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Australian Energy Market Operator

Submitted via email to: forecasting.planning@aemo.com.au

To whom it may concern,

Climateworks Centre submission on the Draft 2023 IASR consultation

Climateworks Centre welcomes the opportunity to respond to the Australian Energy Market Operator's (AEMO) Draft 2023 Inputs, Assumptions and Scenarios Report (IASR). Climateworks develops expert, independent solutions to assist the transition to net zero emissions for Australia, Southeast Asia and the Pacific in line with limiting global warming to 1.5-degree Celsius. Co-founded by the Myer Foundation and Monash University in 2009, Climateworks is an independent not-for-profit working within the Monash Sustainable Development Institute.

Climateworks and CSIRO were engaged by AEMO as part of the latest Integrated System Plan (ISP) process to conduct multi-sectoral modelling to establish least-cost pathways for Australia's economy to achieve emissions targets while meeting other key parameters that are important from a planning and investment perspective. We welcomed the opportunity to work with AEMO to model scenario from narratives that designed by AEMO and its stakeholders for this ISP. This submission provides recommendations on how the IASR might inform the ISP and further strengthen and future-proof it. A robust ISP that reflects the electricity sector's vital role in economy-wide decarbonisation can better support the sector's evolution. Further, it can help enable Australia to act to keep the Paris Agreement goals within reach and make the most of potential opportunities available as the world transitions to an economy with net zero emissions. This is especially urgent given the window to keep global warming within 1.5 degrees is still open, but narrowing.

Submission summary

Climateworks recommends multiple scenarios are given equal weight within the ISP to determine the Optimal Development Path. Climateworks further recommends that AEMO commission a wider range of analysis to explore a greater range of possible futures – this could include additional scenarios, sensitivity analyses or other types of foresighting of potential changes. This would:

- improve the flexibility of the process to create the ISP to take full account of the potential for further disruptive change and allow the National Electricity Market (NEM) to keep pace with a rapidly transforming energy sector.
- enable well-timed transmission investment and address risks associated with long-lead-time transmission assets constraining generation, especially if existing work under-predicts the real rate of system change. Such constraint could limit energy and industry from unlocking emerging economic opportunities such as exports of green hydrogen, green steel and similar products.

Australia's 2030 economy-wide emissions reductions and the role of electricity

Climateworks' scenario analysis, as part of IASR and other projects, shows that Australia can still achieve trajectories compatible with the Paris climate goals. These trajectories involve very strong emissions reductions by 2030:

- about 75 per cent reduction below 2005 levels for the 1.5-degree scenario; and
- about 50 per cent reduction below 2005 levels by 2030 for the 2-degree scenarios.

Electricity generation is Australia's largest emissions source, and can underpin emissions reductions for energy use across the economy. As a result, decarbonising electricity plays a significant enabling role in decarbonising other sectors, which utilise electricity for energy supply or have electrification opportunities. Climateworks notes the increased ambition of emissions reductions across all scenarios for the 2024 ISP. This is particularly important given that decarbonised energy can unlock potential opportunities from electrification and clean energy exports, both of which provide flow-on benefits for the entire Australian economy.

Flexible planning that takes full account of further disruptive change is essential to keep pace with a rapidly transforming energy sector

The renewable transformation of the electricity sector has historically out-paced modelled projections. Previous ISP modelling and Climateworks' own economy-wide modelling¹ have consistently underestimated the pace and scale of renewable generation deployment. This historical trend demonstrates the need for AEMO to plan using multiple scenarios that include very rapid change. Climateworks recommends AEMO works to two or more scenarios, rather than one 'most likely' scenario, to respond more effectively to uncertainty in future dynamics within the energy system.

This would enable development of an efficient, lowest-cost and reliable electricity system for customers that is robust to uncertain futures. While the future is uncertain, broadening the work of the IASR would help the ISP respond to this uncertainty and enable planning and investment that is more able to adjust to the pace of transformation.

Climateworks' summary of latest scenarios modelled for AEMO compared to previous modelling

Climateworks and CSIRO's whole-of-economy modelling has provided scenarios for two rounds of the ISP process – for the 2022 ISP and this current round for the 2024 ISP. We have also worked with CSIRO on other decarbonisation scenarios for Australia, using the AusTIMES model.

Significant decarbonisation coupled with growth in capacity of the electricity system is central to all modelled cost-effective pathways to meet Australia's new 2030 emissions reduction targets. When compared with our 2022 ISP modelling, current modelling shows that Australia's stronger 2030 emissions reduction target has contributed to a narrowing gap in electricity sector emissions between the modelled scenarios. For example, coal-fired generation completely retires in all scenarios in this round of modelling.² The Progressive Change scenario explores a future where near-term constraints on fossil fuel retirement limits the role the electricity system can play towards Australia's 2030 emissions reduction targets. In spite of these constraints, coal-fired generation in this scenario declines by 44 per cent by 2030, compared to 22 per cent in the Net Zero 2050 scenario previously modelled by CSIRO and Climateworks Centre in 2021. This reflects, in part, the fossil fuel retirements that have been announced since the previous modelling was completed and supports the recommendation for the ISP to anticipate faster shifts.

Energy management and energy performance are key levers of electrification and integration of renewables in the grid

Research on net zero pathways identifies the need for a broad range of policy approaches and

¹ Climateworks Centre (2020) *Decarbonisation Futures*. Available here: <https://www.climateworkcentre.org/resource/decarbonisation-futures-solutions-actions-and-benchmarkmarks-for-a-net-zero-emissions-australia/>

² See Figure ES-1 in CSIRO and Climateworks (2022) *Multi-sector energy modelling 2022: Methodology and results: Final report*. Available here: <https://publications.csiro.au/publications/publication/Plcsi:EP2022-5553>

technologies.³ Improved energy management and energy efficiency would enable Australia to scale up its energy system in a more cost-effective way for electrification and renewable energy exports. Electrification presents one of the most cost-effective options to reduce economy-wide emissions in all 2024 ISP modelled scenarios for AEMO.

While the multi-sector modelling scenarios were designed to explore implications of different technology options on the transition to net zero emissions, a result that consistently emerged from the modelling was the critical role of electrification in decarbonising the economy. Given the cost-optimisation approach of the AusTIMES model used for this project, consistently high uptake of electrification suggests it is one of the most cost-effective emissions reduction strategies across all scenarios (alongside other decarbonisation levers including energy efficiency and renewable energy). In most scenarios, electrification reaches a similarly high scale by 2050, largely driven by the transport and industry sectors.⁴ It is notably lower only in the Progressive Change scenario, which explores a future with limitations on electrification uptake.

The first pillar of decarbonisation, energy efficiency, is critical for reducing both energy wastage and the cost of decarbonising other sectors and other pillars. Energy efficiency provides significant benefits across all four scenarios even in scenario narratives assuming a more restricted role for energy efficiency, varying from 68 TWh of avoided electricity in the NEM in 2054 in the Progressive Change scenario, to 122 TWh avoided in 2054 in the Hydrogen Export scenario. Corresponding figures for WA are 10 TWh avoided electricity in 2054 in Progressive Change and 21 TWh avoided in Hydrogen Export.

Electrification and energy management is also key to cost-effective pathways in other scenario work Climateworks has developed with CSIRO. This includes analysis for *Decarbonisation Futures* and the Australian Industry Energy Transition Initiative.

Rate of change for the energy system is rapid and uncertain and the ISP process would benefit from additional analysis

To assist AEMO in developing an ISP that is most effective at guiding investment and planning, Climateworks suggest the following areas of additional analysis. This work would also allow AEMO to make better use of existing and near-term energy assets. Climateworks is not suggesting that any of these pieces of work would necessarily be best delivered by CSIRO and ourselves. Some of this work may already be underway, especially given workstreams under the National Energy Transformation Partnership, work by the Energy Security Board on post-2025 market reform, research programs such the Cooperative Research Centre RACE for 2030, and other research institutes.

- A 1.5-degree scenario without assumptions of major exports that includes high rates of electrification and energy efficiency
- Explore different technologies and assumptions around firming for the electricity system, including consideration of a wider range of alternatives to gas peaking
- Explore different levels of decentralised energy and how this would influence transmission requirements and timing
- Explore impact of variation in energy and demand management, including energy efficiency, short-term demand response and load management
- Investigate future of gas demand and gas network assets, which was not within the scope of the current modelling that was undertaken by Climateworks.

To fully realise the economic opportunities for Australia in the global transition to a net zero economy, the ISP should enable system transition in line with the Paris Agreement (including striving to keep 1.5 degrees in reach). This will require rapid scaling-up of firmed, zero-emissions electricity networks. To date, the scale and pace of the transition in the energy sector has been underestimated, and we recommend AEMO update the draft ISP to address the risks should this trend continue.

Thank you for taking the time to consider our submission. We would welcome an opportunity to brief your

³ IEA, Net Zero by 2050: A roadmap for the global energy sector, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

⁴ See Figure ES-2 in CSIRO and Climateworks (2022) *Multi-sector energy modelling 2022: Methodology and results: Final report*. Available here: <https://publications.csiro.au/publications/publication/Plcsi:EP2022-5553>

team to explore our response in further detail.

Yours sincerely,

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