11 April 2023

Lodged via the AEMC website

Dear Ms Collyer,

PROJECT: Efficient provision of inertia rule change

The Clean Energy Council (CEC) is the peak body for the clean energy industry in Australia. We represent and work with hundreds of leading businesses operating in renewable energy and energy storage along with more than 7,000 solar and battery installers.

The CEC is committed to accelerating the decarbonisation of Australia's energy system as rapidly as possible, while maintaining a secure and reliable supply of electricity for customers.

We welcome the opportunity to comment on the AEMC's Consultation paper for the Efficient Provision of Inertia rule change.

The CEC is supportive of the intent of the proposed change, on the basis that it will enhance transparency for market participants and support investment in assets to provide necessary system services. However, these system services must be procured from zero carbon assets. This is also the only sustainable way to maintain power system frequency stability and deliver efficient energy prices for consumers.

The AEMC must focus on sending clear and strong investment signals, when designing system services markets. This is consistent with the NEO, as drawing in new zero carbon investment for provision of frequency control recognises the value of emissions reduction, while maintaining efficient prices and system security for consumers over the long term.

We consider a RoCoF control service represents a better option than an inertia services market. A RoCoF service is more likely to support investment in new zero carbon sources of system stability. While existing synchronous assets will play some role in maintaining system frequency and stability through the transition, relying on these assets is not a sustainable solution. A RoCoF service must therefore be designed to actively favour zero carbon sources of frequency control and system stability.

We consider the AEMC should consider the following when assessing the rule change request

- Whether the design of the system service will be consistent with the expected inclusion of an emissions reduction limb of the NEO. This should also emphasise the efficiency benefits of bringing on new investment in zero carbon assets.
- Basing system services around transparent system standards, so the private sector can invest in the provision of new zero carbon sources of power system frequency stability
- How the proposed change will interact with the various other system services reforms currently in play, particularly the system strength frameworks and operational security mechanism
- Careful treatment of incumbent thermal synchronous assets, to reduce the risk of wealth transfers while maintaining signals for new investment.
- The importance of getting underpinning frameworks right, to enable the capabilities of zero carbon sources of system stability.

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Meeting the NEO through actively favouring zero carbon technologies

While the NEO has not yet been formally amended to include an emissions reduction component, this will soon be the case. The AEMC must therefore consider whether rule changes currently on foot will be consistent with the expanded NEO.

The AEMC must also acknowledge the physical realities of NEM transition. Synchronous thermal assets are rapidly exiting the system, and it is likely that moves to seasonal unit operation or even mothballing will increasingly become the norm.

In this environment, there is a real risk that reliance on synchronous assets for system stability will result in both higher costs for consumers - given the greater opportunity for remaining thermal synchronous assets to exercise transient market power - as well as reduced system security.

Such an outcome would be clearly inconsistent with the emissions reduction limb of the NEO, as well as the general NEO requirements for efficient prices and system security.

The focus should be on accelerating investment in replacement sources of system stability. New markets should be designed to deliberately favour investments in zero carbon technologies for the provision of energy and system security. While historically this may have been interpreted as contradicting the so called 'technological neutrality' market design principles of the NER, in practice it is the only way to support the investment needed to meet the long term interests of consumers.[1]

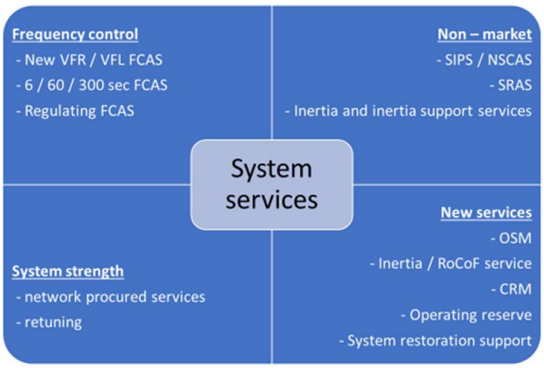
The AEMC must therefore make this rule change with a view to:

- purposefully promoting and favouring investment in zero carbon sources of power system frequency stability, such as grid forming inverter based resources (IBR), including grid forming batteries and renewables, or renewable synchronous sources such as hydro or generator owned syncons.
- minimising the extent to which existing synchronous thermal assets receive windfall gains from the development of new markets for the provision of 'inertia'

We unpack the implications of this in further detail below.

[1] In any case, it should be noted that the technological neutrality principle is not set out in the NEL, but rather in Chapter 3 of the NER, which states that a key design principle is "the avoidance of any special treatment in respect of different technologies used by Market Participants". Aside from the fact that a specific NER requirement must not contradict a NEL requirement – as per the soon to be amended NEO – the AEMC periodically makes rule changes that give special treatment to specific technologies, such as in the current definitions of inertia as well as in schedule 5.2.5 of the NER regarding specific requirements for synchronous and asynchronous technologies in S5.2.5.5.

Coordination of system service development



The AEMC has correctly identified the large number of system service procurement reforms that are currently underway. These are described in Figure 1 below.

The significant number of these new procurement mechanisms makes it likely there will be a degree of overlap and interaction. The key challenge for the AEMC is therefore to carefully manage the implementation of these various mechanisms to minimise complexity and duplication.

As discussed above, the overarching assessment principle should to ensure these mechanisms effectively drive new investment in zero carbon assets to provide new sources of system stability.

The CEC therefore considers there are several underlying principles to be followed when developing these various procurement mechanisms:

- **Unbundling.** Clearly defining the specific capabilities and responses that are needed by the system is key to driving private investment in assets to provide those services. This approach remains the ideal, and we encourage the AEMC the resist any suggestions that a bundled approach is preferable or necessary for maintaining system security and operability. While this approach may be desirable from a system operator perspective, bundled approaches are opaque and unpredictable not easily managed by investors.
- **Standardisation.** System needs should be clearly defined in system standards, which should in turn be developed utilising robust cost benefit analysis. This provides transparency around AEMO and NSP actions, ensuring that market participants and consumers bear only the efficient costs associated with maintaining security and resilience of the system.
- **Risk asymmetry.** The power system is rapidly decarbonising, with most synchronous thermal generation expected to exit in the next decade. It's therefore critical to accelerate investment in zero carbon sources of system stability, particularly IBR assets with grid forming capability, to replace these thermal assets *before they retire*. These replacement investments cannot follow a just in time approach, as regards thermal synchronous asset exit. To do so brings with it disproportionate risks of system instability, and therefore risks of supply interruption and cost impacts for consumers. The AEMC must therefore

purposefully design any procurement mechanisms so they are focussed on proactive investment in zero carbon sources of power system frequency stability, to ensure these assets are in place and their operation fully understood, well in advance of the expected exit dates of thermal synchronous asset exit.

The rest of this submission provides targeted commentary regarding several elements of the proposed rule change and the AEMC's initial assessment of potential options.

A RoCoF service represents the best way forward

The CEC supports the general intention of the AEC's proposal, which was to identify and value inertia, which, at the time, was defined as a critical 'system service'.

However, the CEC considers the underlying problem should be recast. The primary issue is the need to drive investment in zero carbon assets, to deliver necessary system services for efficient control of RoCoF. This must be done at the lowest possible cost to consumers, while maintaining security and reliability of the system.

We consider the first step in this process is to clearly define the underlying power system need, and work from there to determine the best way to meet that need.

The underlying system need is to manage the rate at which power system frequency changes following a disturbance.[2] As identified in the Reliability Panel's recent draft determination of the Frequency Operating Standard (FOS), controlling the rate of change of frequency (RoCoF) of the system ensures effective operation of under frequency load shedding (UFLS) relays and stable operation of legacy thermal assets.

Once the underlying system need has been identified and standardised, it is then possible to identify and value the services to be procured to manage that need. In the case of managing rate of change of frequency, this is the instantaneous (or extremely rapid) injection or absorption of active power.[3] Our view is that this injection and absorption is most effectively provided by zero carbon assets, such as IBR and hydro generators.

With this in mind, we consider the proposed 'RoCoF control service' model represents a preferable solution to the original inertia service model as proposed by the AEC. This is on the basis that a RoCoF control service has the following characteristics.

Firstly, a RoCoF service reflects **an identified underlying system need** - managing the system to meet a given rate of change. RoCoF must be controlled to ensure secure operation of the power system. This is in contrast to defining an inertia service - which is just one of way managing RoCoF.

Secondly and in contrast, developing an inertia service **creates a risk that other solutions to the underlying issue are not effectively identified**.

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[2] Inertia levels themselves should not itself be considered an inherent system need. Inertia, as measured in MW seconds, is a potential characteristic of the power system that changes in time, depending on system conditions. However, along with maximum contingency size, it is just one variable that can be controlled to manage the key power system requirement of RoCoF.

[3] Care must also be taken not to conflate inertia in this sense, with other characteristics of synchronous units, such as reactive current contribution, fault current and management of angular/ transient stability.

This would give rise to significant issues for consumers. As the current NER definitions of inertia service are limited to synchronous kinetic inertia, an inertia service would likely translate to limited competition and create material barriers to entry. This would give rise to market power issues, increasing costs for consumers and likely creating security issues in the long run as synchronous assets are mothballed or exit. This is discussed in more detail below.

Thirdly, **a RoCoF service can be reflected in a RoCoF standard**, as is now included in the Frequency Operating Standards. Transparently defining the volume of a system service by reference to a system standard represents the most efficient approach to system procurement. This is because the standard is determined through a robust cost benefit assessment process. This provides clarity around exactly what AEMO is procuring and why they are procuring it, ensuring customers face only efficient costs.

Fourth, **the effectiveness, and therefore the value, of different assets' ability to provide a RoCoF service can be clearly defined by reference to its relative ability to manage the system need at hand.** In this case, by the assets ability to provide a rapid and effectively damped active power response to control the rate at which frequency changes following a disturbance. This expands the range of potential sources of the service, which improves both system security and competition outcomes.

Finally, **this approach recognises that the potential RoCoF of the system is likely to be relatively dynamic**. For example, the potential RoCoF of the system, should a disturbance occur, will reflect the size of the largest contingency, the amount of synchronous / grid forming generation online at that point in time and the probability of a region separating from the remainder of the NEM. A RoCoF standard can be changed over time, to reflect these changing variables.

A RoCoF service would likely need to have a regionalised dimension, to reflect the fact that the potential RoCoF may be markedly higher in some regions of the NEM than others. For example, regions like South Australia and the north QLD subnetwork are at greater risk of separation and therefore face the risk of higher potential RoCoF values.

Other issues for consideration

Eligibility: As discussed above, the CEC considers that defining an inertia service would artificially restrict competition in provision of services to maintain frequency stability.

Basing the design of the service on the provision of inertia relies on the NER providing a reasonably open definition of what constitutes inertia. At present, this is not the case, with inertia defined as:

> "Contribution to the capability of the power system to resist changes in frequency by means of an inertial response from a generating unit, network element or other equipment that is ***electro-magnetically coupled*** with the power system and synchronised to the frequency of the power system."

The reference to *electromagnetically coupled* implies that only assets that can provide synchronous, kinetic inertia (synchronous generators and synchronous condensers) will be eligible to participate in any inertia services market. This would clearly exclude the many

other power electronically connected assets – such as batteries with grid forming inverters - that can effectively contribute to control the RoCoF of the system.[4]

Examples such as the Wallgrove and Hornsdale batteries illustrate the ways in which IBR assets can provide an automatic and instantaneous inertial response that is more or less indistinguishable from the inertial response of a synchronous asset.

Careful distinction should also be made between these grid forming responses, and so called 'synthetic' inertia or ultra fast frequency control – that is, faster than the newly defined very fast raise and lower FCAS - which is not instantaneous but rather based on sensor responses and therefore limited by the latency of those sensors and asset response.

As discussed below, the CEC considers that eligibility could in fact be recast by reference to actively preferencing IBR technologies. We consider this is consistent with maintaining frequency stability at the lowest cost for consumers, by ensuring there is adequate investment in zero carbon sources of power system frequency stability.

Role of existing synchronous assets: The AEMC must give careful consideration as to how existing synchronous thermal assets would be captured under a RoCoF service market. While we consider a RoCoF service appears more open to all technologies, the current generation fleet is such that existing synchronous thermal assets could well dominate a RoCoF service market as much as they would an inertia market.

This has the potential to deliver windfall gains to existing synchronous assets. This would increase costs for consumers, with no obvious benefit in terms of enhanced system security. These consumer costs could be exacerbated by the ability of some synchronous generators to exercise transient market power.

Over time, any such windfall gains would likely be eroded by entry of new zero carbon sources of RoCoF service. However, this is in turn dependent on there being no barriers to entry created that would penalise these new services – such as relying on strict definitions of inertia services. The speed of new entry is also critical to bringing down consumer costs.

We consider there are various options open to the AEMC to address these risks:

- **Allowing only zero carbon assets to participate in a new RoCoF service market.** This would represent the cleanest solution. However, noting the delays in developing necessary underlying technical frameworks to enable zero carbon assets to provide RoCoF control, this solution may not be tenable.
- **Excluding already committed synchronous assets from earning revenue in a RoCoF service market.** This approach recognises the fact that most existing synchronous assets are likely to be committed on the basis of the energy market. It could therefore be argued that any payments to already committed units represent a windfall gain and wealth transfer from customers to generators. Of course, it might also be argued that such payments change operational decisions of thermal asset owners,

[4] We acknowledge that 'inertia support services' are contemplated in the NER, which allow for IBR, power electronic connected, non-synchronous assets such as batteries to participate in the market for inertia. However, at present these services are contemplated as secondary complements to synchronous kinetic inertia, rather than as direct substitutes.

such as delaying shut down decision like unit cycling or even timing of seasonal shut downs. However, its unlikely the relatively minor payments available in an ancillary service market would affect these decisions, particularly the latter.

- **Making synchronous assets 'price takers'.** This approach would require all synchronous units already online to 'bid zero', effectively making them price takers in the market. Although this reduces market power risks, it also dampens overall price outcomes in the market. This would keep prices lower for consumers in the short term, however over the longer term it would deter new entrant, zero carbon assets. Eventually this would result in a shortage of new assets to provide RoCoF control, once synchronous units exit due to carbon requirements or end of operational life
- **Segment the market to mandate a portion of RoCoF requirement is met by zero carbon sources.** The best way to support investment in zero carbon sources of frequency stability may be to mandate a portion of the system need be met from zero carbon assets. Provided the relative size of the zero carbon 'portion' of the RoCoF service market is increased gradually over time, price impacts for consumers could be minimised, while providing investors with increased certainty regarding forward volumes of required RoCoF service. This approach also enables existing zero carbon assets, particularly some hydro generators, to provide this service and be remunerated accordingly.

The CEC looks forward to working with the AEMC to explore these various approaches.

Interaction with OSM and network procurement frameworks: Another difficult interaction is the relationship with the OSM, and network procurement of system strength and inertia services.

Generally, we consider the AEMC should undertake some form of cost benefit analysis to understand how these mechanisms might most effectively interact with each other. This should consider not just operational efficiencies, but also the impact of different mechanisms on investor confidence. As discussed throughout this submission, transparency and predictability are key to enabling efficient investment. All new mechanisms, particularly the OSM, must be carefully assessed against this principle.

In terms of the OSM interaction, the CEC considers that a RoCoF control service should be prioritised over the development of a non-market 'bundled' service, as is contemplated in the current design of the OSM. Peeling specific services out of the OSM is consistent with the stated long term ambition of the AEMC and ESB to unbundle system services. It also delivers clearer investment signals, to drive investment in zero carbon sources of frequency stability.

In terms of the various network procurement models - inertia and system strength - there are likely to be a number of complex overlaps, although this is probably more the case with network procurement of inertia.

The system strength frameworks are designed around meeting a different system need – provision of fault current and management of converter driven instability – so there should be limited overlap between a RoCoF service and these frameworks. However, if an asset

procured to provide system strength also provides inertia as a byproduct, it will inevitably have an impact on the volumes of RoCoF control service.

Interactions with the minimum inertia frameworks are obviously more complex. Generally however, we consider that these NSP procurement frameworks can remain as they are, targeted around meeting a relatively defined system need – that is, maintaining RoCoF post separation. An ancillary service for procurement of a RoCoF control service is a natural complement to that underlying network procurement, as it is flexible and can be used to match system need in real time. Furthermore, unlike the system strength requirement, the volume of inertia required at any point in time is only that which is necessary to meet the 2Hz/s FOS requirement. A real time ancillary service procurement mechanism is probably sufficient to hit this required volume of RoCoF control service.

Technical underpinnings: We urge the AEMC to consider the need to expeditiously reform the technical and regulatory frameworks to underpin a viable RoCoF service. In particular, its essential that access standards for grid forming inverters are developed, to ensure that this valuable new technology can be rapidly adopted.

Alternatively, as discussed above, if the AEMC decides to pursue an inertia service model, then it follows the underlying definitions of inertia must be revised, to ensure that zero carbon assets can participate in the market. In fact, we consider that these definitions would need to be revised, to prioritise zero carbon sources of inertia.

AEMO must also expeditiously amend the guidelines that enable new services. This includes the market ancillary services specification (MASS), which sets out the specifics of how the various ancillary services operate.

Cost recovery: In the consultation paper there is little information provided as to as to who would bear the costs of any inertia or RoCoF control service.

It's not clear whether the existing FCAS model for cost recovery – where costs are recovered on a 'causer pays' basis – would necessarily be applicable here. For example, arguably the 'causers' that necessitate a RoCoF control service are the operators of legacy thermal assets and the networks that operate UFLS relays that display vulnerabilities to RoCoF values in excess of 2Hz/s.

Equally however, care must be taken to avoid any assertion that the causers are grid following inverters, as has been argued in some cases. This is manifestly untrue – sole allocation of the costs of RoCoF control to grid following IBR assets would be unacceptable to the clean energy industry.

The CEC considers that consumers will ultimately bear the cost of any service, given that they are the ultimate beneficiaries of a stable power system. It follows that the simplest and easiest to implement cost recovery framework is simply to recover these costs from consumers in a given region.

As always, the CEC welcomes further engagement from the AEMC and AEMO on this reform. Further queries can be directed to Christiaan Zuur at the CEC on czuur@cleanenergycouncil.org.au

Kind regards

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