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Climateworks Centre response to the Capacity Mechanism High-level Design Paper

Dear Anthea,

Climateworks Centre and the Monash Energy Institute welcome the opportunity to respond to the Energy Security Board's Capacity Mechanism High-level Design Paper. Climateworks develops expert, independent solutions to assist the transition to net zero emissions for Australia, South-east Asia and the Pacific. A non-profit organisation, it was co-founded in 2009 by the Myer Foundation and Monash University and works within the Monash Sustainable Development Institute.

Climateworks bridges the gap between research and action. In the energy sector, Climateworks has recently worked closely with CSIRO and the Australia Energy Market Operator (AEMO) on multi-sectoral modelling of least-cost pathways for Australia's economy to achieve emissions targets while meeting the scenario-based demand parameters.

This submission provides recommendations to the Energy Security Board (ESB) on the Design Paper. Our view is that the design of any such mechanism should be integrated into a broader post-2025 market design process. The way the energy sector transitions is vital for Australia to fully contribute to the Paris Agreement goals while also realising economic opportunities as the world transitions to net zero. The energy transition is urgent – the window to keep global warming within 1.5 degrees Celsius (ºC) is open but narrowing.

SUBMISSION SUMMARY

Climateworks agrees that changes to the National Energy Market are required to address growing issues with imbalances between supply and demand. However, Climateworks recommends that the design of the capacity mechanism should be more clearly integrated with any reforms under the ESB's post-2025 market design process. We are of the view that there is a risk of missing out on least-cost interventions and creating stranded assets unless reforms consider the following elements:

- Market design and investment decisions that backcast from the goal of an energy system that supports Australia's net zero economy and utilises the opportunities available from the global economic transformation.
- Market design and investment decisions that address the need for integration across the multiple technology and system transformations happening simultaneously.

- Energy management/flexibility and energy efficiency is prioritised to ensure system transformation is least cost as it responds to electrification and high levels of decentralisation and variable renewables in the grid.
- Flexibility to respond as greater foresight develops into the scale and nature of disruptive change given the rapid transformation of the energy sector.
- The role of zero-emissions energy in maintaining Australia's industrial and export strengths.

Climateworks recommends the ESB considers these elements when assessing whether a capacity mechanism is required as part of the more detailed design process. If the ESB considers that the NEM cannot wait to have a more integrated approach through post-2025 market reform, we suggest any capacity mechanism is explicitly designed as an interim measure.

CONTEXT: AUSTRALIA'S 2030 EMISSIONS REDUCTIONS AND ELECTRICITY

Emissions reductions are an important consideration in the reform of the National Energy Market. Climateworks' scenario[1] analysis demonstrates the key role the electricity sector plays in Australia's transformation to a net zero economy. In our least-cost scenarios, the scale and pace of changes include:

- Whole of economy emissions reductions of approximately 75 per cent below 2005 levels by 2030 for the 1.5ºC scenario (and approximately 50 per cent reduction for the 2ºC scenarios).
- Coal generation will completely exit the electricity sector by 2035 for the 1.5ºC scenario, and between 2035–2045 for the 2ºC scenarios.
- The share of variable renewable electricity (VRE) in the electricity sector will be 79 per cent by 2030 for the 1.5ºC scenario and between 70–74 per cent for the 2ºC scenarios.
- Australia's electricity sector grows to 263 TWh in 2030 for the 1.5ºC scenario with 29GW of additional renewable energy capacity, and grows to 258–281 TWh by 2030 for the 2ºC scenarios with 24-28GW of additional renewable energy capacity.

In addition, if Australia takes advantage of our natural resources and ramps-up energy exports, AEMO's Hydrogen Superpower scenario[2] nearly quadruples national energy market (NEM) energy consumption to support a hydrogen export industry.

BACKCASTING FROM A NET ZERO ALIGNED ENERGY SYSTEM

As noted in section 6.2 of the High-Level Design Paper, emissions reductions need to be considered in the NEM market design. Climateworks analysis demonstrates the electricity system will be rapidly transformed to align with the emissions reduction goals of Australia's Paris Agreement commitments. Climateworks recommends the ESB's market design process backcasts from an energy system that fully enables Australia's shift and prosperity within a net zero global economy. Characteristics of this system include:

- near zero emissions electricity by around 2035[3]
- higher demand, driven by fuel switching in end use sectors such as buildings, transport and industry

[1] Climateworks Centre, Decarbonisation Futures Technical Report and Main Report (2020), https://www.climateworkscentre.org/resource/decarbonisation-futures-solutions-actions-and-benchmarks-for-a-net-zero-emissions-australia/

[2] AEMO, Integrated System Plan (2022), https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en&hash=D9C31A16AD6BF3FB2293C49AA97FE1EA

[3] Climateworks Centre, Decarbonisation Futures Technical Report and Main Report (2020), https://www.climateworkscentre.org/resource/decarbonisation-futures-solutions-actions-and-benchmarks-for-a-net-zero-emissions-australia/

- different patterns and variability of peak demand
- high proportion of electricity generated by VRE
- high levels of decentralised and utility scale energy and storage.

These are significant shifts from the system that was envisaged when the NEM was designed in the 1990s. We recommend comprehensive consideration of this future system when assessing a capacity mechanism within the context of post-2025 market design. If the capacity mechanism cannot clearly support this future system but is needed as an interim measure, we recommend it be introduced in a time-limited way.

ADDRESS THE NEED FOR INTEGRATION IN THE ENERGY SYSTEM

Shifts in the electricity system are already underway, and will accelerate simultaneously, in a number of ways:

- change from large, centralised thermal generation to more dispersed, variable, renewable generation and storage
- switching from fossil fuel use to electricity and hydrogen use across industry, transport and buildings sectors
- changed operational profiles due to the zero marginal cost of VRE and high capital costs
- two-way electricity flows
- opportunities for load-shaping included in demand side measures
- opportunities to capitalise on Australia's natural resources in the global net zero economy including exports of clean energy and clean manufacturing.

The simultaneous changes and opportunities underscore the need for an integrated approach to system design.

The transition to increasing renewable energy and fuel shifting across the energy system needs to be coordinated, as well as specific consideration for the sectors where fuel use will dramatically change (industry, transport and buildings). For example, Climateworks Centre's work in the Australian Industry Energy Transition Initiative demonstrates the enormous changes involved in industry decarbonisation.[4]

ENERGY MANAGEMENT AND ENERGY PERFORMANCE

Energy management and energy performance will be key levers to support electrification and integration of renewables in the grid. Improving energy management and efficiency can optimise production capacity, infrastructure and spatial resources of the electricity system. Global IEA projections indicate that:[5]

- Electricity demand is going to increase from 24TWh to 60TWh (+150 per cent) in the net zero scenario
- Without additional energy efficiency action, electricity demand will go to 80TWh (an additional 20TWh, almost the equivalent of today's global electricity demand) and a total increase of 230 per cent.

[4] Australian Energy Transition Initiative, Setting up industrial regions for net zero Phase 2 report: A guide to decarbonisation opportunities in regional Australia (2022), https://energytransitionsinitiative.org/wp-content/uploads/2022/06/Setting-up-industrial-regions-for-net-zero-Australian-Industry-ETI-report-JUNE-2022.pdf

[5] 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

We recommend that any capacity mechanism is integrated fully into the post-2025 market design to ensure that demand-side measures, including load shaping, are fully recognised given their cost-effectiveness rather than focusing on providing additional supply side capacity. Experience in the Australian market to-date suggests that attempts to incentivise demand management have not unlocked the potential cost-effective opportunities available.

If the ESB develops a capacity mechanism, it is critical that not only demand response and energy storage can bid for capacity, but also that energy efficiency and long-term load-shifting are incentivised. The International Energy Agency highlights the importance of energy efficiency within the energy system. We recommend that the ESB prioritises considering supply and demand in an integrated way – as in other markets such the European Union.

Australia has an opportunity to design a NEM that supports the ongoing electrification of the buildings, transport, and industry sectors as well as future exports of renewable energy. Energy management and energy efficiency will be important to enable a cost-effective scale up of Australia's energy system, as well as providing 'firm' capacity consistent with emissions reduction goals. In addition, by leveraging the benefits of energy efficiency and energy management, the NEM can make better use of existing and near-term energy assets. It is important that at the end of the current market redesign process we end up with a market design that will last to 2040 and beyond.

THE ROLE OF RENEWABLE ENERGY

Renewable energy can support Australia's industrial and export strengths during the energy transition. Australia's natural assets in mineral resources, wind, solar, land, and strong industry capability offer incredible opportunities as the world moves to net zero. If decarbonisation occurs in a timely and effective way, Australian industry can be competitively positioned in a decarbonised global economy. A crucial component of industry decarbonisation is the early uptake and effective integration of renewable electricity, electrification, and green hydrogen. This will help achieve competitive costs for reliable decarbonised energy, and allow Australia to remain an energy and commodity export powerhouse.[6]

This opportunity could be supported by a marked design that encourages over-building VRE and matching over-supply with energy production or manufacturing timed to take advantage of the low marginal cost of this electricity. For example, the low-cost supply of VRE during times of high wind or sun could be used to manufacture hydrogen for use as energy storage, or for export.[7]

A FLEXIBLE MARKET DESIGN

Future market design will need to take into account the disruptive change that is expected as the energy sector rapidly transforms. The renewable transformation of the electricity sector has historically out-paced modelled projections. AEMO's integrated system plan (ISP) modelling and Climateworks' economy-wide modelling[8] have consistently updated the pace and scale of renewable generation deployment in each iteration of scenario development. This historical trend demonstrates the need for a flexible market design that can manage this uncertainty, as well as avoid energy security issues and capitalise on opportunities when they arise.

MEASURES TO IMPROVE FORECASTING PROCESS

The traditional forecasting method is known for its limitations, especially when the demand side becomes more variable due to increased distributed energy generation and demand management activities. More holistic approaches may include Integrated Resource Planning (IRP), and innovative

6 Australian Industry Energy Transitions Initiative – Phase 1 Report https://www.climateworksaustralia.org/resource/australian-industry-energy-transitions-initiative-phase-1-report/

7 Australian Industry Energy Transitions Initiative – Phase 1 Report https://www.climateworksaustralia.org/resource/australian-industry-energy-transitions-initiative-phase-1-report/

8 Climateworks Australia, Decarbonisation Futures (2020). Available here: https://www.climateworksaustralia.org/resource/decarbonisation-futures-solutions-actions-and-benchmomarks-for-a-net-zero-emissions-australia/

foresighting and anticipatory planning approaches. A consortium, including University of Technology Sydney, Curtin University, Monash University and Climateworks, and University of New South Wales, has investigated these approaches under the RACE for 2030 E2 Opportunity Assessment[9]. The proposed Foresighting report, Decentralised Energy Statement of Opportunity, and Decentralised Energy Survey aim to address data issues for distributed energy resources, and incorporate more innovative foresighting and planning from a whole of system perspective.

Professor Rob Hyndman from Econometrics at Monash University has developed distributed energy resource forecasting methodologies to support decisions regarding the supply of electricity across a power grid taking into consideration the inherent uncertainty in demand[10]. This work provides a specific, immediately practical pathway and as well as a framework for more complex opportunity development pathways when needed.

To fully realise the economic opportunities of Australia's transition to a net zero economy, Climateworks recommends the post-2025 market design process considers the elements set out in this submission. The ESB can assess the proposed capacity mechanism against these elements and proceed accordingly. The market design should enable the rapid scaling-up of firmed, zero emissions electricity production systems that will position Australia for prosperity in the global net zero economy.

Thank you for taking the time to consider our submission. We would welcome an opportunity to brief your team if you would like to explore our response in further detail.

Yours sincerely,

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Co-signed by:

Ariel Liebman (PhD)
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This submission from Climateworks Centre is endorsed by the Monash Energy Institute which works to accelerate the transition towards a sustainable energy future.

[9] RACE for 2030 reports available here: https://www.racefor2030.com.au/opportunity-assessment-reports/
[10] https://robjhyndman.com/publications/hpf-electricity/