04 June 2025

Electricity Authority
By email: decentralisation@ea.govt.nz

Tēnā koe,

Decentralisation Green Paper - Working together to ensure our electricity system meets the future needs of all New Zealanders

Thank you for the opportunity to respond to the Electricity Authority (**Authority**)'s Green Paper on decentralisation and join the discussion about what a more decentralised electricity system might look like for Aotearoa New Zealand, how this might benefit consumers, and what might be needed to gain these benefits.

The transition to a net zero emissions energy system is crucial for New Zealand's future both in terms of responding to climate change and to capitalise on the commercial opportunities that the transition represents[1]. Decentralised energy will be an important enabler for the transition alongside large-scale generation.

We've followed the Authority's question structure in the main body of the submission. Our key observations are:

Decentralised solutions are complementary	• The transition to a net zero energy system must be affordable and secure • Distributed generation is increasingly cost-competitive • However, a least cost transition will require large-scale generation with economies of scale complemented by decentralised solutions
Democratisation supports social licence	• The transition to a net zero energy system must minimise the impact of assets and works on the communities who host them • Democratised participation in the energy system will allow communities to share benefits • Communities will be more prepared to host projects which share benefits with them
Access to capital is a major barrier	• The transition to a net zero energy system will require billions of dollars of investment in appliances, networks and generation • Widening participation to existing and new investors to the electricity industry will be essential • Networked local energy systems are an opportunity for new investment models, but capital will need to be sourced globally not just locally

[1] See https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/industry-insights/grow-to-zero_nov-2024.pdf

We are always keen to meet with the Authority to discuss and develop the ideas in our submissions. In the meantime, if you have any questions or would like to talk further on the points we have raised, please contact Emma Wilson (Emma.Wilson@powerco.co.nz).

Nāku noa, nā,

Emma Wilson
Head of Regulatory, Policy and Markets
POWERCO

1. Do you agree with the description of decentralisation?

We disagree with the Green Paper's definition; our view is that smaller scale renewables and other DERs located closer to consumers will complement large scale generation rather than replacing it. The Green Paper defines "decentralisation" as

> *shifting from large scale electricity generation at a small number of sites across the country, to smaller scale renewables and other DERs located closer to consumers*

While decentralisation describes the adoption of smaller scale renewables and other DERs located closer to consumers, Government Policy is for a least-cost, secure transition[2]. This will require large scale generation too – we don't expect to see a "shift away from" it.

The price-performance of DERs, particularly solar generation and batteries, has improved exponentially over decades to the point that local generation and storage solutions can compete with large centralised ones. It is inevitable that distributed solutions will play a vastly larger role in the future of our energy system than they have in the past.

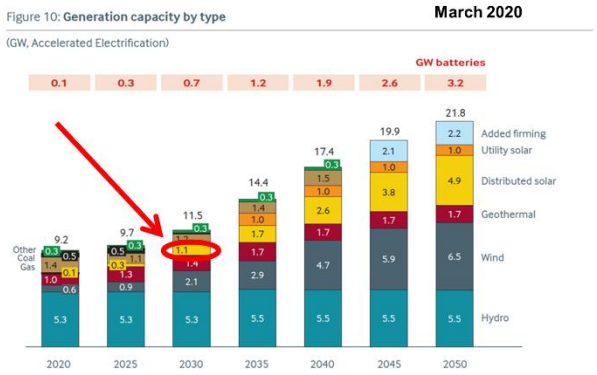
While this trend is likely to continue, electricity generation has long had economies of scale, and it is likely that the least cost pathway to a secure net zero energy system is one that balances both large scale and smaller scale generation.

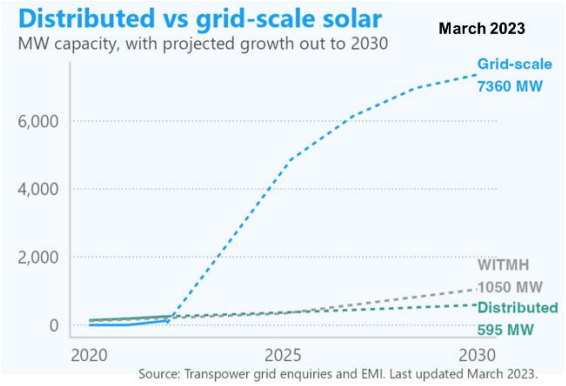
Transpower have changed their view on the proportion of solar that will be distributed to grid-scale. In 2020's *Whakamana i Te Mauri Hiko* report, Transpower forecast 1.1GW of distributed solar and next to no grid-connected solar in 2030. Only 3 years later they completely revised this prediction:

> *The original Accelerated Electrification scenario projected 6 GW of solar by 2050, with the majority (83%) of this coming through distributed (i.e. embedded) solar and only 1 GW of grid-scale solar. Since the publication of this work in 2020, new information is now leading us to revise these expectations.*
>
> *The below chart shows the actual and projected growth of grid-scale and distributed solar out to 2030. By 2030, the original projection was for 1,050 MW of solar in total, all of which is distributed. However, while distributed solar continues to grow, the projections show that we estimate the uptake of grid-scale solar could exceed all expectations and outpace distributed solar, with a potential of 7,360 MW connected by 2030.*
>
> *This estimate is based on enquiries lodged with Transpower that have a plausible chance of completion. While all of this solar might not be developed (or at least not before 2030), grid-scale solar has emerged as a central technology that we will need to consider carefully to maintain secure system operations* [3]

[2] *October 2024 Statement of Government Policy to the Electricity Authority*, Minister for Energy. Paragraph 2

[3] *Whakamana i Te Mauri Hiko Monitoring Report - March 2023*, Transpower. p.4



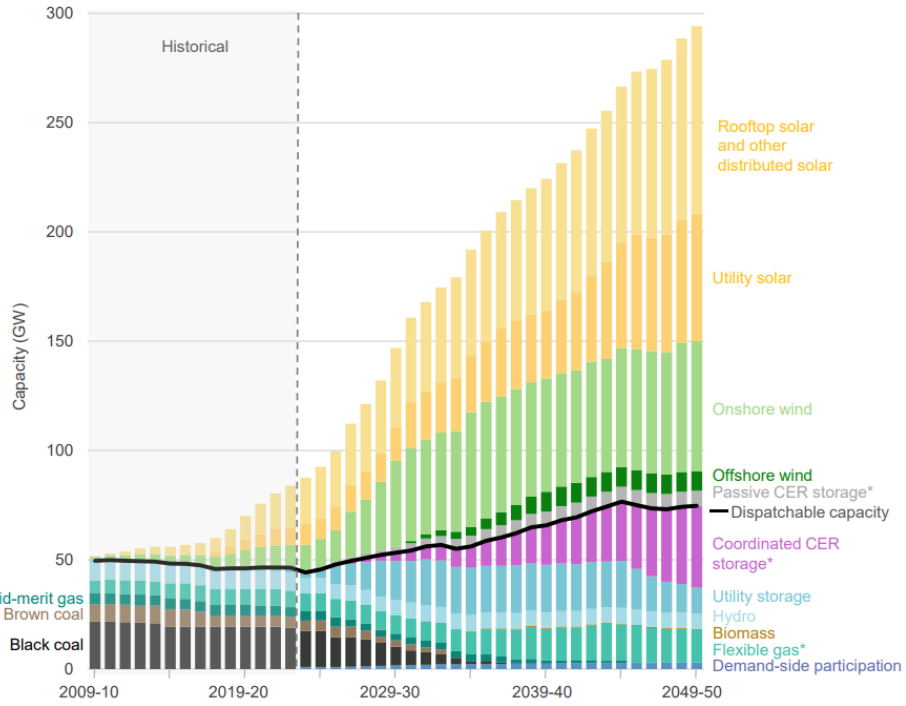


Transpower's revised position is that solar generation has such large scale of economies that there is likely to be 15 times as much grid-connected as distributed solar. This is not a "shift from large scale generation". The clarification is important – no generation expansion models developed for New Zealand's energy transition see a shift away from large scale generation[4]. The insight is that doubling the size of our generation fleet by 2050 will require new plant of all sizes, and that removing barriers to efficient investment in distributed energy resources will be essential if we are to do so securely and at least cost. They complement large scale generation rather than replacing it.

1.1 Dispatchable and passive capacity

Even the Australian National Electricity market (NEM), with the highest penetration of distributed generation in the world is projected[5] to see more large scale new generation than rooftop and distributed solar by 2050.

Figure 2 **Capacity, NEM** (GW, 2009-10 to 2049-50, *Step Change*)



[4] None of MBIE's electricity and demand generation scenarios, the Climate Change Commission's generation expansion models, NZ Battery Project forecast models for MBIE, BEC's Waka and Kayak scenarios or Transpower's *Whakamana i Te Mauri Hiko* see a reduction in large scale renewable generation by 2050.

[5] NEM Capacity to 2049-50 in the "Step Change" scenario in the *2024 Integrated System Plan for the National Electricity Market*, AEMO p.11

AEMO's *2024 Integrated System Plan* distinguishes between "dispatchable" and "passive" capacity and sets out

how the optimal development path would provide:

- *Storage of varied depths and technologies, able to time-shift electricity supply for up to 4 hours, 12 hours, or longer.*
- *Storage for intra-day shifting, including consumer-owned batteries, and shallow and medium utility-scale storage.*
- *Storage for seasonal shifting and renewable droughts, including pumped hydro and hydro generation, with new potential technologies emerging.*
- *Flexible gas generation to support storages during renewable droughts and cover rare peak demand spikes.*
- *Reliability and security in a renewable energy power system, secured through the range of solutions to provide system services traditionally provided by coal.* [6]

AEMO's "step change" scenario graphed above distinguishes between

> *Consumer-owned storage (or distributed or CER storage): behind-the-meter household, business or industrial batteries, including EVs that may be able to send electricity back into the grid. Coordinated CER storage is managed as part of a VPP, while passive CER storage is not. While the combined installed capacity of these batteries is large, they can only dispatch electricity for about two hours at full discharge, so their energy storage capacity is relatively small, and deeper, utility-scale storage is needed.*[7]

And three types of grid-connected storage

- *Shallow storage: grid-connected storage to dispatch electricity for less than four hours, valued for both their system services and their energy value.*
- *Medium storage: to dispatch electricity for four to 12 hours. This may be battery or pumped hydro (or other emerging technologies in future) which can shift large quantities of electricity to meet evening or morning peaks. These solutions are increasingly needed to support renewable energy growth.*
- *Deep storage: strategic reserves that can dispatch electricity for more than 12 hours, to shift energy over weeks or months (seasonal shifting) or cover long periods of low sunlight and wind (renewable droughts), backed up by gas-powered generation.*

Their projections are that there will be more than 10 times as much large-scale pumped hydro as distributed deep storage by 2050:

> *Borumba's anticipated 48 GWh capacity in Queensland would be larger than all coordinated CER storage combined, and Snowy 2.0 would provide 350 GWh*[8].

Like Australia, we see value in distinguishing between dispatchable and passive DER, their different contributions to a least-cost secure energy transition and ensuring they complement large-scale resources as efficiently as possible.

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[6] *2024 Integrated System Plan for the National Electricity Market,* AEMO pp. 65-72

[7] *2024 Integrated System Plan for the National Electricity Market,* AEMO p. 66

[8] *2024 Integrated System Plan for the National Electricity Market,* AEMO p. 67

2. Do you agree with the articulation of the potential outcomes and benefits from decentralisation for consumers?

To our point in the previous section, Transpower's original *Whakamana i Te Mauri Hiko* modelling forecast 4.9GW distributed solar and 3.2GW batteries in New Zealand by 2050. While these forecasts will change and the final numbers will be different, this represents over half of New Zealand's installed generation capacity today. For this reason alone, consumers will benefit from decentralisation and it's key to minimising the cost of the transition.

The Authority also notes that consumer and stakeholder engagement, and trust is a critical success factor to enable decentralisation. We see engagement and trust as a benefit of decentralisation as well as an enabler of it. New assets and the works to build and commission them will impact communities all over the country. It's likely that communities will not welcome these projects unless they benefit from them in some way.

Of the Authority suggestions to empower communities and local economies[9] we see participation as by far the most important and challenging. Engaged consumers will see the benefits of the transition and will be more likely to welcome them into their communities. Not all consumers will want to participate in new business models or with distributed technologies but if they know people who do, they'll be far more willing to accept the impact they make. Others who would like to participate may struggle to access capital to be able to.

3. Do you agree with the articulation of the possible challenges to unlocking the benefits of decentralisation?

We agree with the list of challenges and risks that Authority sets out in chapter 4 of the green paper.

3.1 Governance, local electricity sharing and markets and grid and system operations complexity

In terms of addressing these challenges, it's important that the Authority does not lose sight of the comprehensive package of reform options presented by its Market Development Advisory Group in its 2023 report *Price discovery in a renewables-based electricity system.* In terms of governance, local electricity sharing and markets and grid and system operations complexity they recommend a

> *significant multi-year project to develop an efficient form of security constrained economic dispatch (SCED) on distribution networks for the purpose of 'integrating' into the wholesale market widely dispersed DSF and other distributed sources of 'supply' …*
>
> *This project needs to be resourced similarly to the multi-year effort that led to the implementation of the current version of SCED on the transmission system in 1996 (recognising that the adaptation of SCED for*

[9] Electricity Authority, *Working together to ensure our electricity system meets the future needs of all New Zealanders*, 10 April 2025, page 10

networks does not imply that it is the same as the SCED on the grid. Its design and development must deliver an efficient system where benefits clearly exceed costs).[10]

MDAG recommended

> *an integrated package of 31 actions to update the design of the wholesale electricity market … to deliver reliable, renewable electricity at lowest cost for the long-term benefit of consumers into the future*[11]

But cautioned

> *It may be tempting to view our package of recommendations as a kind of 'regulatory buffet' from which interested parties can pick and choose what to put on their plate. But that kind of approach would not work. The recommended measures form an integrated package to be implemented as a sustained and coordinated programme of action over the coming four years.*[12]

This is relevant to addressing the potential risks and challenges of decentralisation, where a *network of localised energy systems connected by a strong central spine* is connected to the national grid directly or indirectly then it will interact with the wholesale market. MDAG's recommendations address how best to do that. As the Authority develops its thinking on the topics raised by the green paper it is crucial that it develop models that are consistent with MDAG's integrated package of 31 actions to update the design of the wholesale market.

3.2 Barriers to funding and finance

Access to funding and finance could be the most significant barrier to timely and efficient uptake of decentralised energy solutions. Importantly though, there's no shortage of capital globally that could be invested in decentralised energy solutions in New Zealand – it's not necessary to rely on homeowners to finance the investment. The challenge is structuring investment opportunities in a way that is attractive to international capital.

In our experience it is helpful to separate access to capital from the community benefits that decentralised solutions provide. Given that the primary benefits of decentralisation relate to participation and social licence, it is not necessary for homeowners to own the DERs that they are participating with.

It would, of course, be helpful to understand the nature of the barriers to investment and whether it is necessary for homeowners to own the DERs that they find difficulty funding.

Despite solarZero's exit from the market, we're seeing increasingly sophisticated solar and battery solution providers who may be better placed than homeowners to structure ownership arrangements for distributed resources with long lives. Powerco is currently trialling different models of battery ownership and leasing[13]. Our primary interest in these trials is to understand their potential for network investment deferral but it may be

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[10] *Price discovery in a renewables-based electricity system*, Market Development Advisory Group 2023 recommendation 5

[11] *Price discovery in a renewables-based electricity system*, Market Development Advisory Group 2023 p. 13

[12] *Price discovery in a renewables-based electricity system*, Market Development Advisory Group 2023 p. 23

[13] https://www.powerco.co.nz/news/media/battery-storage-technology-to-be-mounted-on-power-poles

possible to explore how such resources could be used to provide community energy storage services similar to those being offered by AusNet – an electricity distribution business in Victoria[14] which:

- Store excess solar energy from local rooftop solar during times of high production (middle of day) and provide energy after sunset;
- Provide energy to the local community during outages, for example when a community battery is installed to support a community facility;
- Provide new income opportunities for battery owners when power from the battery is traded on the wholesale electricity market; and
- Provide a cheaper electricity source for consumers during the evening.

In other trials, Powerco is installing unique hybrid Stand Alone Power Supply units at targeted community buildings to help communities prone to frequent and long power outages stay connected and access power as a community independently of the main power grid[15]. Again, our primary focus in these trials is to provide resilience using non-network solutions but they could also be made available to provide community energy storage systems in time.

These units are solely for network support but similar resources could also be used for energy trading. Importantly electricity distribution businesses are regulated by both the Authority and the Commerce Commission to ensure that when resources are used for both regulated and unregulated purposes like this, they do so on the same competitive terms as every other provider.

4. Do you agree with the articulated opportunity statement for a more decentralised electricity system?

As we confirm in our answer to question 1, while decentralised solutions are becoming and will continue to be increasingly important, no forecasters are predicting that there is a least cost pathway to a future with less large scale generation than we have. Where the green paper argues that *Aotearoa New Zealand is now rapidly moving towards more a decentralised electricity system*, it is important to quantify the proportion of generation and storage that will be economic at different points in the transition to 2050 to calibrate the amount of resource and effort to apply to enabling decentralisation.

Without this quantification of benefit, cost and pathway, there is a real risk that the pursuit of decentralisation becomes an end in itself rather than a means to an end. This risks inefficiency, raising the costs of the transition and making electricity unaffordable.

As the Authority's noted in its recent issues paper on the Distributed Generation Pricing Principles [16], the policy intent behind the incremental cost limit in the DGPPs was a political initiative from 2006 to stimulate investment in DG by deliberately tilting the playing field to support DG connections. Similar to the 2004 low user fixed charge

[14] https://www.ausnetservices.com.au/about-us/community/community-energy/community-batteries

[15] PowerHubs created to support community energy resilience

[16] *Distributed Generation Pricing Principles Issues paper*, Electricity Authority. February 2025. 1.2-1.4

regulations[17], the motivation behind the policy was well-intended but mandating inefficient distortions to distribution pricing as a means of implementing it has had adverse consequences. It increasingly presents a barrier to a least cost transition to an expanded low-carbon electricity system and unwinding this policy is difficult.

Quantification of benefit and cost is critical in the Authority's development of any options supporting New Zealand's future electricity system, including to enable increased decentralised solutions.

Picking decentralisation as a 'winner' by overly incentivising it, will lead to adverse consequences. Ensuring a level playing field for the most efficient investment in providing energy to customers must be the goal and, as the GPS notes

> *It is not the Electricity Authority's role to prefer one form of supply over any other[18].*

5. What other feedback would you like to provide to input into the discussion on?

The Authority's opportunity statement is that *by 2040, Aotearoa New Zealand's electricity system has unlocked the affordability, decarbonisation, and security and resilience benefits of distributed energy solutions for regions and communities ... enabled by our electricity grid, existing largely renewable electricity generation assets, locational electricity market and highly localised electricity distribution businesses.*

Our main observation is outlined in section 3.1 above; unless it is physically disconnected from all other networks, a decentralised electricity system is part of the interconnected grid and so consumers will enjoy access to the *affordability, decarbonisation, and security and resilience benefits* of electricity generated remotely. As well as enjoying these benefits, they will also be exposed to the cost of electricity carried by the grid and will be able to decide how much to rely on local resources versus remote ones.

The green paper opens: "*In the not-too-distant future, our system will have evolved – with collective input – to provide for more of our power needs at the local level, in ways that work for us,*" but it is important to clarify that we do not want to regress to local industry structure that the industry started with. Whiteboard Energy's *Powering New Zealand*[19] documentary series charts our course from a collection of standalone networks, through the establishment of the national grid to a fully interconnected power system.

Just like the internet, electricity networks offer all consumers access to power generated all over the country. This "diversity" effect supports the economics of electricity networks and the total maximum demand of individual consumers is always higher than their diversified maximum demand when on a network because their peak consumption doesn't all happen at the same time. A rule of thumb for network planning is that standalone peak demand is between 1.2 and 2.5 diversified peak demand, varying by consumer type and their usage patterns. This

[17] Electricity (Low Fixed Charge Tariff Option for Domestic Consumers) Regulations 2004 (SR 2004/272) (as at 01 April 2024) Contents – New Zealand Legislation

[18] *October 2024 Statement of Government Policy to the Electricity Authority*, Minister for Energy. Paragraph 31.d

[19] Whiteboard Energy – Powering NZ

means that networked electricity systems are around twice as efficient as individual consumer or community developing resources for their sole dedicated use.

We suggest that the Authority clarify that the our goal is a secure, least cost transition to a net zero energy system by 2050 and that a key enabler of this is that *by 2040, Aotearoa New Zealand's electricity system has unlocked the affordability, decarbonisation, and security and resilience benefits of an interconnected power system... enabled by our electricity grid, existing largely renewable electricity generation assets, locational electricity market, local electricity distribution businesses distributed and energy solutions for regions and communities* rather than describing decentralisation as an end in itself.

MDAG's advice is the roadmap of how to do this – decentralisation policy cannot be set in isolation from it.

6. What are other emerging case studies we could learn from?

Although the industries and regulatory regimes aren't identical, they are similar enough that we can learn from Australia's early experience – particularly around optimising market and regulatory arrangements to ensure that consumers benefit investments in democratised energy solutions.

Australia has the highest levels of residential solar penetration in the world. We refer to AusNet's community battery initiatives in section 3.2 as an example of how a distribution business can help consumers benefit from their investments in rooftop solar more cheaply than investing in batteries behind the meter.

Similarly, Energy Queensland is executing a major community battery programme, with significant support from the Queensland Government[20]. This project, which is a combination of small community batteries on low voltage networks as well as substation size batteries at higher voltage levels, aims to provide customers access to a virtual energy storage plant. A subscribing customer's excess PV generation is stored for later, after-hours use.

The project also aims to reduce the significant variability in network power flows caused by high levels of solar PV generation and avoid net exporting to adjacent states or networks. It also allows them to trade stored energy on the spot market, in cooperation with Origin Energy.

Another interesting case study is the work done on Community DSO schemes, by Northern Powergrid in the UK, in conjunction with LCP Delta and TNEI[21], part-funded by an Ofgem innovation grant. The intent of this project is to enable local communities to pursue their own decarbonisation agenda and extend their control over their own energy use and assets, while supporting DSO functionality for the distribution network. While still in trial phase, this type of arrangement appears to hold significant potential for enabling islanded networks close to the edge of distribution networks.

All three case studies are examples of community-level initiatives aimed at making the best use of decentralised energy resources to minimise the cost of a secure transition.

[20] https://arena.gov.au/projects/energy-queensland-community-batteries-project/

[21] https://smarter.energynetworks.org/media/rjcnixxb/eif-23-npg-community-dso.pdf