Capacity Market reform – greater resilience and value for money, with less carbon

An enhanced and optimised Capacity Market has the potential to deliver a lot more than just capacity adequacy. It could add to our overall system resilience, incentivise flexibility and other system capabilities, and support the net zero transition; all at a lower cost to the consumer.

In this insight paper, Regen explores the development of the current Capacity Market design, its evolution to date, and the options for reform being considered as part of the Review of Electricity Market Arrangements (REMA) process.

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1. Reforming the Capacity Market

The Capacity Market (CM) has been a critical element of the current electricity market arrangements since its introduction in 2013. Its key purposes are to ensure that there is sufficient capacity adequacy by providing a subsidy to existing capacity that would otherwise exit the market, and to encourage investment in new capacity. Over the next decade, it will be especially important to incentivise investment in energy storage and dispatchable low carbon generation, which will be essential for a very high renewable energy system.

The design and operation of the Capacity Market is currently under review as part of the government's **Review of Electricity Market Arrangements (REMA)**. The government has also recently **consulted on the operation of the existing Capacity Market 2023** with a focus on security of supply and alignment with net zero.

There is some overlap between the **REMA review** and the **Capacity Market 2023 consultation**, but broadly speaking, REMA is considering the wider design, objectives and purpose of the CM over the longer term, while the 2023 consultation focused on the specifics of its current operation, such as performance testing, assessment of connection capacity and the non-delivery penalty regime. The 2023 consultation also contains proposals that would go part of the way to end the ***"inconsistency between our decarbonisation commitments and the 15-year agreements available for unabated fossil fuel generation"*** with a specific proposal to reduce the emission intensity limits applicable to new build plants from 1 October 2034[1] to 100g CO_2 per kWh.

1 Emission limits are currently set at 550g CO_2kWh, which is below the level of coal and diesel, although higher carbon technologies can still participate if they adhere to an absolute yearly emission limit of 350kg CO_2/kWh – which limits coal/oil/diesel to around 400 hrs of operation (4.5% utilisation) and older gas (650g per kWh) to 580 hours operation (6% utilisation factor).

Regen has submitted its response to the Capacity Market 2023 consultation, which you can see **here**. In this insight paper, we reflect more widely on the purpose and design of the Capacity Market with a focus on four critical outcomes:

1. **Decarbonisation** – ensuring that the CM supports (and does not hinder) the UK's net zero targets.
2. **Flexibility and resilience** – ensuring that the market provides not just capacity, but other attributes and capabilities that will be essential in providing resilience and security in a more dynamic future energy system.
3. **Capacity adequacy** – ensuring that the CM and/or other mechanisms are sufficient for an adequate capacity margin over both the short and long term.
4. **Value for money** – ensuring that a) the Capacity Market works efficiently to secure energy security at a competitive price and b) that assets that are being supported via the CM are prevented from gaming and exploiting their position in the Balancing Mechanism.

Regen's recommendations

1. **Strengthening and accelerating the decarbonisation of the Capacity Market** by setting tougher (and earlier) carbon intensity limits and reducing/removing annual carbon allowances.
2. Developing the **"Optimised Capacity Market plus Flex"** REMA design that recognises the system value of attributes and capabilities such as flexibility and responsiveness, which will be critical to ensure system resilience and manage more dynamic and diverse system events in the future.
3. Extending the use of a separate **Strategic Reserve** (including an option to bring assets into public ownership) to a) ensure capacity adequacy, b) send a strong decarbonisation signal c) reduce price pressure within the Capacity Market and ensure value for the consumer.
4. Linking the Capacity Market to a **new code of behaviour and generator obligations** in the Balancing Mechanism to ensure that CM participants do not then exploit their market position, or 'game' the market to earn super-profits through system balancing.

2. Capacity Market – background and basics

First introduced in 2013 as part of the **Electricity Market Reform** package that included Contracts for Difference (CfD), the CM provides a mechanism by which the government can subsidise ('buy') capacity adequacy to ensure that the GB energy system has sufficient capacity margin available to meet peak (winter) demand and to manage potential 'stress events'.

It does this by providing an annual capacity payment to generators which serves two purposes:

1. **It provides a subsidy** to older and more expensive generators who would otherwise find it uneconomic to remain in the market, and
2. **It contractually ensures that generators must be available** to provide capacity in the event of a defined stress event when called upon by the system operator (via a **Capacity Market notice**).

The Capacity Market notice, which must be issued at least four hours in advance of any event commencement, is automatically triggered if the available capacity margin forecast is less than 500 MW. So far, the CM notice has been issued on a fairly regular basis (usually in winter, but in 2022 a summer notice was issued) but has always then been cancelled by the ESO well before a stress event commencement.

The Capacity Market operates via a clearing market auction in which the government instructs the ESO to 'buy' an amount of capacity. There are normally two separate auctions for capacity, four years ahead (T4) and one year ahead (T1). New build assets, however, receive a CM contract that lasts for up to 15 years – this is a significant incentive to build new assets. The normal strategy is for the government to instruct the ESO to buy a certain amount of capacity adequacy four years ahead (the T4 auction) and then to top that up with a smaller amount of additional capacity in the year ahead (T1) auction.

In theory, all generation assets can now compete in the CM, even variable renewable generation, provided they pre-qualify and have sufficient controls in place to assure performance. Variable generation assets and short duration storage assets (less than four hours) are however significantly 'de-rated'[2] and so receive much lower CM payments. Despite this de-rating and the need to pass performance tests, storage assets have been competing successfully in the market for some years, and this has helped to encourage them to increase their duration. The 2023 auction also saw the first offshore wind farm to receive a CM contract, although, as Figure 1 shows, this pales in comparison to the capacity awarded to gas-fired assets.

2 The CM market is based on the provision of four hours of generation/supply. The capacity of shorter duration storage assets (e.g. 1hr, 2hr, 3hr duration) is de-rated (reduced) as a proportion of the full four hour supply. Variable renewables are also heavily de-rated based on a calculation of their statistical probability of availability during a stress event.

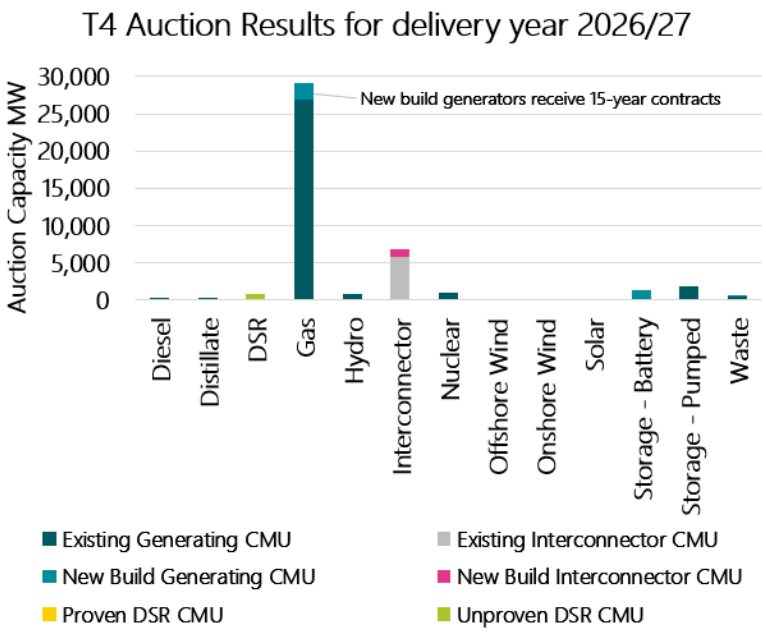

Figure 1. Capacity Market – T4 Auction Results for delivery year 2026/27

The CM auction clearing price is primarily a function of how much capacity the government wishes to buy and the available generation, but it also reflects generators' forecast of future market conditions and whether they will be able to earn revenue in the wholesale and balancing markets. Competition within the Capacity Market is critical. Since its inception, CM prices have increased significantly, reflecting tighter margins as coal and nuclear stations have come offline, and a lower expectation of future market revenue.

This highlights an inherent problem: if there is a loss of liquidity (fewer generators competing for more capacity), then the CM auction will be exposed to **scarcity rent**[3] taken by the marginal generators and **infra-marginal rents**[4] for other generators. To put this in plain English, a few generators can push up the auction price for everyone if they realise that their capacity is now essential for energy security.

Without reform, future CM prices are likely to be even higher. There is already a question as to whether the Capacity Market offers value for money, and a proper means of price discovery.

3 **Scarcity rent** – excess profit earned by exploiting capacity shortages and (in this case) fear of loss of supply.

4 **Infra-marginal rents** – excess profit earned by lower cost generators in a clearing price market where the price is set by higher cost generators.

2.1 Unsustainable Capacity Market costs – the 2022/23 T4 Auction Results

The latest CM auction round has again produced a record-breaking clearing price result. This has largely been unnoticed in the media but represents a significant (and unsustainable) increase in energy system costs. The 2022/23 T4 auction for delivery year 2026/27 was notable for a number of reasons:

- T4 CM auction prices have risen from less than £20 per KW to a record breaking **£63 per kW** in the 2023 auction for delivery in 2026/27 – a total eye-watering auction cost of **£2.7 billion** for the year.
- The capacity going into the auction was already low and **(3 GW)** exited within three bidding rounds – implying that there was limited capacity in competition. Hence the high auction clearing price.
- Energy storage continued to perform well with **1.2 GW** awarded capacity.
- Over 2 GW of new build unabated fossil fuel plants were awarded lucrative 15-year contracts – including **510 MW** of reciprocating engines and **1552 MW** of new CCGT capacity.
- T1 auction prices have also increased reaching new peaks at £75 per kW for delivery year 2022/23.

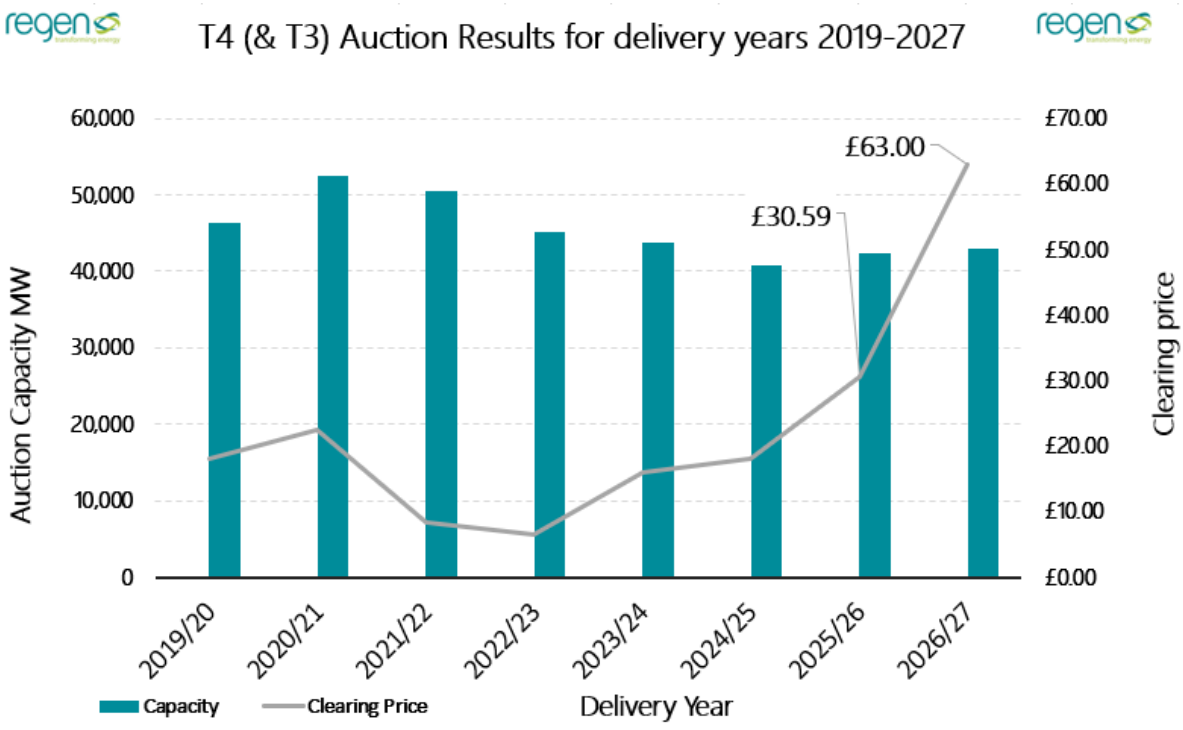

Figure 2. Capacity Market – Year 4 Auction Results for delivery years 2019/20 to 2026/27

3. Capacity Market reform objectives

The REMA consultation has identified a number of potential market reforms and design options (see Appendix 1 – Short Description of REMA Design Options) including optimisation of the current Capacity Market, enhancements to recognise the value of flexibility, a centralised reliability option, a targeted tender approach and the creation of a separate Strategic Reserve. Since its publication last summer, a number of options have already been discounted, as shown in red in Figure 3. Options highlighted in orange have been discounted as standalone mechanisms but are being considered in conjunction with other reforms.

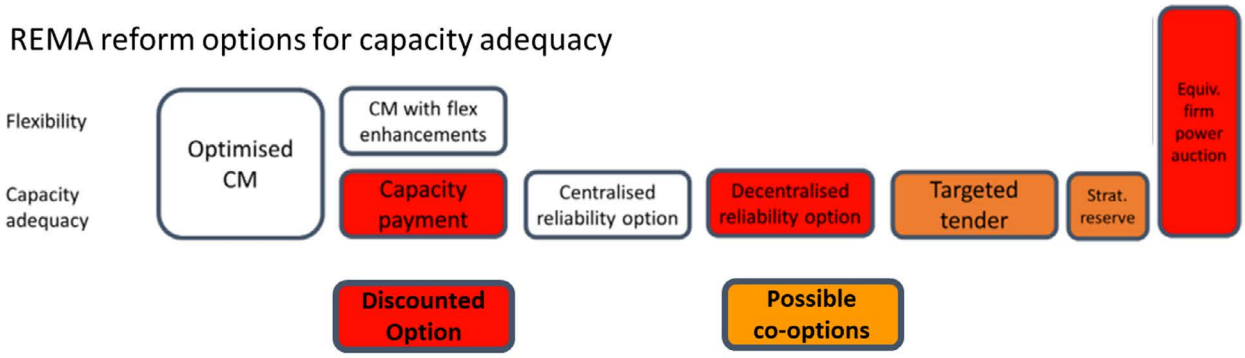

Figure 3. REMA options for Capacity Adequacy – DESNZ

The consultation response from industry stakeholders suggests strong support for a future market based on optimising the existing Capacity Market to support both low carbon solutions and to promote greater flexibility. There was also support for a Strategic Reserve, although mainly as a secondary option to manage energy security during the transitional phase when unabated fossil fuel capacity will be needed as a backup.

Stepping back from the various options under consideration, the REMA market reforms are essentially trying to deliver four energy security and net zero strategic outcomes:

1. **Decarbonisation** – ensuring that the CM supports (and does not hinder) the UK's net zero targets.
2. **Flexibility and resilience** – ensuring that the market provides not just capacity, but other attributes and capabilities that will be essential to provide resilience and security in a future, changing and more dynamic, energy system.
3. **Capacity adequacy** – ensuing that the CM and/or other mechanisms are sufficient to ensure an adequate capacity margin over both the short and long term.
4. **Value for money** – ensuring that a) the Capacity Market works efficiency to secure energy security at a competitive price and b) that assets that are being supported via the CM are prevented from gaming and exploiting their position in the Balancing Mechanism.

3.1 Decarbonisation

3.1.1 Backing the right low carbon solutions

The UK needs to invest significantly in new dispatchable generation to provide capacity that can be flexed around the output of variable generation, like wind and solar. This is highlighted in Regen's study for National Grid ESO; **A Day in the Life of the electricity system 2035**[5], and recent analysis from the **Climate Change Committee**[6].

However, at this stage in the UK's net zero transition, dispatchable generation should be in the form of low carbon solutions such as battery storage, gas with carbon capture and storage (CCUS), and hydrogen-fuelled power generation and storage. The expansion of CCUS has been severely delayed, while the availability of hydrogen-fuelled turbines for power generation is a relatively new market development.

The reason why CCUS deployment has been disappointingly low is a point of contention. The basic technology has been available for some time and, although early projects have produced mixed results in terms of cost and efficiency, there is not a significant technological barrier to overcome. The UK government continues to provide significant support for CCUS technology deployment[7] – the main barrier, therefore, seems to be the willingness of investors to commit to this technology and the willingness of existing fossil fuel generation to convert to a new technology which could cannibalise their existing assets (and revenues).

Whatever the reason for the lack of investment in low carbon dispatchable technology, it is clear that the Capacity Market arrangements, and the current carbon intensity limits within the Capacity Market, have not prevented unabated gas turbines and reciprocating engines from dominating the market.

This presents a policy dilemma: we need security of supply, but the 15-year term for new unabated fossil fuel generation takes the contract beyond the 2035 target for the UK to decarbonise its electricity supply. Continuing to support new build and refurbished fossil fuel plants, including CCGT and gas reciprocating engines in the CM therefore risks locking GB into an expensive high-carbon future while also breaking the government's decarbonisation commitments.

As a prime example, in the 2022/23 T4 auction, two new CCGT plants at Eggborough (total 1552 MW) were awarded 15-year CM contracts worth a massive £98m per annum. This new capacity will be able to compete in the wholesale and balancing market, with no equivalent CfD clawback if energy prices and revenues are high and no imperative to switch to a low carbon alternative within their contract term.

3.1.2 Supporting low carbon solutions within the Capacity Market

Regen, and many other organisations, have highlighted this inconsistency between the government's commitment to decarbonise the power sector by 2035 and the continued support for unabated fossil fuel and biomass power generation via the CM.

5 Depending on other options, a net zero power system in 2025 may need circa 15-20 GW of low carbon dispatchable generation and 15-20 GW of short and long duration storage.

6 Climate Change Committee, 2023: **www.theccc.org.uk/publication/delivering-a-reliable-decarbonised-power-system**

7 The March 2023 budget has committed a further £20 billion to support CCUS technology deployment.

To address this, the REMA reform proposals include an "Optimised Capacity Market" option under which the Capacity Market parameters may be set to favour low-carbon solutions, or low-carbon solutions could be supported through separate auctions or the setting of separate clearing prices within the same auction.

A weighting of auction parameters towards low-carbon options would be beneficial, but it is not clear that splitting the Capacity Market or setting multiple clearing prices would be necessary.

Regen therefore welcomes the proposals set out in the **Capacity Market 2023 consultation** to:

1. Reduce the CM intensity emission limits for new and refurbished generation plant to **100gCO_2/kWh from 1st October 2034**.
2. Allow generation plants to exit their CM obligations for a short period in order for them to implement a low-carbon conversion including installation of CCUS solutions, shifting to hydrogen fuel or conversion to energy storage.

However, it is urgent that new emissions limits be implemented as soon as possible and at least be in place before the 2023/24 Capacity Market auctions. We have also recommended in our consultation response that carbon intensity limits should be phased in over a period of time before 2034, in order to accelerate the removal of the highest carbon plants and to avoid a cliff-edge distortion in the market. Implementing a phased approach to carbon limits in this way would send a stronger signal to existing fossil assets that they must decarbonise if they intend to continue to participate in the CM.

We also disagree with the proposal to allow higher carbon 'peaking plants' to continue to operate within a generous annual carbon allowance, which is currently 350 kg CO_2 per year or circa 750 hours per year. The reasons to challenge this proposal are that: a) as the consultation acknowledges, this operating limit is already above the normal operating hours of peaking plants, which should be no more than circa 400 hours per annum and b) there are already competitive alternatives to high carbon 'peakers' including battery storage and, in the near future, hydrogen and hydrogen/gas blend turbines, which should be encouraged.

Maintaining higher carbon peaking plants within the CM is unnecessary and contrary to the government's decarbonisation goals.

As an alternative, Regen would recommend a number of further measures:

1. Reducing the term of any future new build CM contract for any unabated fossil fuel or biomass plant to terminate by October 2034, unless they have converted to a low-carbon solution.
2. Implementing an interim carbon intensity limit of, for example, 450g CO_2/kWh by 2028, in order to remove the least efficient OCGT, older CCGT and gas reciprocating engines from the CM and avoid a cliff-edge reduction in 2034.
3. Reducing the annual carbon allowance to 200 kg per year by 2028 (around 450 hours for a typical peaking plant) and removing it completely by 2034.
4. Formalising the existing arrangement whereby fossil fuel, and other high-carbon plants, that are no longer within the carbon limits of the CM, but are still needed for energy security, can be moved into a **Strategic Reserve** (see Section 3.3) as part of their end-of-life management plan.

3.2 Flexibility and resilience

As the name implies, the purpose of the Capacity Market has been to ensure capacity adequacy, and to date that has been its sole function. Capacity adequacy is important, but a focus only on capacity is a reflection of traditional energy security thinking, based on maintaining a certain capacity margin in order to meet a predicted winter peak evening demand. That thinking is in turn based on the logic that, provided there was some capacity headroom against the winter peak, other aspects of energy system resilience could be managed by the System Operator.

The definition of a Capacity Market system stress event – four hour duration with sufficient pre-warning for the system operator to issue a Capacity Market Notice at least four hours in advance to mobilise large generation capacity – reflects this thinking.

Maintaining an adequate peak demand capacity margin will still be important, and is still a useful benchmark to gauge security of supply. However, it is becoming clear that future energy system stress events will be more varied and more dynamic, and will require different system attributes to deal with them. For example:

- With far more variable renewable generation on the system, we might expect to see greater volatility in supply caused by weather changes. This might be reflected in higher 'ramp rates' as generation rates change rapidly over relatively short periods.
- With a higher dependence on interconnectors, the GB energy system may be subject to EU market fluctuations as well as the possibility that interconnectors may come offline with little notice.
- Summer stress events may become more common – as already seen in 2022 – during periods of unexpectedly low renewable generation while other dispatchable assets are offline.
- We might expect to experience longer duration stress events lasting days, caused by low wind generation combined with some other system constraint.
- We might also experience very short and unexpected stress events caused, for example, by sudden changes in demand responding to wholesale price changes.
- Low or falling demand may produce its own operability issues, including frequency fluctuations and loss of reactive power.

Even within traditional supply interruptions the ability to respond very quickly at the outset of a stress event may have additional value to the energy system and lessen the impact of 'bullwhip'[8] effects. As seen in the area of frequency management, a fast response will likely often require less intervention.

A good example of the need to have a rapid response capability was the lightning strikes of 9 August 2019[9] which knocked out two generators, producing a sudden frequency variation, which in turn had a knock-on impact on other generation assets.

8 **Bullwhip** – a reaction and then overcompensation to a supply/demand imbalance which can be reduced by faster response and targeted actions. See: **https://regensw.wpenginepowered.com/wp-content/uploads/Regen-Insight-Managing-Constraint-Costs**

9 Ofgem, 2019: **www.ofgem.gov.uk/publications/investigation-9-august-2019-power-outage**

This points towards a resilience model which requires different types of assets and capabilities; assets that can respond very quickly and flexibly to 'hold the line', assets that can then provide extended capacity over several hours and assets that can provide resilience over even longer durations such as long duration storage. Assets in this context could mean generation assets but could equally mean demand flexibility solutions and storage solutions that are able to provide both supply and demand.

3.2.1 Recognising the value of flexibility, responsiveness and other system attributes

If the purpose of the Capacity Market is support investment in assets that are intended to provide energy security and resilience, then it makes sense to ensure that the mix of assets built provides more than just capacity. Or, to put this another way, if the consumer is being asked to pay substantial sums to support new capacity build, it would be better for the system operator to use this lever to get the energy system that is needed.

This implies moving away from a market design that considers all forms of capacity to be equal, provided they can provide the requisite four hours duration, and instead to begin to value a range of attributes that add to overall system resilience. This shift in emphasis does imply that there is a system architect/strategic planner function that is able to determine the appropriate attribute mix.

Under these arrangements, the CM could still be 'technology neutral' but would begin to provide a value weighting towards certain attributes and capabilities that are of value to the energy system.

Potential desirable attributes in a resilient energy system	
Potential attribute	**Capability and application**
Responsiveness	The speed with which an asset or flexibility service can respond to system events, both in terms of its dispatch lead time and response time.
Flexibility	The ability of an asset or flexibility service to provide a targeted response – short duration, demand and generation, incremental capacity increase.
Long duration	The ability of an asset or service to guarantee to run beyond a four hour minimum – especially assets that are able to support the market over a crucial three to four-day low wind period.
Stability and reactive power	The ability of an asset to provide other system services such as inertia, synthetic inertia and reactive power.
Location	The Capacity Market is one of several options (alongside network charging, leasing and system planning) that could be used to provide stronger locational signals for asset siting.
Diversity – generation profile, weather dependency, technology and geography	It is increasingly recognised that diversity of technology, geography and generation profile is an important system benefit and security of supply consideration. See for Example '**Go West!** An analysis of the energy system benefits and policy implications of a more geographically diverse offshore wind portfolio'.
Low carbon	A weighting towards low carbon assets and flexibility services.

3.2.2 Capacity Market weighting and multipliers

There are a number of ways that different attributes could be recognised with the Capacity Market. The System Operator could, for example, run separate auction pots with different clearing price for particular attribute types. This would, however, complicate the CM process and risks disaggregating liquidity within each auction.

A more likely approach would be to apply a weighting or multiplier to recognise different beneficial attributes. In a sense, this approach is already in use in respect to the capacity de-rating applied to different technologies based on the their ability to supply a four hour duration capacity.

One could imagine a weighting system whereby an asset (energy storage for example) might be de-rated because of its short duration but then uplifted because of a multiplier that is applied in recognition of its very fast response time, shorter lead time and flexibility.

Inevitably, this will make CM auctions more complex to run, but different weightings could be introduced over time. For example, the first priority may be to encourage more flexibility and responsiveness within the GB energy system. However, later auctions could promote longer duration assets (long duration storage and hydrogen generation).

Investors and providers of capacity and flexibility would therefore be able to respond to a scorecard of attributes with different weightings applied to determine capacity payments.

3.3 Capacity adequacy through the transition

Maintaining capacity adequacy is an absolute priority objective for any energy policymaker or system operator. It is also clear that maintaining capacity adequacy will become more challenging during a period of rapid transition as first coal and then older gas-fired power stations are decommissioned, and while investment in alternative solutions such as low carbon dispatchable generation and energy storage has not yet been fully realised. Added to the removal of fossil fuel plants, the UK is also facing a reduction in nuclear output with a very slow and uncertain replacement plan for decommissioned nuclear stations.

Regen's analysis for the **Electricity System Day in the Life 2035** identifies a potential pathway to a largely decarbonised electricity system by 2035. This pathway relies on some very big commitments to invest in decarbonised generation, notably CCUS and hydrogen fuelled generation, energy storage and interconnectors, and the replacement of at least 8 GW of nuclear power. All of these investments are at risk and uncertain.

Even if this pathway were successfully delivered, during the period of transition – from 2025 to 2040 – it is very likely that a fleet of at least 10 GW of unabated fossil fuel plants would still be needed on standby as a last resort. As we discuss in our Day in the Life 2035 report, such capacity would come online if, for example, an interconnector failed. But, in a secure and resilient electricity system, its use is expected to be so infrequent that it should have little impact on emissions.

So, while there is an imperative to shift to a low-carbon power system as quickly as possible (to achieve net zero, to reduce the UK's import dependency and to reduce consumer bills) it is realistic to assume that the energy system will still require some volume of unabated fossil fuel capacity on standby through the 2030s.

Currently, there is over 12 GW of gas-fired capacity in operation via CCGT and single cycle plants that were built in the last century, and are at least 25 years old. As we have discussed in previous sections, the first priority for such generators should be to decarbonise, and the CM should strengthen the signals it sends via emissions limits and multipliers to encourage this.

As emissions limits tighten, some generators might choose to drop out of the CM and operate solely in the wholesale market, and other markets such as the Balancing Mechanism, although as carbon signals are strengthened in these markets they may be increasingly squeezed out[10].

Some of these older plants may find there is no financially viable route to decarbonisation. If they are still required for energy security during the transition, an option could be to manage these in a Strategic Reserve until such a time as they can be decommissioned.

Regen's recommendation is that policymakers should enable the system operator to actively manage these assets, and their removal from energy markets, in a way that maintains energy security at an affordable cost, while ensuring that their presence does not slow or stymy the transition to a net zero energy system.

Policy in relation to use of transitional unabated fossil fuels for power generation should therefore have clear objectives:

- Maintaining **security of supply** and **minimising** capacity adequacy **risk**.
- Ensuring that the presence of fossil fuel assets does not preclude or slow down **investment in low carbon solutions**.
- **Eliminating the unnecessary use of fossil fuels** at times, and in markets, where they are not required.
- Ensuring that a **fair price is paid** for backup generation, without allowing the **exploitation** of **scarcity rents** and **super-profits** as we are now seeing in the Capacity Market.
- **Incentivising** the conversion of fossil fuel plants, and their generation sites, to **low carbon solutions**.
- **Decommissioning fossil fuel plants** as they are no longer needed for security of supply.
- Retraining and providing a **transition pathway** for workers into the low-carbon economy.

10 In our response to the REMA consultation we highlighted that carbon markets will become increasingly important as the UK approaches net zero. We recommended that the REMA process should, at least, consider the integration and interaction of carbon markets (carbon trading scheme, carbon tracking and the use of REGOs) as these will strongly impact and underpin the transition to net zero in the wholesale market.

3.3.1 Managing the transition while maintaining capacity adequacy

In addition to the Capacity Market, and other balancing and reserve mechanisms, energy security could be enhanced by :

1. Moving unabated fossil fuels generation out of the Capacity Market as and when carbon limits have been reached (as described in Section 3.1).
2. Continuing to operate a separate **Strategic Reserve** to maintain those fossil fuel generation assets, outside the Capacity Market, that are still required for energy security and backup generation.
3. Retaining an option to **bring legacy fossil fuel assets into public ownership** (or regulate) in the event that an asset that has either fallen into financial difficulty or for which a negotiated Strategic Reserve agreement cannot be reached is judged to be needed for the purpose of energy security.

The Strategic Reserve would operate separately to the Capacity Market, in a similar way to **today's winter coal contracts** which have been negotiated by the System Operator. Strategic Reserve contracts could be established by bilateral agreement, or potentially a tender process, on a multi-year basis as part of an end-of-life management plan for the asset. As with today's coal plants, Strategic Reserve assets would be centrally dispatched at the request and control of the ESO. Crucially, Strategic Reserve assets would be prohibited from participating in the Capacity Market, wholesale market or Balancing Mechanism.

The rationale to create a Strategic Reserve, rather than run a dual or parallel CM for higher carbon assets, is to separate those assets from the main energy markets and ensure that their utilisation is solely for energy security and backup purposes at the command of the ESO. This would then refocus the CM to support low -carbon generation and flexibility assets. It would also reduce the price pressure within the CM auction by ensuring that the clearing price does not become a hostage to scarcity rent taking by the marginal capacity held by the most expensive legacy plant.

This would enable a more proactively managed capacity portfolio by providing a mechanism to manage the end-of-life operation and timing of the eventual decommissioning of legacy fossil fuel assets. It would also, as a backstop, create a route to public ownership as an end-of-life option for assets that are still needed for energy security but are no longer commercially viable.

It is not certain at this stage what capacity of generation assets may become part of the Strategic Reserve. The size of the Strategic Reserve will depend on a number of factors including the rate at which fossil fuel assets are removed from the Capacity Market and the rate at which new low-carbon capacity can be added to the GB energy system. This will need to be proactively managed by the ESO under instruction from government.

The Strategic Reserve is not equivalent to a second Capacity Market in that, amongst other things, Strategic Reserve assets would not participate in the wholesale and Balancing Mechanism. Like coal today, their utilisation would be controlled by the ESO to maintain security of supply.

If there is competition between capacity providers, and the option to nationalise or regulate the reserve assets, it is expected that the system cost to retain assets within the Strategic Reserve should be limited to provide an acceptable operating return for assets that will have been largely depreciated.

3.4 Value for money

The fourth policy objective of market reform is to ensure that the consumer gets value for money in return for the (considerable?) cost of maintaining capacity adequacy.

There is a growing recognition, especially after recent auction rounds, that the Capacity Market may become a very expensive mechanism to secure adequate capacity. Ensuring that the Capacity Market remains competitive, with a true price discovery for both existing and new build capacity, is critical. Recent auctions have been less competitive, as evidenced by high auction prices and relatively low exit capacity. This paper has already suggested some remedies for this, including the recommendation to transition higher cost legacy fossil fuel assets out of the Capacity Market into a Strategic Reserve, and retaining the option to bring assets into public ownership.

Fundamentally, however, the Capacity Market will only be competitive if there is sufficient new capacity entering the market. This pipeline of new projects cannot be managed by the CM in isolation – it depends a wide range of investment drivers including revenue support and planning. A key factor at the moment is the availability of network connections, and the current delay which is preventing new generation capacity – and especially energy storage – from connecting.

This reinforces the need for a joined-up and integrated delivery plan for the energy transition. Failure to deliver network investment has a direct impact in higher prices for the consumer.

Another aspect of value for money is to ensure assets that are being subsidised via the Capacity Market are also contributing to, rather than hindering, the effective functioning of the wholesale and balancing markets. There is now some degree of frustration/suspicion that assets who are receiving substantial CM payments may also be making super-profits by exploiting scarcity rents, and even gaming the market, within the Balancing Mechanism.

A 2022 study by LCP has identified that 51% of wholesale price increases, during a period of high price volatility, could not be explained by the underlying supply/demand balance and bid fundamentals[11]. This implies that there is a significant amount of speculation, market sentiment and/or inefficiency in market which is driving up prices and costing the consumer billions. REMA should consider the operation of the market and what is driving pricing behaviour: forecasting, transparency, speculative behaviour, interaction with the BM, liquidity, trading platforms, price triggers and the occurrence of bullwhip effects.

In November 2021, the ESO launched an investigation to identify whether irregular behaviour of some participants has become a factor driving up balancing costs. Such tactics can include making late changes to Physical Notifications, bid gaming and setting unreasonable technical parameters for minimum run times (MNZT) and minimum downtime (MZT).

11 LCP, 2022: *"51% of price uplift is NOT explained by scarcity presented and bidding fundamentals"* **www.linkedin.com/posts/lcp-energy_power-gas-electricity-activity-6977959550620467201-SHop?utm_source=share&utm_medium=member_desktop**

That study, which led to a report in July 2022[12], identified a long list of recommendations, but concluded there was ***"no clear evidence"*** of definite rule-breaking. Perhaps unconvinced, Ofgem has responded by announcing its intention to undertake ***"a range of near-term interventions to improve existing market arrangements"*** and has now taken a further step of fining Drax Pumped Storage over £6m[13] for excessive bid pricing in breach of its transmission constraint licence conditions.

It seems reasonable that if capacity providers are receiving CM payments they should behave competitively within the Balancing Mechanism and other flexibility markets. Whether they should have additional obligations could be investigated.

For example, Ofgem is now consulting on an additional Inflexible Offers Licence Condition ("IOLC")[14] that would limit the 'excess' profits that can be made by generators if their units are operated inflexibly in a manner that limits their responsiveness to market and system conditions (i.e with a relatively long Minimum Zero Time (> 60 mins)).

Whether CM contract holders are subject to additional licence conditions is an open question and would need detailed analysis to ensure that additional market efficiency is not offset by higher CM bid prices.

12 National Grid ESO, 2022: **www.nationalgrideso.com/research-publications/eso-balancing-market-review-2022**

13 Ofgem, 2023: **www.ofgem.gov.uk/publications/ofgem-closes-its-compliance-engagement-drax-pumped-storage-limited-relation-breach-transmission-constraint-licence-condition-tclc**

14 Ofgem, 2023: **www.ofgem.gov.uk/sites/default/files/2023-02/IOLC%20Consultation.pdf**

4. Conclusion and recommendations

To continue to provide an important role in GB's future energy system, the Capacity Market will need to both decarbonise and evolve to better manage the more varied and more dynamic stress events of the future. As we have discussed, it will be especially important to incentivise investment in energy storage and dispatchable low carbon generation, which will be essential in a very high renewable energy system.

However, it is also crucial that the Capacity Market evolves to minimise the opportunities for gaming and scarcity-rent taking, in order to provide the best value for money for consumers and ensure that this market it working productively alongside other markets.

Regen's recommendations

1. **Strengthening and accelerating the decarbonisation of the Capacity Market** by setting tougher (and earlier) carbon intensity limits and reducing/removing annual carbon allowances.
2. Developing the **"Optimised Capacity Market plus Flex"** REMA design that recognises the system value of attributes and capabilities such as flexibility and responsiveness which will be critical to ensure system resilience and manage more dynamic and diverse system events in the future.
3. Extending the use of a separate **Strategic Reserve** (including an option to bring assets into public ownership) to a) ensure capacity adequacy, b) send a strong decarbonisation signal c) reduce price pressure within the Capacity Market and ensure value for the consumer.
4. Linking the Capacity Market to a **new code of behaviour and generator obligations** in the Balancing Mechanism to ensure that CM participants do not then exploit their market position, or 'game' the market, to earn super-profits through system balancing.

5. Appendix 1

Short Description of REMA Design Options

REMA Capacity Adequacy Market Design Options	
Design Options	**Brief Description**
Optimised Capacity Market	This option involves making changes to optimise the existing Capacity Market for the participation of low-carbon solutions. An optimised Capacity Market directly targets generators with low-carbon or new build characteristics, for example via separate auctions or multiple clearing prices to encourage low-carbon solutions.
CM with flexibility enhancements	Similar to the Optimised Capacity Market – making changes to Capacity Market for the participation of flexible and responsive assets.
Centralised reliability option	This mechanism is based on the concept of a 'call option contract', which gives the buyer of the contract the right to buy a commodity at a predefined price. The System Operator determines the amount of capacity to be auctioned (sufficient to ensure peak demand can be met) and, in return for a reliability premium (usually determined through the auction process), secures the right to buy electricity from the assets on the wholesale market at a 'strike price' (usually determined by a formula). A reliability option mechanism theoretically ensures the availability of supply during scarcity because the design of the mechanism penalises contract holders that remain unavailable during a period when the real-time price is above the agreed strike price. Contracts obligate contract holders to pay the difference between the real-time price and the agreed strike price when there is system scarcity and the real-time price is higher than the agreed strike price. A contract holder that is unavailable not only loses the income from the spot market (at the strike price level) but also has to pay the difference between the spot price and the strike price. There can also be an additional penalty mechanism for capacity providers that do not meet the availability and/or pay back obligations. Capacity providers with options contracts continue to participate in the wholesale market, and the System Operator only exercises the reliability option in situations of scarcity, i.e. when the price on the spot market exceeds the strike price of the option. Generators who participate in capacity options effectively cap their wholesale revenues in times of peak system stress in exchange for the premium, which is their capacity rent. This cap prevents generators from being double-remunerated for their capacity rent on the wholesale market. Other generators, including flexible generators, that do not participate in options contracts are unaffected. As generators that participate in options contracts are still able to generate in the wholesale market during times of system stress, it is unclear if there would be any effects on the wholesale market.
Targeted tender	Potential co-solution – to procure specific technologies of asset capabilities alongside Capacity Market.
Strategic Reserve (with the option to bring into public ownershop)	Potential co-solution and currently in place in GB for coal fired power stations. A Strategic Reserve could be used to manage the transition of legacy fossil fuel plants – as a time-limited transitional measure as fossil fuel generation facilities retire, or a backstop in case sufficient capacity cannot be procured in the main mechanism. A Strategic Reserve could allow the rest of the market to operate with a lower clearing price, by taking take high-carbon plant out of the main capacity mechanism. Potentially a more cost-efficient way to ensure adequate reserve capacity, especially for legacy fossil fuel plants. Capacity in Strategic Reserves generally does not participate in the market, and is dispatched only in case the market does not clear, i.e. when there is a danger that demand will outweigh supply.