10 February 2022

Anna Collyer
Chair
Energy Security Board
Submitted via email to: info@esb.org.au

Dear Ms Collyer

Submission: Capacity Mechanism Project Initiation Paper

CS Energy welcomes the opportunity to provide a submission to the Energy Security Board's (**ESB's**) *Capacity Mechanism Project Initiation Paper* (**Initiation Paper**).

About CS Energy

CS Energy is a Queensland energy company that generates and sells electricity in the National Electricity Market (**NEM**). CS Energy owns and operates the Kogan Creek and Callide B coal-fired power stations and has a 50% share in the Callide C station (which it also operates). CS Energy sells electricity into the NEM from these power stations, as well as electricity generated by other power stations that CS Energy holds the trading rights to.

CS Energy also operates a retail business, offering retail contracts to large commercial and industrial users in Queensland, and is part of the South-East Queensland retail market through our joint venture with Alinta Energy.

CS Energy is 100 percent owned by the Queensland government.

Key recommendations

The NEM is changing and will continue to do so as it transitions to a market with more variable renewable energy (**VRE**) and an overall lower carbon footprint. The ability to effectively and efficiently manage power system security and reliability against this evolving landscape is paramount, and CS Energy supports the need to develop flexible and adaptive market and regulatory frameworks to ensure this objective at least cost to consumers.

The Initiation Paper acknowledges that *"there is a continued need to demonstrate why new market arrangements that explicitly value capacity, separately from the energy price, are needed to support investment for a future net zero emissions NEM"* but focuses the consultation on the potential design of such a scheme.[1] CS Energy considers that it is equally important to develop a clear and consistent objective for a capacity mechanism.

Clarification of reform objective

CS Energy considers many of the questions posed in the Initiation Paper as premature as they cannot be diligently addressed without a clear articulation of the objective of any capacity mechanism. CS Energy implores the ESB to focus attention on clarifying the objective which can then set the foundations for the scheme design.

The first step for the ESB is to clarify the level of reliability that the future NEM needs to target. In managing political and community expectations of reliability, consideration must be given to all aspects of reliability. The Reliability Standard refers only to supply adequacy, which constitutes only 0.3% of total power interruptions for consumers.[2] The cost of tightening reliability of supply will therefore increase significantly and only have marginal benefit if considered in isolation.

Once the desired level of reliability has been determined, the “at risk periods” would ideally be identified. This requires a quantification of the size, frequency, duration and timing of potential capacity shortfalls. Without this assessment, an effective and efficient market design cannot be achieved:

- **Defining capacity** –It is important not to conflate capacity adequacy with resource adequacy. Capacity adequacy refers to the ability to meet the next megawatt while resource adequacy refers to the ability to supply bulk energy over time. How the ESB defines capacity will inform the efficiency of long-term resource adequacy and thus the success of any potential capacity mechanism.

- **Defining at risk periods** – at risk periods can only be determined once the risk/objective has been defined. The “at risk” periods suggested in the Initiation Paper do not appear to be consistent with the stated intent of the capacity mechanism.

- **Quantifying the objective** – any procurement mechanism requires a clear metric on which procurement is based. This may be derived from the Reliability Standard or may be more specific if the objective of the CM is more targeted. This will also intrinsically specify the timeframe over which the CM is intended to act.

- **Role of existing and emerging mechanisms** – in determining the reliability gap that the CM needs to address, it is important to understand how existing (e.g., transmission planning and investment frameworks) and future frameworks (e.g., Essential System Services procurement) will mobilise resources to meet this gap, and thus the quantum of the residual reliability gap.

- **Articulating the gap to be addressed by a capacity mechanism –** any residual reliability gap then becomes the core objective of the CM, and design decisions can then be progressed informed by the nature of this gap. This includes the timeframes over which the CM will target, the volume and type of capacity to be procured and based on this, the appropriate investment signals.

[1] Energy Security Board, Capacity Mechanism Project Initiation Paper, December 2021, page 8
[2] Australian Energy Market Commission, *The Reliability Standard Factsheet*, page 2

Energy Ministers' principles

CS Energy does not consider that one mechanism will be able to address all the principles set out by Energy Ministers. Whilst the principles are sound, satisfying them all simultaneously with a singular mechanism may not be possible. Utilising the process of determining the CM's core objective outlined above would set a framework to clarify exactly what outcome each jurisdiction is seeking and can better inform how the system needs can be met.

To this end, the ESB could present Ministers with a menu of underlying CM objectives at the high-level that will then facilitate the detailed design process. For example:

- If the objective is to incentivise long-duration storage, Model A could be explored;
- If the objective is to manage peak demand periods, Model B is more appropriate; or
- If the objective is to reduce unserved energy, Model C warrants further examination.

Assessment criteria

The Initiation Paper lists five high-level assessment criteria yet does not detail how the assessment will be conducted and the necessary trade-offs. While CS Energy is supportive of achieving an optimal level of reliability, this criterion needs to be qualified by an explicit linkage to the Reliability Standard, with this set at the appropriate level.

The assessment criteria also would ideally draw upon the suggested design principles (discussed further in Appendix A), particularly with the goal of minimising distortion to energy and non-energy markets.

It is CS Energy's view that the process moving forward should, in conjunction with stakeholders, seek to:

- Understand what constitutes optimal reliability;
- Define the objective of a capacity mechanism and associated metric; and
- Undertake a robust cost-benefit analysis of all options.

In particular, the base case that is used to compare the relative costs and benefits of the options must include the impact of existing and planned mechanisms so that the true marginal benefit of the capacity mechanism is assessed.

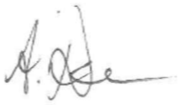
Caution must be applied when seeking to transfer design elements from international jurisdictions, particularly when not properly contextualised. However, the implementation of capacity mechanisms in these markets does provide some broad learnings that should be integrated (with appropriate qualification) into the ESB's process.

Further detail on key aspects of the reform process

CS Energy's suggested framework for clarifying the objective of a potential CM in the NEM and a discussion of international CM examples and their applicability to the NEM are set out in Attachment A.

If you would like to discuss this submission, please contact me on 0407 548 627 or ademaria@csenergy.com.au.

Yours sincerely



Dr Alison Demaria
Head of Policy and Regulation (Acting)

ATTACHMENT A

In the Initiation Paper, the ESB acknowledges that the justification for the need of a capacity mechanism in the NEM still needs to be presented, and that this case will be prosecuted in parallel with the development of design options.

Given the sensitivity of reliability concerns (whether perceived or real), it is incumbent on the ESB to utilise its position as a national strategic market body to appropriately frame any design proposal such that recommendations are well informed and expectations of outcomes (both positive and negative) are managed.

CS Energy emphasises the need for any capacity mechanism to be supplementary to the existing and future wholesale and ancillary markets, and thus should not be progressed in isolation of the broader market structure and reform agenda.

CS Energy considers many of the questions posed in the Initiation Paper as premature as they cannot be diligently addressed without a clear articulation of the objective of any capacity mechanism. CS Energy implores the ESB to focus attention on clarifying the objective which can then set the foundations for the scheme design.

Thus, CS Energy's comments are heavily caveated with the need to define the objective of a capacity mechanism for the NEM. Caution must also be applied when seeking to transfer design elements from international jurisdictions, particularly when not properly contextualised. That said, the implementation of capacity mechanisms in these markets does provide some broad learnings that should be integrated into the design process here.

Much of CS Energy's submission focusses on these two aspects as the necessary initial steps in the design process. Discussion and input into design aspects will follow once the necessary preparatory work has been conducted.

Objective of a capacity mechanism in the NEM

CS Energy considers that an energy-only market without distortions is the most-efficient driver of investment signals for reliability, as stated in its previous submissions. Within the changing landscape however, this may evolve depending on how markets or mechanisms to value non-energy services are implemented. The disparate pace of the development of these markets has created market distortions in operational and investment timeframes. Any capacity mechanism shouldn't further diverge these distortions but instead identify where additionality can be directed. This mechanism needs to be practical and not add to the distortions.

As stated in the Initiation Paper, it is the current reality that the risk appetite is changing, and the optimal level of reliability needs to be clearly defined and agreed. This is the first step in the required process to define the objective of a potential capacity mechanism, as illustrated in Figure 1.

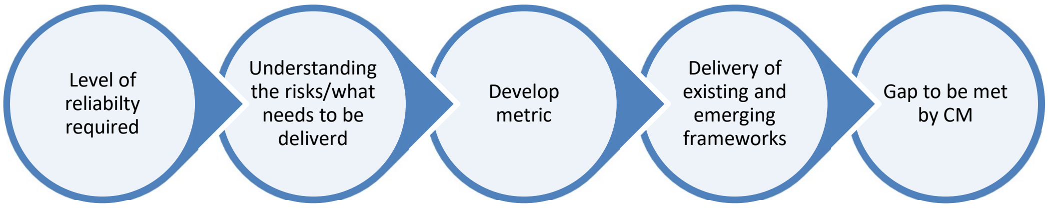


Figure 1: Process to determine objective of a potential capacity mechanism

(a) Defining target reliability

Given the divergence in expectations of reliability, the first step is to clarify the level of reliability that the future NEM needs to target. While the Reliability Standard stipulates a level of Unserved Energy (**USE**) of 0.002%, an Interim Reliability Standard (**IRS**) of 0.0006% has also been introduced and NSW has instituted an Energy Security Target (defined as the sum of 10% probability of exceedance forecast maximum demand plus a reserve margin equal to the sum of the two largest generating units).[3,4]

While the Reliability Standard is the remit of the Reliability Panel and is determined based on an economic trade-off of cost versus consumer value, the ESB has the responsibility to clarify and quantify what the broader expectation of reliability is (particularly from a policy perspective) and the associated cost of achieving levels of reliability above the current standard. This is supported by the fact that the Reliability Panel does not have the remit to review the IRS.

In managing political and community expectations of reliability, consideration must be given to all aspects of reliability. The Reliability Standard refers only to supply adequacy, which constitutes only 0.3% of total power interruptions for consumers.[5] The cost of tightening reliability of supply are likely to significantly increase and only have marginal benefit if considered in isolation.

(b) Characterising reliability risks

Once the desired level of reliability has been determined, the "at risk periods" need to be identified. This requires a quantification of the size, frequency, duration and timing of potential capacity shortfalls. Without this assessment, an effective and efficient market design cannot be achieved.

The Initiation Paper approaches this characterisation in two parts:

- **Defining capacity** – the ESB would ideally exercise caution and not introduce ambiguity through definitions of capacity. Alignment with the National Electricity Rules (**NER**) and AEMO definitions is preferred. It is also important not to conflate capacity adequacy with resource adequacy. Capacity adequacy refers to the ability to meet the next megawatt (**MW**) while resource adequacy refers to the ability to supply bulk energy over time. The latter is not restricted to supply adequacy but also considers the ability of the network to transport energy when required.[6]

[3] National Electricity Rules, 3.9.3C
[4] Electricity Infrastructure Investment Act 2020 No 44
[5] Australian Energy Market Commission, The Reliability Standard Factsheet, page 2
[6] See Australian Energy Market Operator, Power System Requirements, July 2020

How the ESB defines capacity will inform the efficiency of long-term resource adequacy and thus the success of any potential capacity mechanism. Capacity is not simply a question between nameplate capacity and derated capacity of generation sources but a confluence of network capacity and generation adequacy.

The level of new generation investment that is required to meet long-term resource adequacy will vary in total capacity depending on the technology mix (with the level of firmness relative to technology type) and the ability for this generation to be transported efficiently across the network. If there is insufficient network capacity to transport bulk energy, much of the new capacity will be constrained due to the technical ratings of transmission lines. In this instance, greater volumes of generation capacity needs to be procured across the network to accumulatively meet the bulk energy need, though each generator is operating at lower capacity factors. This increases the total cost to consumers. This is clearly demonstrated in the counterfactual comparisons in AEMO's Integrated System Plan (**ISP**), where if new network is built, new capacity is greatly constrained by comparison.

Generation adequacy itself is increasingly multi-dimensional in the context of the future energy system and defining capacity in this context needs to consider the optimal level of system capacity to meet the system reliability standard, the optimal timing of investment, the optimal availability at times of system stress and the optimal mix of resources.

- **Defining at risk periods** – at risk periods can only be determined once the risk/objective has been defined. The "at risk" periods suggested in the Initiation Paper do not appear to be consistent either internally or with the stated intent of the capacity mechanism:

  - Daily load profiles are largely predictable and do not reflect system stress events. Regular changes in demand over the day are captured in the operational timeframe and its frameworks;

  - Large unexpected changes in supply and demand do pose a reliability risk but are addressed in the contingency event frameworks. These frameworks allocate capacity reserves to manage these events via the Frequency Control Ancillary Services (**FCAS**) markets, the Protected Event framework and reclassification processes for non-credible contingencies. Furthermore, these frameworks are being enhanced to better accommodate weather-related changes in supply and demand via the integration of indistinct events.[7]

  Resource adequacy concerns during periods of renewable droughts is a risk that a capacity mechanism could target. Initial modelling by Endgame Economics presented to the Operating Reserves Technical Working Group (**TWG**) explored the reliability risk at times of high system stress and could be utilised as an initial assessment of understanding the challenge.

- **Quantifying the objective** – any procurement mechanism requires a clear metric on which procurement is based. This may be derived from the Reliability Standard or may be more specific if the objective of the CM is more targeted. This will also intrinsically specify the timeframe over which the CM is intended to act.

[7] Australian Energy Market Commission, *Enhancing Operational Resilience in Relation to Indistinct Events Draft Determination*, October 2021

For example, if the objective is to maintain a certain level of USE, then the appropriate metric for the CM may be Loss of Load Probability (**LoLP**). This metric would be applicable to a CM targeting system stress due to periods of high demand.

Metrics targeting peak demand periods do not capture reliability risks that may have a duration of hours or days that may be expected from resource droughts. In this instance, a metric based on LoLP over a period of time for example would be more appropriate.

Given the emerging risks in the NEM at times of minimum demand, it may also be prudent to consider what metric, if any, may be appropriate to capture the reliability risk at these times.

Once the ESB has clarified the objective of a CM, it would be useful for a targeted consultation process to determine the metric on which capacity procurement will be based and the methodology applied to determine the "CM demand curve". Given the importance of this metric and the complexities in balancing the costs of its achievement against the community and political value placed on reliability, the development of the appropriate metric and methodology should fall into the remit of the Reliability Panel and its governance arrangements articulated in the National Electricity Rules (**Rules**).

- **Role of existing and emerging mechanisms** – in determining the reliability gap that the CM needs to address, it is important to understand how existing and future frameworks will mobilise resources to meet this gap, to then determine what the residual need is:

  - Transmission planning and investment frameworks need consideration to determine the level of network capacity to deliver adequacy needs at the specific periods targeted by the CM. This will also assist in identifying whether the reliability risk arises from the supply side or the network capacity;

  - The establishment of procurement mechanisms for ESS will minimise the need for operational intervention by AEMO to maintain system security, and thus remove associated distortions of the energy price;

  - Appropriate remuneration mechanisms for ESS will incentivise investment in generation and storage with the capability to supply both system security and reliability services. The need for ESS at the identified times of system stress will determine the mix of capability required to be available at these times and will inform any gap in the capacity incentivised by ESS mechanisms that a CM may need to target;

  - The impact of the introduction of five-minute settlements in October 2021 on investment signals is yet to be revealed but it is anticipated that it will provide incentives for dispatchable capacity;

The Wholesale Demand Response Mechanism (**WDRM**) has also just commenced and is targeted at incentivising demand response during periods of high energy price.

  - The Reliability Emergency Reserve Trader (**RERT**) and the potential introduction of jurisdictional strategic reserves also procure capacity to be utilised as a last resort in times of system stress. The interaction with these mechanisms with the CM needs consideration; and

  - Jurisdictional Renewable Energy Zones (**REZs**) policies and supporting frameworks will incentivise a level of new investment independent of a CM. Any reliability gap to be targeted by the CM would ideally discount REZ-driven investment, particularly where financial incentives are in place.

  CS Energy notes that that none of these interactions have been identified in Figure 2 of the Initiation Paper.

- **Articulating the gap to be addressed by a capacity mechanism –** the final step in outlining the objective of the CM can proceed now that the core ingredients have been determined:

  1. A system reliability standard that balances cost with community and political expectations is set and provides an explicit and transparent signal to the market. This standard should not be overlayed with additional system reliability requirements;

  2. Robust and transparent resource modelling is performed to identify and quantify the size, frequency, duration and timing of potential capacity shortfalls. This modelling includes an assessment of both supply adequacy and network capacity.

     This modelling then informs the periods or scenarios in which reliability is most at risk based on the system reliability standard, establishing a "capacity demand curve". It also considers the type of resources that may be required to address this gap and maintain system security;

  3. Informed by the modelling, the Reliability Panel quantifies this risk through the development of a procurement metric that is specific that reflects the economic trade-offs of addressing the identified reliability risks;

  4. The ability of existing and emerging markets to coordinate the required volume and type of capacity required at the specific periods of high stress is determined; and

  5. Any residual reliability gap then becomes the core objective of the CM, and design decisions can now be progressed informed by the nature of this gap. This includes the timeframes over which the CM will target, the volume and type of capacity to be procured and based on this, the appropriate investment signals.

(c) <u>Energy Ministers' principles</u>

In outlining the process of refining the objective, CS Energy has not overlaid the principles set out by Energy Ministers as CS Energy was focussing on the core operational and market challenge. Individually the principles are sound but satisfying them all simultaneously will prove challenging.

Importantly, the design principles could apply to the package of market reforms reflecting that there is not one "big bang" model that can simultaneously achieve all the principles but rather these result from the interplay of all market and regulatory frameworks. Unless appropriately targeted, a CM will only deliver marginal benefit at significant cost.

Steps 1 and 2 above could be utilised iteratively to highlight where reliability challenges may arise and to understand the overall expectations of the level of reliability from each jurisdiction. Steps 3 and 4 can then be utilised to delve more granularly into these expectations informed by the modelling to converge on the desired objective of the CM as well as demonstrating that some of the principles such as incentivising demand response are already the subject of reforms. The ESB could then present each jurisdiction with an informed “menu” of underlying CM objectives at the high-level that will then facilitate the detailed design process. For example:

- If the modelling demonstrates a need to manage periods of renewable drought, then the objective of the CM could be to incentivise long-duration storage. This would warrant exploring a CM that was of type Model A;

- If the preference is to utilise a CM to manage peak demand periods, Model B is more appropriate; or

- If a CM is targeting system reliability above the Reliability Standard set by the Reliability Panel, then the CM objective would be to incentivise available capacity to meet periods where USE is expected to be between X% and 0.002%[8]. In this instance Model C is more appropriate and would likely need to be out-of-market to avoid distorting the wholesale market.

The ESB has the responsibility to ensure that any potential CM benefits consumers and this may involve reframing the Energy Ministers’ design principles to outline how they are being addressed across the spectrum of market reforms.

International examples

The Initiation Paper provides cursory reference to some international examples of capacity mechanisms and seeks stakeholder feedback on what design aspects may be transferrable to the NEM or whether there are other examples of international design choices upon which the ESB could draw.

The design choices of international schemes cannot be assessed without the appropriate contextualisation. This includes understanding the objectives of these mechanisms, the process by which certain design choices were developed as well as the broader energy market landscape. For example, all five cited jurisdictions operate under Day Ahead Markets (**DAMs**) where the influence of scarcity price signals is more muted than in the NEM. The PJM and CAISO DAMs apply centralised decision-making while the European DAMs have decentralised decision-making. These and other factors affect the design specifics of the capacity mechanisms.

Although the design features cannot be properly assessed, lessons can be drawn from the development, implementation and performance of these capacity mechanisms that can aid the ESB.

The common element to all five examples is that they are designed to be complementary to the underlying wholesale markets and represent last resort actions to manage periods of high system stress, with varying focus on the retention of existing resources and the development of new resources. The French, I-SEM and UK mechanisms were all developed

[8] Reliability Panel, *2022 Reliability Standard and Settings Review Issues Paper*, January 2022

in alignment with the European Commission guidelines and approval process. In its inquiry into capacity mechanisms[9], the EU Commission concluded that:

- Resource adequacy concerns should be addressed through market reforms first. Suggested reforms include explicitly engaging in demand-side response, making hedging products available to generators to reduce revenue risk and thereby encourage investment;

- Market-wide capacity mechanisms are likely to be the most appropriate form of intervention where there is a long-term risk that there will be insufficient investment in capacity. Strategic reserves are likely to be the most efficient transitionary solution.

- Capacity mechanisms in EU member states must satisfy the following stipulations:

    - They are last resort mechanisms to deal with adequacy concerns and are thus are approved only for a maximum of 10 years;

    - Should not distort actual or forecast electricity market prices;

    - Careful design supported and informed by robust resource adequacy assessments;

    - Pan-EU harmonised approach to the assessment of reliability risk based on Value of Lost Load (**VoLL**) and expressed as a function of Loss of Load Expectation (**LoLE**) or expected USE;

    - Maximise competitive price-setting as much as possible;

    - Appropriate and robust penalties to incentivise delivery on contracted capacity; and

    - Facilitate cross-border participation.

The ESB may benefit from further understanding the design choices of international jurisdictions prior to any assessment of their suitability to the NEM. In particular, CS Energy considers there to be many learnings from the I-SEM, given the DS3 Programme of market reform echoes the intent of the Post-2025 NEM Reform project in which the capacity mechanism was one component of a complex, integrated market reform process. Some of the learnings specific to capacity mechanisms include:

(a) Need for a clear, consistent objective

As discussed above, for any mechanism to be effective and efficient, there needs to be a clear objective that is transparent and consistent. For all capacity mechanisms to date, the high-level objective is a clear policy intent to be complementary to existing markets for times of high system stress.

This then needs to be reinforced with a clear metric on which procurement is based. The cited centralised, market-wide capacity mechanisms are volume-based, with the regulator setting the required quantity and a market clearing process setting the price. These generally take the form of a call option based on a strike price, thereby both tying suppliers

[9] European Commission, *Final report of the Sector Inquiry on Capacity Mechanisms*, 2016

to the capacity they sell to the market and providing a hedge against high electricity prices. In this way, they incentivise the provision of capacity at times of system stress.

The required quantity is based on a metric that reflects the desired reliability outcome:

- PJM utilises a variable resource requirement curve that sets the amount of capacity required (based on forecast peak demand and a reserve margin) and is the basis for the price formation;

- The I-SEM transitioned from a price-based mechanism to a volume-based mechanism in 2018 acknowledging the need for more specific targeting towards periods with higher load and loss of load probability. Procurement is now based on LoLE of eight hours; and

- The UK had a further objective to incentivise investment in combined cycle gas turbines (**CCGTs**).

Once the overarching objective has been operationalised into a metric, then considerations such as eligibility of participation can be determined.

For decentralised mechanisms, a clear objective is just as critical as it determines the obligations imposed on market participants:

- The French capacity mechanism is not intended to provide a reliability price signal or incentivise new investment but rather to mobilise in-market resources to manage high peak demand days. France has a highly sensitive heating load which led to the winter peak increasing by over 30% in ten years; and

- The CAISO obligation[10] has two objectives: to ensure reliability in real-time and to incentivise the siting and development of new resources for long-term reliability. This is reflected in the Resource Adequacy (**RA**) obligation which allocates a capacity requirement tiered into system, local and flexible components.

(b) Importance of integrated design

The design of any mechanism needs to be cognisant of its symbiotic relationship with all aspects of the market in which it is to be integrated. This includes the underlying market structure and revenue streams, system security, network capacity and interaction with incentive schemes.

- **Underlying market structure** - A capacity mechanism will only be effective and efficient if its interaction with the energy market is understood and minimises distortions. In the I-SEM "*coherent alignment between all revenue streams (energy, capacity, system services and others such as RESS auctions in Ireland), for market participants/service providers and this aspect needs to be carefully considered in the design of future arrangements*".[11] Furthermore, it was determined that the Market Reference Price (**MRP**) of the Reliability Option (**RO**) would be settled based on volumes sold in the DAM at the DAM reference price, volumes sold in intra-day markets at the intra-day MRP and any remaining capacity of the RO volume at the

[10] Note, to avoid confusion with the formal capacity mechanism in CAISO, the decentralised resource adequacy requirement is referred to as an obligation here.
[11] EirGrid and SONI, *Shaping Our Electricity Future – Technical Report*, February 2021, page.142

balancing market reference price. For those also providing system services, this is also considered in the settled price.

The CAISO RA is considered against the backdrop of a capacity mechanism and reliability must run contracts.

As power systems become more dynamic with the changing generation mix, power systems with DAMs are increasingly reliant on intra-day markets and the balancing market to manage real-time security and reliability as forecast demand accuracy increases closer to real-time. Energy-only markets such as the NEM do not have this challenge, with scarcity pricing reflecting the changing dynamics. Capacity mechanisms cannot replace the role of scarcity pricing, rather the reliance can increase depending on the exact design. Reliability options (such as those in the jurisdictions referenced) incentivise delivery by providing a hedge against high prices during system stress events and penalties for non-delivery. That is, instances of high wholesale prices are still necessary to incentivise resource adequacy, and depending on the design, establish the revenue stream from which capacity payments are made.

- **Complementarity with system service provision** – the emerging challenge of the energy transformation is the need to ensure the correct investment signals are in place to incentivise the required mix of capability to efficiently deliver system security as well as reliability. Investment signals for the provision of essential system services will be the predominant driver of this capability but "*in order to ensure efficiency and delivery of the necessary flexibility, it is important that the capacity and system services market investment signals work synergistically and do not counteract one another in any way*".[12]

  The design of capacity mechanisms needs to accommodate the reality that not all MWs are necessarily equal in this regard and needs to evolve around the incentives founded in current and future system services markets and mechanisms in order to be effective. The ESB cannot consider a potential capacity mechanism for the NEM without explicit consideration of the package of system security reforms required going forwards.

- **Power system dynamics** – the ability to deliver capacity on the necessary timescales relies not only on the supplier but is also contingent on real-time operational and transmission constraints. The capacity mechanism needs to consider real-time limitations to capacity delivery so as to avoid paying for capacity that physically cannot be delivered and thus increasing costs to consumers.

- **The role of networks** – supply is only one dimension of resource adequacy. As outlined in AEMO's *Power System Requirements*, network transport capability is also a critical component.[13] This is recognised in overseas capacity mechanisms with the EU models incentivising increased interconnection through its eligibility to participate, and PJM includes transmission upgrades as eligible suppliers.

  The ESB will need to consider network capability, the eligibility of network participation in the capacity mechanism as well as the interaction with the broader transmission investment and planning frameworks.

[12] EirGrid and SONI, *Shaping Our Electricity Future – Technical Report*, February 2021, page.136
[13] Australian Energy Market Operator, *Power System Requirements*, July 2020

- **Interaction with non-market incentive schemes** – each jurisdiction has a range of policies and incentive schemes supporting investment in renewable energy, storage and demand side technologies. Eligibility for the capacity mechanism requires these incentives to be surrendered.

(c) Compliance frameworks

Some learnings may also be derived from the compliance frameworks of international jurisdictions:

- I-SEM has an opt-out framework for suppliers to suspend their obligations when undertaking a planned outage longer than three months or for unit mothballing;
- Exposure to penalties based on non-delivery at times of system stress needs to be clear and within the control of the asset (that is, default is not due to operational or network constraints);
- Non-compliance penalties for renewable resources is difficult to ascertain given the need to determine the reliable capacity of renewables from the system perspective;
- To provide assurance, I-SEM requires new providers that are successful under the auction to post a performance security and meet completion milestones ahead of the delivery year. If the new provider defaults on their delivery obligations, they are liable for termination fees;
- Performance of demand side participation needs careful consideration; and
- The compliance schemes of decentralised mechanisms can be onerous and costly. The layers of obligations in CAISO for example requires participants to submit monthly and annual forecasts and undergo regular auditing processes.

The compliance burden is additional to the overall effort of the implementation and administration of a second market. This includes measures addressing and monitoring performance of both supply and demand side participants as well as an assessment of network capacity and the contribution of each to reliability which is not a trivial exercise. Given the role of resource adequacy assessments, appropriate accountability and governance frameworks also need to be established.

(d) Modelling

The successful design and operation of a capacity mechanism requires robust and rigorous resource adequacy assessments. The EU investigation found a tendency for system operators to over forecast lost load especially in relation to VRE, leading to larger capacity auctions than the system required.[14]

EirGrid and SONI perform comprehensive resource adequacy assessments to determine capacity requirements including subtracting capacity procured external to the capacity market (including previous auctions). The experience in I-SEM has indicated many learnings with its modelling underpinning the capacity market:[15]

[14] European Commission, *Final Report of the Sector Inquiry on Capacity Mechanisms – Commission Staff Working Document*, 2016
[15] SEM Committee, *Capacity Remuneration Mechanism Detailed Design Decision Papers*, 2015-2016

- The modelling conducted did not appropriately capture evidence from operational experience including:
    - Reliance on historical data for wind and demand and the consideration of average values didn't project accurate assessments of reserve margins;
    - Scheduled outages were optimised to occur over the summer when system demand is low when in reality this is not always the case;
    - Assumptions that interconnectors were importing or exporting simultaneously at a fixed rated capacity; and
    - Modelled system constraints and other assumptions represented a gross simplification of actual operation.

  They are looking at implementing changes to the modelling process to a forward casting approach that takes into account all technology types and different operational models such as hybrids. They are also seeking to ensure that any modelling during the qualification process for auction eligibility will also clarify the reliability needs in terms of both availability and the ability to meet dispatch instructions.

- Transparency in the scenario building process and simulations is critical as is public consultation with stakeholders;
- Demand forecast uncertainty is minimised via a stochastic approach applying a 'least worst regret costs' principle.

While not a direct issue for the NEM, resource adequacy modelling is complicated by the disparity between DAM outcomes and the physical dispatch needs. For the I-SEM, it has been found that DAM outcomes result in a scheduling of interconnections and critical plant that is inadequate for system security needs, and often leads to tight reserve margins. This is compacted by the increased inaccuracy in day-ahead wind forecasts.

(e) <u>Performance of capacity mechanisms</u>

Capacity mechanisms are often criticised for their tendency to over-procure and result in increased cost to consumers. The experience in Western Australia's (**WA**) Western Electricity Market (**WEM**) is testament to this. CS Energy provides the following comments specific to learnings from the performance to date of the jurisdictions identified in the Initiation Paper.

- **Trade-off between volume and price** – both the I-SEM and UK mechanisms have not incentivised the level and type of new investment that was anticipated. Under the price regulated approach, the I-SEM distributed a fixed pool of money across all capacity providers based on the calculated capacity requirement to meet the reliability standard. The shift to competitively auctioned ROs decreased the overall cost of the scheme, but the reduced prices resulted in contracts being awarded mostly to existing generators rather than new entrants. I-SEM has since identified that the rate of new capacity delivery may not be sufficient to deliver long-term resource adequacy.

  In the UK, the competitive price-discovery of the volume-based mechanism was insufficient to incentivise investment in the new entrant gas that the mechanism was intended to achieve. Successful recipients were largely small, distribution connection generation, storage and trials of demand-side response.

Depending on the objective of the capacity mechanism, a volume-based approach based on competitive price discovery may not incentivise the desired mix of capability, particularly large-scale. The trade-off of this mix however is a higher cost of the scheme.

- **Non-delivery during stress periods** – in the four years of operation the UK mechanism has had delivery issues, with the system experiencing periods over winter with high demand and low wind generation. Concerns with its efficacy also lead to a standstill period from November 2018 to October 2019.[16]

  In the I-SEM, analysis suggests that the structure of the ROs and the intended incentive may not be as effective as anticipated.[17] One option being pursued is strengthening the scarcity pricing signal. Currently, there is expected to be a shortfall in procured capacity for the 2024/25 delivery year.

- **Delivery incentives for new assets** – new providers awarded contracts in the I-SEM had requirements of a security bond and delivery milestones. The need for a stronger incentive has been identified to ensure effective delivery. Under the original framework, projects had a long stop date for delivery which manifested in new plant potentially being absent for the first 18 months of its contracted capacity tenure.

- **Mechanisms need to be designed for the future system** – EirGrid and SONI have identified potential shortfalls in the I-SEM capacity market arising from its design being centred on the current power system and generation mix. While it may deliver resource adequacy in the short-term, it is likely that the design will need to change to facilitate resource adequacy of the future I-SEM. It has been identified that the capacity market inadvertently favours certain generation as the changing generation mix has not been adequately defined. Work is currently underway to better align the market to the future vision.

- **Technology neutrality is caveated** – while technology neutrality is, and should be, a tenet of market design, capacity mechanisms need to acknowledge that not all MWs are equivalent in a future system that is more dynamic and needs to actively procure system security services. This is also evident in discussions about long-duration storage. Capacity mechanisms need to achieve the required balance between neutrality and incentivising the right mix of capability.

- **Transparency of costs** – given the tendency of capacity mechanisms to over-procure, it needs to be clear from the onset how "over-delivery" will be identified and reported as well as the framework to appropriately allocate the costs of this over-procurement. A poorly designed capacity mechanism has the potential to adversely impact consumer affordability.

(f) Market power considerations

Market power considerations were integrated into the I-SEM design capacity market via a principle of mandatory bidding for existing dispatchable plant. This was strengthened by the consideration of a single zone for assessing capacity needs in alignment with the single zone energy market. These actions were undertaken to encourage greater competition.

[16] Ofgem, Report on the Operation of the Capacity Market in 2018/19, March 2020, pages 13-14
[17] Eirgrid and SONI, *Op. Cit.*, p.132

Interestingly, the EU investigations found that capacity mechanisms in member states impacted adversely on competition in the EU internal electricity market given differences in their design features and government underwriting in some instances.

Furthermore, the pan-EU trading has experienced distortions and complications with the presence of different types of capacity mechanisms (or their absence in some jurisdictions) particularly given the eligibility of interconnectors to participate. This impacted market power across the jurisdictions.

While the NEM is not interconnected with other power systems, the design principle that facilitates jurisdictions to opt-out of the mechanism may facilitate similar outcomes with respect to market power and the treatment of interconnectors.

(g) The WEM capacity mechanism

The Initiation Paper omits reference to the capacity mechanism in Western Australia's WEM from which key insights can be derived. The capacity market is volume-based and was established based on capacity requirements to meet 10 POE plus a reserve margin. Capacity was awarded two years in advance, and with contracts capped at the Long-Run Marginal Cost (**LRMC**) of a new gas turbine.

Figure 2 below shows the cumulative new entrant capacity for the years since the mechanism's implementation.[18] The average capacity utilisation of this capacity was approximately 35% at a cost to consumers of over $1 billion.

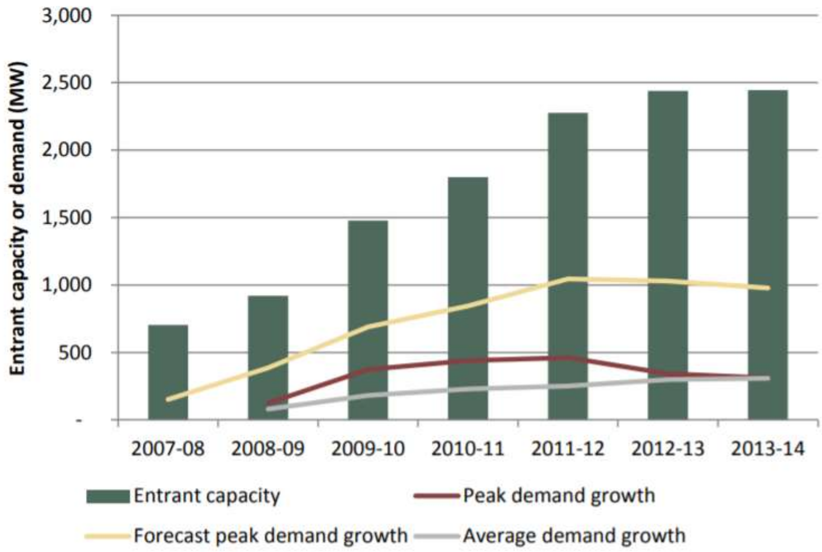


Figure 2: Cumulative new entrant capacity, demand growth and forecast demand growth

The oversupply was driven in part by the disparate treatment of generation and demand response under the scheme as well as capacity prices being unresponsive to excess capacity. The chronic oversupply forced the WA government to intervene in the scheme to reduce the capacity imbalance and reduce the costs of excess capacity borne by consumers.

[18] Public Utilities Office, Department of Finance, *Electricity Market Review*, July 2014, page 24

The mechanism is also unlikely to facilitate the transformation of the energy sector, as contrary to the scheme's objective, the pricing structure creates price risk for investors meaning the outlook for merchant investment in flexible generation or storage is poor.

Design principles for a capacity mechanism in the NEM

CS Energy considers the following design principles should underpin the development of a potential CM:

- The wholesale energy market (via scarcity pricing and associated settings) remains the dominant driver of investment, with the CM acting as a supplementary mechanism at times of system stress. This includes a clear definition of the product or obligation and interface between energy and capacity markets;
- As many parameters of the CM as possible should be determined by the market in order to achieve the least cost outcome;
- Market distortions in both energy and non-energy services should be minimised, and there should be clear alignment between energy, capacity, system services, network capacity and other support services such as RERT;
- Any procurement should be based on a transparent and credible metric that is stable and the remit of the Reliability Panel, and underpinned by robust resource adequacy assessments that are transparent that instils confidence in the market;
- The design of the CM and any rights awarded under the scheme should not be revisited each time the resource adequacy assessment is reviewed;
- The required technical capabilities and performance for participation should be determined in advance of procurement/obligation, with procurement facilitating a transparent, non-discriminatory and competitive process;
- The mechanism should reward delivery not just availability;
- Appropriate risk allocation;
- Appropriate penalty regime that is fair, transparent and consistent;
- The administration of the scheme should be as simple as possible; and
- Frameworks for clear and transparent cost allocation established upfront.

Design options in the Initiation Paper

The design options proposed in the Initiation Paper have been determined based on key design components rather than what the mechanisms are seeking to achieve, namely:

- Option 1a – a decentralised capacity mechanism with retailers responsible for forecasting requirements and procurement to meet their obligation;

- Option 1b – a decentralised approach but with requirements determined by AEMO; and
- Option 2 – a centralised mechanism in which AEMO both determines the requirements and is responsible for procurement.

While CS Energy broadly agrees that capacity mechanisms that are market-wide and employ a volume-based approach are generally the more efficient type of capacity mechanism in delivering long-term resource adequacy, insightful comments on the three options proposed cannot be given due to both the lack of a clearly articulated outcome and limited detail on how each option is expected to deliver against the objective.

Questions regarding derating approaches, appropriate incentives and such only become relevant when it is clear exactly what type of investment is required. CS Energy hopes that there is flexibility in these options to adapt to the objective once articulated. Consumers will not benefit from an underlying objective that evolves as the mechanism design evolves.

Given this, CS Energy can only provide broad comments on considerations on the areas outlined in the Initiation Paper.

- **Derating** – as acknowledged in the Initiation Paper, several factors impact capacity availability and thus decisions on how technologies may be derated cannot be independent of the mechanism objective. For example, wind would have different derating factors under a mechanism targeting periods of prolonged low wind compared to a scheme targeting peak demand.

  There is also a question of who determines the derating factor. Generally this is determined by the central body and there is a tendency to undervalue availability. An option could be allowing participants to self-appoint their own derating factor, the compliance with which may drive efficient investment.

- **Forecasting and modelling** – it is interesting that the Initiation Paper separates the modelling approach from the consideration of transmission constraints, even though it acknowledges the need for their integration into any requirement assessments.

  AEMO is best placed to model resource adequacy from a system perspective, informed by TNSP projections of network transfer capability. Depending on how far out the obligation is set, retailers are best placed to understand their future load obligations. Depending on how often the capacity obligation is anticipated to apply, retailers may be better placed to manage their risk if they self-forecast. This has the advantage of allowing portfolio considerations.

  An alternative to the hybrid model proposed could be that retailers and TNSPs submit load forecasts to AEMO who integrates them with other considerations such as demand response to perform the broader resource adequacy assessment. This would be similar to the process undertaken by CAISO.

  Centralised forecasting may provide AEMO and government with more certainty, but experience has shown this to have an adverse impact on investor certainty as well as higher costs to consumers.

- **Certificate trading and procurement methods** – the most efficient procurement mechanism can be determined once the volume, frequency and duration of capacity requirements is determined.

  It is difficult to assess the efficacy of decentralised mechanisms based on principles similar to the Retailer Reliability Obligation (**RRO**). Given the changes to the RRO in the brief time it has been operational, the market is unlikely to view a similar mechanism as stable.

  A decentralised capacity mechanism in the NEM would likely result in increased costs to consumers. If the obligation on retailers is applicable for a handful of trading periods across the year, a slight risk premium will be factored into pricing. If the obligation was ongoing, it is anticipated that retailers will place a "capacity charge" on contracts similar to how environmental costs are currently allocated. It is expected that commercial and industrial customers would bear the brunt of these costs.

  CS Energy is concerned with the language in the Initiation Paper with respect to Option 2, particularly that *"central determination of the demand curve… can be manipulated to an extent to achieve policy aims"*.[19] Given the capacity mechanism has been touted as addressing investment uncertainty, any suggestion whether implicit or explicit of price manipulation will hardly generate certainty and market confidence.

- **Transmission constraints** – CS Energy agrees with the articulation of the need and challenges presented by transmission constraints and considers TNSPs best placed to determine forward transfer limits.

  Instead of focusing on how to integrate these constraints into the modelling process, the ESB should also explore the eligibility of network investment as a viable participant in the capacity mechanism.

  Treatment of interconnection cannot draw upon international experience given the fundamental differences in the underlying market structures. For example, PJM's approach works as it is applied in the DAM and with the primary objective is to allocate network capacity based on the optimised day-ahead schedule.

- **Market Power** – CS Energy agrees that frameworks need to be in place to avoid potential duplication of payments. However, given the intent of the capacity mechanism to be supplementary to the energy market and the need to minimise distortions, there is no justification for adjusting the energy market settings. This will undermine investment, have flow-on impacts on non-energy markets and violate the market design principles.

  Simpler approaches exist to manage this risk such as referencing capacity payments against the energy price during settlement as applied in I-SEM.

- **Incentives and compliance** – The most effective and efficient incentives will be those tailored to the delivering the right type of investment when required. It is imperative that the incentives are linked to wholesale market outcomes.

[19] Energy Security Board, Capacity Mechanism Project Initiation Paper, December 2021, page 21

Incentives will also rely on the qualification criteria for participation and the ESB could also consider whether upgrades to existing plant including conversions may be eligible capacity providers.

The ESB will also need to consider how compliance is measured and ensure that suppliers aren't penalised for non-delivery that was not within their control.

Process going forward

The Initiation Paper lists five high-level assessment criteria yet does not detail how the assessment will be conducted and the necessary trade-offs. While CS Energy is supportive of achieving an optimal level of reliability, this criterion needs to be qualified by explicitly linkage to the Reliability Standard, with this set at the appropriate level.

The assessment criteria also need to draw upon the suggest design principles of above, in particular minimising distortion to energy and non-energy markets.

It is CS Energy's view that the process moving forward should, in conjunction with stakeholders, seek to:

- Understand what constitutes optimal reliability;
- Define the objective of a capacity mechanism and associated metric; and
- Undertake a robust cost-benefit analysis of all options.

In particular, the base case that is used to compare the relative costs and benefits of the options must include the impact of existing and planned mechanisms so that the true marginal benefit of the capacity mechanism is assessed.