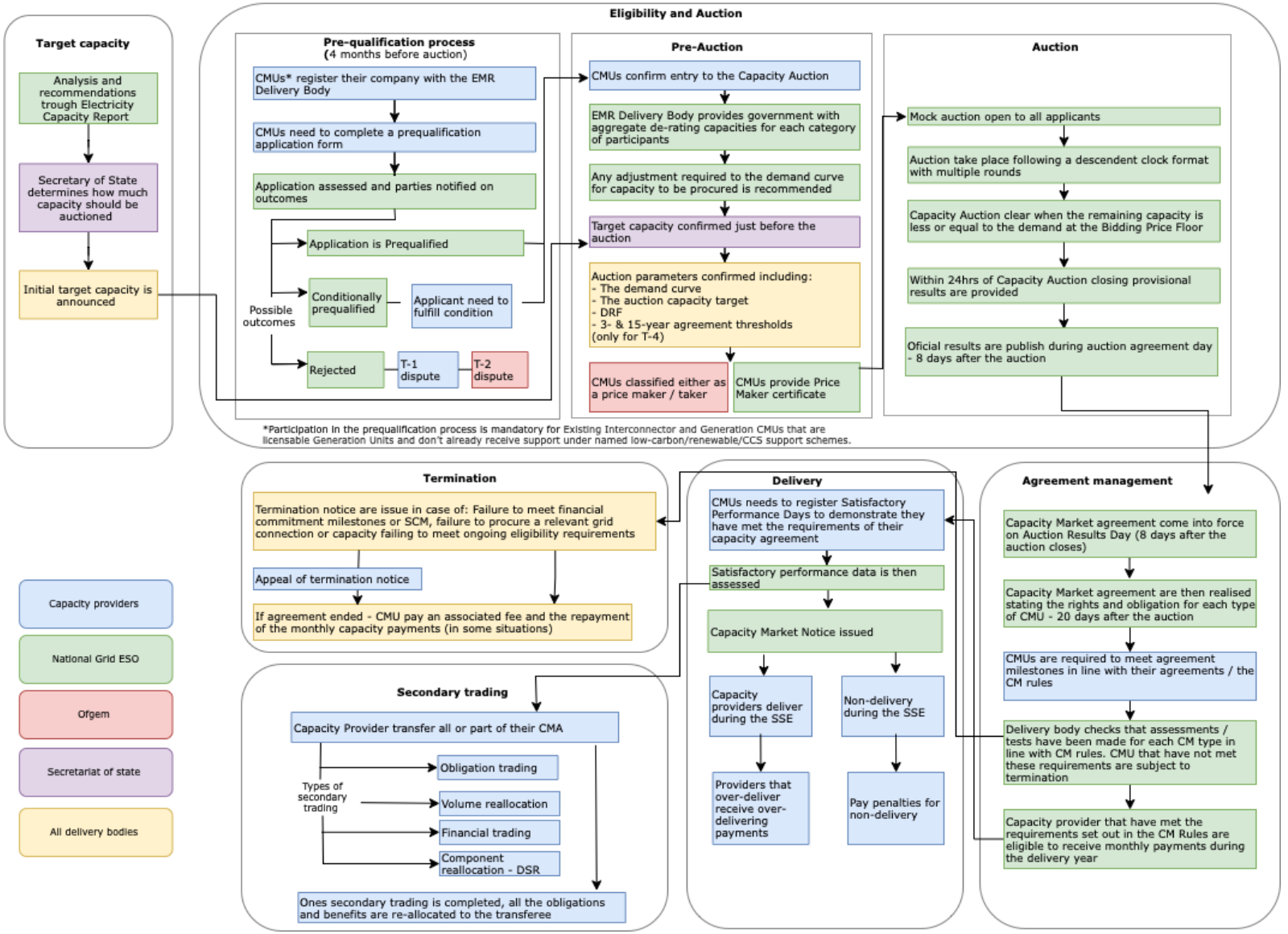
[7] www.emrdeliverybody.com/CM/Capacity.aspx
[8] Panel of Technical Experts Terms of Reference
[9] The prequalification process opens approximately 22 weeks and closes 16 weeks before the first auction opens.
[10] More information on how these parameters are calculated: Background on setting Capacity Market parameters1
[11] Net- Cost of New Entry (Net-CONE) is defined as additional revenue that a new generation resource would need to recover to funds its capital investment and fixed costs, given reasonable expectations about the amount of money it is expected to make from energy markets over its economic life.
[12] A Capacity Market Unit (CMU) is a unit of electricity generation capacity or electricity demand reduction that can then be put forward in a future Capacity Market auction
[13] The milestones (and associated impacts from not achieving them) vary depending on the type of CMU and may affect whether a unit can continue to hold an agreement. If an SSE occurs before the necessary milestones are completed the Capacity Agreement holder may not receive payments.

The Delivery Body is responsible for determining whether a termination event has 15valued and issuing appropriate notice. Once the Termination Notice has been issued, the Capacity Provider has 60 Working Days before the agreement is ended. Capacity Providers can submit a dispute or request to either have the Notice withdrawn or extended.

Capacity Providers have the option to participate in Secondary Trading. Secondary Trading occurs when a Capacity Provider transfers all or part of a Capacity Agreement to another CMU. The agreement is exchanged for a Capacity Committed CMU for all or a specified number of calendar days in a Delivery Year.

A more detailed process narrative is available in Annex F.

Figure 1 Capacity Market Process Map



Source: Technopolis

Capacity Market mechanisms

Auction Design

The Capacity Market's auction design was seen by most stakeholders as satisfactory. In particular, the pay as clear auction design met expectations as it is simple to understand, enables fair competition and encourages participants to submit their bid prices at the lowest marginal cost. Some stakeholders were able to articulate an understanding of the implicit trade-offs between a pay as clear and pay as bid approach[14]. For example, some stakeholders identified pay as bid could be disadvantageous for new builds as they cannot submit bid prices as low as existing builds. Furthermore, pay as clear incurs a risk that the Capacity Market is overpaying for some parties which would deliver at lower cost, given all bidders are offered the same clearing price. As a result, pay as bid could be a better option from the consumers' point of view as it may yield lower overall cost, but Capacity Market participants interviewed were not in favour of changing the scheme to pay as bid due to the potential lower prices and the associated administrative burden involved. Most stakeholders felt that pay as clear was a good or 'good enough' option and that improvements to the scheme should be focused on other areas.

There was broad support for introducing a split auction design[15]. This was perceived to support the UK's Net Zero transition. While a split auction would be welcomed by several stakeholders, others felt that a split auction design would not fit within the core aims of the Capacity Market, because the Capacity Market does not currently have a specific Net Zero objective (more information on split auction design can be found in the impact evaluation chapter "Options for moving forward").

There were suggestions that modifying the Capacity Market Notice to a narrower window could better support storage and Demand Side Response (DSR) participation. Stakeholders suggested that the Capacity Market Notice should be accompanied by additional information of how much CMA holders need to provide and when.

> *"[If] they start the moment that the notice comes into effect, but that turns out to be several hours before the actual stress event, they're doing absolutely nothing to contribute to system security. They'll be penalised for non-delivery, even though they did their best on what they were told" – CMA holder, Existing Generation CMU, DSR*

The participation of interconnectors in the Capacity Market saw a range of strong views with most stakeholders expressing views in this area holding a vested interest. The majority of CMA holders held negative views over the participation of interconnectors within the Capacity Market as it was perceived that an increase in the number of interconnectors participating

[14] The arguments for pay-as-clear in the Capacity Market are set out in the Detailed Design Proposals (DECC, 2013), available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/209280/15398_TSO_Cm_8637_DECC_Electricity_Market_Reform_web_optimised.pdf

[15] A split auction refers to an auction in which there are multiple separate auctions depending on the characteristics of the auction entrant. For example, a low carbon auction and a high carbon auction.

could potentially put at risk GB system network security of supply due to the reliance on capacity outside of GB system network borders. It was noted that should the electricity system experience an SSE, it is feasible that the exporting country may also experience an SSE at the same time. Furthermore, it was noted that by clearing interconnectors in the Capacity Market there was a risk that domestic generators do not clear and thus, do not have the financial incentive to stay in the system. Most respondents felt that generation should happen domestically (within UK) to be more efficient and to capture wider societal and economic benefits (though this was not an intended objective of the Capacity Market).

Interconnector stakeholders, however, were in favour of their participation and felt that their technical reliability should be adequate to participate in a technology-agnostic scheme. Furthermore, they felt that interconnectors facilitated the co-integration of energy markets, and that cross-border participation was particularly relevant, as the UK government has set a target of 18GW total interconnector capacity by 2030, almost doubling the current capacity[16].

Parameters

Price Cap

Auction participants view the price cap (£75/kW/year) as calculated in an appropriate way. However, stakeholders in all categories expressed concern about recent clearing prices, particularly T-1 2022/2023 which cleared at the price cap (£75). The high recent clearing prices suggest more capacity was sought than was pre-qualified, which can result in high clearing prices during the T-1 auctions.

> *"[In the] T-1 auction, the capacity required was more than the capacity that was pre-qualified resulting in a price of £75. [In the] T-4, there was a reduction in expected capacity which helps keep the price down, but then you've got to pay £75 when you get the T-1. It's like robbing Peter to pay Paul. Is that the best for the consumer? I don't think so." – CMA holder, Existing Generation CMU, high-carbon technology*

CMA holders and investors felt that high clearing prices could be attributed to: i) global geopolitical issues ii) low liquidity within the Capacity Market, iii) or the under procurement of capacity in earlier auction rounds, which lead to low clearing prices and had not incentivised investment in the construction of new builds.

Reliability Standard

There have been no SSEs to date, which suggests that the reliability standard has been appropriately set at a sufficiently conservative level. There is, however, concern that the reliability standard could lead to over procurement (incurring higher costs to consumers) as the system has not yet come close to an SSE. The topic of whether the Capacity Market has

[16] www.nationalgrid.com/document/141856/download#:~:text=In%20its%20Energy%20White%20Paper,million%20tonnes%20of%20carbon%20emissions.

procured appropriate levels of capacity is explored further in the Chapter covering the Impact Evaluation.

Some stakeholders suggested that if the reliability standard[17] had been set lower (i.e. less than 3 hours), then additional capacity (i.e. higher target capacity, see Target Capacity section below) would have been procured in previous auctions and the current perceived scarcity of capacity could have been avoided. However, it is noted that this would have reduced cost effectiveness.

The evaluation did not find any significant steer regarding under or over procurement. The discrepancy in stakeholder views on whether the Capacity Market scheme has under or over procured capacity may be a result of the fieldwork occurring during a period of uncertainty with electricity usage patterns changing due to disruptions of the COVID-19 pandemic and rising energy costs related to the ongoing crisis in Ukraine.

Target Capacity

The Target Capacity was recognised as an important parameter with influence over the liquidity of the market and bidding strategies of market participants. There were a range of views on the appropriateness of the Target Capacity levels amongst stakeholders. The absence of SSEs suggests that the correct volume of capacity is being procured to avoid electricity demand exceeding supply, however other CMA holders and some stakeholders within DESNZ argued that the process of setting the target capacity needs revisiting. It was perceived that the modelling process has not sufficiently considered potential variables that may cause uncertainty in setting Target Capacity, such as older plant going offline without being replaced by new plant.

CMA holders also suggested altering the timing of the target capacity announcement which is currently confirmed after prequalification. Confirming Target Capacity before prequalification would allow providers to make informed decision on whether participate or not in the Capacity Market.

> *"One thing that we find a bit difficult to deal with is the fact that the target capacity is initially set now during the summer before prequalification, and it used to be confirmed before Christmas after the prequalification windows closed. And then the last couple of years it is announced the latest day possible…And that leaves very little time to prepare. So, adding more visibility of what this capacity will look like would be helpful." – CMA holder, Existing Generation CMU, high-carbon technology*

There is no clear evidence that this would support the objectives of the Capacity Market, but it may remove unnecessary barriers to participation and provide 'quality of life improvements' for applicants.

[17] Reliability standard of EMR (2013) sets out benchmarks for LOLE from comparator interconnected countries. "The Republic of Ireland targets an LOLE of 8 hours per year; France targets the same standard of 3 hours per year, and the Netherlands 4 hours per year."

Final decisions on the value of Capacity Market auction parameters (i.e. Target Capacity) were perceived by Capacity Providers to be subjected to increasing levels of risk mitigation over time. The DESNZ Panel of Technical Experts[18], in carrying out their scrutiny function of the Capacity Market, observed a similar pattern in their Report on the National Grid ESO Electricity Capacity Report (ECR) 2021[19] (PT16[20]) that:

> *"For T-4, we accept the 44.1 GW recommendation in the ECR but also register concern that this value reflects a high component of risk aversion due to delivery uncertainties".*

Derating factors

Derating factors were perceived to be complicated and subjective. Few CMA holders felt that derating factors were calculated in an appropriate manner. Several CMA holders expressed concerns over how these parameters are calculated and could pose barriers to entry for certain technologies, notably wind, solar, interconnectors and batteries. These views were typically mixed based on technology type, sometimes affected by seasonality when certain technologies, such as wind and solar, perform better. Some stakeholders felt that technologies with low derating factors missing out on past auctions may be justifiable from a robustness of power[21] perspective, however some CMA holders felt that the calculations were subjective, particularly for interconnectors, and not accurate to the technical reliability of each plant.

> *"If you are going to go on technical reliability, [let] parties take their own view on the risk of their ability to deliver on a system stress event and rely on the penalty regime to incentivise decisions. We are subjectively judged for our derating factors [and] we don't understand until the derating factors are published and if they are too low, it is too late. And the next year, they bounce back up again, and you think great, we've driven up the cost to the consumer because 500 MW of perfectly good capacity was discounted, and we've gone ahead and built capacity to replace that, but it was there all along. And that has driven the clearing price up which is paid by everybody". – CMA holder, Existing Generation CMU, interconnector*

One wider stakeholder offered insight that derating factors needs more data driven decision making based on how the asset reacts to a Capacity Market Notice rather than an expectation of how technology types react. A suggested approach was to replace Satisfactory Performance Days (SPDs) with 'mock days', where the technical reliability of each asset could be assessed based on how they reacted.

CMA holders provided several other suggestions to improve the ways derating factors were calculated. Common suggestions were to use the same criteria (i.e., technical reliability) to

[18] The DESNZ Panel of Technical Experts is an advisory group of independent consultants who were appointed by government to perform a specific and technical function as part of the first Electricity Market Reform delivery plan process.
[19] Panel of Technical Experts: Report on the National Grid ESO Electricity Capacity Report 2021
[20] Process Tracing Test 16 tests if PTE (and other stakeholders) challenge target levels prior to auction delivery.
[21] National Grid ESO states that derating factors are applied to all forms of electricity as there is an assumption that 100% of capacity will not be available 100% of the time (due to plant break down or intermittency).

calculate derating factors for all technologies and to separate derating factors dependent on seasonality.

Penalty Regime

The penalty regime is intended to work alongside termination fees and Secondary Trading as a cohesive set of mechanisms that service a trade-off between ensuring obligations are met in case of an SSE and not disincentivising participation in the scheme. There were mixed opinions on whether the penalty regime is appropriate to incentivise delivery during an SSE. The survey found that respondents agreed that penalty levels were either very sufficient (44%) or somewhat sufficient (30%) to deter participants from not satisfying their obligation. This viewpoint was not widely echoed in interviews, where a significant number of CMA holders expressed that the current penalty regime is insufficient to incentivise delivery during an SSE. This discrepancy can be understood as CMA holders having a vested interest in ensuring penalties do not rise but were more forthcoming about their implications during interviews.

Most survey respondents viewed the penalty regime as sufficiently high to incentivise providers to avoid risks of non-delivery without being overly punitive and discouraging participation. One stakeholder felt that reputational damages acted as a deterrent to non-delivery in addition to penalties. Three stakeholders considered the penalties for non-delivery to be excessively high, and risked dissuading technologies such as battery storage and DSR from participating.

Two stakeholders speculated that some assets may not be operational (whilst still accumulating Capacity Market revenue[22]) as the chances of having an SSE were perceived to be low, and the penalties for failing to meet an obligation were not high enough to incentivise delivery. This view cannot be substantiated, though it suggests an area for further exploration. Another stakeholder suggested that low penalties may have increased speculative bidding into the Capacity Market.

> *"If [a CMU] needs to be taken offline for let's say 4 months, most people will just do nothing take the risk and hold their obligations… People prefer to keep things as they are rather than trade their capacity for those 4 months" CMA holder with some unsuccessful CMUs, new build, high-carbon technology*

Adjusting other elements such as the Capacity Market Notice window or transferring the SPD obligations to mock days may support the penalty regime by improving delivery assurances. Other suggestions to improve the penalty regime included excluding non-compliant CMAs from participating in future auctions and raising the penalty cap from 100% to 120%.

Terminations

Termination fees and the risk of termination was considered overly punitive and a significant area for risk mitigation by auction applicants prior to application (72% of surveyed respondents). In comparison with penalties, termination fees were viewed by CMA holders as a stronger deterrent for non-delivery, with some stakeholders speculating that termination fees were unnecessarily severe to compensate for weak non-delivery penalties. Some stakeholders

[22] This is not permitted within the Capacity Market rules.

indicated that termination fees are overly punitive and have become a central factor for consideration when bidding into the Capacity Market, potentially acting as a barrier to entry.

Improvements for the termination regime were suggested by stakeholders. A CMA holder of an existing plant expressed concerns over discrepancies in termination fees between new and existing builds, indicating the need for more clarity around the termination regime. In this scenario, an existing CMU with multiple short-term agreements can face multiple termination fees for the same unit, whereas a new build who is terminated faces a single fee as they have a single (long term) agreement. Another CMA holder requested flexibility in situations in which CMA holders were not able to fulfil or trade their obligations due to external reasons such as COVID-19[23].

> *"We tried our best, we couldn't deliver, and it would be nice if there was some leeway [before termination]. It was a difficult situation; I can see why BEIS needed to abide by the rules. There should be an incentive to deliver on time, but perhaps there is some space for amendments in cases [where there is] an external influence outside of your control and you can show how you will deliver" CMA holder with a terminated agreement, new build, low-carbon technology*

Secondary Trading

The evaluation found evidence that providers are engaging in some levels of Secondary Trading (PT 8[24]). Secondary Trading was considered by some stakeholders as a useful tool to re-allocate capacity to mitigate the financial risks of non-delivery in the event of an SSE. Having spare capacity and uncertainty about ability to meet agreed obligations were viewed by stakeholders as the main reason to participate in Secondary Trading. Some stakeholders perceive that Secondary Trading is most appropriate within portfolios[25] favouring larger scale organisations as it allows companies to transfer obligation within their own assets reducing the complexity of trading obligation with external organisations.

> *"We have done Secondary Trading only within our own portfolio. We did engage with external counterparty, but we never really got to it. So, we haven't really transferred any agreement externally." CMA holder, Existing and Refurbishing Generation CMU, high-carbon technologies, 'big player'[26].*

Stakeholders that have not traded their obligations considered that Secondary Trading rules are not clear enough for them to participate in Secondary Trading. Capacity Providers have been discouraged from participating due to administrative difficulties and lack of financial incentives, as the penalties for non-delivery may be insufficient to encourage trading. In addition, a significant number of stakeholders considered that Secondary Trading is not working as efficiently as it should be as a result of the low liquidity in the market and the

[23] Note: measures were put in place during COVID-19, including allowances and extensions, to reduce risk and burden for capacity providers.
[24] Process Tracing test 8 tests if Secondary Trading volumes are non-zero and contributing towards a liquid marketplace for Secondary Trading which contributes to reducing costs to consumers
[25] Organisations participating in the Capacity Market with several CMUs
[26] Big Player is a non-specific term used in the evaluation analysis to identify CMA holders with large MW portfolios and/or large numbers of CMUs in their portfolio.

difficulties of finding counterparties to trade obligations. This topic is explored further in the Cost effectiveness of the scheme section of the Impact evaluation. The process was also perceived as slow, time consuming and inefficient and respondents stated that it is unclear how much capacity is there to be traded as well as the rules of who is eligible.

The introduction of a third-party that centralises the reauctioning of CMAs (i.e. central platform / marketplace) was recognised as the best alternative to streamline the process making it more efficient and transparent. One respondent mentioned the Piclo Flex[27] platform as an example of good practice in the flexibility market. Other suggestions were increasing market liquidity, allowing more flexibility in timing of Secondary Trading agreements, strengthening penalties and reducing risks of termination following agreement.

The penalty regime, termination fees and Secondary Trading are intended to incentivise and enable delivery. Evidence suggests that the mechanisms require incremental changes to strengthen their efficacy, including tighter rules around penalties.

Application

Rationale

The most prominent reasons for applying were to ensure a stable income, to stay operational and meet fixed costs, and to attract investment. The majority of CMA holders applied to the Capacity Market to obtain a secure revenue stream and increase their income security. This income security was enabled by the long-term nature of the agreements and short-term agreements were viewed as less appealing. An attractive feature of the Capacity Market is the stackable nature of the revenue stream, allowing assets to participate in tandem with other markets. This feature was especially noted by flexible assets such as battery storage and DSR where a stackable revenue stream is typically required as part of a sustainable business model.

A significant reason for applying to the Capacity Market was that the scheme was viewed as a low-effort source of income.

> *"We are eligible and it's a potential revenue stream that realises the benefits that our assets bring to the wider market. Why wouldn't we?" – CMA Holder, Existing and New Build Generation*

Several CMA holders indicated that revenue from the Capacity Market did not make up a large portion of their revenue with their assets holding 'day jobs' which accounted for the great majority of their revenue. This topic is explored further in the Impact Evaluation chapter.

One CMA holder with a large portfolio applied because they were required to[28] and indicated that they would have preferred to opt-out of prequalification had they had the option. A

[27] Piclo Flex is an independent marketplace that brings together Flex Providers with System Operators to procure local flexibility services www.piclo.energy/

[28] Mandatory participation in prequalification applies to Existing Interconnector and Generation CMUs that are licensable Generation Units and don't already receive support under named low-carbon/renewable/CCS support

secondary reason for applying was to use the Capacity Market as a way to bring about wider benefits to the market, such as growing the number of interconnectors or enhancing the level of flexibility on the existing network using DSR.

> *"It is very good for the customers to get them involved. And it's very good for the country to have demand side flex in the Capacity Market because you get a cheaper power system than you would if you over-relied on supply side resources." CMA holder, Existing Generation, high-carbon technology and DSR*

The evaluation also found that the Capacity Market can act as a signpost for when to decommission or refurbish plant. While not a prominent view, CMA holders stated that if plant did not receive a CMA, this acted as a signal that the plant were more expensive to operate than competitors' assets and therefore provided an exit signal for a particular plant or technology type.

> *"I think the Capacity Market, as well as supporting investment, provide[s] a signal to market participants that their assets are more expensive to operate than their competitor's assets [and] you're demanding a higher level of missing money from the Capacity Market than the rest of the market is. So, it just provided an exit signal as well." CMA holder, Existing and Refurbishing Generation CMU, storage*

Prequalification and Applications

The evaluation found that there were a number of areas of improvement in the application and prequalification processes which would facilitate applicants to participate more easily. The survey found 76% of respondents (who participate in the CM) either felt negatively or very negatively about the process, which was also reflected in the great majority of interviews.

The rationale for this dissatisfaction was that the application and prequalification processes are time and resource intensive resulting in a high administrative burden for applicants. Stakeholders suggested that reviewing what information is required from applicants would help simplify the amount of documentation which needs to be produced. One stakeholder suggested that reducing the administrative burden may widen the pool of participants.

Many stakeholders were frustrated that 'minor' and/or 'clerical' errors led to a prequalification or application failure[29]. Examples of these minor errors were grammatical mistakes or using a wrong map grid reference or an incorrect post code. Consequentially, one stakeholder noted how they minimised the information they provided which was perceived to reduce the risk of errors.

> *"The process is a nerve-wracking experience, knowing one mistake could potentially lead to [a] reject[ion]. It's counterintuitive to have it so punitive. It forces*

schemes (set out in the Electricity Capacity Regulations, Reg 16 and 17). Mandatory CMUs can opt-out of participation in the CM auctions but this must be notified through the prequalification.

[29] Please note that regulations were amended in 2021 to enable the Delivery Body to consider information that corrects clerical or administrative errors in pre-qualification applications. For more information: https://www.gov.uk/government/consultations/capacity-market-2021-proposals-for-improvements

> *you to try and give as little information as you can get away with because that gives you less opportunity to make a mistake. So, you give them less information as possible and then once you are pre-qualified, you can then submit new information." CMA holder with one unsuccessful CMU, new build, high-carbon technology*

Stakeholders acknowledged that there was an appeals process but found it difficult to navigate. Several stakeholders suggested that the process could be improved through allowing a dialogue between themselves and the Delivery Body, regarding errors made in documents[30].

Auction participants were also frustrated with the portal which was perceived as being too slow and cumbersome to use.[31] There was dissatisfaction at the inability to copy information from previous years' information which increased the level of work required to re-apply with the same unit. This view was exacerbated by the fear over minor clerical errors. Evergreen Prequalification[32] would allow CMA holders to copy over information they were confident had been previously accepted, reducing the risk of failure.

There were some positive findings associated with the prequalification and application process. For example, several stakeholders praised the pre-application training materials, such as workshops and webinars, as it helped them understand the process.

A purely practical suggestion by applicants was noted. The timing of the prequalification currently coincides with the summer holidays where workers typically take more annual leave, creating increased capacity constraints. Stakeholders also suggested holding the prequalifying process closer to the auction. One stakeholder noted that the guidance is published eight weeks before the prequalification process which was not enough time to properly digest the materials. Whilst this may ease constraints on applicants, it is noted that the timeline for the auction is likely to be guided by ensuring delivery of capacity during the seasonal winter peak. As such, measures such as Evergreen Prequalification are likely to be a lower risk solution.

Agreement Management

Agreement management was viewed in broadly positive terms as most stakeholders received their Capacity Market Agreements on time and have experienced no issues with agreement management. Many stakeholders feel they have a good understanding of their obligations.

[30] It is noted that an application checking option is offered by the Delivery Body, however this was not highlighted by stakeholders during discussion of application.
[31] Despite frustrations with the portal, some evidence acknowledges that there have been changes to the portal and that they have led to process-related improvements for existing generators.
[32] Evergreen Prequalification can be defined in this context as an application that brings forwards all information from the previous auction application. This reduces the burden on both applicant and Delivery Body to check factual and unchanging information from auction to auction. Delivery partners have consulted on a proposal to incorporate this into the prequalification process. See: www.ofgem.gov.uk/publications/consultation-capacity-market-rule-amendments-evergreen-cmr-and-applicant-notice

> *"On the whole, it's pretty well managed by both the Delivery Body and settlement body… We haven't had any issues." CMA holder, Existing Generation CMU, DSR, large portfolio of projects*

Several stakeholders noted the positive change in automating part of the SPD process for existing generators, but some stakeholders suggested automation could be further expanded and would be useful to reduce paperwork. One example of this simplification process could be the removal of Independent Technical Expert reports, which stakeholders felt were costly to produce. Wider stakeholders suggested randomising SPDs to appropriately reflect the nature of SSEs and allow for potential issues to be solved before a real SSE occurs.

Governance regime

Stakeholders were evenly split on whether support from delivery partners was effective and useful or not[33]. Half of CMA holders and non-CMA holders interviewed had positive experiences when contacting the delivery partners for support noting their responsiveness and helpfulness. The other half struggled with issues that included perceived poor communications from delivery partners or lack of understanding/misunderstanding of the rules from both participants and from within the delivery partners. This was exemplified by some CMA holders who felt that the delivery partners were hesitant to give what could be perceived as 'legal' advice, and that they were encouraged to seek legal advice elsewhere.

> *"The main issues come when they start to feel uncertain about what the rules actually mean and don't want to give what might be considered to be advice, effectively legal advice. BEIS and Ofgem at times can feel rather distant and want to try and wash their hands of these issues." CMA holder, Existing Generation CMU, low-carbon technology (nuclear)*

There was speculation that accessing support from delivery partners may be easier for larger organisations that have longstanding relationships with the delivery partners and that navigating detailed information may be more challenging for smaller organisations. Several stakeholders commented on the apparent high turnover of staff and lack of resources within the delivery partners (including within the Delivery Body) suggesting poor retention of institutional knowledge. One stakeholder felt that high levels of turnover led to a declining understanding of industry needs within the energy system.

It should be noted that the evaluation was only able to collect a small amount of evidence relating to the division of the governance role between the delivery partners. The semi-structured interviews tended to focus on other topics that were of a greater priority to stakeholders. The governance division between delivery partners is complex, and half of the interviewed CMA holders did not know who to contact and in what circumstances. Stakeholders who felt that the division of governance was clear commented on how it could be

[33] This finding was broadly echoed in the survey, with 38% expressing satisfaction with support from deliver partners (n=8 of 21), 24% expressing dissatisfaction (n = 5 of 21) and 38% neutral (n = 8 of 21).

simplified, with a suggestion of re-introducing an account management system where each Capacity Provider had a 'single point of contact' within the Delivery Body.

Evidence from the evaluation interviews suggested widespread dissatisfaction amongst interviewees with the Capacity Market Rules and Regulations. The Rules are perceived by Capacity Market participants to be overly complex, open to interpretation, and time consuming to understand with too much bureaucracy associated with the Rules (PT 22[34]). Stakeholders commented on the 'grey areas' within the Rules which can be interpreted in different ways or applied inconsistently and suggested a simplification process. This sentiment was echoed as the rule documentation changes each year, causing increased bureaucracy associated with interpreting the Rules for the correct auction year.

> *"All the Capacity Providers think there's lots of different 'vintages' of the Rules, because for each agreement the Rules are stuck in time for the duration of that agreement. So there's like 20 different versions of the Rules out there, it's a pretty complex landscape and managing change in that environment is very difficult."*
> *Sector stakeholder*

Whilst this presents a challenge for auction participants, it may also provide an explanation for the challenges noted above – delivery partners themselves are also required to grapple with managing and interpreting multiple versions of complex rules as a result of grandfathering[35] requirements – compounded further by the perceived high turnover of staff in these organisations described above.

Many stakeholders felt that the Capacity Market feedback mechanism is functional as changes that reflect stakeholder feedback have been implemented but would have welcomed a more user-friendly approach. Stakeholders found the experience complex, time consuming and were left feeling as if they were not listened to (even though they recognised that their suggestions were incorporated into future auctions). Several stakeholders commented that the process felt opaque, and that they would welcome visibility over feedback from other organisations.

Public consultations were viewed as being more effective for larger organisations to influence change and there was a suggestion that voices of smaller organisations were less well catered for. One stakeholder commented that public consultations felt repetitive, noting duplication between National Grid, DESNZ (formally BEIS) and Ofgem consultations, suggesting an element of consolidation may be required to increase industry engagement.

The implementation of the Capacity Market Advisory Group (CMAG) was noted as a positive change by multiple CMA holders, which was believed to increase industry's ability to feedback to delivery partners.

[34] PT 22 tests that CM governance mechanisms are sufficiently flexible to adapt to unforeseen consequences by demonstrating that rules changes are simple and easy to follow
[35] Grandfathering can be defined as exemption for (someone or something) from a new law or regulation. In this case it refers to allowing continued use of the old rules for existing Capacity Market Agreements.

Impact Evaluation

This chapter summarises the findings from the Impact Evaluation of the Capacity Market. The chapter provides a review of the extent to the Capacity Market is meeting its intended objectives. It also presents the findings of process tracing analysis.

This section will answer HLEQ 1: *To what extent, how and why has the CM been contributing to its intended objectives?* and HLEQ 3: *To what extent does the current CM design minimise costs to consumers?*

This includes sub questions:

HLEQ 1.1:	*What impacts have the different elements of the CM had towards the CM's objectives (e.g., auction design, parameter setting, agreement management, penalty system and termination fees, Secondary Trading)?*
HLEQ 1.2:	*Did the impacts and outcomes, both intended and unintended, vary across different stakeholders? (e.g., by technology type)*
HLEQ 1.3:	*How much new capacity, and what type, has been kept on the system and brought online through the CM, and to what extent did the CM and its various components contribute to this? How has the CM and its components factored into the bid size decision of CM participants?*
HLEQ 1.4	*What is the cost (both carbon and financial) of any unintended consequences?*
HLEQ 3.1:	*To what extent do the mechanisms of the CM (e.g., auction design, penalties, Secondary Trading) minimise costs to consumers?*
HLEQ 3.2:	*What is the value of the CM outside resource adequacy, and does it vary across different stakeholders? Is it going to vary in a Net Zero energy system?*
HLEQ 3.3:	*To what extent does the CM reduce cost of capital and investment risks?*

To answer the evaluation questions, this chapter is broken into four subsections with reference to relevant Process Tracing (PT) tests set out in the process tracing framework (Annex E)

Summary Assessment of Impact Evaluation Findings (HLEQ 1 and HLEQ 3)

- There is strong evidence that the Capacity Market has incentivised adequate new and existing capacity onto the system to support the Security of Supply. Derated margins are sufficient and there have been no SSEs to date. This indicates that there has been adequate capacity to supply the forecasted demand whilst instances of non-zero LOLPs[36] and relatively low derated margins suggest that the system has avoided over procurement[37].
- Low Capacity Market auction clearing prices provide evidence that long term system security has, to date, been delivered in a cost-effective manner. Overall, the scheme has stimulated the necessary level of competition to deliver enough capacity at the maximum price and, in most cases, well below the maximum price.
- However, the Capacity Market is a mechanism with a long-term outlook and therefore the early years of the scheme cannot be evaluated in isolation. There is uncertainty over whether the Capacity Market has provided sufficient medium or longer-term incentives for investment to ensure system security of supply moving forward. Recent increasing clearing prices indicate the need to support capacity to maintain margins though there is not enough data at this time to make predictions.
- There is mixed evidence to suggest whether all unintended consequences (e.g. misalignment with Net Zero, impacts on network operability and locational constraints) have been mitigated by the Capacity Market, especially in relation to decarbonisation. The Capacity Market awards long contracts to carbon-emitting plant whilst also providing clearer investment incentives to technologies that are revenue stacking[38] than to conventional plant.

[36] The Elexon Balancing and Settlement Code LoLP Calculation Methodology Statement defines LoLP as: “A LoLP value is a measure of scarcity in available surplus generation capacity that the NETSO will calculate for each Settlement Period“

[37] Over procurement of capacity would result in a system that had persistent high derated margins and LOLP = 0, even during peak demand periods.

[38] i.e. low carbon enabling technology such as battery storage and DSR

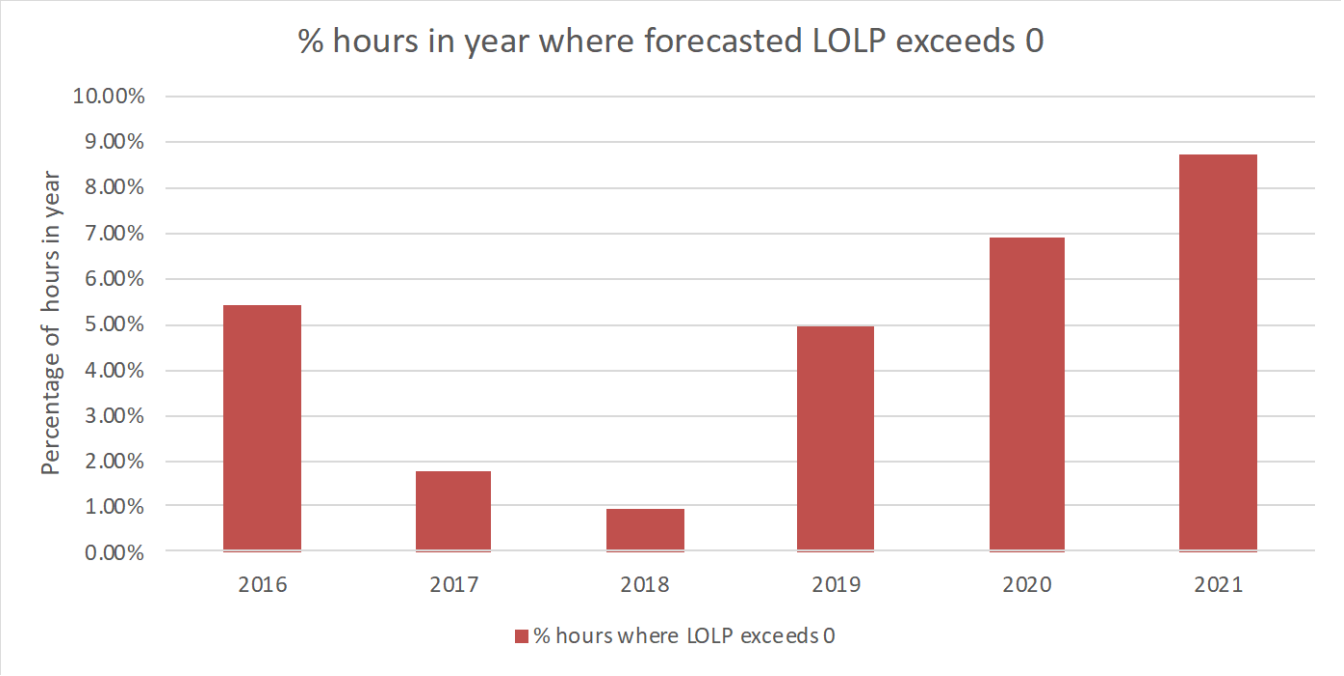
Ensuring security of supply (HLEQ 1.1, 1.2, 1.3)

Resource adequacy

The evaluation found clear support for the Capacity Market in its role for securing system adequacy for the GB system. There have been no SSEs declared to date. The low instances of Capacity Market Notices (10 since 2016), and low instances of non-zero Loss of Load Probability (LOLP) (PT 4[39]) is also an indication that the security of supply objective of the Capacity Market is being met. The Capacity Market - as an established part of the wider GB energy market - plays a partial role in reducing market volatility which developers, investors and policymakers can depend on. A small number of CMA holders queried whether the Capacity Market was the optimal way to achieve resource adequacy but agreed over the need for government intervention in this area.

Analysis of Elexon (BMRS) data[40] shows that system adequacy metrics are falling. Figure 2 shows that there an increasing number of hours per year where the likelihood of inadequate capacity is above zero. In addition, 8 of the 10 Capacity Market Notices have occurred between 2020-2022, with 4 occurring in 2022 alone.

Figure 2 Analysis of 1 hour ahead forecast Loss of Load Probability



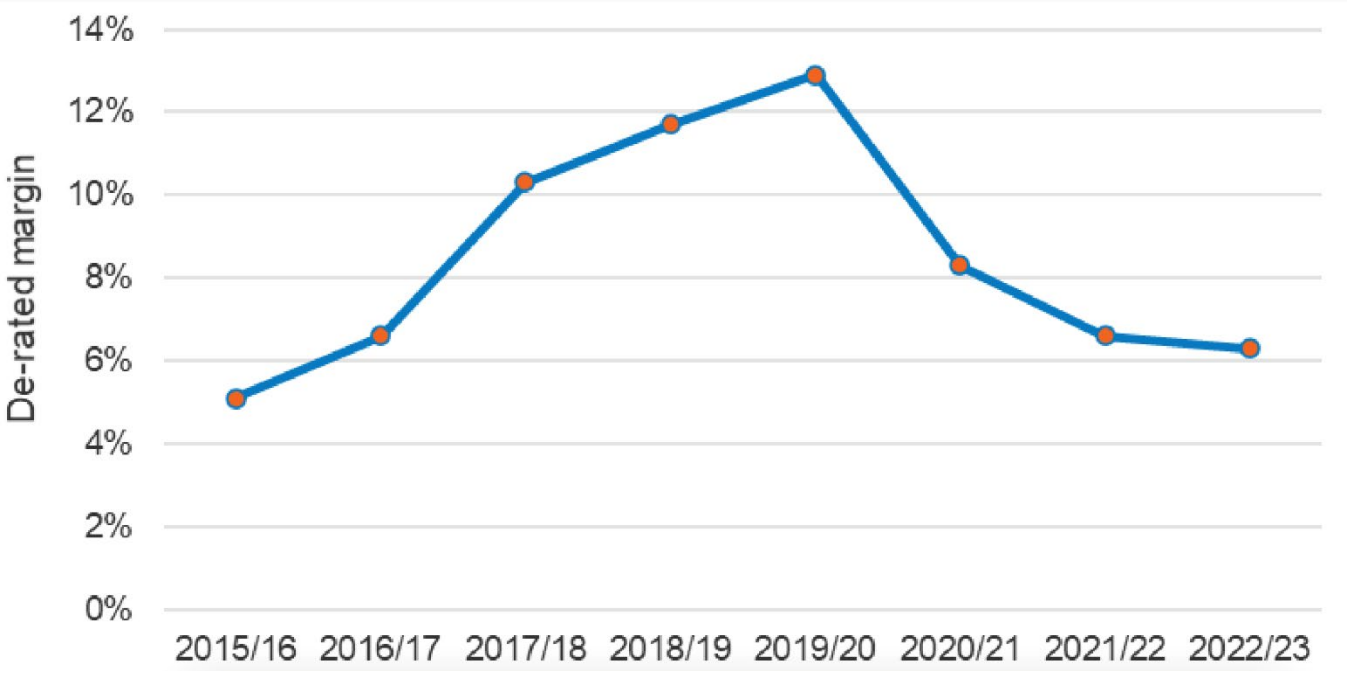
Source: Technopolis, using Elexon (BMRS) data

Stakeholders share the perspective that there is a historical under procurement of capacity prior to 2022 that is now leading to a tightening of margins. Data from National Grid ESO[41] supports this suggestion with Figure 3 showing that ESO forecasted derated margins have

[39] PT 4 tests if the CM incentivises capacity to stay on the grid system to support SoS. Also relevant for PT 1, PT 15, and PT 6
[40] Data collected from https://bmreports.com/bmrs/?q=transmission/lossloadProbDerateMargin/historic
[41] ESO Winter Outlook Report 6 Oct 2022

initially increased before tightening recently in 2020/21 and 2021/22 (and are projected to tighten further in 2022/23).

Figure 3 NG ESO Derated margin forecast/ System margin Winter view 2015/16 – 2022/23



Source: ESO Winter Outlook Report 6 Oct 2022

Several stakeholders cite the 2022 T-1 auction which cleared at the price cap (£75/kW/year), suggesting that more capacity is sought than was prequalified (see Figure 3).

> *"I think the issue would be under procurement. Particularly when you start taking geopolitics into account and gas shortages all over the world, I think the one of the big advantages of the Capacity Market is that you can hedge against those sorts of risks." – CMA holder, new build, interconnector*

Auction Target Capacity is the key determinant of procurement levels in the Capacity Market. Under procurement of capacity can gather momentum as low procurement levels result in lower clearing prices. Low clearing prices do not provide sufficient incentives to participate in future Capacity Market auctions. As a consequence, this may result in lower than anticipated rates of new capacity development.

Stakeholders shared the concern that under procurement may contribute towards increased risk of potential SSE in the winter of 2022/2023[42] as well as high energy bills. A common suggestion was that, in the face of uncertainty as a result of the Russian invasion of Ukraine and resultant energy price increases, the best strategy moving forward should be to over procure to ensure adequate incentives for new capacity to be built. A small number of CMA holders[43] felt that interconnectors should be excluded from this strategy, suggesting interconnection is subject to short-term market dynamics and geopolitical challenges, therefore

[42] National Grid ESO (2022) Winter Outlook Report: www.nationalgrideso.com/document/268346/download
[43] These stakeholders were CMA holders and assets that did not prequalify which can be characterised as 'not interconnectors'

reducing their reliability and the UK's control over the security of supply in the face of energy uncertainty.

Incentivising Existing and New Capacity

The majority of generator stakeholders felt the Capacity Market was useful for keeping existing generators online but was not an instrumental part of the business case (PT 5[44]). A high-level revenue/costs assessment[45] showed that CM revenues could represent up to between 20-40% of overall of non-fuel costs for some technology types. Individual project investment cases will be subject to a variety of factors. Larger fossil fuel projects have less technical scope to operate as revenue stackers in the same way as DSR/battery. In this context, 20-40% may not represent a proportion of non-fuel costs that will drive forward a business case for investment, especially for technology-types with an uncertain longer-term future (in the context of Net Zero).

New build CMA holders have obtained agreements totalling 27.7GW[46] of capacity since 2016 (exclusive of Unproven DSR). Technology types securing new build CMAs include CHP, coal/biomass, CCGT, EfW, OCGT, onshore wind, reciprocating engines, storage and interconnectors. (PT 3[47]).

There was a range of views around the role of the Capacity Market in incentivising new builds. 70% of surveyed respondents felt that participation in the Capacity Market either contributed a lot (40%) or somewhat (30%) to the business case (PT 2).[48] However, survey respondents comprise of a small number of CMA holders. In contrast, interview evidence suggests that Capacity Market revenues were typically a contributing factor to business cases, but not instrumental to their success or failure (plants would be built otherwise, even without securing a CMA). CMAs were viewed as helpful for the business case, but neither necessary nor sufficient for incentivising the delivery of new build.

The new builds which most cited the Capacity Market as important for their development were DSR and battery storage as they engage in revenue stacking (PT 18 and PT17[49]), especially as these low-carbon or low-carbon enabling technologies were perceived to have higher cost of capital (CAPEX and OPEX) than non low-carbon technologies making them less viable in a merchant only market. For DSR and battery storage, securing a CMA is necessary to their delivery however Capacity Market revenues are not sufficient in isolation and require additional revenue stacking. The view of flexible assets was mixed, with some indication that the requirements of the Capacity Market can pose unique challenges. For example, DSR may

[44] PT 5 tests if the CM incentivise existing capacity to stay on the system to support SoS
[45] Assessment used CMA revenues and data from the DESNZ Cost of Generation reference plants
[46] Please note that some of these are new builds that have received 1-year agreement in multiple auctions
[47] PT 3 tests if the CM incentivise new capacity onto the system by demonstrating that new builds have secured CM contracts
[48] PT 2 tests CM influence over new capacity brought onto the system to support SoS
[49] PT 18 and PT 17 tests that CM arrangements incentivise low carbon to participate in the CM which contributes to Net Zero by demonstrating that DSR/low carbon new builds entering the market identify CM as contributing factor to business case to enter the market

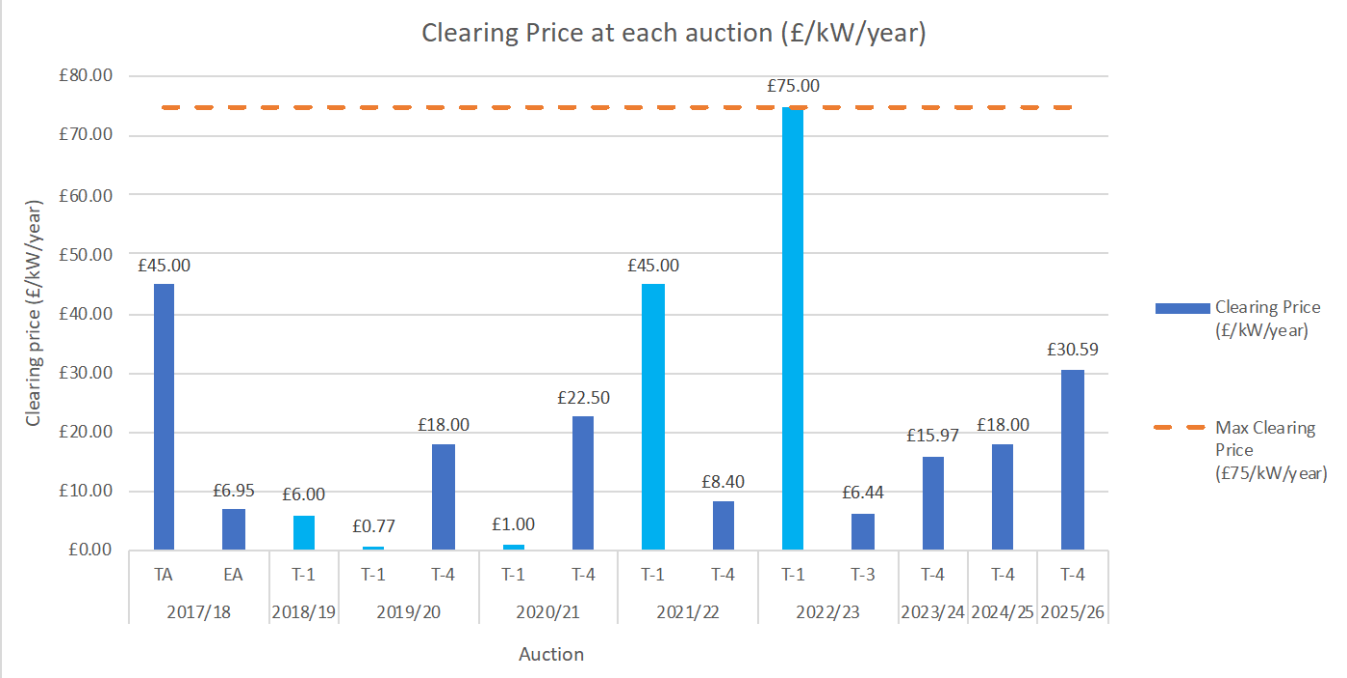
have difficulty securing long term customers and batteries (even with longer durations) may not be able to deploy as effectively without a narrower Capacity Market Notice period.

Reduced costs to consumers (HLEQ 1.1, 1.2, 1.4, 3.1, 3.2, 3.3)

Low auction bids

Capacity Market clearing prices should not be considered in isolation as providers and new build developers view the price signal over a medium to long term time horizon (5-10 year price signal).

Figure 4 Clearing price at auction



Source: Technopolis using data from Capacity Market Auction Results

Figure 4 shows that clearing prices were initially low (PT 11, 13[50]) but have increased in recent years (T-1 auction results for 2022/23 were capped at the maximum clearing price of £75/kW/year).

Low clearing prices may signal the scheme's cost effectiveness when compared to the value of lost load[51], but another perspective is that the real value of the Capacity Market is observed in the certainty and assurances of the security of supply. A long term signal enables longer forward planning, which theoretically allows for a reduction of cost. However, it should be noted the primary factor impacting the costs of energy in recent years has been the increasing price of gas on international markets which currently acts as a price setter in the GB system.

[50] PT 11 and 13 tests if clearing prices are lower than expected (relative to the impact assessment) to ascertain if CM mechanisms are providing sufficient incentives for new builds are entering the market and if the mechanisms are reducing costs to consumers

[51] Value of lost load is valued for the GB system at £17,000/MWh

It was suggested that customer bills are detached from the Capacity Market and clearing prices do not significantly impact direct costs to consumers. Recent spikes in customer energy bills can be attributed to external factors (i.e., Ofgem price cap reflecting wholesale gas price increases), not the recent Capacity Market clearing[52] prices.

> *"The last 12 months of energy market has been so volatile, and it is not a direct consequence of the Capacity Market. It is because the price of oil and gas is rising. The wholesale prices are too high; it is not possible to reduce them based only on the Capacity Market." – CMA holder, Existing Generation CMU, high-carbon technology*

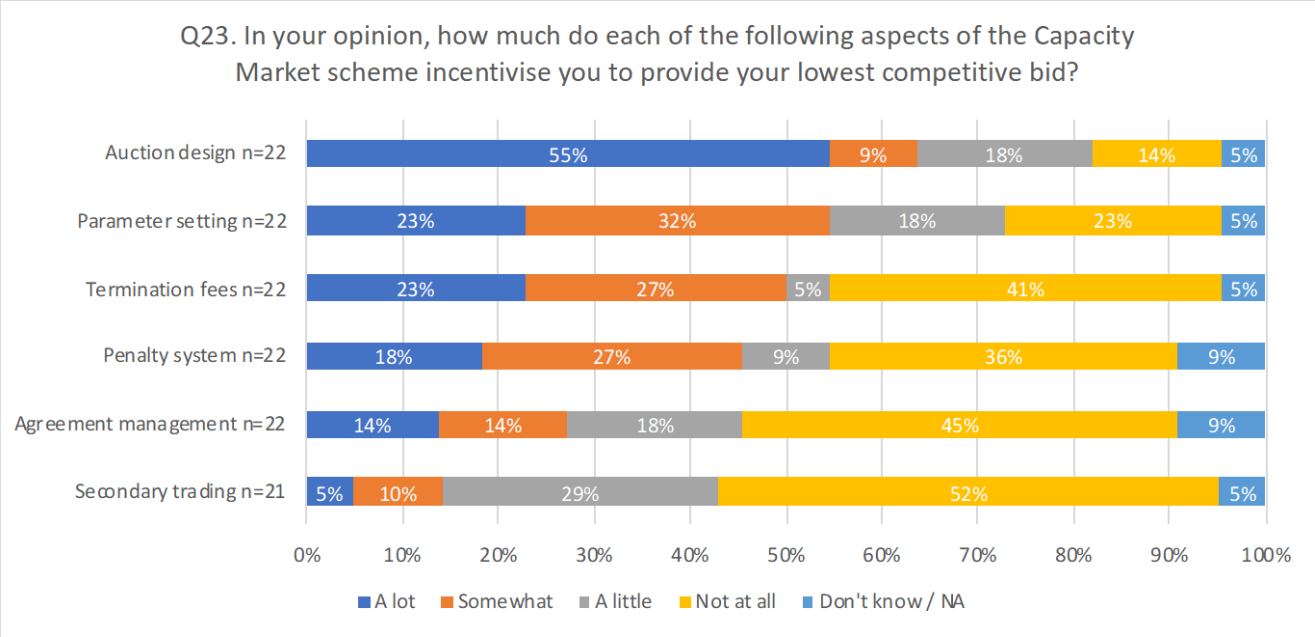
Whilst non-Capacity Market factors were seen as key drivers of price changes, it was suggested that the Capacity Market plays a role in reducing price volatility and providing a stabilising effect on overall prices. One stakeholder speculated that, in the absence of the Capacity Market, wholesale energy prices would rise, increasing costs to consumer.

> *"[Without the Capacity Market], we'd end up with higher wholesale prices, more risk premium built into prices. Having to recover long run costs through other mechanisms would mean that it gets more expensive" – CMA holder, Existing Generation CMU, new builds and refurbishing, high-carbon technology*

Whilst it is noted that low individual auction clearing prices may not represent the long-term optimal cost-effectiveness for consumers, the evaluation examined mechanisms for incentivising lowest competitive bids. Figure 5 shows that auction design[53] (as opposed to parameter setting or the penalty and termination regime) is important in securing competitive bids. For new builds, auction design was found to be more important, with 61% of surveyed respondents stating auction design incentivises them to provide their lowest competitive bid by 'a lot'. However, survey respondents represent a small number of CMA holders. In contrast, auction design was not perceived by the CMU and non-CMU who were interviewed as a relevant element to decide / define their bid prices.

[52] T-1 2022 auction cleared at £75/kW/year
[53] Auction Design was defined in the survey as: descending clock, pay as clear, price cap, net-CONE, and price taker threshold

Figure 5 Aspects of the Capacity Market that incentivise CMUs to provide the lowest competitive bid



Source: Technopolis survey

The evaluation found evidence of new and existing builds taking different cost considerations into account when submitting bids. Existing builds (price takers) maximise MW agreements across their portfolio by submitting the lowest possible bid to increase the likelihood that most of their units win agreements. New builds attempt to be as cost competitive as possible while still considering their business case and cannot submit bids as low as existing builds.

When submitting bid prices, Capacity Providers consider capital costs, projected running hours, forward planning horizon and assumptions on future wholesale market prices and carbon prices. There was not clear evidence that penalties and Secondary Trading have an effect on bid prices[54] (PT 10). The evaluation found that most CMA holders formulate bid prices by balancing the cost of building and maintaining plant against the risk of termination by not meeting Capacity Market requirements (including Substantial Completion Milestones) (PT 14[55]). Longer term, CMA holders were also required to price in their perceived outlook on government policies for new build high carbon emitting plant. For example, the upcoming UK target to be gas free by 2035[56] has influenced bid pricing decisions.

> *"I might want to build a gas peaking plant but it not be able to generate after 2035. The plant used to have a 20-year lifecycle [but] now it's only got an eight or nine year lifecycle because gas might be outlawed…[The] returns I need [are] 10%, if it's got a 25 year life I could live with a [15-year] capacity market contract at 5,000, but if I've only got an eight year life, it might need to be 35,000." – CMA*

[54] PT 10 tests the possibility of SSE and penalties regime incentivises Secondary Trading, and Secondary Trading markets are sufficiently liquid to allow CMUs to trade away their obligations with ease which leads to cost effective supply

[55] PT 14 tests that the CM mechanisms work together to provide the lower cost for consumers by demonstrating that CM mechanisms incentivise low auction bids

[56] www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

holder with a large portfolio of project, Existing Generation CMUs and new build, high-carbon technology

Cost effectiveness of the scheme

Assessing the cost effectiveness of the Capacity Market should always be framed in the context of the scheme delivering against resource adequacy objectives. In addition, it is noted that the assessment of cost effectiveness can be considered at the whole system level, rather than exclusively at the scheme level. Given this framing, the evaluation found different views over the role of the Capacity Market in providing a cost-effective approach.

As the Capacity Market directly leads to changes in consumer bills[57], it is important to ensure that it is delivering its intended value. The evaluation found concern amongst wider stakeholders, without an SSE to prove that assets are delivering, that some assets may be collecting revenues without running, though these views have not been substantiated in this evaluation.

"Ideally, we want to keep things on the system that are helpful to the system, but because [the Capacity Market] only pays CMA holders to deliver during stress events, we might be paying for [capacity] that sits there and does nothing and doesn't take part in the [wider market] because the Capacity Market is the backstop." – Sector stakeholder

There were mixed views over whether the Capacity Market reduces overall costs or whether it is neutral. Some stakeholders suggest there is a breakeven level of revenue required by market participants from across the Capacity Market and wholesale market[58]. As such, market participants may aim to recover more revenue in the wholesale market if Capacity Market revenues are depressed, creating increased volatility in those wholesale markets.

"[The Capacity Market] avoids a spike in the price when there's a shortfall in generation and potentially uneconomic plant might need to be brought back into the stock if there wasn't capacity available through the Capacity Market. So, yes, I guess it does make a contribution to avoiding spikes in the wholesale market." – CMA holder

The role of the Capacity Market in reducing volatility in other markets was also noted in that it allows the GB system to avoid short-term bilateral tender arrangements. These arrangements are likely to be a more reactive and therefore a costly approach to procuring capacity in advance, increasing the cost effectiveness of the Capacity Market scheme.

[57] The 2012 Impact Assessment estimated that the Capacity Market adds £14 to consumer bills https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/66039/7103-energy-bill-capacity-market-impact-assessment.pdf

[58] For generating stacking revenues, sources of revenue from other markets such as Balancing Mechanism and other ancillary services should also be noted.

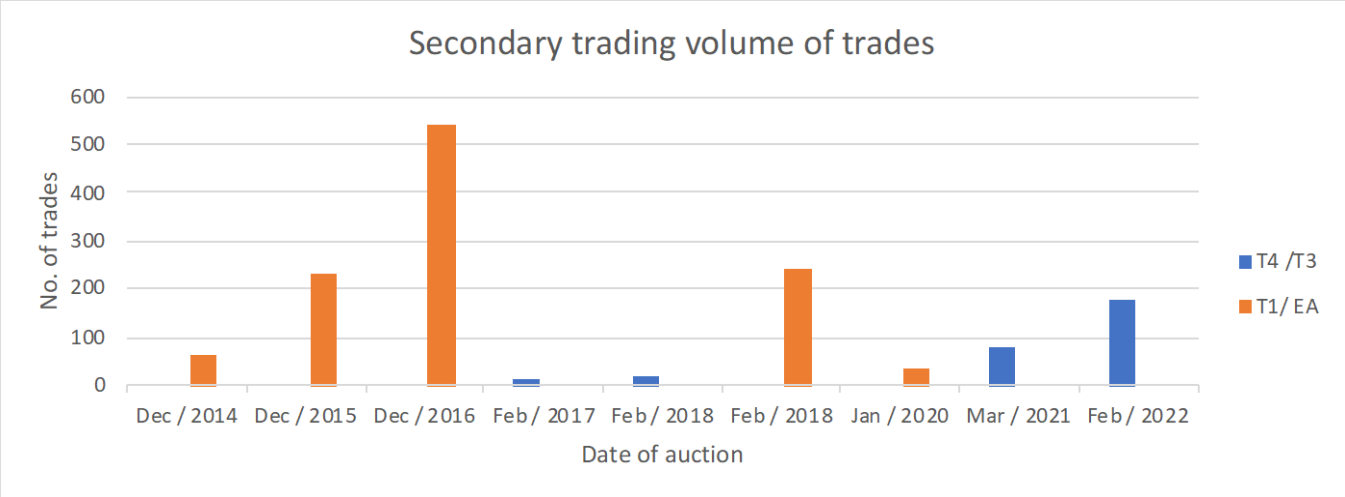
> *"The presence of a Capacity Market avoids other more costly alternatives to securing urgent capacity, or a 'strategic reserve', however there is no counterfactual to prove this." – Sector stakeholder*

As a criticism of the Capacity Market a few CMA holders interviewed stated that the Capacity Market is a blunt instrument which has not driven sufficient competition in the market to incentivise investment. As the capacity target was set higher than the prequalified capacity in the T-1 auction held in Feb 2022 for delivery year 2022/23, all prequalified assets expected to (and did) receive the value of scheme payments at the price cap (£75/kW/year). Echoing those criticisms, the evaluation also found concerns that the Capacity Market operates purely as a windfall payment to market participants, as there have been no SSEs to date[59].

> *"I think there is an unintended windfall to everybody [sic] and it is completely unfair to the taxpayer or to the consumer." – CMA holder, Existing Generation CMU and new build, high-carbon technology.*

As referenced in the process evaluation, Secondary Trading has experienced a low number of trades (Figure 6 below) demonstrating low liquidity in the secondary market (PT 10[60]) and the difficulties of finding counterparties to trade obligations. Low clearing prices, coupled with insufficiently strong penalties appear to have depressed the Secondary Trading market in its infancy with no clear evidence that Secondary Trading incentivises lower cost bids. As no SSEs have occurred, there have also been a limited number of opportunities to test the Secondary Trading robustness.

Figure 6 Secondary Trading number of trades



Source: Technopolis, using CM Register data

[59] It should be noted that no SSEs may also show that the Capacity Market is working and procuring adequate capacity to ensure security of supply

[60] PT 10 tests the possibility of SSE and penalties regime incentivises Secondary Trading, and Secondary Trading markets are sufficiently liquid to allow CMUs to trade away their obligations with ease which leads to cost effective supply

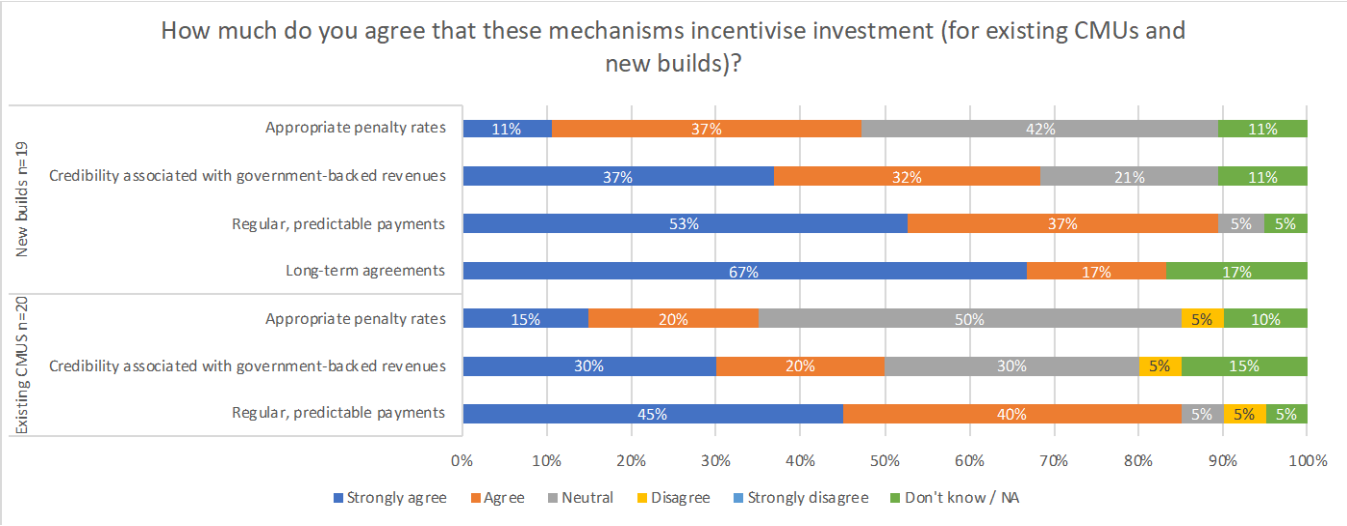
Investment (HLEQ 1.3, 3.3)

Incentivising investment

Investors identified elements of the Capacity Market that contribute to the case for incentivising investment in new builds and refurbishments of existing plant. Investors agreed with developers that Capacity Market revenues were neither necessary, nor sufficient for incentivising investment in isolation as they only contribute a moderate amount to the business case. The evaluation found investors to prioritise other public and private revenue streams (including Power Purchase Agreements and arbitrage) which form the bulk of an asset's revenue. However, Capacity Market revenues do play a role in an asset's business case when considered as part of a wider ecosystem of policies which together incentivise investment.

Figure 7 shows found that long-term agreements (84% positive new builds survey responses) and the stability of the revenue stream (90% of new build and 85% of existing build survey response) were key to making forward investment decisions in new assets, though survey respondents comprise of a small number of CMA holders.

Figure 7 CM mechanisms that incentivise investment



Source: Technopolis survey

The evaluation found strong evidence that the Capacity Market's value is that it acts as a diversified income stream for most projects – in addition to their primary source of revenue (excluding DSR/storage) or as part of a wider revenue stack (DSR/ storage). The Capacity Market, though often only a moderate portion of CMA project revenue streams, is viewed as independent, stable and with minimal credit risk, which is of value to investors. In addition, there was some evidence to indicate that for new builds Capacity Market revenues can form the residual amount needed to meet required returns, allowing plant to leverage further investment from other sources.

Contract length was a key factor in the decision to invest and contracts of different lengths were found to hold different risk mitigation values for investors. CMA holders perceive long term agreements to be a key mechanism in incentivising investment into new build plant.

Investors viewed a one-year contract (with a need to bid the following year) as being of lesser value than longer contracts, and in some cases, of little to no value.

> *"A one-year capacity contract (and then having to bid into the next auction just to secure capacity) doesn't really change the risk profile for us. We consider that to be merchant." – Capacity Market investor*

The evaluation found that long term agreements offer the greatest benefit to new build projects, as those projects require a high capital expenditure. One investor noted that longer agreements can help banks offering debt finance achieve a level of comfort with investment cases predicated on revenues from other revenue streams more uncertain in energy markets.

> *"There can be quite a lot of volatility in the earnings [from the energy market]. Some base level earnings [from Capacity Market revenue] is not something that will hold up the investment case on a standalone basis [but its] long duration gives [banks] comfort that there is a fixed revenue stream to continue servicing the loan." – Capacity Market investor*

The certainty of the revenue stream associated with the Capacity Market scheme was often found to be one important factor whether to keep a plant on the system. The credibility of government backed revenues was viewed as less important to existing plant in comparison to new build, implying that decisions to keep a plant online or to close a plant are based more on the wholesale market, which are short- or medium-term revenue streams, over the certainty of Capacity Market payments.

However, there is some evidence that Capacity Market revenues act as an incentive for investors to continue investing in the UK's energy market as it is perceived to be a stable investment environment.

> *"In the absence of the Capacity Market - it is not to say we would walk away from the market - but we would be less likely to invest in the UK" – Capacity Market investor*

Value of Capacity Market contracts to investors

The value of Capacity Market revenues to investors is purely in their availability, and Capacity Market revenues do not typically form the bulk of an asset's revenue stream. However, the value of a Capacity Market revenue stream was found to differ by technology type. More flexible assets (i.e. revenue stackers) valued Capacity Market revenues higher in the investment case than other technologies (such as CCGTs). Capacity Market revenues are, rarely a deciding factor[61] on whether to invest in an asset, as investors typically base

[61] In some cases (revenue stackers), Capacity Market revenues can be considered necessary but not sufficient. In most other cases (existing generation, and new build generation), Capacity Market revenues are neither necessary nor sufficient to incentivise an investment case.

investment cases on fully merchant financing in the wholesale market, using Power Purchase Agreements (PPAs)[62] or (in the case of interconnectors) arbitrage.

This difference can be explained as the Capacity Market revenue stream de-risks investment into these flexible assets (e.g. DSR, storage), which typically engage in a revenue stacking business model. In these cases, Capacity Market revenues are necessary but insufficient in isolation to support the business case.

More widely, the Capacity Market revenue is seen as 'firm revenue' and reduces exposure to more volatile merchant revenue. Existing gas plant viewed Capacity Market revenues as an additional, but not important, benefit.

There was no clear answer on the extent to which Capacity Market revenues de-risked investment into interconnectors, whose primary revenue streams are arbitrage and the Cap and Floor regime. In particular, the Cap and Floor regime was considered to be a more credible, stable, and bankable mechanism compared to the Capacity Market. Where stakeholders expressed views, they were typically in line with their vested interests surrounding the wider involvement of interconnectors in the Capacity Market. As an example, one investor noted that while their interconnectors were not reliant on Capacity Market revenue, removing it would make interconnector projects less likely to gain investment decision and suggested that some interconnector projects may not have gone ahead if they had not been eligible for the Capacity Market.

> *"Capacity Market revenues are a small but vital part of our income stream because although it might only be approximately 10% of annual revenue, it might make the difference between a project that hits the hurdle rate of return that we required to be able to invest in the project or not." – Capacity Market investor (interconnectors)*

Avoiding unintended consequences (HLEQ 1.1, 1.2, 1.4, 3.2)

Alignment with Net Zero

The evaluation found a disconnect between the Capacity Market and the transition to a Net Zero energy system as the Capacity Market continues to provide support to technologies which emit high levels of carbon. However, the evaluation revealed mixed views on whether introducing a Net Zero specific objective to the Capacity Market. Several stakeholders, across various groups expressed concern that this move would result in an overcomplicated mechanism that may jeopardise success against its existing objectives. However, there was widespread acknowledgement that as the energy system changes, the mechanism for ensuring system adequacy must evolve.

[62] A PPA is a call-off contract that secures the long term supply of renewable electricity. For more information: www.crowncommercial.gov.uk/agreements/RM6289

Scheme compatibility with Net Zero

On initial inspection, there was no clear consensus amongst stakeholders around whether the Capacity Market is compatible with Net Zero policy. The survey of CMA holders shows that larger, more established CMA holders (who are more likely to hold carbon emitting plant) skew more positive (or neutral) towards the compatibility of the scheme with Net Zero transition.

Insights from organisations that operated a significant capacity (more than 50 CMAs) portfolio[63] (so called 'big players') observed areas of alignment between the Capacity Market and Net Zero as the scheme has brought forward investment in both low carbon enabling technology such as batteries and DSR, and more efficient fossil fuel generation, which may have contributed to the business case for closing coal stations.

However, during in-depth interviews with the group of wider stakeholders and a significant number of CMA holders, there was general consensus within these groups that the Capacity Market is not aligned with transition to Net Zero and is not supporting the transition. They acknowledged that contributing to further negative climate change outcomes could be considered an 'unintended consequence' that needed to be avoided, however the existing wording of the 'avoid unintended consequences' objective is insufficient to adequately align the Capacity Market with wider government policy around decarbonisation and a transition to Net Zero[64]. This was largely as the Capacity Market (through longer term agreements for high carbon emitting plant) currently provides explicit incentives for polluting units to remain on the GB system. Some stakeholders expressed that contracts for unabated gas generation should be adjusted to align with the ambitions of a decarbonised electricity system by 2035.

A prominent concern over misalignment between the Capacity Market and Net Zero was derating factors for low carbon technologies. Stakeholders commented that current methodologies for calculating derating factors tend to encourage the development of gas which was perceived as being quicker and easier to build.

Despite concerns over the Capacity Market's alignment with Net Zero, the evaluation found evidence of the Capacity Market's increasing relevance in the context of a 'Net Zero world', as larger generators go offline. There was agreement that the mechanism for ensuring resource adequacy (currently the Capacity Market) will need to evolve to keep pace with the transition to Net Zero and associated changes in market dynamics such as gas-fired power stations moving offline.

> *"Transitioning towards Net Zero [means] less gas stations will be built and operating [and] I think that the [current] volume of renewables won't be able to deliver all the electricity needed. This is not a problem with the target, [but] it*

[63] The definitions of these stakeholders are distinct, but not necessarily mutually exclusive, from those that held a large number of CMAs

[64] Important to note in government decarbonisation policies, it is explicitly stated that decarbonisation ambitions are subject to security of supply. Examples of this are the Energy White Paper and Net Zero Strategy: www.gov.uk/government/publications/net-zero-strategy

> *come[s] down to splitting the target capacity between different technologies."*
> *CMA holder with a terminated agreement, new build, storage*

The issues of Capacity Market alignment with Net Zero policy were queried by some CMA holders. They argued that the Capacity Market didn't need to align with Net Zero as other mechanisms such as the Emissions Performance Standard[65] or the Emissions Trading System[66] were the appropriate policy mechanism for limiting the type of electricity available for the Capacity Market to procure. This allows the Capacity Market to remain technology neutral, whilst only capable of procuring energy sources that could meet these environmental constraints. The addition of Net Zero as a distinct objective to what was perceived as an already complex scheme could overcomplicate the scheme.

Impact of Net Zero on the Capacity Market

The evaluation found positive signs that the transition to Net Zero will not adversely affect participation in the Capacity Market.

Theoretically, unabated gas plant will be required to transition to low-carbon generation in line with UK government targets for a decarbonised electricity system by 2035[67]. This is expected to occur either through increased supply from renewables or nuclear power generation in order to support Net Zero targets. Some stakeholders expressed that the Capacity Market was not in conflict with Net Zero as their unabated OCGT is expected to transition to hydrogen to align with the phase out of natural gas. This was a point of contention in the evaluation, as a significant number of stakeholders were sceptical that unabated gas would actually be required to phase out in line with the 2035 policy.

> *I think the government needs to stop awarding 15 year agreements to carbon intensive generation because at the moment we've just had an auction and that was delivery year 25-26 and gas plant got 15 year agreements. This means, they'll be around in 2040. That's not consistent with the government's net zero ambition for 2035. – CMA holder, new builds, low-carbon technology*

Investors were broadly in agreement that the Capacity Market conflicted with Net Zero targets, and therefore misaligned with the objectives of their portfolio. Interviews revealed that investors are already moving their investments into low carbon or low carbon enabling technologies (e.g. battery/storage) as the direction of travel has been clearly indicated by the UK government. However, there was some questioning of whether existing policy was entirely consistent as investors commented that the Capacity Market's enabling of unabated gas signalled that the UK was not committed to Net Zero targets and may impacting decisions to invest in the UK.

> *"You can still build an unabated gas power station and get a [15-year] Capacity Market contract… I don't see how that's compatible with net zero. What could be*

[65] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/357217/implementing_emissions_performance_standard.pdf
[66] www.gov.uk/government/publications/uk-emissions-trading-scheme-markets/uk-emissions-trading-scheme-markets
[67] Please note this is subject to security of supply www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035

looked at [are] technology specific auctions, you could have a low or zero carbon auction and a high carbon auction." – Capacity Market investor

Options for moving forward

Moving forward, changes in the Capacity Market will be needed to align with wider government policy surrounding decarbonisation (even if this wasn't achieved through a Net Zero objective).

Insights from the process evaluation proposed that the introduction of a split auction may allow the System Operator to maintain resource adequacy while aligning the Capacity Market with Net Zero. There were a range of views that expressed how the auction should be split. One suggestion was to begin procuring capacity with a low or zero carbon auction first and hold a second auction where non-low carbon capacity can participate. An alternative suggestion from one stakeholder was to split the auction between existing and new build generation which would more efficiently reward existing generators for staying online instead of providing payments to generators who would stay online regardless of holding a CMA. Likewise, DSR developers noted that a split auction separating out DSR assets would stimulate the DSR market, however there were also risks that a split auction may further entrench existing perceptions amongst stakeholders that technologies with high upfront costs are more deserving of long-term agreements.

A small minority of stakeholders were against a split auction, as it was perceived to split the market, triggering unfair competition when there were already initiatives exclusively focused on reducing emissions (i.e. emissions limits). In addition, separate schemes introduced as part of EMR already exist to support increased development of renewable electricity generation, such as the Contracts for Difference (CfD) scheme. This viewpoint also echoed concerns over overcomplication of the Capacity Market scheme to deliver against all of government's energy objectives.

Another prominent suggestion was to strengthen the use of emissions limits. Emissions limits are the tool currently used for regulating fossil fuel emissions and are therefore indirectly regulating the scheme's contribution to Net Zero. Some stakeholders perceived that emissions limits in the Capacity Market may have reduced the effectiveness of the Capacity Market by limiting the running hours of unabated fossil fuel generation, thereby limiting the resource adequacy. One suggestion was to strengthen the use of emissions limits by linking them to future carbon budgets.

Echoing the findings of the process evaluation, stakeholders also suggested that derating factors should be amended to reflect risks for low carbon generators, by making derating factors softer for these technologies. Whilst this may contradict the current technology-neutral principles of the scheme, incentivising the participation of additional low carbon generation was seen as a pathway to achieving the transition to Net Zero.

Security of Supply beyond resource adequacy

Resource adequacy is not the sole requirement for ensuring the security of supply in the context of a Net Zero transition. Other considerations are locational constraints, and factors

that are addressed through ancillary services[68]. Wider considerations may also include sourcing an adequate independent fuel supply.

A small number of CMA holders felt that the Capacity Market cannot easily adapt or respond quickly to short term shocks to the supply and demand of capacity (e.g. Russian invasion of Ukraine) (PT 23[69] fails), however stakeholders acknowledge this was never part of the scheme's intentions.

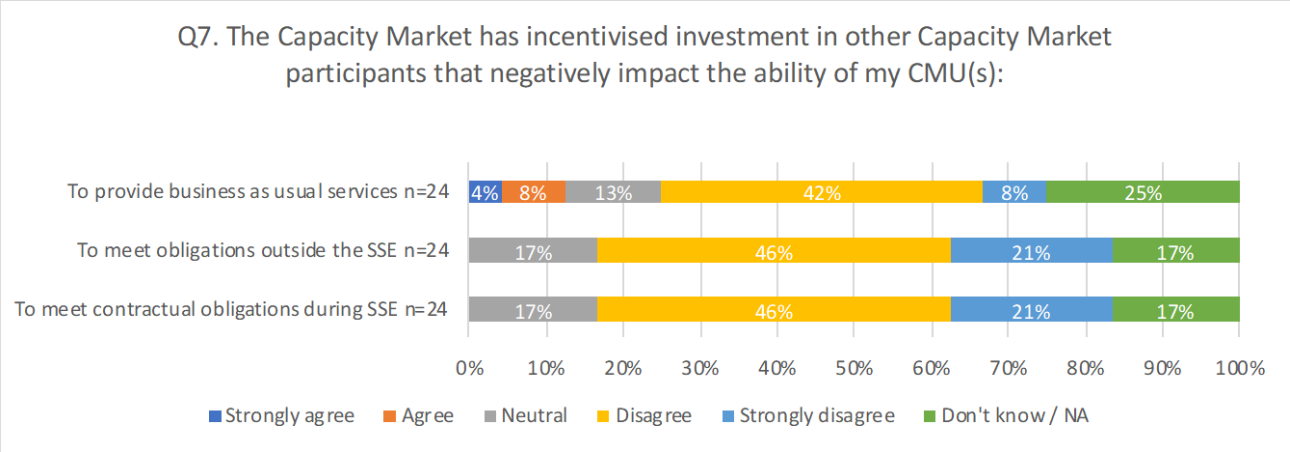
> "The Capacity Market needs to adapt to the current Ukraine crisis. The UK is exporting more than importing; this speaks to the ability of the Capacity Market to respond quickly to external shocks" CMA holder, *Existing Generation CMU*, high-carbon technology

Impact on network operability

The Capacity Market's current security of supply objective targets resource adequacy only, however both network operability and resource adequacy are needed in order to achieve overall security of supply. Although raised in the scoping phase of the evaluation by a Delivery Body stakeholder as an area for concern, the evaluation did not find evidence of the scheme's contribution towards network operability problems (Figure 8) (PT 20[70]).

The majority of CMA holders agreed that the Capacity Market did not provide incentives to other CMUs that negatively affected their operation. A potential issue of the Capacity Market is that it is GB wide and does not consider grid constraints. Some stakeholders suggested that the Capacity Market could play a role in further supporting network operability by providing locational incentives to CMA holders[71].

Figure 8 Operability impact on CMA participants of Capacity Market



Source: Technopolis survey

[68] Frequency response, Voltage management, Reactive power management, System inertia
[69] PT 23 tests if the CM governance mechanisms are sufficiently flexible to adapt to unforeseen consequences
[70] PT 20 tests that the CM design avoids incentivising generation onto/off the network which results in poor operability of the network by demonstrating that CMU participants state that outside the CM system does not experience operability concerns
[71] This could include supplements for capacity located in areas that are modelled to have weak grid infrastructure, particular at times of SSE.

Positive and negative effects of participation

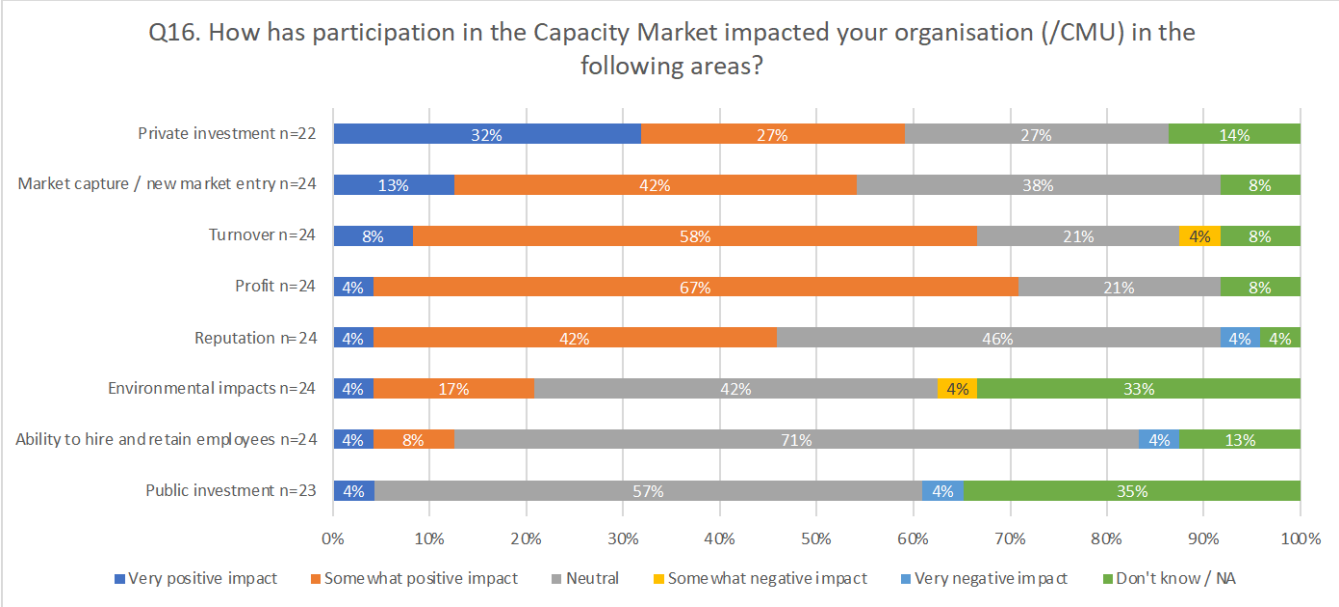
The evaluation found positive, spill over effects for Capacity Market participants which fell outside of the Capacity Market objectives. The Capacity Market was found to stimulate investment where needed and provide revenue streams that facilitated companies to enter the market, but other factors (such as wholesale market revenues) are responsible for stimulating the bulk of investment.

Figure 9 shows that there were very few instances where participation in the Capacity Market experienced negative impacts, indicating that in these areas, the Capacity Market has successfully met its objective of avoiding unintended consequences.

Securing Capacity Market agreements safeguarded existing jobs and provided rationale for new jobs and inward investment in localities because of new project investment. There was evidence that new jobs were created purely as a result of the prequalification process.

> *"It has helped us to change our revenue and therefore to be able to hire more people" CMA holder, new build, low-carbon technology*

Figure 9 Impacts of participating in the Capacity Market (Successful CMUs)



Source: Technopolis survey

The evaluation also found evidence that the Capacity Market stimulates pre-auction competition to 'pull through' the best projects. This occurs as the availability of Capacity Market revenue stimulates competition during the development phase of projects. One stakeholder suggested that the best projects are also the most cost-effective and are able to bid at more competitive rates. While recent higher auction clearing prices show that the Capacity Market auction may not always effectively incentivise competition during the auction, there is some evidence that the Capacity Market can incentivise competition pre auction. In a similar manner, there is some limited evidence from auction participants who were not awarded a CMA that losing out on a Capacity Market agreement can act as an exit signal as it demonstrated that their assets were no longer cost-competitive.

The evaluation found little evidence of unintended negative consequences on CMA holders. However, one CMA holder discussed that they have made the decision to exit the Capacity Market as a result of increased complexity and risk. As a DSR aggregator, they felt it was difficult to secure capacity four years ahead of the delivery year from many different customers, and the associated collateral was too high. The increased complexity of the rules further increased the risk of non-compliance, and therefore the risk of penalty or termination.

> *"[Due to] complexity and risk… the Capacity Market is seen as no longer a viable and attractive part of the revenue stack and a revenue stream for us and our customers". CMA holder, Existing Generation CMU, DSR*

Conclusions and recommendations

The Capacity Market is a complex mechanism delivered within a complex wider energy ecosystem. The Energy Market has evolved since 2014, and the recent announcement of REMA demonstrates that there is appetite in the market to assess changes to the ways in which the whole electricity system is structured.

The evaluation of the Capacity Market has been conducted during a period of intense pressure on the GB energy system, with unprecedented consumer price rises in the market. Russia's invasion of Ukraine has put short term pressure on energy markets with a narrowing of focus on both energy independence and energy security of supply.

Broadly, the Capacity Market has met its core security of supply objective with no System Stress Events recorded since its inception. Low Capacity Market auction clearing prices provide evidence that long term system security has, to date, been delivered in a cost-effective manner. The scheme has stimulated the necessary level of competition to deliver adequate capacity to meet the Security of Supply at or below the price cap. However, the Capacity Market is a mechanism which exists within a wider ecosystem of government policies and cannot be evaluated in isolation. As the Capacity Market has a longer-term outlook, the early years of the scheme cannot be used as accurate predictors of future cost effectiveness. There is uncertainty over whether the Capacity Market has provided sufficient medium or longer-term incentives for investment to ensure system security of supply moving forward. Recent increasing clearing prices indicate a likely persistent tightening of margins.

The transition to Net Zero has been driven by a series of increasingly strict emissions targets for the electricity system and has resulted in rapid change to market dynamics that the original Capacity Market was not designed to facilitate. There is mixed evidence from the evaluation to suggest whether all unintended consequences have been mitigated by the Capacity Market. On the one hand, it is noted that the Capacity Market continues to offer long contracts to carbon-emitting plant. However, the evaluation found that the Capacity Market provides clearer investment incentives to technologies that are revenue stacking (e.g. low carbon enabling technology such as battery storage, DSR) than it does to conventional plant.

A clear finding of the evaluation was that there is scope for operational and process improvements to the scheme. The scheme is broadly functional, with some significant areas of frustration for a wide range of participants. Improvements in these areas will result in improved quality of life for scheme participants.

The Process Evaluation identified a number of conclusions:

- Whilst not an explicit mandate of the Capacity Market, the auction design was not found to sufficiently incentivise technologies aligning with decarbonisation. Several stakeholders outlined suggestions for improvement.
- There were mixed views on the various auction mechanisms: the price cap was found to be calculated in an appropriate way, but while the reliability standard has been set

conservatively enough to avoid SSEs, this may suggest over procurement. There was no consensus on the correct Target Capacity as the absence of SSEs suggest it is appropriately set, however the evaluation found concerns that the Target Capacity has not adequately considered the context of older plant going offline with some stakeholders suggesting that there has been an historical under-procurement of capacity.

- There are clear areas for improvement in the prequalification and application processes which would facilitate easier participation. There was strong evidence which called for a review of prequalification processes which were viewed as a stressor for stakeholders.
- The evaluation found that penalty, termination and Secondary Trading regime did not function optimally as a cohesive package. The penalty regime was found to be insufficient in incentivising delivery during an SSE but the termination fees were viewed as overly punitive by most stakeholders and were considered to be a significant deterrent for non-delivery and an area where disproportionate risk mitigation was required prior to application. In addition, the Secondary Trading and the penalty system were not found to significantly contribute to low bid prices.
- The evaluation found mixed views on the governance regime and the associated helpfulness of the delivery partners. Whilst half of the respondents viewed responsiveness and communication favourably, there were concerns over poor communication and levels of responsiveness. Many Capacity Market participants felt they did not know who to contact in which circumstances. As Capacity Market Rules and Regulations were found to be overly complex and time consuming to understand, this represented a significant area of concern for stakeholders. In addition, feedback mechanisms were felt to be effective, albeit opaque for users.

Assessing each of the objectives of the Capacity Market, the Impact Evaluation identified the following conclusions:

- Security of Supply:
    - There is strong evidence that the Capacity Market, as part of a wider ecosystem of government policies, has incentivised adequate new and existing capacity onto the system to support the Security of Supply. The scheme is neither necessary nor sufficient to incentivise investment in most cases, however certain technologies (DSR and battery storage) have found Capacity Market revenues to be necessary, though still insufficient in isolation. There have been no SSEs to date and the LOLE has remained sufficiently low. This indicates that there is adequate capacity to supply the forecasted demand but higher than zero LOLP / derated margins shows that the system has avoided over procurement. The evaluation found sufficient evidence of stakeholder challenge to the target capacity to support the claim of appropriate checks and balances. However, the instances of non-zero LOLP as well as CMNs have risen in recent years, indicating a need for continued monitoring.

  - The scheme has awarded contracts totalling 27.7 GW[72] to new build CMUs since 2016. The evaluation did not find evidence that the scheme revenues are instrumental to new build business cases, which are predominantly based on the wholesale market, though there is some evidence that scheme revenues make a higher contribution to the business case for revenue stackers such as DSR and storage.

- Cost effectiveness:
  - The evaluation found auction prices to be low enough the ensure there is low market scarcity. However, one recent auction cleared at the price cap indicating that more capacity was sought than prequalified. This may be as a result of low early auction results not incentivising enough new build to replace ageing plant going offline, indicating a need for continued monitoring.
  - The evaluation found evidence of Secondary Trading occurring, however the volume of Secondary Trading peaked shortly after auctions began and declined with consistently low trading volumes. The evaluation did not find evidence that Secondary Trading and penalties have had an effect on bid prices; rather, termination fees were found to represent a significant area of risk mitigation for providers. Due to low volumes of Secondary Trading, the evaluation did not find clear evidence that Secondary Trading will encourage future participation.
  - The evaluation found strong evidence that low carbon and low carbon enabling assets (in particular, DSR and storage) have been competitive in auction, securing CMAs for every delivery year since 2017. The evaluation found moderate evidence that scheme revenue contributes to the business case to enter the market, with revenue stackers (storage) benefitting the most.

- Unintended Consequences
  - The evaluation did not find evidence that the Capacity Market currently contributes to poor network operability, despite integrating some intermittent generation onto the system.
  - The evaluation found the scheme adapts to certain external shocks but found the scheme is rigid in reacting to structural changes that may impact the energy market, such as the current crisis in Ukraine.
  - There was qualitative evidence that there were positive spillovers from the Capacity Market including contributing to improved investment cases in particular for DSR and batteries for both new build and existing plant leading to positive job and local investment outcomes.

[72] Noted earlier, this includes new builds that have received 1-year agreement in multiple auctions

Suggestions for future market interventions

Suggestion 1: Review the prequalification process

Rationale: The evaluation found the prequalification process to be time and resource intensive for applicants, indicating significant areas for improvement. Applicants can lose out on prequalification due to a perceived harsh judgement of minor errors, must duplicate work when prequalifying the same unit across multiple years and struggle to use the portal. The timing of the prequalification period is also not convenient for many applicants.

Suggestion: The Delivery Body should review the prequalification processes with the intention of reducing applicant burden. Options include gentler judgement of minor errors; updating the portal[73]; allowing an 'evergreen' prequalification process in which information can be pulled from previous years; creating an open dialogue to discuss small appeals allowing amendments to minor errors in applications; and altering the timing so the prequalification period does not coincide with the summer holiday period.

Suggestion 2: Explore using split auctions to incentivise low carbon and low carbon enabling capacity

Rationale: The evaluation found a disconnect between the Capacity Market scheme and wider government policy surrounding decarbonisation as the scheme continues to provide support for unabated, fossil-fuel intensive technologies. A range of stakeholders proposed a split auction to support low-carbon technology in the Capacity Market.

Suggestion: DESNZ should explore options for a split auction[74]. An option of how a split auction could function is to begin by procuring capacity with a low or zero carbon auction followed by a second auction for all capacity to participate. The second auction could offer contracts for capacity needed to reach the target which the first auction did not procure, allowing for the maintenance of resource adequacy while aligning the scheme with Net Zero.

Suggestion 3: Further work to explore options for a centralised and easy to use Secondary Trading marketplace

Rationale: The evaluation found evidence of low Secondary Trading volumes, suggesting the effort required is not matched by penalties for non-delivery. The evaluation found several challenges associated with Secondary Trading: the process of finding counterparties is time consuming and inefficient. Large CMUs must either find another large CMU or multiple smaller CMUs to trade with. Secondary Trading is only allowed after the T-1 auction for each delivery year, meaning providers must wait to trade risking capacity being left untraded if the CMA holder is unable to find an appropriate counterparty in the timeframe.

[73] The EMR portal was updated in 2021 and many stakeholders involved in data collection were unfamiliar with the new portal. The feedback received regarding the EMR portal may therefore based on experiences with the old system with fewer stakeholders perceiving a problem with the current system.
[74] Please note that DESNZ is continuing to explore different auction design with sector stakeholders: www.gov.uk/government/consultations/review-of-electricity-market-arrangements

Suggestion: CM Delivery partners should create a platform to support Secondary Trading. The platform can help CMA holders identify appropriate CMUs to transfer all or part of their agreement more easily. CMUs can use the marketplace to advertise the capacity they wish to trade, or advertise that they can take on more capacity, reducing the risk of penalties to CMUs who struggle to find trading counterparties and removing the administrative burden associated with Secondary Trading.

Suggestion 4: Further work to assess the balance of incentives (penalties, termination, Secondary Trading) to meeting SSE obligations

Rationale: Termination fees are considered overly punitive and are an area for significant risk mitigation for auction applicants. Penalties do not present a sufficiently high risk for CMA holders to pursue mitigating actions resulting in higher risks of not meeting obligations. Stakeholders are also concerned with the mismatch in termination fees between new and existing builds. As margins begin to tighten, these incentives will be tested further.

Suggestion: The evaluation recommends reducing the risk of termination which can be done in conjunction with strengthening the penalty regime. Together, the two regimes can ensure the risks associated with non-delivery remain sufficiently high to discourage Capacity Providers not delivering on their agreements, while potentially removing a barrier to entry from the scheme.

Annex A: Glossary

The glossary of terms has been replicated from Annex C: Glossary in the Capacity Market – Five-year Review (2014 – 2019)[75]

Abbreviation	Definition
Aggregator	An aggregator provides an intermediary service of aggregating DSR capacity from a range of other organisations for the purposes of National Grid ESO Balancing Services or the CM, in return for a share in the revenues generated by those organisations.
Ancillary services	Ancillary services refer to functions that help National Grid ESO maintain a reliable electricity system. Ancillary services maintain the proper flow and direction of electricity, address imbalances between supply and demand, and help the system recover in the event of a black out. They include Balancing Services, as well as other services such as Black Start.
Auction clearing price	The price at which the supply of capacity offered by bidders at that price is equal to the volume of capacity required to be secured in the auction.
Auction parameters	The parameters of the capacity auction, which are determined by the Secretary of State. This includes the capacity target, net-CONE, the price-taker threshold, price cap, the capacity margins and the capital expenditure thresholds.
Capacity	An amount of electrical generating capacity or DSR capacity, usually expressed in megawatts (MW) unless stated otherwise.
Capacity Market Agreement (CMA)	The rights and obligations accruing to a Capacity Provider under the Regulations and the Rules in relation to a CMU for one or more delivery years.
Capacity auction	An auction held under Part 4 of the Regulations, as a result of which successful bidders are awarded capacity agreements.
Capacity Market Notice (CMN)	A signal issued by National Grid ESO four hours in advance that there may be less generation available than expected to meet national electricity demand on the transmission system.
Capacity Market Rules/ CM Rules ("the Rules")	The Capacity Market Rules provide the technical detail for implementing the operating framework set out in the Regulations.
Capacity Market Unit (CMU)	A unit of electricity generation capacity or DSR capacity that can be put forward in a capacity auction. It is the product that forms the capacity to be purchased through the CM.
Capacity obligation	An obligation awarded pursuant to a capacity auction, applying for one or more delivery years, to provide a determined amount of capacity when required to do so in accordance with Capacity Market Rules.

[75] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819760/cm-five-year-review-report.pdf

Abbreviation	Definition
Capacity payment	A payment to a Capacity Provider under the Regulations for its commitment to meet a capacity obligation during a delivery year.
Capacity Provider	A person who holds a capacity agreement or a transferred part in respect of a capacity agreement.
Capacity target	The target capacity recommended to secure through each capacity auction. This is decided by the Secretary of State, based on recommendations from the PTE and analysis by the Delivery Body.
Capacity Market Register	The register which is required to be maintained by the Delivery Body. It records, among other things, each Capacity Provider's capacity obligation for each delivery year, including whether any Secondary Trading of a capacity obligation.
Combined heat and power (CHP)	An electricity generating unit that also supplies heat.
Contracts for Difference (CFDs)	CFDs are 15 year private law contracts between low carbon generators and the Low Carbon Contracts Company. CFDs stabilise revenues for generators at a fixed price level, set by the government (the 'strike price'). Generators receive revenue from selling their electricity into the market as usual, but when the market reference price is below the strike price they receive a top-up payment. If the reference price is above the strike price, the generator must pay back the difference.
Delivery assurance	An umbrella term that refers to the framework of checks and balances that are used to ensure that CMUS are available to deliver their capacity obligation at start of and during the delivery year. This includes processes in the lead up to the delivery year, such as termination events and the posting of credit cover, as well as processes within the delivery year such as satisfactory performance days.
Delivery Body	The national electricity system operator (i.e. National Grid ESO).
Delivery milestones	Milestones imposed on new build CMUs and DSR, such as the Financial Commitment Milestone (FCM), the Substantial Completion Milestone (SCM) and the DSR tests to ensure that they are on track to deliver their capacity committed CMU by the start of the relevant delivery year.
Delivery partners	Refers to Ofgem, the Settlement Body and the Delivery Body.
Delivery year	In relation to a capacity auction, this means the year for which a one year capacity obligation is awarded, or the first year of the period for which a multi-year capacity obligation is awarded. Delivery years run 1st October- 30th September of each calendar year. The delivery year 2019/20 commences on 1st October 2019.
Demand curve	The demand curve shows how the total amount of capacity that will be secured in a capacity auction varies depending on the auction clearing price. It is set at the capacity target to be secured through a capacity auction, plus or minus 1.5GW.

Abbreviation	Definition
Demand side response (DSR)	DSR is a method of reducing electricity demand. This can be achieved by either reducing demand by switching off assets (see turn-down DSR), or by starting up on-site generators to provide electricity in place of drawing it from the distribution network or transmission network (see behind the meter generation).
De-rated capacity	The capacity that a CMU is likely to be technically available to provide at times of peak demand, which is specific to the CMU's technology type and individual characteristics.
Derating factor	A factor that is applied to a CMU's capacity to derive its de-rated capacity.
Dispatch signal	A signal that could be provided by National Grid ESO to signal to operators when their CMU(s) should provide their capacity. Currently there is no dispatch signal for the CM.
DSR Tests	Tests carried out to ensure that DSR Capacity Providers are on track to deliver their capacity obligation before the start of the delivery.
Electricity demand reduction (EDR)	Energy efficiency projects that deliver lasting electricity savings at peak.
Electricity Market Reform (EMR)	A programme created by DESNZ (formerly BEIS and DECC) to deliver secure electricity supply and new low carbon generation. It consists of four mechanisms: Contracts for Difference, the Capacity Market, Carbon Price Support and an Emissions Performance Standard.
Electricity Settlements Company / ESC / Settlement Body	Referred to in the CM legislation as the "Settlement Body". A private limited company owned by the Secretary of State for the Department, established to oversee the settlement of payments to and from suppliers and Capacity Providers such as the supplier charge and capacity payments.
Emissions Performance Standard (EPS)	A policy that was implemented as part of EMR. It limits carbon dioxide emissions from new fossil fuel power stations.
Load factor	The proportion of total hours that an energy generation resource runs throughout the year.
Loss of load expectation (LOLE)	the number of hours/periods per annum in which it is statistically expected that electricity supply will not meet demand.
Megawatt (MW)	A unit of capacity (1000 kilowatts)
Missing money problem	The lack of financial incentive to build new generators or refurbish existing generators to provide capacity caused by generators' and investors' uncertainty about whether the prices they would eventually receive for generating electricity and selling it in the wholesale electricity market would cover the costs of those activities.
National Grid Electricity System Operator (ESO)	The organisation operating the national electricity transmission network for GB.

Abbreviation	Definition
Net cost of new entry (net CONE)	Net CONE represents the additional revenue that a new generation resource would need to recover to funds its capital investment and fixed costs, given reasonable expectations about the amount of money it is expected to make from energy markets over its economic life. In GB the value of net-CONE is currently based on a combined cycle gas turbine (CCGT).
New build capacity / New build generator/ New build generation	Generators that are to be or are being constructed.
New build CMU	A generating CMU that is not built at the time of the relevant capacity auction.
Obligation trading	The transfer of part or all of a capacity obligation from one Capacity Provider (the transferor) to another (the transferee).
Ofgem	A non-ministerial government department and an independent regulator, governed by the Gas and Electricity Markets Authority. Ofgem's powers and duties in relation to the CM are provided for in Chapter 3 of Part 2 of the Energy Act 2013 (c. 32), the Regulations and the Capacity Market Rules, in which it is referred to as "the Authority".
Panel of Technical Experts (PTE)	An independent panel of experts that are appointed by the Secretary of State to oversee the development of auction parameters and derating methodologies.
Pay as bid	An auction model in which all successful providers will be paid their bid price.
Pay as clear	An auction model in which successful providers will be paid the auction clearing price set by the most expensive bid submitted by a successful provider (as opposed to their bid price). This is the auction model used in the capacity auctions.
Penalty regime	The regime of financial penalties that are applied to Capacity Providers who do not provide their committed capacity during a system stress event.
Prequalification	The process set out in the Capacity Market Rules for the Delivery Body to confirm whether a CMU may bid in a capacity auction. A CMU must meet the requirements specified in the Regulations and the Capacity Market Rules to be prequalified.
Price cap	The starting price of the capacity auction. Currently set at £75/kW/year.
Price-maker	A prequalified CMU who is allowed to bid into a capacity auction above the Price-taker threshold. New build generators and DSR capacity are automatically able to participate as price-makers without justification, but existing generators must justify why they should be allowed to be registered as price-makers.
Price-taker	A prequalified generating CMU is automatically a price taker unless they are registered as a price-maker.
Reliability market / reliability option	An alternative energy security measure in which capacity payments are funded by suppliers through cash-out prices.

Abbreviation	Definition
Satisfactory performance days (SPDs)	Days within the delivery year in which Capacity Providers must demonstrate that they are able to deliver their capacity obligation.
Secondary Trading	Trading by Capacity Providers in respect of the capacity obligations they hold. Takes the form of obligation trading or volume reallocation. Settlement Body The body tasked with overseeing the settlement of payments to and from supplier and Capacity Providers.
Split auction	An auction design in which different types of capacity are auctioned separately e.g. new build and existing or different capacity types.
Strategic reserve	An alternative energy security measure that involves setting aside a pool of generation from the main electricity market, to be deployed during times of system stress.
System stress event (SSE)	An SSE occurs when demand for electricity outstrips supply; it is defined in Rule 8.4.1 of the Rules.
T-1 auction	This is the capacity auction held one year ahead of the delivery year, which 'tops up' any capacity secured in the relevant T-4 auction.
T-4 auction	This the capacity auction held four years ahead of the delivery year, which secures the large majority of capacity needed in the relevant delivery year.
Termination	In order to prevent speculative bidding and create strong incentives for new build CMUs to deliver new capacity on time, new build capacity and unproven DSR that is not on track to deliver in time for the delivery year may have its capacity agreement terminated, resulting in termination fees.
The reliability standard	The decision on how much capacity to secure in each capacity auction is informed by the statutory reliability standard. This is an objective level of security of electricity supply representing the trade-off between the cost of providing additional back up capacity and the level of reliability achieved. It is expressed as LOLE i.e. the number of hours/periods per annum in which it is statistically expected that supply will not meet demand. For the GB electricity market, the reliability standard required is 3 hours LOLE per year (providing a system security level of 99.97%). The reliability standard is defined in regulation 6 of the Regulations.
Transitional Arrangements (TA) auctions	Two standalone capacity auctions designed specifically to support, and open only to, nascent DSR participants (and distribution connected generators) to prepare them for competition in the main capacity auctions. They were held in January 2016 for the delivery year 2016/17 and March 2017 for delivery year 2017/18.
Transmission network	This is the high-voltage electricity network that transmits large quantities of electricity over long distances across the country (cf. distribution network).
Unproven DSR	DSR that has not yet demonstrated it has the necessary metering in place or demonstrated it can deliver a specified level of capacity.

Abbreviation	Definition
Value of lost load (VoLL)	VoLL is a monetary indicator expressing the costs associated with an interruption of electricity supply (in other words, the average value that electricity consumers attribute to additional capacity needed to maintain security of electricity supply).
Volume reallocation	(See Secondary Trading) Where over-delivery by a CMU during an SSE (relative to the CMU's capacity obligation) is reallocated to another CMU that has under-delivered during the SSE.
Wholesale electricity market	The market in which generators sell electricity to suppliers.

Annex B: Survey Methodology

A survey of CMA holders was conducted between May 2022 and July 2022. The survey collected evidence of experiences and views from the Capacity Market participants. This was a key source of quantitative data, allowing triangulation with the interviews and secondary data analysis. The online survey was shared with Capacity Market participants that by the time of the survey have, or have had, Capacity Market agreements.

The survey was sent to 153 CMA holders. Table 1 shows the number of responses received. 25 Capacity Market participants responded to the survey - representing 38.7% of the total capacity awarded since the Capacity Market was in operation and 33.97% of the total number of CMUs that have or have had a Capacity Market agreement. From the total number of respondents six were identified as “big players” in the industry and in the Capacity Market.

As Table 1 shows most of the respondents were CMA holders with high-carbon CMUs (e.g. CHP and Auto generation) followed by CMA holders with DSR. The majority of respondents were participating in the Capacity Market with existing generation builds. The profile of the respondents in terms of technology type reflect the characteristics of all the Capacity Market participants. However, there was a clear underrepresentation of new build CMU within the survey respondents.

Table 1 Comparison of survey respondents’ technology profile with all Capacity Market participants’ technology profile

Technology type	All CMA holders over time (Percentage of total CMUs)	Survey respondents
CHP and Autogeneration	8.97%	13.84%
Coal	0.15%	0.46%
Coal/Biomass	2.20%	2.08%
Combined Cycle Gas Turbine (CCGT)	8.72%	7.15%
Combined Heat and Power (CHP)	7.88%	11.45%
DSR	18.17%	25.60%
Energy from Waste	3.97%	0.54%
Hydro	6.22%	8.99%
Interconnector	1.16%	2.00%
Mixed	0.58%	0.46%
Nuclear	2.63%	3.07%

Technology type	All CMA holders over time (Percentage of total CMUs)	Survey respondents
OCGT and Reciprocating Engines	18.25%	7.84%
Oil-fired Generators	0.15%	0.00%
Onshore Wind	0.45%	0.08%
Open Cycle Gas Turbine (OCGT)	2.00%	5.69%
Reciprocating engines	10.18%	7.76%
Storage	6.44%	2.92%
Unknown	1.87%	0.08%

Table 2 Comparison of survey respondents CMU category profile with all Capacity Market participants CMU category profile

CMU Category	All CMA holders over time (Percentage of total CMUs)	Survey respondents
Existing Generating CMU	57.52%	63.11%
Existing Interconnector CMU	0.81%	0.92%
New Build Generating CMU	20.12%	8.46%
New Build Interconnector CMU	0.35%	1.08%
Proven DSR CMU	2.73%	4.77%
Refurbishing Generating CMU	2.02%	0.85%
Unproven DSR CMU	16.45%	20.83%

As part of the survey analysis framework, survey questions were explicitly mapped to the relevant HLEQs and PT framework tests. Analysis of survey responses were conducted on a question-by-question basis using Excel.

Annex C: Interview Methodology

Interviews were the primary form of data collection and were employed to explore why and in what context the Capacity Market has or has not operated as intended. In particular, they were used to gather information on effectiveness and efficiency of the Capacity Market processes and ways in which specific mechanisms have affected decision making (e.g. participation, auction bids, investment decisions), alternative business model routes in the absence of Capacity Market agreements and the role of the Capacity Market in attracting private sector investment. The extent to which the Capacity Market has met its intended objectives was also explored. Interviews were structured to ensure the evidence covered key areas in sufficient depth to carry out the proposed PT tests.

As part of Phase 1 and Phase 2 of this evaluation a series of qualitative semi-structured interviews were conducted with Capacity Market providers, non-providers, investors and key sector stakeholders. Phase 1 interviews were conducting during March 2022 and Phase 2 interviews were conducted between June 2022 and August 2022. The table below provides a breakdown of the number of target and achieved interviews with representatives of each stakeholder group, across both Phase 1 and Phase 2 of the evaluation.

Table 3 Phase 1 and Phase 2: interviews achieved against targets

Stakeholder Group	Target no. of interviews Phase 1	Achieved no. of Interviews Phase 1	Target no. of interviews Phase 2	Achieved no. of interviews Phase 2	Total no. of achieved interviews
Capacity Providers – hold (or held) a CM agreement	0	0	30	22	22
CM providers – unsuccessful bids/ agreements terminated/ did not participate	0	0	15	8	8
Investors	0	0	10	8	8
Key sector stakeholders and the Delivery Bodies (Ofgem, DESNZ, NG ESO)	10	10	0*	4	14
Total	10	10	55	42	52

* Interviews with sector stakeholders and delivery bodies were initially only planned in Phase 1. The methodology was later revised to include further interviews with these stakeholders in Phase 2.

A high number of CMA holders interviewed participated in the Capacity Market with DSR followed by high-carbon technologies such as CCGT and reciprocating engines. The profile of interviewees is very similar to the profile of all CMA holders over time.

Table 4 Comparison of interviewees' technology profile with all Capacity Market participants' technology profile

Technology type	All CMA holders over time (Percentage of total CMUs)	Interview respondents
CHP and Autogeneration	8.97%	5.27%
Coal	0.15%	0.53%
Coal/Biomass	2.20%	1.58%
Combined Cycle Gas Turbine (CCGT)	8.72%	13.43%
Combined Heat and Power (CHP)	7.88%	2.90%
DSR	18.17%	28.97%
Energy from Waste	3.97%	0.09%
Hydro	6.22%	10.27%
Interconnector	1.16%	2.90%
Mixed	0.58%	0.61%
Nuclear	2.63%	3.51%
OCGT and Reciprocating Engines	18.25%	9.92%
Oil-fired Generators	0.15%	0.00%
Onshore Wind	0.45%	0.35%
Open Cycle Gas Turbine (OCGT)	2.00%	6.41%
Reciprocating engines	10.18%	4.83%
Storage	6.44%	8.17%
Unknown	1.87%	0.26%

As with the survey, a limitation of the sample frame for the interview programme was a clear underrepresentation of new build CMU within the survey respondents (Table X).

Table 5 Comparison of survey respondents CMU category profile with total Capacity Market participants CMU category profile

CMU Category	All CMA holders over time (Percentage of total CMUs)	Interview respondents
Existing Generating CMU	57.52%	58.21%
Existing Interconnector CMU	0.81%	1.67%
New Build Generating CMU	20.12%	8.34%
New Build Interconnector CMU	0.35%	1.23%
Proven DSR CMU	2.73%	4.65%
Refurbishing Generating CMU	2.02%	1.40%
Unproven DSR CMU	16.45%	24.50%

All interviews were carried out via video conference (MS Teams) and lasted around 1 hour on average. Interviews were audio recorded (with respondent's consent) and then transcribed into individual Word documents. Nvivo, a qualitative data analysis software package was used to store and structure the data analyses. This involved identifying different concepts within the dataset, and subsequently assigning these different concepts to different "nodes", or themes of interest. The list of nodes was mapped to key parts of the relevant HLEQs and PT framework tests. The analysis assessed coded data at each node for evidence that did or did not support the hypotheses that are implicit in the process tracing framework.

Annex D: Secondary Data Methodology

Secondary data was used to inform the evaluation and validate findings from the primary data collection (interviews and survey). In particular, they were used to provide quantitative evidence to support findings. Some secondary data sources were provided to the evaluation team by DESNZ and others are open source. Table 6 outlines the data used, where they were accessed from, and the useful information gathered from each source.

Table 6 Secondary data sources

Data source	Source	Dataset(s) analysed
Auction results	www.emrdeliverybody.com/CM/Published-Round-Results.aspx	Total amount of capacity entered awarded at each auction Clearing price at each auction
Capacity Market Registers	Capacity Market Registers available here: www.emrdeliverybody.com/CM/Capacity-Market-Register.aspx	Characteristics of different CMA holders and auction entrants Characteristics of each auction and delivery year, including total spend
Capacity Market Notice data	https://gbcmn.nationalgrideso.com/	Number and frequency of CMNs
Digest of UK Energy Statistics 5.1.2 - Electricity supply, availability and consumption 1970 - 2020	www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes	UK electricity availability and consumption between 1970 and 2020 Volume of excess electricity 1970 – 2020
BEIS Electricity Generation Costs 2020 – Key data and assumptions for generation technologies	www.gov.uk/government/publications/beis-electricity-generation-costs-2020	Estimated CapEx and OpEx for different technology types – used alongside Capacity Market Register data to explore the typical proportion of revenue from the Capacity Market (by technology type)
Loss of Load Probability (LoLP) and De-rated Margin – Historic data	https://bmreports.com/bmrs/?q=transmission/lossloadProbDerateMargin/historic	Loss of load probability and de-rated margin – including annual averages, and frequency of exceeding 0
National Grid ESO – Carbon Intensity	www.nationalgrideso.com/future-energy/our-progress/carbon-intensity-dashboard	Carbon intensity of GB electricity system over time

Secondary data was downloaded or accessed and cleaned. Data analysis was conducted primarily using Microsoft Excel. The datasets were analysed using standard techniques for

data analysis with Excel such as pivot tables, to ascertain which aspects of each dataset would be useful for the evaluation.

Once findings from the primary data collection techniques began to emerge, secondary data was further analysed to triangulate and verify claims.

Annex E: Process Tracing

Process Tracing methods were used as a means of developing tests that assess the strength of evidence in support of contribution claims.

Process Tracing makes causal inferences by identifying types of 'clues' that would either support or reject programme hypotheses if observed. There are four types of causal tests commonly used in Process Tracing (PT). The tests are based on the principles of certainty and uniqueness; in other words, whether the tests show evidence that is necessary and/or sufficient for inferring causal links. The types of tests are briefly defined below in order to show how conclusions were drawn on the contribution Capacity Market has made to its intended outcomes and impacts.

- **"Hoop tests"** – disproves or considerably weakens the hypothesis if not found, but not sufficient to confirm the hypothesis. These are pieces of evidence that we would 'expect to see' if the given hypothesis is true
- **"Straw-in-the-Wind"** – evidence that lends more support to a causal claim in the hypothesis but not sufficient in itself to confirm it if observed, or to disprove with certainty if not observed. For example, evidence based on interview findings alone may be considered 'shaky' (like a straw-in-the-wind) if there is potential for positive confirmation bias among grant funded participants who wish to portray an overly positive picture of benefits achieved
- **"Smoking gun"** – evidence that provides a convincing cause-and-effect type contribution story. It strengthens the hypothesis if observed but does not disprove the hypothesis if not observed (although may slightly weaken it). These are pieces of evidence that we would ideally 'like to see' if a given hypothesis is true but may in practice be difficult to uncover
- **"Double-decisive"** – strengthens or confirms the hypothesis if observed and if not observed the hypothesis is rejected or significantly weakened.

Finally, the approach to categorising the strength of evidence across multiple sources was also informed by two of the additional tests defined by Delahais and Toulemonde (2017[76]) for assessing the strength of supporting evidence in theory-based evaluation:

- **Authoritative source** - a piece of evidence which has already passed a thorough test or reliability by credible authorities. An example is published reports on the safety assessment of using hydrogen boilers, which have undergone independent peer review and acceptance by the HSE
- **Convergent triangulation** - sources that are independent from one another in so far as they stem from stakeholders having different vested interests. Pieces of evidence originating from such sources are mutually reinforcing as far as they converge

[76] Delahais, Thomas and Toulemonde, Jacques (2017) Making rigorous causal claims in a real-life context: Has research contributed to sustainable forest management?. Evaluation. 23. 370-388. 10.1177/1356389017733211.

The Process Tracing Framework used in the evaluation is attached as an Addendum to the Report.

Annex F: Process Map

Further information relating to the Process Map is described below.

Target Capacity

The amount of capacity for which capacity agreements are to be auctioned is determined by the Secretary of State. This decision is informed by analysis provided by the annual National Grid ESO Electricity Capacity Report[77] and scrutinised by a Panel of Technical Experts[78].

Prequalification and Auction

Prequalification - Before (4-5 months ahead of the auction) participating in a Capacity Auction, companies need to apply to prequalify the generation, storage or demand side response (DSR) resources for which they are seeking Capacity Agreements.

To participate in the prequalification process, applicants must first register their company in the EMR DB portal[79]. Upon completion, the EMR Delivery Body validate Authorised Person against public records and set up an account on the EMR Delivery Body Portal. As a second step, applicants need to complete a Prequalification application form. The EMR Delivery Body oversees of assessment of all applications and notifies the parties of the outcome. CMU applicants are then notified if their application has been Prequalified, Conditionally Prequalified, Rejected or had their Capacity Connection changed during the Prequalification process.

Disputes - A brief description of any errors found in an application is provided in the Prequalification Results letter. If an applicant disagrees with the decision made by the EMR Delivery Body they may raise a dispute to have a decision reviewed. Tier-1 disputes are assessed by the EMR Delivery Body within one month after they submission. Tier-2 disputes are assessed by Ofgem which will then consider the appeal and inform of the outcome[80].

Pre-Auction activities - Applicants that have successfully prequalified must then confirm entry to the Capacity Auction and complete the relevant pre-Auction activities. At this stage, the EMR Delivery Body also provides government with aggregate derating capacities for each category of applicant. They also recommend any required adjustment to the demand curve for capacity to be procured in the Capacity Auction.

[77] www.emrdeliverybody.com/CM/Capacity.aspx
[78] Panel of Technical Experts Terms of Reference
[79] www.emrdeliverybody.com/CM/Prequalification-Process.aspx
[80] See: https://cmuat.emrdeliverybody.com/CM/Disputes.aspx

In addition, three important parameters are confirmed by the EMR Delivery Body before the auction[81]:

- **The maximum price**: the maximum price the auction can clear. After this price is met, no additional capacity will be auctioned.
- **The net-CONE**: the Cost of New Entry (CONE) to the market[82].
- **Price taker threshold**: a lower threshold for existing Capacity Providers, as the cost for existing generators is expected to be lower than new entrants.

As part of the pre-auction activities, it is also decided if a CMU enter the auction either as a 'Price Taker' or 'Price Maker'. CMUs that are Price Takers may only choose to submit Exit Bids at a price lower than the "Price Taker Threshold". CMUs that are Price Makers are free to submit Exit Bids at any price less than the Auction Price Cap. By default, all Existing CMUs are Price Takers. However, existing generation CMU or interconnectors CMU can submit a price-maker memorandum[83] to Ofgem to become a Price-Maker within the Capacity Market auction.

Auction - After the prequalification and pre-auction activities processes are concluded, participants have to log in to the IT Auction System to apply to the Capacity Auction. Before the Capacity Auction takes place, applicants can take part in a mock auction.

The Capacity Auction is then run using a descending clock format with multiple rounds. The first round starts with the price set at the Price Cap. The Capacity Auction clears when the supply (remaining capacity) is less than or equal to the demand at the Bidding Round Price Floor.

Within 24 hours of the Capacity Auction closing, Bidders are notified whether, based on provisional results, they have been awarded a Capacity Agreement. Official results are published 8 working days after the conclusion of the auction, on Auction Results Day. Capacity Market agreements come into force on Auction Results Day, following publication in the Capacity Market Register, and Capacity Agreement Notices with details of the agreements are released after 20 days from the auction.

Agreement

Once CMA awarded, Capacity Providers are required to meet agreement milestones in line with their agreements/the Capacity Market Rules. These confirm that the CMU has been commissioned or recommissioned or is operational. The Delivery Body then checks that assessments and tests have been made for each CMU-type in line with Capacity Market Rules. The milestones and associated impacts vary depending on the type of CMU but overall affect whether a unit can continue to hold an agreement. In addition, if there is a SSE before

[81] More information on how these parameters are calculated: Background on setting Capacity Market parameters1

82 Net-CONE is defined as the cost of a new entrant after accounting for wholesale and ancillary market revenues. It is the key anchor point for the Capacity Market demand curve, by providing an estimate of Capacity Market revenue requirements of a new entrant. - Background on setting Capacity Market parameters1

[83] See: www.ofgem.gov.uk/publications/providing-price-maker-memorandum-authority-guidance

the necessary milestones are completed the Capacity Agreement holder may not receive payments.

The Capacity Agreements comes into effect once they are published in the Capacity Market Registers. Payments shall be made from this point.

Delivery

All Capacity Providers are required to demonstrate that they have met the capacity obligation which they acquired at auction on three separate days (Satisfactory Performance Days, or SPDs) over the winter of relevant Delivery Year. This capacity must be demonstrated for at least one Settlement Period on each of those days.

In addition, Capacity Providers which have secured a Capacity Agreement at the auction must deliver against their capacity obligation during a system stress event (SSE) or face a financial penalty. The Capacity Market Notice is a signal to all providers that system stress is anticipated and is automatically issued when margins fall below a given threshold 4-hours ahead of time. Providers can deliver the obligation by scheduling generation or proactively reducing consumption to deliver sufficient electricity to meet their "Adjusted Load Following Capacity Obligation" (ALFCO)[84].

Termination

The Delivery Body is responsible for determining whether a termination event has occurred and issuing notices to the Capacity Provider, Secretary of State and the Settlement Body. The termination process can also be initiated by the Secretary of State if they become aware of prohibited activities. Once the Termination Notice has been issued, the Capacity Provider has 60 Working Days before the agreement is ended for a particular CMU. In certain situations, a notice of intent to terminate may be issued. Once the Termination Notice has been issued, the Capacity Provider can submit a request to either have the Notice withdrawn or request an extension to the termination date.

When an agreement is terminated, the Delivery Body sends a further notice to the Capacity Provider, Secretary of State and EMRS confirming the end date and reason for the termination. Certain termination events have fees associated with them. Termination events may also trigger the repayment of the monthly capacity payments that the Capacity Provider has received.

[84] See: www.lowcarboncontracts.uk/sites/default/files/2019-05/Capacity%20Market%20Stress%20Event%20Guide%20v1_0.pdf

Secondary Trading

Secondary Trading is intended to mitigate both financial risks to participants (via penalties) and risks to the security of supply. Secondary Trading occurs when a Capacity Provider transfers all or part of a Capacity Agreement to an Acceptable Transferee in respect of another CMU. The agreement is exchanged for a Capacity Committed CMU for all or a specified number of calendar days in a Delivery Year. The minimum period for a secondary trade is 1 working day and the maximum length is the full delivery year.

There are three types of secondary trading:

- **Obligation trading** - Prior to delivery capacity providers can trade their obligations to provide capacity in what is known as obligation trading. This occurs after the T-1 auction, in the year before delivery. If capacity providers are concerned about delivering, they can trade with other capacity providers, and the process is monitored and enacted by ESO. Unsuccessful bidders from the auctions are automatically considered to be acceptable transferees and can participate in the secondary market.
- **Volume reallocation** - During a system stress event, some capacity providers may not be able to deliver the required capacity, so volume is reallocated to a capacity provider who will be able to over-deliver on their agreement. After a system stress event, if a capacity provider failed to deliver, they can again reallocate capacity to another provider who did deliver, to avoid being penalised for failing to deliver.
- **Financial trading** - This is an agreement between two capacity providers to act as insurers if one party fails to fulfil their capacity obligation. For example, for a fixed free, one capacity provider agrees to pay another if the first provider receives a penalty. This works if the second provider receives overpayment for their capacity.

An alternative for DSR capacity providers is component reallocation in which DSR providers can replace a portion of their assets with new ones (e.g. in the event that the DSR provider loses a certain portion of their customers).

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