Enhanced System Planning Project

C4NET | ESP

Australian Energy Market Operator
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Attn. Eli Pack

Re: C4NET submission to AEMO ISP methodology consultation

We thank the Australian Energy Market Operator (AEMO) for the opportunity to provide the Centre for New Energy Technologies (C4NET) consideration into the scenarios informing the 2026 AEMO Integrated System Plan (ISP) methodology. C4NET delivers multi-disciplinary solutions to the challenges the energy industry is facing. Working with complexity requires diverse skills, reliable data and new approaches, which C4NET facilitates by bringing together governments, industry and universities, creating new links across the sector.

Central to C4NET's program of work is the Enhanced System Planning (ESP) project, a significant and collaborative research project aimed at informing sub transmission level electricity planning beyond 2030, with a focus on building methodologies and approaches for bottom-up modelling and to highlight the opportunities presented through the distribution system and integrating Consumer Energy Resources (CER), to inform whole of system planning.

The methodologies developed through the ESP can inform the impact of various levels of CER hosting on distribution network systems to identify constraint issues down to localised levels, and key differences across both network types (topologies) and orchestration/coordination levels. This is consistent with the Energy and Climate Change Ministerial Council's recommendations to the recent ISP review. In addition, the ESP provides a bottom-up approach to validate some of the assumptions in the ISP from a localised and technological level.

C4NET's submission will focus on the consultation question 6.

What are your views on AEMO's proposed inclusion of distribution network capabilities and their impact on CER within the ISP model? What further enhancements could be made?

We support a more in-depth view of the distribution network capabilities and the integration of CER into those networks, for more detailed consideration within the ISP model.

Our initial views support a bottom-up approach to modelling to ensure full consideration of the evolving bi-directional energy system that originates at the household/business level based on the policy incentivised investments being made into CER/distributed energy resources (DER) and the energy being exported into the distribution system, that may benefit further understanding to inform whole of system energy planning.

As part of the Enhanced System Planning project we are considering what data, assumptions and modelling approaches could be integrated into the ISP to inform a more detailed understanding of the role of CER, and that we have considered is necessary as part of the ISP. At this time, reflecting the increasing capability of households and their solar systems to be net-generators (as reflected in the 2024 ISP) we request that AEMO consider adjusting its language within the system from *supply* and *demand* side to more readily reflect the evolving, bi-directional nature of the market.

This will also have a flow-on effect of how the industry and the consumers themselves discuss and see their future role in the energy system and speaks more widely of changes necessary across the energy system including market bodies to accommodate this change. Moving towards a common language approach will be instrumental in supporting the engagement and insights needed from a more localised and complex analysis involving CER and distribution system considerations.

The consultation paper notes that "AEMO proposes to implement distribution capabilities and augmentations in the ISP models at the sub-regional level, meaning that data relating to distribution capabilities and augmentations will need to be aggregated and summarised". C4NET welcomes this approach particularly as the methodologies being developed as part of our ESP program are intended to support a consistent and replicable (across Australia) aggregation approach at the distribution network level.

We will be in a position to share the expanse of our research in line with the next phase of consultation on the methodology in April 2025. This timing aligns with the progress of each work package under the Enhanced System Planning project, which AEMO has been a contributor to. Our input at that time will include a foundational methodological approach to key aspects, which will assist AEMO in considering its path forwards in terms of integrating CER more fully, via distribution systems, into its whole of

system energy planning approach. A summary of areas of our proposed contribution can be found in Appendix 1.

We look forward to engaging with AEMO further and providing additional input into the next phase of consultation on the ISP methodology in April 2025.including providing the outputs of the ESP resulting in methodologies and approaches that will further enhance the ISP.

Yours sincerely,

James Seymour

Chief Executive Officer
Centre for New Energy Technologies (C4NET)

Appendix 1

Proposed outputs from C4NET's Enhanced System Planning Project that will assist AEMO in consideration of future methodologies and planning needs for the ISP 2026 and beyond, focussed on the residential connections and LV networks.

Available April 2025

- Datasets and models:
  - for example, in the form of multi-parametric load and DER profiles, for electro-thermal modelling of buildings, transport and electrical model of EVs and charging stations, modelling of virtual storage and demand response flexibility, and optimal mix of localised storage in different scenarios, for whole-of-network and whole-of-system studies
  - for steady-state and quasi-steady-state electrical equivalent models for DER aggregates and flexibility studies, including impact of downstream network constraints, to assess aggregated profiles and bottom-up provision of network and system services
  - including relevant options for different control mechanisms and their merits and the need for standards for different types of DER coming from electrification (incl. V2X, hot water, size of PV and EV charging points, etc.)
  - prioritisation of loads to be controllable or schedulable and assessment of the contribution of different flexible DER segments (e.g., hot water storage, EV charging stations, V2G etc.)
  - controllable/schedulable loads/sinks (incl. V2X, hot water, etc.) within distribution system constraints and considering the detailed physical features and control mechanisms of different options (e.g., resistive heating to back up heat pumps for hot water)
  - identifying different storage options under different scenarios
- Techno-economic modelling frameworks as a foundation to:
  - support network-constrained flexible DER operation in a multi-sided market environment and assess its impact at the transmission level
  - inform methodological developments of next-generation network investment approaches and inform costs benefit analysis of different impact mitigation options across different network areas
  - inform investment pathways under different flexibility scenarios and optimization approaches of EV charging/discharging, heating electrification, and DER operation and uptake more generally

    - inform investment pathways under different flexibility scenarios and the role of integrated development and management of electrified heating and transport and rooftop PV
- Insights into:
    - consumer expectations around fair integration of DER
    - the impact of electrification scenarios at the State level (by representative network topology type, demand peak & min, infrastructure limitations, load shape, etc). This will be shown as Victoria as being a case-in-point, however the underlying methodology is applicable to any region.
    - the impact of V2G usage levels on distribution network reinforcement requirements and equivalent transmission demand
    - the system value of transport and heating flexibility in dealing with renewable integration issues (ramping, minimum load, price volatility, etc.)
    - the network value of transport and heating flexibility in dealing with DER integration issues and to inform policy views (e.g., network reinforcement moderation, DER as non-network solutions, max size of rooftop PV and EV charging points, etc.)
    - methodologies to assess the optimal balance between grid and system capacity expansion and the cost of various options to reduce impact of electrification via DER flexibility