01 March 2021

Submitted via email – ISP@aemo.com.au

Dear AEMO

AEMO's Integrated System Plan Methodology Issues Paper

Hydro Tasmania appreciates the opportunity to respond to AEMO's Integrated System Plan Methodology consultation process.

The National Electricity Market (NEM) is undergoing a rapid transition with significant connection of Variable Renewable Energy (VRE), and the retirement of ageing thermal generation assets. This rapid transition necessitates a thorough, transparent and robust system planning approach to provide a clear pathway for future investments in the NEM.

AEMO's efforts to consult widely and transparently with stakeholders are appreciated and will be important in continuing to build confidence in the Integrated System Plan (ISP) process. We acknowledge the complexity of this work and commend AEMO on their progress thus far.

Hydro Tasmania is broadly supportive of the proposed ISP methodology as set out in the consultation paper. **Attachment I** to this submission provides an overview of several points that Hydro Tasmania wish to clarify within the proposed ISP Methodology paper for the 2022 ISP. The six main areas we seek further clarification on are:

1. The use of **sub-regional modelling** in NSW and QLD, and potential implications associated with this approach;

2. Challenges around accurately modelling **storage and perfect foresight**;

3. The rationale for the inclusion of **Take-one-out-at-a-time (TOOT) analysis**;

4. The new approach for the application of **Renewable Energy Zones (REZ) resource limits** to include a 'soft' REZ resource limit, and the importance of utilising existing renewable energy capacity;

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5. Future **ramping and operational reserves requirements** to meet future variability and uncertainty of the NEM under higher penetration of VRE; and

6. **REZ transmission network limits** and the need to recognise ancillary service benefits.

We support AEMO's efforts to ensure robust and transparent planning information – this is integral to underpinning the effective transition of the NEM. While recognising the inherent uncertainty in modelling practices, it remains essential to identify optimal development pathways that are robust to a breadth of plausible future scenarios, drawing information from a wide range of independent sources.

Regardless of efforts to enhance and strengthen the modelling process, uncertainty in the ISP will persist. We commend AEMO's efforts to make step change improvements to this important forward plan, and we look forward to ongoing engagement with AEMO as the plan evolves.

If you wish to discuss any aspect of this submission, please contact Prajit Parameswar (Prajit.Parameswar@hydro.com.au).

Yours sincerely

Alex Beckitt
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Attachment I – Hydro Tasmania comments on proposed ISP Methodology

- **Sub-regional modelling** – Hydro Tasmania notes that AEMO is proposing to move from regional topology to sub-regional topology in NSW and QLD. We hold some concerns that this may reduce the granularity of analysis in other regions, which may ultimately put other states at a disadvantage in the modelling process. In particular, we consider this may result in the model identifying less resourcing needs in the regions not modelled with sub-regional topography. In addition, we query as to how sub-regional forecasting will be reconciled with regional demand forecasts. It has been evident in the push back from the COGATI process at an industry level that stakeholders would like to continue representing the NEM on a regional level for forecasting and operational considerations.

- **Storage and perfect foresight** – Hydro Tasmania notes that AEMO are proposing to explore new methodologies, which generalise the reliability benefits of different storage configurations.

  We appreciate AEMO's efforts to address the firmness contribution during peak demands and recognise this amendment as a 'step in the right direction', however this will still be an imperfect solution. Hydro Tasmania consider it appropriate that AEMO run scenarios with a longer foresight window and a shorter foresight window to account for the impacts of sudden demand and VRE changes – this is because storage is not necessarily able to efficiently optimise at all times.

  The assumption of perfect foresight will substantially affect the outcomes of the next ISP:
  - AEMO's modelling 'knows' what generation, demand, costs etc. will be at all times over the modelling period; and
  - As a result, investment decisions and operational dispatch decisions will be made to perfectly minimise cost.

  In reality, without perfect foresight (and also perfect confidence to invest on the basis of perfect foresight) less optimal decisions will be made and more dispatchable and flexible supply options will be needed to minimise the cost to consumers.

  The use of perfect foresight is particularly problematic for the assessment of the dispatch of energy-constrained resources, such as energy storage. Hydro Tasmania has over 100 years of experience in managing a power system reliant on hydropower, an energy-constrained supply. For fuel-based generation types, it may be sufficient to approximate them as having access to fuel when they need it, subject to fuel costs. However, energy storages need to make decisions about when to store and when to supply based on uncertain forecasts.

  Analysis[1] by Hydro Tasmania has identified that with more realistic generation forecasts (e.g. daisy chaining of batteries to meet a VRE drought), more and longer duration storages are likely to be required to deliver similar system outcomes. To achieve a similar value to that predicted by a model with perfect foresight, a storage with 2-3 times the duration would be required when using real (imperfect) forecasts – and that is not including the relative price

[1] https://www.hydro.com.au/docs/default-source/clean-energy/battery-of-the-nation/storage-with-imperfect-foresight.pdf?sfvrsn=72e59528_4

impact of scarce long-duration options. To this end, more work to accommodate the limits of perfect foresight on modelling is strongly recommended, and Hydro Tasmania would welcome continuing our collaboration with AEMO to resolve this dilemma. Including such analysis in modelling will simulate a more realistic version of the NEM, which is important from a reliability perspective.

AEMO's modelling provides unrealistic flexibility for utilisation of storage either in daisy chaining or individual dispatch versus reality. Storage developers/owners would look at optimising generation/pumping outcomes based on commercial imperatives, as such daisy chaining of 'shallow storages' could result in sub-optimal modelling outcomes.

- **Take-one-out-at-a-time (TOOT) analysis** – Hydro Tasmania seeks more clarity on the inclusion of the TOOT analysis. This analysis is good for illustrative purposes only and should not influence ISP projects, mainly because this analysis is only tested on the central scenario. It also remains unclear to Hydro Tasmania as to how state-based policies and proposed developments would be recognised in the Optimal Development Pathway (ODP), in comparison to the TOOT analysis. We encourage AEMO to provide further clarity on this point.

- **REZ resource limits** - AEMO is proposing to move to a 'soft' REZ resource limit for the 2022 ISP. This means the resource limit can exceed the previously defined limit, provided a penalty cost is incurred. The intent of this penalty cost is to reflect the increasing complexity and costs as the preferred sites for renewable generation development are used. We note in particular, the decision to include REZ land-use penalty factors, which can allow AEMO to model a staged increase in land costs. This approach seems reasonable; however, we wish to clarify how these limits will be applied, and subsequent implications for proposed developments.

  Candidate supply options for new developments consist of a mixture of real proposed projects, and "generic" opportunities. While it is necessary to have generic opportunities available to model, as not all possible future opportunities will have been identified, it is important to consider the relative credibility of various options. This is particularly important for technologies that are highly site dependent, such as Pumped Hydro Energy Storage (PHES). As Hydro Tasmania has outlined in previous submissions, we believe precedence should be given to real identified projects over generic modelled generation development options. This should particularly apply where there is a credible proponent attached to a development who has already invested significantly in the site. To do this, AEMO could consider an appropriate threshold test, such as: feasibility studies; formal steps towards development approvals; material spend (e.g. greater than $5m); community information sessions and/or consultation.

  It is also critical that resourcing issues are considered for new developments. There may be practical limits to the total development of all technologies including gas peakers, pumped hydro, batteries, solar and wind generation. Given the risk of resource-induced delays to "just in time" generation development, Marinus Link should be brought forward so that existing Tasmanian latent and repurposed dispatchable capacity can be leveraged.

- **Ramping/operational reserves** – With high levels of VRE penetration, it is expected that there will be periods where wind or solar generation will increase or decrease at high rates of change, and that these fast changes will require dispatchable generation sources to compensate in order to prevent security issues from arising. AEMO therefore proposes using maximum VRE ramp rates, as determined in AEMO's Renewable Integration Study (RIS) as indicators of required online headroom at all times. It remains unclear to Hydro Tasmania how

this will work if traces are implemented. We encourage AEMO to provide further clarity on this point.

Hydro Tasmania would also like to query whether charge/discharge characteristics for batteries are modelled realistically. Hydro Tasmania has been made aware that the product warranty for utility-scale batteries currently in use in the NEM mandates that the systems be operated in such a way that they are not discharged below 20 percent or recharged above 80 percent of their storage capacity. We would recommend that this charge/discharge range be modelled so that realistic battery cost assumptions can be made.

- **REZ transmission network limits** – Hydro Tasmania would like to note that the modelling may not recognise the significant ancillary service benefits that will arise as a result of investment in the Marinus Link interconnector. In particular, the Marinus Link interconnector will enable a significant increase in FCAS transfers between Tasmania and the rest of the NEM. These services are expected to become increasingly important as the NEM's energy mix transitions. Therefore, we encourage AEMO to include benefits from ancillary services in the modelling.