Hydro Tasmania

6 February 2025

Australian Energy Market Commission (AEMC or the Commission)

Submitted via AEMC website

Dear Mr John Kim

Efficient Provision of Inertia (Directions Paper)

Hydro Tasmania welcomes the opportunity to provide feedback to the *Efficient Provision of Inertia* Directions Paper. Hydro Tasmania is Australia's largest producer of renewable energy and is an active participant and significant contributor to the energy market reform agenda. We own Victorian-based electricity and gas retailer Momentum Energy, and specialist power and water professional services firm Entura.

Hydro Tasmania commends the Australian Energy Market Commission (AEMC or the Commission) for its efforts in advancing this rule change and for seeking independent analysis to support the consideration of operational procurement of inertia. As highlighted in the Directions Paper, we also look forward to the Australian Energy Market Operator's (AEMO) response and ongoing contribution to this process, particularly regarding technical analysis and implementation costs, as noted by the Commission.

Hydro Tasmania has a strong preference for essential system services, such as inertia, to be delivered by properly priced market mechanisms, rather than via mandatory requirements. We note this was the basis of our, now completed, 2019 rule change request which sought to address the shortage of inertia and related services in the National Electricity Market (NEM) by integrating their dispatch with the existing energy and Frequency Control Ancillary Services (FCAS) spot markets. We note that the Commission's ultimate goal aligns with our own that security services are independently valued and procured. We agree with the Commission's view that this would provide investment and scarcity signals for participants to deliver these services at least cost to consumers.[1]

Hydro Tasmania wishes to emphasise the ongoing role that synchronous generation will play in delivering inertia needs as we transition to a low- or zero-emissions power system. AEMO considers that synchronous inertia will remain a critical service for the NEM, as highlighted in their recent *Transition plan for system security* where AEMO noted it is not proposing to directly replace synchronous inertia with synthetic inertia. [2] In this context Hydro Tasmania wishes to clarify that it is not *all* synchronous generators which are nearing retirement – only *thermal-based* synchronous generators. Provided there are appropriate market incentives, renewable synchronous generators like hydropower can continue to deliver valuable essential system services like inertia as the market transitions.

Hydro Tasmania supports additional inertia being procured through an operational model. Our preference would be a standalone inertia spot market, that is able to recognise the value of inertia provided by both synchronous and asynchronous generators. We consider this mechanism would provide greater transparency and flexibility by separately valuing and pricing inertia, allowing for more precise market signals and potentially fostering competition and innovation in providing inertia services. If implemented through a staged approach, we consider it would be beneficial to codify this approach in the Rules, providing certainty for investors and stakeholders, while avoiding the need for subsequent rule changes. However, this preference is made without the full implementation costs provided by AEMO and we welcome further information on costs to determine the most suitable procurement mechanism moving forward.

We are also supportive of an operational procurement mechanism being able to procure additional inertia requirements to meet gaps in the minimum inertia requirements, if the additional inertia requirement is at a lower cost than the pre-dispatch clearing price. We consider this approach to be beneficial for consumers and believe it could provide AEMO with valuable experience and confidence in procuring minimum inertia requirements close to real-time. This experience may help advance the industry toward the goal of individually valued and procured security markets by providing critical insights into its technical feasibility which, as noted above, is essential to achieving this objective.

Hydro Tasmania is also pleased to see the AEMC highlight the transitional services framework as an avenue for AEMO to gain experience in how emerging technologies could assist in the creation of a procurement mechanism for additional inertia.[3] We agree with the Commission's assessment and consider this framework a valuable tool for AEMO, and the wider industry, to gain insights in how inertia needs may be met, and the mechanism to procure these services, as we transition to a new operating environment. We look forward to AEMO utilising this valuable framework, particularly type 2 contracts, to support its understanding of how it can operate a system securely in a low-emissions future.

We look forward to engaging further with the AEMC as this work progresses and if you wish to discuss any aspect of this submission, please contact Shannon Culic at [redacted]

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[1] AEMC, *Efficient provision of inertia,* Directions paper, 12 December 2024, p. 2.
[2] AEMO, *Transition plan for system security,* December 2024, p. 45.
[3] AEMC, *Efficient provision of inertia,* Directions paper, 12 December 2024, p. 55.

Additional information in response to the Directions Paper consultation questions is provided in Attachment 1.

Yours sincerely

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John Cooper

Manager Market Regulation

ATTACHMENT 1 – Hydro Tasmania's response to the *Efficient Provision of Inertia* Directions Paper consultation questions

<u>Question 1:</u> Do stakeholders expect that the NEM will have smaller or larger credible contingencies in the future? What will drive trends in contingency sizes?

Hydro Tasmania considers the future of credible contingencies in the NEM to be uncertain and difficult to predict their size as we transition to a new operating environment. As the Commission notes, this uncertainty partly stems from whether large renewable energy zones and offshore windfarms will be classified as credible contingencies in the future. Any limits placed on these contingencies could significantly shape the power system's future landscape, as demonstrated in Tasmania.

The market design itself can also shape the future generation landscape, as evidenced by Tasmania's maximum contingency limit of 144MW, which was designed to manage the cost impacts of procuring contingency FCAS. This differs from the mainland NEM's largest credible contingency, which is based on a technical limit of Kogan Creek's capacity of 744MW. As a result, subsequent connecting generations must take Tasmania's contingency limit into account which has seen the Tasmanian generation landscape include the 144MW Cattle Hill windfarm, and several 288MW generators including the TasRex Connorville Estates solar farm[4] and the Whaleback Ridge windfarm.[5] Consequently, while the size of future credible contingencies may influence the type of connections we see in the future, existing or future contingency limits are also likely to shape the nature of these connections.

<u>Question 2:</u> Do stakeholders expect that synchronous condensers for system strength are likely to provide most of the NEM's minimum inertia needs? What would influence the uptake of synchronous condensers in the NEM?

Hydro Tasmania recognises that synchronous condensers are a growing part of the technology mix in the energy system as it transitions to a new operating environment. Selected hydro plants can also be operated as synchronous condensers. In recent years, we have undertaken several upgrade projects to reinstate the capability of plant to run in synchronous condenser mode.

As noted in the Directions Paper, mainland TNSPs have an expected investment of 36 additional synchronous condensers within the coming decade.[6] However, TNSPs may face challenges in acquiring enough synchronous condensers to meet the forecast inertia needs within the required timeframe. Subsequently, TNSPs may decide to explore alternative solutions, such as the conversion of retired thermal-based generation to synchronous condensers.

An ARENA-commissioned report found that repurposing existing generators as synchronous condensers could be up to 40 per cent cheaper than building a new synchronous condenser.[7] In the *Transition Plan for System Security,* AEMO notes it is observing more exploration by TNSPs of

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[4] For more information see: https://www.hydro.com.au/news/media-releases/2024/12/18/hydro-tasmania-backs-new-solar-farm-with-off-take-agreement.

[5] For more information see: https://infrastructurepipeline.org/project/whaleback-ridge-renewable-energy-project-stage-one

[6] AEMC, *Efficient provision of inertia,* Directions paper, 12 December 2024, p. 31.

[7] ARENA, *Repurposing existing generators as synchronous condensers,* p. 37.

repurposing existing synchronous generation.[8] Consideration by TNSPs to assess potential conversion projects may influence the uptake of synchronous condensers in the NEM for the better, circumventing supply-chain shortages and other complexities. However, while these options present a cost-effective and efficient pathway to maintaining system strength and inertia, appropriate market and investment signals are essential to drive their implementation. As noted on page 2, without clear incentives and a supportive policy framework, these lower-cost solutions may not be fully realised.

It is also important to note that while synchronous condensers are not a new technology, operating synchronous condensers is a new and specialised skillset for TNSPs, diverging from their core focus on poles and wires. Developing expertise in operating and maintaining synchronous condensers within the network may take time. Developing this skillset could lead to a higher cost which could impact the RIT-T outcomes. Subsequently, TNSPs may seek alternative sources of inertia, such as Battery Energy Storage Systems, as they work to build their capabilities and procure a sufficient number of synchronous condensers.

<u>Question 3</u>: What do stakeholders consider to be the potential role of grid-forming inverters in future inertia provision? We would be interested in thoughts on technical and economic challenges, opportunities for co-optimisation with other system services, and the conditions necessary for scaling their deployment effectively.

Grid-forming inverters (GFIs) are an emerging technology that could support the uptake of renewables and promote the transition to a low-emissions power system. In the *Transition plan for system security,* AEMO notes it is observing increasing interest in the application of grid-forming inverters in new generator applications to self-remediate system strength impacts.[9] AEMO further notes that it is *actively monitoring* how existing GFIs perform within the system to increase its understanding of this technology.[10] We also consider that AEMO could explore the application of type 2 contracts to gain more insights into how this technology could contribute to system security as we transition. Specifically, insights into how the integration of this technology and how it could support the co-optimisation of inertia with other services, would be invaluable to the broader market and future market design considerations.

<u>Question 4:</u> Do stakeholders have any further information about the fixed and variable cost estimates of future inertia supply?

As noted above, selected hydro plant can be operated as synchronous condensers. For example, , this is achieved by 'dewatering' Francis turbines using high pressure air to force the water level below the turbine so that it can spin freely and with minimal hydraulic resistance. This is also referred to as 'tail water depression mode'. For Pelton turbines, synchronous condenser operation is generally easier to achieve, as the turbine is not submerged during normal operation.

Not all of our assets have the ability to run as synchronous condensers and over the last decade we have undertaken several upgrade projects to install this capability on a number of our plant. However, this upgrade requires a significant financial and resource commitment.

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[8] AEMO, *Transition plan for system security,* December 2024, p. 12.
[9] AEMO, *Transition plan for system security,* December 2024, p. 12.
[10] AEMO, *Transition plan for system security,* December 2024, p. 43.

There is also a number of ongoing costs associated with running our hydro generators in synchronous condenser mode. This includes the cost of energy used to operate in this mode, and associated operational and maintenance costs. To further increase system inertia, Hydro Tasmania has the option to dispatch certain hydro generating units at low output. Such measures are also used to increase Fast Raise FCAS (R6) capability when needed. Such an approach, although effective in the short term, can cause additional wear and tear to these units, as hydro machines are typically not designed to operate at low output for long periods. For example, hydraulic cavitation is a common issue which can cause mechanical damage to the turbines as a result of extended low output operation.

The increasing connection of inverter-based renewables in the NEM could lead to an increase in providing inertia services. e. The need to operate our units at low output to support stable operations in the NEM can in turn increase its wear and tear (as noted above), leading to higher maintenance costs.

<u>Question 5:</u> Do stakeholders agree that long-term procurement models are currently most suitable to meet minimum levels – given the high cost to the system if minimum inertia requirements are not met?

Based on AEMO's existing engineering knowledge and confidence, Hydro Tasmania accepts that long-term procurement models are the preferred approach to meet minimum inertia levels at this point in time. However, as noted above, this should not preclude the exploration and future consideration of operational procurement of minimum inertia needs. Trials through the transitional services framework and/or the real-time procurement of additional inertia needs to meet shortfalls in minimum inertia requirements could provide critical learnings to assist AEMO and the wider industry to better understand the possibility of operational requirements of all inertia requirements.

<u>Question 6:</u> Are there other potential benefits from operational procurement that stakeholders consider we should include in our analysis? If so, can stakeholders provide further information about how these could be modelled and/or the quantum of such benefits?

As highlighted by the Commission, the operational procurement of inertia offers several benefits. These include efficiency gains from reducing reliance on fast-frequency response services, increasing market efficiency due to reducing impacts of network constrains caused by low inertia, o, and decreasing the need for directions to synchronous generators during inertia shortfall events. Hydro Tasmania supports these benefits, particularly the potential for co-optimising inertia with fast-frequency response services. Additionally, we consider that implementing a standalone inertia market could present an opportunity to co-optimise inertia with other system services, further supporting an efficient power system.

<u>Question 7:</u> Do stakeholders have suggestions on implementation considerations that should be taken into account? For example, how we can mitigate regulatory uncertainty?

A clear implementation plan for an operational procurement model is essential to mitigate regulatory uncertainty. As noted above, if the Commission decides to progress with a staged implementation approach, we consider it would be beneficial to codify this approach in the Rules. This would help investors and stakeholders make informed decisions and reduce ambiguity around timelines, responsibilities and compliance requirements. This would also avoid the need for subsequent rule changes.