16 February 2024

Australian Energy Market Operator (AEMO)

Submitted via email

Dear AEMO ISP Team,

Draft 2024 Integrated System Plan (ISP)

Hydro Tasmania welcomes the opportunity to provide a response to the Australian Energy Market Operator's (AEMO) Draft 2024 Integrated System Plan (ISP).

We strongly support robust and strategic system planning that enables the transition of the energy sector and can ensure the security and reliability of Australia's long term energy supply. The energy landscape in Australia currently includes many uncertainties and it is critical that the ISP's modelling and forecasting continues to support policy makers, industry, and market participants through this energy transition.

Tasmania is uniquely placed to support Australia through the transition to cleaner sources of energy. The state has over 100 years of experience in managing a renewable power system, with storages and assets that can be repurposed to firm increasing shares of variable renewable energy (VRE). Tasmania offers flexible renewable energy generation and deep energy storage options (both conventional and pumped storage hydro). In addition to Tasmania's flexible generation and storage capacity, the Tasmanian region has other diverse supply options, including wind with high capacity factors, and a demand profile that contrasts with the rest of the National Electricity Market (NEM). These characteristics make Tasmanian projects highly complementary to the efficient transition of the electricity sector.

The Draft 2024 ISP forecasts a rapid retirement of coal-fired assets – significantly faster than that currently announced in the NEM but consistent with the views of many market participants. With this rapid transformation in mind, it is clear that delayed or late delivery of critical transmission, energy storage and additional flexible capacity represents an increased risk for energy consumers. This risk should provide a strong signal to governments, market bodies, transmission network service providers, and market participants on the importance of swiftly progressing these strategic projects.

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It is pleasing to see a strong focus on decarbonisation across all scenarios – consistent with market, corporate and social trends. We are also pleased to see that the Optimal Development Path (ODP) highlights the criticality of Marinus Link 1, as well as including Marinus Link 2 as an actionable project.

Increased interconnection between Tasmania and the rest of the NEM is critical to supporting the transition of the NEM as well as to achieving other outcomes forecast in the Draft 2024 ISP such as increases in Tasmanian electricity demand. Hydro Tasmania believes that in order to achieve the Tasmanian load growth that is forecast in the Step Change scenario, it is likely that Marinus Link 2 will be required sooner than the ISP currently predicts and will need to be complemented by a higher level of Tasmanian long duration energy storage (LDES). This issue is examined in more detail later in this submission.

Hydro Tasmania has included further comments regarding AEMO's Draft 2024 ISP in Appendix A. These additional observations relate to:

- Flexibility of hydrogen operations;
- Inputs to Tasmanian demand forecast, including assumptions for future load growth;
- Timing of Marinus Link 2;
- Forecasts for Tasmanian deep-storage build; and
- Consumer energy assumptions, including a policy assumption that appears inconsistent with NER 5.22.3(b).

Hydro Tasmania commends AEMO's work so far in developing the 2024 ISP in what is a highly uncertain future market environment. If you wish to discuss any of the above in more detail, please contact me at colin.wain@hydro.com.au.

Yours sincerely,

Colin Wain
Manager Policy Development

ATTACHMENT A – Hydro Tasmania comments on the Draft 2024 ISP

Flexibility of hydrogen operations

The inclusion of notable load growth from grid-connected hydrogen is a major change from the 2022 ISP, particularly for the Step Change Scenario. This places additional importance on the way that the hydrogen load is modelled.

The ISP Methodology notes that the Single Stage Long Term (SSLT) model assumes monthly production targets. Figure 2 from the same document says that the Detailed Long Term (DLT) model "*has a more granular representation to better capture VRE variability, electrolyser operation, …*". However, the Draft ISP does not mention the more granular operation, nor does it share the capacity or utilisation of the electrolysers needed to supply the assumed hydrogen load. Without this additional information, it is assumed that the monthly targets are maintained.

The monthly target effectively assumes a hydrogen storage duration of up to a week (on the basis that the electrolyser utilisation factor is approximately 75%). Hydro Tasmania's understanding is that hydrogen facilities are considering no more than a few hours of hydrogen storage. If that is the case, the modelling assumption will severely underestimate the amount of LDES, gas peaking plant and interconnection needed for the assumed level of hydrogen growth.

Conclusion: Hydro Tasmania suggests that the operation of the system should be tested with AEMO's Time-Sequential Model with an assumed two hours of hydrogen storage per facility, servicing a flat hourly demand. If the modelling identifies a breach of the reliability standard or a notably different energy generation mix (i.e. substantially more gas-powered generation) then this would highlight that there is a problem with this capacity outlook – likely highlighting a need for much greater deep storage and potentially interconnection.

Inputs to Tasmanian demand forecast

Compared with the 2022 ISP, the Draft 2024 ISP shows a marked increase in Tasmanian electricity demand, largely driven by significant hydrogen load growth in the Step Change scenario (as discussed above). This is forecast to increase Tasmanian demand by approximately one third (reaching over ~3.5 TWh annually by 2033) – a growth rate that is nearly four times higher than the previous 2022 ISP Step Change forecast.

Policies, such as the Tasmanian Renewable Hydrogen Action Plan[1], have targeted demand growth within the state. The achievement of this has largely relied on assumptions such as the building of Marinus Link and associated intrastate transmission. However, the 2024 Step Change scenario has delayed the optimal timing of Marinus Link 2 until 2047-48, eight years later than was forecast in the Step Change scenario of the 2022 ISP.

Whilst Hydro Tasmania believes growth in industrial demand is both possible and probable, we also believe that total consumption growth beyond 2 TWh is likely to require an earlier build of Marinus Link 2, as well as significant changes to manage system reliability. These include changes to intrastate

[1] https://recfit.tas.gov.au/__data/assets/pdf_file/0013/313042/Tasmanian_Renewable_Hydrogen_Action_Plan_web_27_March_2020.pdf

transmission, operation of hydropower plants, and the provision of ancillary services (discussed below).

i) Intrastate transmission and system services

Intrastate transmission in Tasmania currently has little capacity to support additional demand in the locations of likely load growth. Furthermore, build timelines for some of this critical infrastructure have been deferred in the Draft 2024 ISP (until Marinus Link 2 is built, or separated out under the "Future ISP project" for the North West Tasmania REZ expansion). This would appear to make near-term load growth even more challenging. Lastly, the additional renewable energy supply required to provide the energy for these projects would also need to be connected, which would likely exceed the limits of the current transmission network. If the timing of Marinus Link 2 and associated transmission investment is brought forward, the large load growth forecast in the Draft ISP would be more probable. Without this, we believe load growth in the near term will be challenging to support.

ii) Operation of hydropower

Tasmania has strong existing capacity through Hydro Tasmania's hydropower portfolio, however due to water constraints, our annual energy production has limits. Hydro Tasmania has flexibility in its operations but must still meet non-power related requirements (such as irrigation, recreational, and environmental flows). Whilst there is capacity to support some new industrial demand, the demand levels forecast by the Step Change Scenario would be challenging to meet with the existing portfolio while also managing storage levels and reliability and may reduce the representativeness of the existing hydro model. This could be relieved with the addition of new dispatchable generation.

iii) Provision of ancillary services

A large demand increase, such as forecast in the Draft ISP, will require large amounts of additional variable supply to support it; this is likely to result in extended periods where the optimal energy operation for Tasmania would be to use Tasmanian VRE and import the shortfall over the interconnector(s). However, the increased ancillary services to manage stability of the power grid during these times will consume more water and thus reduce energy available for capacity provision, potentially pushing beyond the scope of the existing simplified hydro model. This could be relieved with the addition of new flexible load and generation.

Each of the issues above may struggle to be captured in the ISP with the current modelling approach. To continue to meet reliability and system strength requirements and sustain the level of additional demand forecast in the Step Change scenario, we believe the Tasmanian system will need additional energy infrastructure.

Conclusion: Given current ISP modelling approaches may not capture the requirements, challenges and complexities listed above, we encourage AEMO to further consider the interplay of load growth and build timing (for pumped hydro in Tasmania and Marinus Link 2). At this stage, we believe the demand growth assumptions for Tasmania overstate what it feasible without parallel development of enabling storage and transmission projects.

Marinus Link 2 timing

It is pleasing to see that the two best ranked candidate development paths (CDP11 and CDP14) both include Marinus Link 2 as an actionable project. This was also consistently supported across all sensitivities except Reduced Social Licence and Transmission Cost Uncertainty. However, the Step Change scenario has seen notable change since the 2022 ISP, resulting in a delayed timing for Marinus Link 2 under the Step Change scenario. Appendix A6: Cost benefit analysis states:

> *The later optimal timing for Project Marinus Stage 2 in Step Change is driven by cost increases for Stage 2, the development of offshore wind under the Victorian Offshore Wind Target, and the influence of load growth within Tasmania (that reduces the oversupply of Tasmanian renewable energy).*

As noted above, the load growth forecast in Tasmania without additional infrastructure would likely cause reliability challenges that are not able to be captured within the current ISP modelling. The later optimal timing for Marinus Link 2 in the Step Change scenario is influenced by the assumed full achievement of policies such as the Victorian Offshore Wind Target. However, the development of large volumes of offshore wind still faces challenges in both implementation and economics and we encourage AEMO to consider the implications of these targets not being achieved on the optimal timeline for Marinus Link 2 development.

The need for Marinus Link 2 to be online during the 2030s will be critical in maximising the value of resource sharing between Tasmania and the rest of the NEM as variable renewable penetration increases. During this period the NEM will be reaching a point in the energy transition where a very high proportion of bulk energy comes from VRE and there will be crucial demand for dispatchable capacity and in particular LDES.

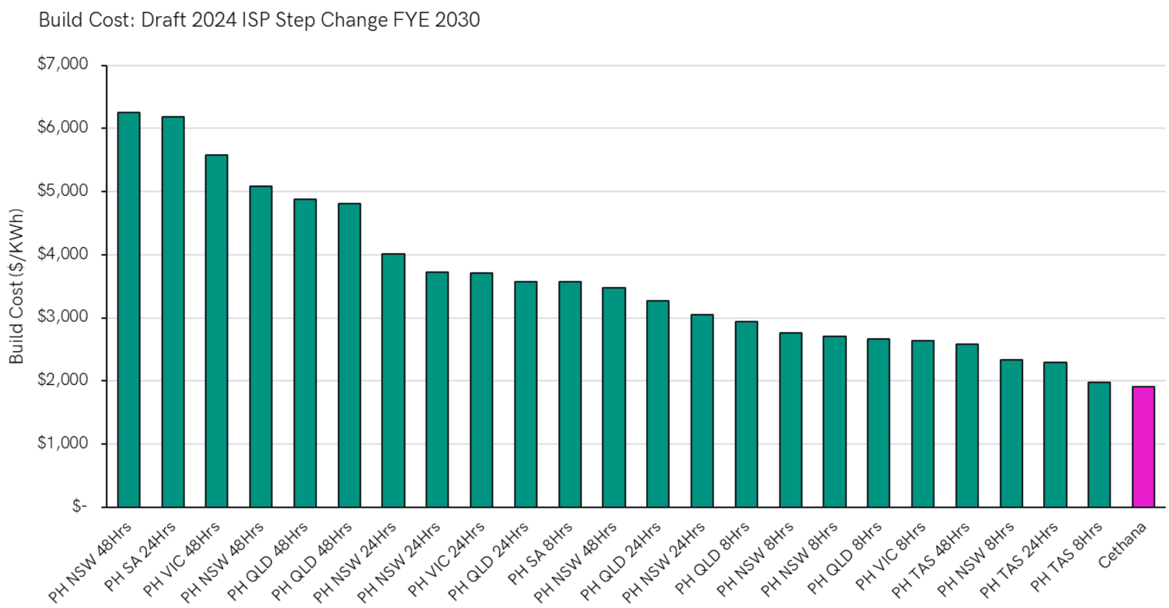
Additional Tasmanian interconnection will provide access to high-quality, geographically diverse wind as well as providing an opportunity to better utilise the solar resources in Victoria. Critically, it will allow better access to Tasmania's existing dispatchable capacity to firm increasing amounts of VRE across the NEM and will connect new low-cost LDES to help stabilise the Victorian grid as coal retires.

Conclusion: It is clear that additional transmission delivers significant benefits to the NEM with the Draft 2024 ISP stating that the ODP *"avoids 17 billion in additional costs to consumers if no transmission was included in capital investment"*. Hydro Tasmania encourages AEMO to continue to consider the impact (and the confidence) of the assumptions that are causing delays in interconnection timing in some scenarios.

Forecasts for Tasmanian deep storage build

As a part of the ODP, there is a total of 370 MW of deep storage built by 2050 in Tasmania. This is substantially less than the optimal and cost-effective size of the proposed 750 MW Cethana pumped hydro energy storage (PHES). The ISP analysis has compared similar technology types within the NEM and found that Cethana PHES is the lowest cost option (Figure 1), and the cost benefit sensitivity analysis shows that the building of Cethana PHES results in higher transmission benefits in every transmission path explored. In addition, an energy system with higher levels of deep storage build is a prudent way to manage risks, including irregular rates of VRE and consumer energy resources (CER) buildout and uncoordinated investment and retirement timeframes. This is supported by internal modelling, which indicates building Cethana PHES to its fullest extent (750 MW as compared to the Draft 2024 ISP's forecast of 370 MW) will result in greater market benefits from Marinus Link 2, which is included as an actionable project in the ODP. It is important to note that build costs of PHES cannot be assumed to increase on a linear basis; the 750 MW size of Cethana PHES is the most cost-effective on a $/kW basis.

Figure 1. Build cost ($/kW) of pumped hydropower projects across different NEM regions[2]



Conclusion: Hydro Tasmania would welcome the opportunity to collaborate with AEMO on the topic of LDES build in Tasmania. We believe there are important market benefits to be gained from a Tasmanian pumped hydro plant that is delivered sooner and larger than the Draft 2024 ISP currently forecasts and we would appreciate the opportunity to share our modelling results on this topic with AEMO.

Consumer energy assumptions

The Draft 2024 ISP makes several assumptions regarding CER that are both exogenous and extremely material to the outcome of this modelling.

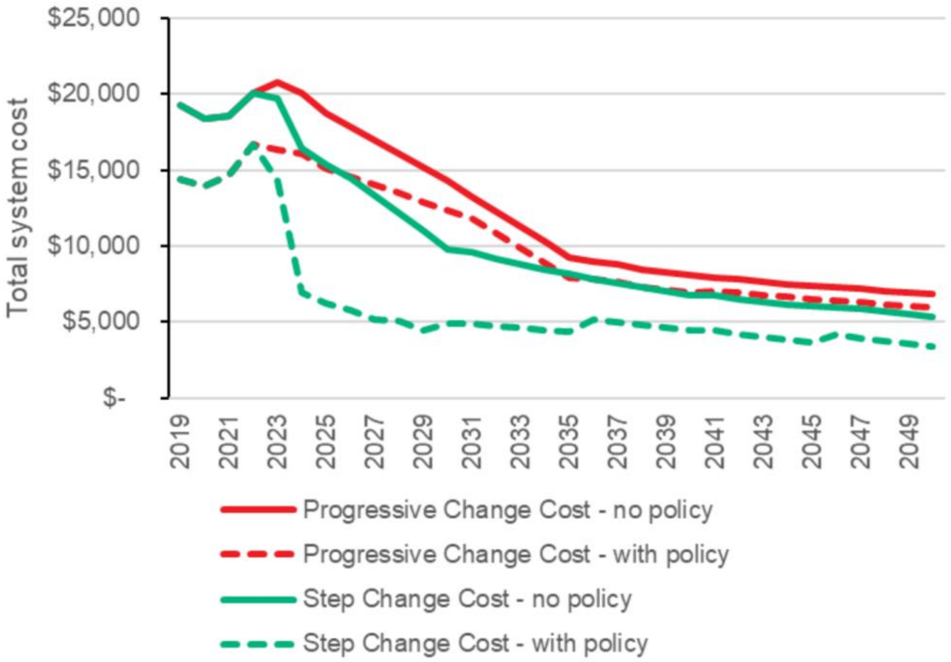
Rooftop photovoltaics (PV) is forecast to increase four-fold over the next 26 years, playing a key part in the decarbonisation of the NEM out to 2050. This will introduce a surplus of energy that is not accounted for in any cost modelling and strengthens the case for storage across the NEM to shift this energy into peak times. Electric vehicle (EV) ownership is also expected to increase rapidly, and the

[2] Data sourced from draft 2023 ISAR: https://aemo.com.au/en/consultations/current-and-closed-consultations/2023-inputs-assumptions-and-scenarios-consultation

current forecast charging profiles have a strong bias towards daytime charging, which would complement the forecast growth in rooftop PV. However, current evidence shows a much stronger tendency for convenience charging by EV owners, which will instead increase peak demand and worsen solar saturation issues in the middle of the day.

Distributed storage is forecast to grow from <1 TWh to over 40 TWh, with the expectation that this will be almost exclusively coordinated. While this would help support both higher rooftop PV and EV uptake, this outcome appears to be driven by an assumed policy in the Green Energy Market's (GEM's) Step Change and Green Energy Export scenarios, which provides a 50% rebate for residential batteries (Figure 2 below, Table 4-1 in GEM's report[3]). As there is no clear indication that the Australian Government (at either state or federal level) will be introducing such a policy initiative, the inclusion of such a rebate is inconsistent with the policy inclusion criteria of the ISP, as outlined in clause 5.22.3 of the National Electricity Rules (NER). This is severely skewing modelling outcomes, and we recommend AEMO addresses this inconsistency by using the CSIRO report assumptions, which adopts assumptions consistent with the NER clauses governing policy inclusion in the ISP. We believe the degree of coordination for CER should also be reviewed and may need to be reduced to ensure that the percentages assumed are in line with observable and likely future behaviour.

Figure 2. Combined solar & battery cost with and without policy support in Step Change and Progressive Change scenarios (6.6kW solar + 10kWh battery system)[4]



[3] GEM's 2022 Consumer Energy Resources Projection Report: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/gem-2022-solar-pv-and-battery-projection-report.pdf?la=en

[4] Figure taken from GEM's 2022 Consumer Energy Resources Projection Report (Figure 1-6, p13): https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/gem-2022-solar-pv-and-battery-projection-report.pdf?la=en

The Draft 2024 ISP also includes a strong forecast for energy efficiency improvements in residential and commercial buildings, which will result in a material decrease in demand, thus reducing the need for extra energy and capacity.

We recognise that the intent of the ISP is about forecasting the optimal pathway for the NEM and that the model assumes perfect foresight. Ideally, the aspects discussed above will all work in tandem as we move through the energy transition. However, many of these forecasts are dependent on the behaviour and choices of individual consumers, which are not always rational. If EV owners decide to continue charging their vehicles on a convenience basis or if energy efficiency improvements are implemented on a slower timeframe due to cost-of-living pressures reducing household disposable incomes, the result to the grid on a macro level could be significant.

Conclusion: Whilst each assumption regarding CER may or may not be justifiable, Hydro Tasmania believes it is important to consider the risks of inaccurate assumptions. In this case, the risks associated with uncoordinated and unpredictable levels of CER uptake can be managed by planning for earlier and larger deployment of interconnection and storage.