ASTRI
Australian Solar Thermal Research Institute

AUSTELA
Australian Solar Thermal Energy Association Ltd

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AEMO ISP Team
Level 22. 530 Collins Street
Melbourne Victoria 3001

Dear AEMO ISP Team

Subject: Joint ASTRI, AUSTELA Feedback on AEMO draft 2024 Integrated System Plan (ISP).

Thank you for the opportunity to provide feedback on the draft 2024 AEMO Integrated System Plan (ISP). The specific focus of our feedback relates to the potential role of Concentrating Solar Power (CSP) systems in the ISP and as a utility scale, dispatchable technology option within Australia's future energy system.

We strongly support the ISP conclusions relating to the significant increase in required capacity, and the consequent need for investment in zero-emission generation and storage technologies. This includes the need for a large investment in dispatchable technologies to provide over 650 GWh in firming capacity to underpin the large projected increase in variable renewable generation inputs.

However, given the large amount of required firming capacity, we were disappointed that CSP, as a commercially deployed, utility scale dispatchable technology, is not discussed as a viable option in the ISP. In fact, with the exception of Antarctica, Australia is the only continent where CSP has not yet been deployed, despite having one of the best solar resource for CSP uptake. With over 7 GW of installed global capacity in around 100 separate utility scale power plants, and with another 3 GW under construction, we find it difficult to understand why CSP is not given greater consideration in the ISP.

In our reading of the draft document, the only mention of CSP appears to be on page 64 where it is stated that:

''In future, the longer-duration role will also be served by pumped hydro storage, and potentially by emerging technologies like advanced compressed air energy storage, gravitational storage, flow batteries and concentrated solar thermal systems.''

In our view, it is inappropriate to describe CSP as an emerging technology. As previously noted, it is a commercially mature technology with a 40-year track record of deployment around the globe. With over 100 operational, utility scale systems, it is therefore misleading to characterise CSP along with the much lower TRL approaches of compressed air, gravitational storage, and flow batteries.

In fact, CSP and pumped hydro storage enjoy similar levels of commercial maturity and similar costs per GWh of provided storage. As such, CSP should be treated in the ISP in the same manner as that for pumped hydro.

The fact that CSP and pumped hydro perform similar roles at a similar cost is important. One of the features of capacity expansion modelling, such as is reported in the ISP, is that where two technology options are close in assumed cost and system role, the model can flip in a non-linear way to favour all of one option and none of the other. In reality, geographical differences, inaccuracies in cost assumptions, and the ability to build other configurations (than that assumed in the menu of choices), mean that quite different technology mixes could actually prove to be optimal, but are never selected.

In the case of CSP, this is further complicated by what we understand to be a limitation of the PLEXOS software used by the AEMO ISP Modelling Team. CSP is not a standard technology choice in PLEXOS and from our understanding, based on descriptions in the AEMO IASR, it is not modelled as a technology that can be dispatched strategically (i.e., similar to that of a gas turbine). This essentially means that CSP's key technical advantage (i.e., strategic dispatch) is not modelled and, as such, there is no predicted net benefit from deploying it.

The draft ISP specifically identifies pumped hydro, batteries, and gas-powered generation as potential firming technologies and assumes that new investment in infrastructure will allow firmed capacity provided by these technologies to be distributed around the NEM. While these firming technologies are all sound, they can be geographically constrained (e.g., lack of water, reservoirs, mountains). Given this constraint, the ISP's reliance on new infrastructure could be problematic, especially given community opposition to new transmission lines. An alternative approach would be to build firming capacity further out in the NEM, to minimise infrastructure investment, to allow for better power distribution and to improve system resilience. In such NEM locations, a technology like CSP is well suited from a geography, renewable resource, operational and land-use perspective.

With respect to the current draft ISP, we would therefore request that CSP be discussed in more detail as a viable firming technology option, in a similar vein to that of pumped hydro, batteries and gas generation. The inclusion of CSP would allow for a more robust system assessment from a technology, financial and risk perspective. Specifically, CSP would complement generation technologies such as PV and wind, delivering a more reliable, secure, and integrated system at a lower cost.

Moving forward, we are keen to assist AEMO in ensuring better assessment on CSP investment options. To this end, ASTRI and AUSTELA have invested significant resources in developing an Australian CSP Cost Model. The work, finalised by Fichtner Engineering in late 2023 (included here as an attachment), has subsequently been adopted by the CSIRO GenCost Team and we note from the IASR that it has also been used in the draft ISP. However, only one configuration has been adopted, which we believe undermines the value that CSP can provide to Australia's future (can be deployed in multiple configurations, with multiple hours storage and capacity factors depending on the specific system need at a specific geographic location. Using this information, we are now working with the GenCost Team to improve the LCOE cost estimates for CSP. We expect to see these revised LCOE estimates included in the 2024 GenCost.

We are also working with the PLEXOS modelling team (Energy Exemplar) to improve the way in which CSP is implemented within electricity system models. Moving forward, we believe that these activities (i.e., GenCost and PLEXOS) will allow AEMO to dynamically configure different CSP configurations and assess better costed investment options within future iterations of the ISP.

With the revised GenCost LCOE estimates and PLEXOS capability, we are keen to reengage with the AEMO ISP Team on how best to model strategic deploymnet of CSP. We would also like to see modelling of different CSP configurations. At present, only one configuration has been modelled in the ISP. However, CSP can be configured in different ways, with varying storage and capacity factors, to meet a specific system need at a specific geographic location. Modelling different CSP configurations in future ISPs will allow for the optimal system value of CSP to be assessed. We would also welcome the opportunity to work with AEMO on technology hybrids (i.e. PV + CSP + Gas), which would likely achieve an even better cost and system outcome.

We look forward to working with the ISP development team during the course of 2024.

Kind Regards,

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