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System Operator, Transpower
22 Boulcott St
Wellington 6011
By email: system.operator@transpower.co.nz
Cc: Future Security and Resilience Team, Electricity Authority, fsr@ea.govt.nz

Tēnā koe,

System Operator Strategy – Key trends and issues

We welcome the opportunity to respond to the System Operator (**SO**)'s consultation on key issues and trends for its strategy refresh. The SO is an important partner for Powerco and this work is timely and helpful as we jointly plan our way to ensuring stability across the interconnected grid and local distribution networks. Our response attached addresses your questions individually, and below we set out key points we think the strategy needs to address:

- **Reflect the prime role of the network that resources are attached to:** The consultation discusses "running the distribution level like the transmission system" and "proactively orchestrating required changes". By default, primary responsibility for forecasting and orchestration for supply, storage and demand should fall to the party whose network the resource is physically connected to. This should be the basis for the SO's proposed work to define "physical capabilities" and "interoperability", in a way that does not bypass or reach over the distributor.

- **Define a common CER data exchange:** The strategy document refers to the Australian consumer energy resources (**CER**) Data Exchange and the UK's digital spine concept. Defining a NZ model for data exchange should be the basis for developing standards for information sharing, network and resource visibility and transparency between SO and Electricity Distribution Businesses (**EDB**) without undermining EDBs' operational control of their distribution networks.

- **Present a technical consensus to the Electricity Authority (EA):** For the strategy to "assist the Authority to scope and develop their work programme" and "feed into the Authority's work plan development", the SO and EDBs must present a unified technical consensus to the Authority for consistent input to the EA's future Code development.

We are always keen to discuss and develop the ideas in our submissions. If you have any questions or would like to talk further on the points we have raised, please contact us at emma.wilson@powerco.co.nz.

Nāku noa, nā,

E Wilson

Emma Wilson
Head of Policy, Regulation and Markets
POWERCO

1. Do you agree with the trends and drivers we have identified?

Yes, in particular we support the identification of "Decentralisation and distributed energy resources" and "Data and digitalisation" as critical drivers. We also agree with the assessment in Section 5.2 regarding the shift toward a highly weather-dependent system.

However, we believe the strategy must explicitly recognise that distribution networks are becoming the primary platform for flexibility. As we noted in our *Rewarding Industrial Flexibility* submission to the EA[1], flexibility is not just about large industrials using less power; it is about orchestrating widespread consumer resources. Our recent winter trial with retailers achieved a ~10% reduction in peak load on participating circuits through hot water control. The SO Strategy must reflect that this volume of flexibility sits within the distribution network, not at the grid exit point (**GXP**) alone and there may be different constraints on the hosting transmission assets from the embedded distribution network.

2. Which ones do you think will have the biggest impact?

Technological change and decentralisation: We believe the shift toward consumer energy resources (**CER**) and battery energy storage systems (**BESS**) will have the most profound impact. As noted in our *Regulatory Roadmap for BESS* submission to the EA[2], BESS provides both demand-side and supply-side flexibility. The SO Strategy must account for assets that act as both load and generation. For example, our Whangamatā BESS creates reliability for the local community but could also offer frequency support to the grid. The impact on system operation will be defined by how well we coordinate these dual use assets.

Regulatory pace will have more impact than identified: We agree with Section 3.3 regarding regulatory inertia. We are currently seeing a disconnect between technology uptake and regulatory settings. For example, in our recent *Wholesale Market for Battery Energy Storage Systems* submission to the EA[3], we noted that current proposals risk the System Operator continuing to direct operations of devices that are physically embedded on distribution networks. If the regulatory framework does not resolve role clarity (in a more decentralised system) quickly, it will act as a brake on the transition. In our view, the impact in section 3.3, is understated.

3. What other trends or drivers may come into play?

Community resilience and islanding: We agree with Section 6.3 regarding community resilience. We are already seeing this driver manifest in projects through the Community Renewable Energy Fund and our PowerHubs programme. We are already observing communities on the edge of the network disproportionately investing in solar & battery to support energy resilience, which we support. The SO Strategy needs to accommodate network configurations (microgrids) that can operate independently of the main grid during emergencies, requiring clear protocols for seamless reconnection.

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[1] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---rewarding-industrial-flexibility.pdf
[2] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---regulatory-roadmap-for-battery-energy-storage-systems.pdf
[3] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---wholesale-market-for-battery-energy-storage-systems.pdf

4. What advanced technologies and real-time data capabilities will be critical?

Our view is that the following technologies and real-time data capabilities will be critical:

- **Standardised data exchange**: The consultation's reference to the Australian CER Data Exchange is helpful and timely. In our *Digitalisation* submission to the EA[4], we argue that where the costs of digitalisation fall on parties (like EDBs) who do not solely benefit, regulation or strong leadership is needed to enforce standards. As the central physical actor in the electricity market, the SO should lead on defining interoperability standards to reduce the friction of data exchange.

- **Visibility vs control**: We caution the SO against conflating data capability with direct control. In our recent submission on the SO's *Connected asset commissioning, testing and information standard* consultation[5], we raised concerns about requirements for real-time SCADA measurements of controllable load. EDBs cannot provide direct measurement of load controlled by third-party retailers. The critical capability for the SO will be forecasting and estimation algorithms that can ingest aggregated data from EDBs, DSOs and flexibility providers, rather than requiring hard-wired visibility of every device.

- **Artificial intelligence (AI) as a support tool**: As the consultation document notes in section 7.4, AI has operational applications in weather forecasting and system state estimation. AI is viewed as a way to shift computationally expensive power-flow modelling to data-driven statistical models for real-time monitoring and scenario testing. In Section 7.5, the consultation document discusses the control room of the future and the future role of AI and machine learning to augment decision-making processes to handle the increasing complexity of the power system and handling variability that human operators can no longer manage alone. This is entirely consistent with Powerco's view as we see AI assisting real-time operations in the future.

5. Where do you see the operation of the power system being in ten years?

Defining roles by which network resources are attached to: We generally agree with the SO's view that implementing DSO capability means "running the distribution level like the transmission system". However, this must reflect which network devices are attached to.

Our recent *Wholesale Market for BESS* submission to the EA[6] emphasises that if firm (e.g. contracted BESS) network flexibility is required to manage a network constraint, it is important that dispatch instructions related to wholesale market participation do not compromise the primary purpose of providing network support. For example, Lodestone's recently commissioned Pāmu Rā ki solar farm in Whitianga is embedded on Powerco's distribution network but offers into the wholesale market. Currently both the SO and Powerco have the ability to curtail the same plant and there are no rules coordinating how roles and responsibilities of doing so. We've approached this

[4] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority--digitalisation.pdf
[5] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/transpower---connected-asset-commissioning-testing-and-information-standard.pdf
[6] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---wholesale-market-for-battery-energy-storage-systems.pdf

situation with the SO adopting a 'hierarchy of control' approach. Under this logic, the lowest dispatch value always wins, allowing any party to lower the threshold as needed, while preventing conflicting signals from compromising either distribution, customer or transmission system. This model may be extensible to other similar situations where large generation assets which may affect security on the transmission system are embedded on distribution networks.

The SO strategy should support a future Operating Model where:

- The DSO manages the distribution layer, ensuring local safety and reliability and
- The System Operator maintains the transmission grid and wholesale market balance.

The SO should not reach down to dispatch distribution-connected assets directly. Instead, the DSO should orchestrate local resources, giving the System Operator visibility of the aggregate supply/demand balance by GXP. As in the Pāmu Rā ki example above, the SO may need to curtail distribution-embedded generation for market security purposes. We support a "Hybrid DSO" model (Option 2 in the EA's *Future System Operation* discussion paper[7]), where functions are shared but responsibilities are clear.

Maximise role of market solutions: Management of grid edge (GXP & transmission spur) constraints should, in the first instance, look to trader response to the locational marginal price in the forecast response and non-response price schedules, especially as trader flexibility portfolios improve and they have more options at different price points. The SO and DSO should expect that operating beyond N-1 (N-1 as determined by gross unconstrained demand) will be commonplace or BAU in future. With the current connection pipeline of grid and utility scale solar, over-supply will be increasingly common, causing more competition for export capacity and pressure on market tie breaker rules. While this should drive BESS uptake, demand and price volatility will be more severe.

With potential small scale actors being price setters, market trading rules may need to be tighter. Traders (i.e. purchasers) should be required to take more responsibility for estimating demand (net of DER under their control). The concept of a "conforming GXP" may not even exist anymore.

As noted in the consultation document, the reduced system strength and inertia will likely need new ancillary services. Intermittent volatility may also see a need for additional frequency keeping and voltage management mechanisms, preferably with a market-based system to reflect costs to causers.

DER uptake and an increase in MV cables used for network subtransmission circuits is seeing radical shifts in reactive power flows at the GXP interface. Whilst it is the Authority's responsibility to amend the Code such that it no longer uses a deterministic power factor based approach, we would see there is likely a need for market-based management of reactive power in the next decade. As noted in the Iberian report[8], DG and grid intermittent generators absorbing reactive power, often to increase the potential export capacity for their plant, can create genuine risks for system stability as voltage rises when they trip off. Common quality or shared obligations may not be effective in future to manage volatile reactive power flows and voltages determined by commercial drivers (e.g. increased export).

[7] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---future-system-operation.pdf

[8] Iberian report referenced in the consultation document section 7.1

6. What skills and capabilities will the System Operator need?

Forecasting in a high-intermittency environment: We agree with the need for better meteorological capability. In our 2024 submission to the EA on *Forecasting provisions for intermittent generators*[9], we noted that while the SO manages central dispatch, the DSO will have better visibility of network dynamics and local intermittent generation. The SO will need the skills to integrate bottom-up forecasts provided by DSOs into their national models.

7. Are there areas where the System Operator could usefully provide more of a leadership role?

Standardisation of flexibility products: The SO can lead by standardising the definitions of flexibility products used in the wholesale market (reserves, frequency keeping) so they can be easily provided by distributed assets. We discuss the need to remove frictions such as search and coordination costs in our submission to the EA on *Rewarding Industrial Flexibility*[10]. The SO should work with the EA to design market products that are technology neutral, to allow BESS and aggregated load to compete fairly with thermal generation.

Emergency reserve coordination: With the introduction of the Authority's new Emergency Reserve Scheme, coordination is critical when reconnecting large blocks of load. We argue in our response to the EA's *Emergency Reserve Scheme* consultation[11] that the SO should lead the development of automated protocols that allow DSOs to manage the restoration of emergency reserves to prevent local network overloading.

8. What is one thing that you would like the System Operator strategy to address?

SO/EDB alignment on a Common Operating Model guiding Code development: The consultation document notes that the SO Strategy will "feed into the Authority's work plan". We urge the SO to use this strategy to align with EDBs on a Common Operating Model as an input to the EA's ongoing Code development work.

Currently, there is a risk of misalignment. For example, the EA's recent Common Quality proposals regarding Under Frequency Events risk holding EDBs liable for physics they cannot control[12]. Again, the SO Strategy should explicitly acknowledge that future system security relies on the DSO orchestrating resources beyond the grid edge. This alignment will give the EA the confidence to regulate for a devolved, efficient model rather than a centralised one that risks the SO overreaching.

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[9] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2024/electricity-authority---forecasting-provisions-for-intermittent-generators.pdf
[10] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---rewarding-industrial-flexibility.pdf
[11] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---emergency-reserve-scheme.pdf
[12] https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/who-we-are---pricing-and-disclosures/submissions/2025/electricity-authority---common-quality-code-amendment.pdf