16 April 2024

Energy Efficiency & Conservation Authority (EECA) feedback on the future operation of New Zealand's power system

Thank you for the opportunity to provide feedback on the 'Future Operation of New Zealand's power system' consultation paper.

We consider the paper captures many of the key drivers of change in New Zealand's power system operation, and identifies plausible problems. EECA is of the view that there is no time like the present to address these.

Energy efficiency and flexible energy systems are crucial to the future power system

EECA's role is to encourage, promote, and support energy efficiency, energy conservation, and the use of renewable sources of energy. Accordingly, EECA would like to encourage the EA to carefully consider how to foster energy efficiency as part of their vision for the future power system, and ensure responsive and flexible energy systems are widely available and benefit the consumer.

Consumers adapting their behaviour is also a key driver of change

A primary aspect of power system evolution only touched on lightly in the paper is the human element, i.e. behavioural adaptation and its role in both demand profiles and technology diffusion. The focus here is on the four technology categories identified among the key drivers, but there is also 1) Non-trivial lifestyle/routine adaptation required to shift demand at scale, and 2) Willingness to engage via self-education on the need for change, upgrading end-use devices, embracing automation, etc.

The EA may want to put stronger emphasis on this human dimension, as the energy user is central to the evolution of the power system, and there is an opportunity to signal the importance of the consumer's perspective here. Behavioural adaptation could realistically be added as a 7th key driver of change in New Zealand's power system operation.

Consumers will need adequate incentives to shift their demand

Ongoing consumer participation in flexible demand and DER will be critical to support the better utilisation of renewables and network infrastructure. As such the settings need to ensure consumers are empowered and incentivised to do so. Financial incentive is a significant driver for consumers, and flexible demand needs to be recognised as a service with fair/competitive compensation offerings to consumers/prosumers. Consumers having the ability to override demand management signals from the grid is also important for gaining/maintaining social license.

Additional comments:

- It seems that the paper is not particularly in favour of inverter-based resources (IBRs), which is not immediately explained. We wonder if key issues with IBR can be brought forward into the executive summary, with possible solutions (e.g. Synthetic inertia) noted.
- We wonder whether energy efficiency is properly accounted for in the analysis. For example, Slide 18 uses Te mauri Hiko demand growth estimate, which may not account for as much efficiency as EECA model in TIMES-NZ.
- We are interested to know how far ahead the analysis is looking? The paper includes a significant amount of commentary about 'bi-directional grid flows'. We see that these are either already common in the case of transmission networks, or likely to remain localised to low-voltage (LV) distribution for quite some time. Bi-directional grid exit point (GXP) flows require local generation to overwhelm demand, which could require 40-50% solar penetration for urban GXPs.

As always, EECA is happy to discuss our comments in more detail.

We look forward to continuing our dialogue with the EA on this important topic.

Questions	Comments
Q1. Do you consider section 3 to be an accurate summary of the existing arrangements for power system operation in New Zealand? Please give reasons if you do not agree.	We agree that this is an accurate summary, noting the following comment: • 3.71 (d): Pricing on transmission networks is an indirect function of system operation. The paper currently doesn't explain how dynamic pricing on distribution networks is related to system operation. Could this be clarified?
Q2. Do you agree that we have captured the key drivers of change in New Zealand's power system operation? Please give reasons if you do not agree.	We note our previous comment that behavioural adaptation and its role in both demand profiles and technology diffusion are only covered very lightly in this paper, and could be added as a 7th key driver of change. Besides from this, we agree that the key drivers have been captured.
Q3. Do you have any feedback on our description of each key driver?	We noted some places where the characterisation of the key drivers and the extent of impacts could be edited for greater technical accuracy. These sections also seem to err on the side of pessimism and/or status quo bias, which could have a negative influence on innovation adoption. Specific examples include: • 4.3 is a simplified representation of the core grid, but in our view it misses some relevant details. Grid injection points (GIPs) and GXPs are electrically and geographically interspersed, a

	significant proportion of them are GXP/GIPs, many are paralleled, etc. A significant number of lines and grid connection points experience bi-directional flow already. Much of the complexity of current system operation arises from this. • 4.8-4.10: Synthetic inertia is mentioned but not discussed. If IBRs supply synthetic inertia, is there still an issue? • 4.11 -4.16: Existing assets have intermittency and variability already, which the system operator needs to manage in real-time. Hence this is not something new, and we suggest it could be described as a scaling-up of an existing function. • 4.17-4.21: Most (if not all) of these issues can be addressed through codes and standards (and training for installers). A software control system can emulate an electro-mechanical system if it is designed to. Plenty of 'traditional' units now have software controls also, electro-mechanical governors are not the most up-to-date approach. • 4.32 (c): It's worth noting that operating and controlling microgrids as electrical islands might require a different regulatory framework to be developed in the future. It is not clear that an islanded microgrid would actually be in scope of the Authority's (or anyone else's) existing regulatory powers. • 4.34 appears to be largely speculative. Examples of such AI-based tools would help to substantiate this view. • 4.46 (e): In our view, this deserves much greater emphasis and discussion given the relevance of lower rainfall for New Zealand's hydro assets, which are currently the largest source of power system inertia and flexibility.
Q4. What do you consider will be most helpful to increase coordination in system operation? Please provide reasons for your answer.	The concept of distribution system operators (DSOs) is useful in that it promotes a regulated, standardised and sophisticated approach to operation of distribution systems, analogous to that deployed for transmission systems, which is generally highly effective and robust. This needs to be balanced with cost and right-sizing based on network capacity and complexity. A standardised approach to distribution connection and pricing would also be a huge step forward, compared to the current fragmented system with 29 approaches.
Q5. Looking at overseas jurisdictions, what developments in future system operation are relevant and useful for New Zealand? Please provide reasons for your answer.	While there are some overseas jurisdictions that are genuinely ahead of New Zealand, there are at least an equal number that are behind, or have gone in clearly the wrong direction. As such, overseas jurisdictions are equally likely to provide a cautionary tale as they are a model exemplar.

Q6. Do you consider existing power system obligations are compatible with the uptake of DER and IBR-based generation? Please provide reasons for your answer.	Power system obligations will need to change over time for a variety of reasons. Many of the issues identified in this section of the paper apply to the power system in general, and are not specific to DER or IBR-based generation. Care should be applied to not conflate competition and access issues with power system operation issues. Power system obligations should be set at the level required to ensure a safe, reliable and resilient system, ideally without imposing unnecessary cost, restriction or administrative overhead on participants.
Q7. Do you consider we need an increased level of coordination of network planning, investment and operations across the New Zealand power system? Please provide reasons for your answer.	The evidence presented in the paper regarding the importance of network planning to manage system security through the energy transition is quite compelling. As such, this statement "*5.46. The Authority does not have a view on whether more coordination is needed when it comes to network planning to ensure the most efficient level of network investment is achieved for consumers. The Authority is seeking information and evidence to help assess whether there is a coordination issue"* is quite incongruous, in that the Authority appears to have identified the required level of network planning and co-ordination, but has not formed an opinion of the current level. We think the Authority, as the regulator, is best placed to determine both the required level of planning co-ordination, and the current level, and therefore any gaps or interventions required.
Q8. Do you think there are significant conflicts of interests for industry participants with concurrent roles in network ownership, network operation and network planning? Please provide reasons for your answer.	The potential for significant conflicts of interest to exist is clear. There may not be any evidence of these potential conflicts becoming realised, but this is not necessarily evidence that they do not exist. Transparency is limited and therefore enables potential conflicts to continue to be exercised without generation of evidence. The technical nature of network asset design and operation, and the inherent uncertainty of future conditions means that it is very difficult to assess impartially whether a network design strikes the right balance between risk and cost, or whether any particular option is optimal for the issues at hand. In general, Transpower has a relatively high level of transparency relative to most EDBs.
Q9. Do you have any further views on whether this is a good time for the Authority to assess future system operation in New Zealand, and whether there are other challenges or opportunities that we have not covered adequately in this	There is no time like the present, and having identified plausible problems, we think the best course of action is to address these without delay.

paper? Please provide reasons for your answer.	