19th August 2025

Electricity Authority - Te Mana Hiko
Te Whanganui-a-Tara - Wellington
Submitted via email: fsr@ea.govt.nz

Submission on the Future Operation of New Zealand's Power System

Tena koe,

Climate Navigator welcomes the opportunity to comment on the Authority's consultation about the appropriate on the future operation of Aoteroa New Zealand's power system. Specifically you are seeking feedback on three proposed models: a TSO, a DSO and a hybrid.

Climate Navigator is a niche consultancy on a mission to unlock the power of people and places to accelerate just climate and energy transitions. We provide the following points for the Authority's consideration:

- **Grounded in Societal & Customer Outcomes**
  Decisions on future systems operations should be grounded in a broader vision for the customer and societal outcomes that the system will contribute to. The Authority's Decentralisation Green Paper provides the basis for the vision and outcomes sought, along with related considerations. We also draw the Authority's attention to a series of reports on 'Navigating to the Future Grid', recently published by Energy Catalyst (Australia)[1] which provide a human-centred design framework to define customer and societal outcomes and translate these through to models for future power systems operation.

- **Creating Simplicity through Systems Design**

  We note the Authority's observation of the future system as a series of 'layers' and the comment that interactions between these layers creates more complexity (Sect. 2.33). We suggest that the opposite could and should be true: breaking down any complex system into layers, with clearly defined and controlled interfaces between layers, and freedom to innovate within each layer, provides a mechanism to simplify and manage the inherent complexity of an emergent future electricity system with millions of devices at the grid edge.

  The Energy Catalyst Report 4 makes the same point (pp.94): *"As a foundational strategy for managing complexity in large, complex systems, layered structural models configure a highly complex system into semi-independent, logically structured tiers/layers, each of which provides services to the tier/layer above and uses services from the one below. In contrast with more traditional 'top-down' hierarchical control, it enables highly complex problems to be decomposed multiple times into sub-problems, which then work in combination to solve the original problem. In the case*

[1] Energy Catalyst, Navigating to the Future Grid (August 2025) https://energycatalyst.au/futuregrid/

of a transforming power system, it provides a structural framework for the operational coordination of edge resources such as CER/DER co-optimised with the more conventional bulk power resources."

The report also highlights that while a hybrid system may seem attractive, being more familiar and less likely to be disputed by influential stakeholders, these hybrid models result in *"significant increase in the technological complexity and economic cost combined with elevated reliability and resilience risks. While several variants of the Multi-entity archetype have been proposed, these downsides are ultimately due to significant, non-scalable characteristics and constraints that are intrinsic to all Multi-entity DSO models".*

- **Incorporating local systems and local energy markets**

  The future system model needs to enable local communities of place to partner with utilities in the development of localised energy systems which reflect their context, aspirations and plans. These localised systems require a number of roles and functions that would benefit from more consideration as part of an integrated future system model, including:

  - provision of energy-related education, advice and support to build consumer capability and confidence to engage in their energy system and solutions;
  - undertaking collaborative and integrated local energy planning, potentially led by local authorities in partnership with local stakeholders including EDBs and Transpower;
  - facilitating consumer and community access to funding and finance;
  - establishing and governing local energy markets and enabling assets such as community-owned batteries, to drive affordability and equitable access to the benefits of DER. These local markets could take a range of forms and be established separately to the wholesale market, so long as the interface is clearly defined.
  - working with local councils and communities to leverage distributed generation and storage to create resilience hubs and islandable networks / microgrids, which build resilience to increasingly frequent and extreme events.

  It is unclear how these critical, consumer and community-centric functions of the future system are envisaged to be delivered, and by whom, in the various models outlined. However overseas examples are providing insights, including in the US where local empowerment for local energy outcomes has been demonstrated by Community Choice Aggregators - local jurisdictions providing electricity and also manage customers assets (including DERs). In the UK Community DSO - Northern Power Grid is piloting a model for localised, community-centric systems, while Social DSO - Electricity NorthWest is exploring a range of mechanisms to enable community outcomes. Meanwhile in Australia 'Local Renewable Energy Zones' (LREZ) models are being piloted in several states.

  A somewhat extreme example is emerging in Ann Arbor in the US, where citizens have voted to establish a second, parallel network utility to build community VPPs –

including DG, storage and parallel network infrastructure in targetted locations to connect community-owned assets and consumers into a local market and islandable microgrid. The NZ system model should aim to unlock these local outcomes without workarounds of parallel utilities and infrastructure.

- **Acknowledging NZ's fragmented sector**

  Perhaps the most critical consideration when exploring FSO models for Aotearoa, is the large number, small scale, and range of ownership models of our 29 EDBs serving just 5 million people. While the hyper local nature of our EDBs could be a benefit, it is hard to imagine that a model which has all EDBs taking on the required new roles and functions could provide the services required at the necessary pace and consistency - despite the best efforts of the ENA's Future Networks Forum, EEA, Ara Ake, Flex Forum, EECA, the EA and others, and the impressive progress made by some individual EDBs. While amalgamation is perennially raised as the solution to this EDB challenge, other options may be more likely to gain traction.

- **Considering community energy services 'hubs'**

  The layered system architecture outlined above could provide an alternative approach to addressing the EDB challenge while enabling a more localised system. For example some of the 'new' roles and functions required at the community 'layer' could be delivered through a national network of community energy services hubs (including community aggregator / virtual power plant and local market facilitator), governed locally by and for their communities, with services delivered through commercial arrangements with providers with the required capabilities and scale.

  This could limit the scope of new core services our EDBs would need to deliver, enabling them to retain focus on the critical asset management services they already provide to their communities. It could also manage some of the real / perceived conflicts of interest associated with EDBs owning or controlling DER, and/or facilitating local markets.

- **Enabling emergent but intentional pathways towards the future system**

  We note that the optimal future system and pathways to get there will emerge over time, as context, expectations and enabling technologies and cost curves evolve. However in considering our future system design and roadmap, the opportunity is to transition with intent towards the envisaged more decentralised / localised future system, avoiding the distraction (and potential barriers) of halfway DSO solutions designed to address interim issues, such as those experienced with high levels of flexible demand but little DG, or high levels of DG but little flexible demand (see figure).

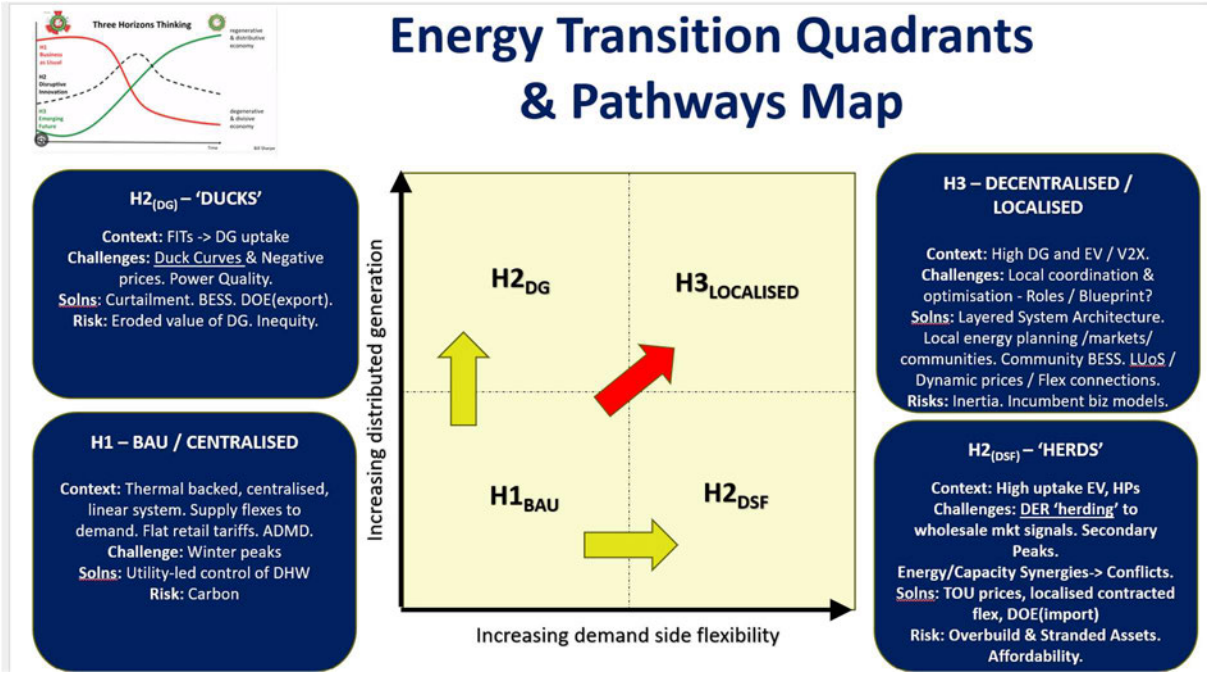

Figure: Scenarios and pathways towards a more localised electricity system

Recommendations:

- Adopt a human-centred design approach to development of our future system, similar to that outlined in the recent Energy Catalyst suite of reports.
- Design the model to realise the vision and outcomes of a more decentralised / localised system, as outlined in the Authority's recent Green Paper.
- Explicitly consider the roles and functions required to empower locally optimised energy systems, including collaborative, integrated local energy planning; local energy markets; community VPPs including shared assets such as DG and community batteries; and consumer and community resilience solutions.
- Acknowledge one of the critical challenges for NZ's system, being the number, small scale and varied ownership models of our EDBs, which will likely require a different system design to those being developed in other countries (where distributors have the scale and in-house capabilities to provide DSO services).
- Manage the inherent complexity of millions of devices operating at the grid edge by adopting a multi-layered system architecture, with tightly defined and managed interfaces between each layer, and freedom to innovate within each layer.
- Given the above, consider whether one 'layer' in the system architecture is best served by a nationally-supported network of locally-led community energy services hubs - providing a range of services including community aggregator / virtual power plant and local market facilitation. [We are unclear if or how this aligns with the 3 models proposed in the consultation paper, but believe any decisions on 'DSO' models should be made in the context of these broader roles and functions].

- Enable emergent pathways towards the future system, while being intentional on the direction of travel and avoiding unnecessary interim steps or DSO models which potentially slow down or stall progress towards the desired end state.

We acknowledge the complexity and uncertainty of the topic under consultation, and appreciate your consideration of the above points. We are more than happy to discuss any aspect of our submission with you.

Ngā mihi nui,

Sam Elder

On behalf of Climate Navigator
[redacted]
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