NZGBC
TE KAUNIHERA HANGANGA TAUTAIAO

Tēnā koutou

Thank you for the opportunity to contribute to the consultation on the future operation of New Zealand's power system. Please see the response from the New Zealand Green Building Council (NZGBC).

About us

The New Zealand Green Building Council (NZGBC) is a not-for-profit industry organisation dedicated to promoting a sustainable built environment. We're a team of people who are passionate advocates for better homes and buildings, because we know that better homes and buildings mean healthier, happier Kiwis. We also know it will deliver a better energy system.

We do this by working alongside politicians, industry and other businesses to bring change. We also run trusted, robust authentication schemes, such as Homestar and Green Star, that highlight the many buildings that have proven their healthy, safe credentials. And, we provide education for hundreds of New Zealanders every year that are keen to learn about the technical aspects behind better buildings. The NZGBC, on behalf of central Government, administers NABERSNZ, the energy efficiency rating scheme for buildings.

Above everything else, we're collaborators. We believe that lasting change for the better, for a sustainable Aotearoa, can only happen working together alongside others.
Our vision is for all homes and buildings in Aotearoa to be green and sustainable, making healthier, happier New Zealanders.

We have more than 700 companies and organisations amongst our members, including banks, energy companies, insurers, government departments, publicly listed property companies, project managers, manufacturers, construction companies, architects, developers, designers, and tertiary education institutions. This includes many of the NZX50. These members have a combined market turnover of $40bn. We also work with local government members, representing over 60% of Aotearoa's population.

Submitter 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 consider that this summary of the power system's operation needs more substantive consideration of the demand side of the equation, particularly with regard to residential and commercial building demand.

This is a significant gap even for a paper that limits itself to "the real-time coordination of New Zealand's power system" because building energy efficiency and prosumer behaviour will increasingly influence demand, daily and seasonal demand peaks, as well as supply.

As part of the consideration of demand as an important element of the power system, buildings deserve special attention. According to EECA Energy Use Energy Database, 25% of electricity is used for space and water heating. Another 45,000 TJ used for space and water heating comes from fossil fuels. This will need to convert electricity in coming decades to meet the country's emissions targets. Buildings' energy use, therefore, is very significant and also dynamic, and needs to be accounted for.

A holistic assessment of the power system, including the demand side, may reveal that a more ambitious programme of energy efficiency improvements in buildings would cost less than the alternative of constructing more generation and supply infrastructure. That

is certainly evidenced by international research that shows energy efficiency upgrades have a negative cost of carbon abatement and are cheaper than new renewable electricity generation. As the International Energy Agency states:

> The cleanest, cheapest, most reliable source of energy is what countries can avoid using, while still providing full energy services for citizens. That is why the IEA refers to energy efficiency as the "first fuel". Without early action on efficiency the energy transition to net zero emissions will be more expensive and much more difficult to achieve. https://www.iea.org/reports/the-value-of-urgent-action-on-energy-efficiency/highlights

Any consideration of how to respond to demand peaks in the future needs to take account of how those peaks are created and how they can be reduced.

Electrification of transport and home heating has the potential to exacerbate daily electricity demand peaks and winter demand peaks. One way to address these peaks, and the variability of renewable electricity supply is supply overbuild. However, this entails building billions of dollars worth of infrastructure in the knowledge that it will be under-utilised. This would not only be costly but also require unclear market mechanisms to drive investment in oversupply - in the current power system, there is no incentive for construction of over-supply that will not only be underused but also reduce the value of existing assets. Another option is energy storage - with batteries for daily peaks and pumped hydro for winter peaks/dry years. However, large-scale energy storage projects appear to be off the cards with the Government's cancellation of the New Zealand Battery Project.

A lower cost option, and one that doesn't require changes to the incentives for supply providers in the power system, is reducing both daily and seasonal peaks. This can be achieved through smart policy, load-shifting, and investment in energy efficiency.

Crucial to this is improving the energy efficiency of residential homes. Analysis from Otago University (Michael Jack, Anthony Mirfin, & Ben Anderson. (2020). *Quantifying the potential of ultra-efficient houses to reduce seasonal electricity demand and enable greater renewable supply*) shows "that rapid uptake of best-practice standards

[Homestar and Passive House, both for new builds and retrofits] could reduce the winter peak by 75 per cent from business-as-usual by 2050. The reduction is so dramatic, that despite predicted growth in floor area and achieving healthy temperatures, the winter peak in 2050 is less than the current peak."

Also important for peak management and load-shifting is time-of-use pricing. Currently, time of use pricing is ad hoc - only available from some electricity retailers and disconnected from the overall electricity strategy. The power system should take a concerted and planned approach to time of use pricing, designed to lower demand peaks.

Time of use pricing, combined with home solar and batteries creates a complex interplay of demand and supply from homes feeding into the wider power system. IT creates opportunities for reducing demand peaks and, therefore, the total investment in generation and transmission required, but also potentially opens opportunities for arbitrage, which the power system may or may not want to encourage.

Although outside NZGBC's core remit, the electrification of transport and the increase in home charging will also have significant impacts on demand and peaks. Smart policy can see EV charging used to load-shift, rather than add to peaks, and the potential for bi-directional charging creates exciting opportunities for the use of EV batteries in managing the supply/demand balance on the power system. On the other hand, home charging, if not coupled with home solar and greater energy efficiency, could challenge the capacity of local distribution.

Reducing demand peaks not only makes planning for the future of the power system easier, it also enables the transition to a 100% renewable system, as demand peaks are likely to be an important factor in the continuing need for existing thermal plants.

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 welcome the reference to solar and batteries as a key driver of change. Prosumer activity through home solar and home batteries is expanding rapidly. The bulk of the 400MW of installed photovoltaic systems in New Zealand are rooftop solar on homes and other buildings. Installed capacity rose by a third in 2023 alone. Home batteries are likely to become more significant as prices fall. There needs to be more research on the implications for the power system of having more generation and storage capacity available at points of use, and whether that will reduce the need for investment in large-scale generation and grid upgrades.

Missing from this section is an understanding of the role that will be played by changing electricity demand for heating (both space heating and water heating). This is a major oversight given the scale of energy demand. The EECA Energy Use Energy Database shows 41,000 TJ of energy a year is used for household space and water heating, and 80,000 TJ used for space and water heating across all sectors, of which 35,000 TJ comes from electricity. This means that 25% of electricity is used for space and water heating. If all 80,000 TJ was sourced from electricity, it would be equivalent to 57% of electricity supply (noting, however, that heat pumps are more energy efficient than gas heating so an entirely electrified space and water heating system would need less energy).

Two major factors will drive change in electricity demand for space and water heating in coming decades.

The first is electrification. While fossil gas continues to be installed in new housing, there will be a significant transition to using electricity for heating as fossil gas supply becomes less reliable, carbon prices rise, and future governments move to limit the use of fossil gas to achieve emissions budgets, with heating being an easily abated and low value fossil gas use case. The Climate Change Commission's demonstration path to achieve New Zealand's emissions targets sees fossil fuel use for heating reduce by one third of

current levels per decade through to 2050. If that is entirely replaced by electric heat pumps, supplying three times the heat energy compared to electricity consumed, this will equate to an additional 140GWh of annual electricity demand each year - 3,500GWh a year by 2050.

The second is energy efficiency. As discussed above, there is significant potential to reduce electricity demand from housing by improving building standards and retrofitting existing homes. The Building for Climate Change programme, which appears to be currently in hiatus but shows the path forward that other countries have already taken, foresees improving building standards in stages to a near zero energy, near zero emissions standard. The Warmer Kiwi Homes programme is currently undertaking insulation retrofits and there is potential for a deep retrofit programme in the future (like the ones currently being carried out by most of the OECD) that would reduce the amount of energy needed to keep homes warm. This will free up energy for other sectors such as electric vehicle use.

The Climate Change Commission's demonstration path sees these two factors interplaying in a complex fashion, with electricity demand per household falling 4% by 2030 with improved energy efficiency, before rising 12% by 2050 as electrification dominates. However, this could be improved upon if concerted policy action results in energy efficiency improving more rapidly. Once again, this leads to the conclusion that opportunities to reduce electricity demand need to be weighed against opportunities to increase electricity supply when planning the future of the power system.

We would strongly encourage the Electricity Authority to make clear to MBIE and EECA that improving the energy efficiency of new build homes, with a strong Building for Climate Change programme and a more ambitious plan to retrofit existing homes, will significantly assist the power system's operation.

Q3. Do you have any feedback on our description of each key driver?

See above

Q4. What do you consider will be most helpful to increase coordination in system operation? Please provide reasons for your answer.

We think that there needs to be greater coordination between the Authority and other power system actors such as MBIE's Building Systems team, the Climate Change Commission and EECA so that the future of demand is accounted for in network planning and investment.

More holistic coordination will allow for better assessment of the trade-offs between investing in more generation as opposed to investing in demand reduction and load-spreading. Without this, investment cannot be optimised and the tendency of power system actors will be to see more power as the answer, whereas it may be more economic to reduce the need for energy.

Q5. Looking at overseas jurisdictions, what developments in future system operation are relevant and useful for New Zealand? Please provide reasons for your answer.

EU - building standards and deep retrofit. The EU has introduced nearly Zero Energy Building standards for new buildings since 2020, and will upgrade to nearly Zero Emissions Building standards from 2030. For established buildings, large deep retrofit programmes are being rolled out in a number of countries. With strong government leadership, both as a climate change measure and out of a desire to reduce the bloc's use of Russian fossil fuels, the improved energy efficiency of buildings is helping to contribute to a very rapid decline in fossil fuel use for electricity generation. America is the same with their large Inflation Reduction Act programme contributing hundreds of billions to retrofit the performance of existing homes.

The EU's example should be watched closely. It is proof that rapid change is possible and practical, so there's no reason for New Zealand to drag its feet.

Australia - building standards and deep retrofit The Trajectory for Low Energy Buildings is a comprehensive programme aimed at reducing the energy use and emissions from buildings in Australia.

In the 2023–24 Budget, the Australian Government allocated $1.3 billion to establish the Household Energy Upgrades Fund. The Clean Energy Finance Corporation will have $1 billion to partner with banks and other lenders to offer low-cost finance and mortgages for energy performance upgrades to more than 110,000 homes. Loans will be available to upgrade homes with battery-ready solar PV, modern energy-efficient appliances and other improvements, creating more comfortable homes that waste less energy.

The Nationwide House Energy Rating Scheme (NatHERS) is in place for new builds and is being expanded to existing homes to help homeowners and buyers better understand the energy demands of a given home.

The National Construction Code 2022 requires that new homes achieve the equivalent of 7-stars (out of 10) for NatHERS thermal performance.

The Australian experience will provide useful information on the potential for New Zealand to reduce electricity demand from homes while reducing emissions.

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.

Our comment on this point would be that the obligations on power system actors should not only facilitate at-point-of-use generation, like residential solar, and the electrification of transport through home charging, but also create incentives for actors to make investments in energy efficiency, rather than focusing on new generation and transmission capacity. An example of this is the Great British Insulation Scheme, which requires energy suppliers to help with home insulation for selected households.

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.

See question 4

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.

We have no comment on this question.

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 paper? Please provide reasons for your answer.

We do think this is a good time for the Authority to assess future system operation in New Zealand, but that this assessment needs to be broader than this paper implies. The lack of consideration of demand is concerning. The level of demand and the size of demand peaks, with electrification of heating and building energy efficiency being major drivers, will determine how much new supply is needed. This, in turn, will influence the ability to move to 100% renewable electricity generation and the economics of new generation.