

19 August 2025

The Electricity Authority Te Mana Hiko
c/o fsr@ea.govt.nz

Tēnā koutou,

Submission on the consultation paper – The future operation of New Zealand's power system – issues and high-level options

Introduction

1. PowerNet Limited (PowerNet) appreciates the opportunity to make a submission to the Electricity Authority (the Authority) on The future operations of New Zealand's power system – issues and high-level options consultation paper.
2. PowerNet is an electricity management company with its head office based in Invercargill and is owned by The Power Company Limited (TPCL). PowerNet manages the non-exempt Electricity Distribution Business (EDB's) of Electricity Invercargill Limited (EIL), OtagoNet and Lakeland Network (LNL), the exempt EDB of TPCL and Ruakura EDB Limited Partnership (Tainui Group Holdings Limited), and the non-grid connected Stewart Island Electric Supply Authority (SIESA).
3. With an asset base and investments in excess of NZ\$1 billion, the aggregated electricity distribution asset base managed by PowerNet is the fourth largest in New Zealand. TPCL operates in Southland and West Otago, OtagoNet in rural and coastal Otago region that surrounds Dunedin City, EIL operates in Invercargill and Bluff, Lakeland Network (LNL) in the Frankton, Cromwell and Wānaka regions, SIESA on Stewart Island, and Ruakura in the Waikato.
4. PowerNet has long-term management agreements in place with TPCL, OtagoNet, LNL, EIL, and Ruakura, with the benefit of integrated business management systems in place, and a core purpose and expertise in asset management capability.
5. PowerNet supports, in principle, the submission made by Electricity Networks Aotearoa (ENA) and have included in our own submission key issues that we wish to raise with the Authority. We support aspiration to reach net zero emissions by 2050 and 100 percent renewable energy generation, that is not cost prohibitive, by 2030. We acknowledge the important role distribution networks will play in supporting New Zealand's transition to an electrified nation and a low emissions economy.
6. This submission can be published in full on the Authority's website.

Customer service is important to us at PowerNet. If for any reason, we do not meet your expectations we would like the opportunity to work through a solution with you, please call our office on 03 211 1899. If we are unable to resolve your concern, there is a free and independent resolution service available through Utilities Disputes Limited www.udl.co.nz

Key discussion points

7. PowerNet, in principle, is supportive of the intent to introduce a distribution system operation (DSO) model and supports the Authority's focus of delivering changes that support the sector's evolution to ensure the best outcome for consumers.
8. We are further supportive of initiatives that improve bi-directional energy flow, and welcome opportunities that allow for managing capacity in a more customer-centric manner.
9. We agree that in the long-term ensuring distributed generation (DG) become flexible assets that can be coordinated to manage load capacity is a desirable outcome of DSO.
10. PowerNet favours a hybrid DSO model where the coordination of real-time dispatch is shared between the transmission system operator (TSO) and the DSO as a minimum regulatory approach which allows flexibility. We view there is no immediate need for regulatory intervention as this can be made as issues become apparent. As the use of small-scale distributed energy resources (DER's) increases, PowerNet believes weighting towards a full DSO will ultimately become more efficient. We would also like to see a full qualitative cost-benefit analysis undertaken by the Authority before any regulatory intervention is deemed necessary and encourage the Authority to consider a wide range of existing international DSO's.

PowerNet's preferred option

11. PowerNet favours building a future system from the bottom up. We support a consumer-centric approach whereby consumers and distributors can participate in the electricity market together, for the benefit of all. We see this as managing capacity and load in a smarter way to support the increasing demand for electricity and supporting the flexibility that will be needed as the demand for electricity increases. The best way to achieve this, in our view, is to utilise a hybrid DSO model, that allows for a future total DSO to meet need as it arises in various locations and networks around the country.
12. Demand for electricity is only going to increase and ensuring a reliable and affordable network for electricity is crucial. Employing a model where distributors and consumers effectively coordinate local assets and agree together when and how they use electricity, not only helps manage demand on the network by moving load at peak times but also contributes to less or deferred network capacity increase.

Visibility of the network

13. We have concerns around the lack of smart meter data visibility that is accessible and affordable. Without insight into the activity of DERs such as electric vehicles, batteries, solar, and hot water the result will be inaccurate network capacity predictions. This ultimately impacts the security of supply for consumers, and can lead to unnecessary network maintenance or upgrades, and significantly alter the future planning for network capacity and constraints.
14. If the DSO model is to be implemented, it will be important for EDB's to oversee and ultimately be able to control DERs to ensure effective and efficient management of the grid.
15. PowerNet advocates for the swift reconciliation of smart meter data access. Without access to this data, there is little ability to develop the congestion monitoring required to determine

network capacity constraints and areas for understanding the necessary development paths. The lack of data (and affordable available data) in this space has the potential to lead to poor investment decisions, or a lack of investment due to a deficit in quantifiable data restricting the investment in the networks that is required.

16. We have raised this issue on numerous occasions and urge the Authority to address the issue of data availability/visibility without further delay to ensure timely and cost-efficient sharing of data.

Energy sharing and microgrids

17. PowerNet is supportive of initiatives that improve the ability of consumers to share energy. As homes and businesses increase the capability and motivation to generate their own electricity, largely through DG, we welcome the flexibility required to support this through bi-directional flow and capacity sharing.
18. For example, if a small farm or business has solar panels installed on one individual control point (ICP), they are currently unable to access efficient energy and pricing arrangements that would enable them to share the capacity stored with another ICP, which may be the farmhouse or property attached to the business. Through a functioning DSO model, PowerNet supports the consumer and distributor to have flexibility over this capacity and to use this flexible asset in a more effective way for the benefit of the consumer and the distribution network.
19. In addition, customer groups/network areas that may become self-sufficient for periods of time and disconnect from the network are also not enabled by the current retail and market arrangements.

Future operation of the power system

20. The rate and scale of change in the electricity industry has posed a challenge to the efficient investment required to meet demand and forecast growth. Ensuring modernization of the grid is crucial for accommodating renewable energy sources, enhancing grid resilience, and improving energy efficiency.
21. To date much of the electricity industry has exhibited sound judgement in investing in their networks and delivering a good standard of maintenance and upgrading, alongside growth and renewal. There is increasing risk that, similar to other infrastructure entities such as waters and road controlling agencies, constrained investment capability, or poorly planned investment due to a lack of credible data in consumer behaviour could result in ageing infrastructure and networks that are not fit for purpose or provide a sub optimally cost-effective service.
22. The electrification and decarbonisation of New Zealand will come at considerable cost and require accelerated innovation. Ensuring there is a supportive environment for efficient and effective network investment, and continued affordability for consumers to invest in their own sustainable energy will require careful coordination and facilitation across regulators and industry participants, and consumers.

23. PowerNet therefore supports the development of a *system* approach to the local management and maintenance of distribution networks.

Summary

24. In summary we support in principle the introduction of a hybrid DSO model that will likely become increasingly weighted towards a total DSO in the longer term. We would support an environment that would reveal the more efficient longer-term options and therefore believe the hybrid option is the minimum regulatory approach.
25. We would also encourage the Authority to consider how energy sharing and microgrid systems can be costed effectively for the benefit of DG and other flexibility consumers. We consider the existence of gentailers being responsible for rewarding their competition (customer solar/DG and other flexibility/DER) is not a viable development environment for flexibility services in NZ.
26. We acknowledge and support the importance of consumer participation in the DSO model and ensuring the best environment is created to encourage optimal consumer behaviour. We acknowledge that the sector as a whole will need to move with greater speed if we are to meet emission and renewable energy targets and agree, that at our current rate of change we will be short of what action is required to have sufficient impact on our own, and global climate change targets, further supporting the need for a coordinated approach to system operation.
27. However, we continue to advocate to the Authority the importance of data visibility to ensure the effective oversight of grid capacity. For a DSO model to be successful, oversight of consumer distributed energy resource impacts will play an important role in this success. The continued lack of access to smart meter data remains of considerable concern to PowerNet.
28. We have provided more detailed response to several of the questions posed by the Authority in the Appendix below and would welcome the opportunity to expand on any comments if the occasion arises. Again, we thank the Authority for the opportunity to submit on these high-level options.

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Questions

Q1. Do you agree with the explanation of the distribution system operator (DSO) role/ entity, and the explanation of the distribution system operation (DSO) functions that one or more DSO entities would be required to perform?

In a general sense yes noting there is no single definition given or agreed assignment of functions to industry entities here. The above definitions are not necessarily complete in themselves for example in the Ofgem definition, what does "smart" electricity distribution network mean? Both AEMO and Ofgem seem to state what activities a DSO does (and for Ofgem includes detailing sub-activities) but not what it achieves or why.

PowerNet suggests a DSO might be defined as a function that delivers increased energy transfer through otherwise constrained distribution network by leveraging customer energy flexibility (until the cost of flexibility becomes financially sub-optimal). This achieves greater utilisation of network capacity to enable DER connection and operation and achieves a more cost-effective electricity system by deferring or avoiding upgrade costs (paid for by customers)

We note additionally that while the DSO would interact with external aggregators, they will also likely be required to aggregate flexibility services at some level, potentially as the final stage of aggregation after coordinating optimal responses from multiple third-party aggregators. In addition, flexibility services impacts will need to be understood and coordinated as they aggregate up the network. In a total DSO model, the DSO would first aggregate response to manage local constraints and then further optimise residual flexibility as a further aggregated response to the TSO based on their requirements at the GXP and wholesale market level.

Q2. Do you think we are correct that the themes we identified in submissions to the initial consultation paper mean we should focus mostly on system operation at the distribution level, and on the new functions required for effective distribution system operation?

We agree this is a primary priority for the EA. We understand that flexibility services are separate from the DSO function and that there may be a conflict of interest if EDBs are offering flexibility services and therefore some precautions are necessary. It must be recognised that ripple control systems are owned and operated efficiently by EDBs currently and are likely to be the predominant flexibility resource available to a DSO in the short term. The EA should be careful in applying its precautionary boundaries to ensure that it does so fairly and that it does not have adverse implications for customers in terms of both cost and reliability/security.

While the focus discussed here is on the interface between distributors and the customer, the interface between EDBs and Transpower must also be considered as the aggregate response from DSOs management of customer flexibility directly impacts the grid interface and wholesale market. The consumer may rely on aggregators to optimise response for distribution, transmission, energy and ancillary services as in a hybrid DSO. Or the customers interface with a total DSO could optimise an overall flexibility value incorporating all of these services (including TSO).

PowerNet believes that effective services pricing goes hand in hand with system operations in a DSO context. Further the current regulatory settings are not effective to create pricing that efficiently supports optimal flexibility services use and reward. Pricing must also be a primary focus for the EA as part of enabling an effective DSO and flexibility services future.

Energy sharing has not been explicitly mentioned but will also be an important feature of our future electricity system. The existing retail model is not suited to allow customers to share energy easily or extract value from their DER assets using energy sharing between ICPs. MTR may help but ultimately energy sharing relies on retailers making suitable arrangements available for customers. Some possible conflicts of interest regarding distributors have been noted however the conflict of interest associated with the "Gen-tailer" structure (we see continuing to increase the concentration of their market power) has not been referenced here but is a critical issue. Essentially retailers (via their pricing) are the gatekeepers to customers getting value from their DER assets while these assets are in direct competition with central generation and flexibility assets. Gentailers are

responsible for rewarding their competition – this can't be a workable solution for customers seeking optimal value from their DER.

To enable customer energy sharing;

- a. Localised retail buy and sell prices within any TOU priced time range need to be substantially similar (i.e. facilitation cost by retailers should be the only buy-sell margin above line charges) like buy and sell rates on the wholesale energy market and as necessary for efficient trading. Customers being driven to "self-consume" by the status quo price differentials, while highlighted as an example of customers' ability to leverage flexibility, is not the most efficient use of their resources. This is a legacy of the top-down centralised generation supply system (or worse a potentially anticompetitive Gen-tailer approach).
- b. Alternatively, ICPs need to be able to "net meter" export against nominated ICPs (i.e. "self-consumption" across multiple ICPs). MTR may find a useful supportive purpose here however Gen-tailer interest conflicts may need to be dealt with first. This would require new well designed regulatory settings that require retailers to perform this reconciliation for nominated sharing ICPs (and potentially at nominated prices).

This makes sense where customers want to install assets at a single ICP to provide services to other ICPs that they either own or have other community/whanau connections with. Community shared assets provided by third parties also need to be installed behind ICPs and need a similar mechanism to support the required energy sharing. Care needs to be taken that other local customers are not disadvantaged by these sharing arrangements (practically, exported energy will be used by the nearest consumers regardless of whether they are part of an energy sharing scheme or not). Ultimately this may be overly complicated and inefficient compared with similar buy and sell prices which largely offsets the need to create energy sharing arrangements.

Q3. Do you think we have accurately covered the main changes to the distribution system in this section? If not, what have we missed or where have we gone wrong?

At 4.11 the practice of self-consumption is used as evidence of customers obtaining value from the DER. We would question whether customers chasing prices that represent a distortion of the underlying value of services (i.e. large differences in buy and sell rates) is a good thing albeit correlations between this behaviour and behaviour that should result from efficient TOU price signals.

At 4.14 we have been advised to have regard for pitfalls of herding. PowerNet has been warning about the pitfalls of status quo retail pricing for quite some time, potentially herding control at 9pm is a good strategy for gen-tailers to appear to be load shifting while avoiding hurting their generation earnings if they were to move properly off peak, e.g. 1am.

It is frustrating to have the EA enforce rewarding beneficial DG injection where it is clear that the value on the table is so minimal, especially while solar customers typically enjoy much more significant subsidies by reducing kWh based line charges but do not reduce their peak demand which drives network cost. PowerNet has concern that those who cannot afford solar are subsidising those who can. PowerNet is not opposed to rewarding customers where they do provide benefit to the network but is disappointed by the lack of appropriate prioritisation of issues affecting the electricity market.

Again as discussed above, energy sharing aka peer-to-peer/sleeving PPA/net metering etc (with MTR as an enabler that may introduce new control dynamics/complexity) may need to be facilitated by improved regulatory settings although perhaps may not be necessary/attractive if customers see sufficiently similar buy and sell rates.

PowerNet see LV networks as likely to be most challenged by aggregated effects of DER. Bi-direction power flows challenge supply quality with voltage varying both above and below the nominal set (starting) point, whereas traditionally there was only volt drop (variation below) the set point voltage. The starting set point voltage has been set at the top of the legislated volt range to allow maximum use of the voltage variation limitations however injection from solar means deviation upward which may quickly encroach on existing design voltage limits. Increased voltage variation limits from +/- 6% to +/-10% certainly helps and PowerNet is pleased that this initiative has been acted on in a short

time frame, although the extra capacity afforded is perhaps less than is intuitively anticipated after working through the implications.

Microgrids are another important issue that the EA needs to understand especially as rural electrification progresses. PowerNet has done significant analysis around the potential for remote customers to be more efficiently supplied using microgrids and sees this as an arising challenge for EDBs, especially those that supply rural areas. The Electricity Industry Act deals with continuance of supply obligations and alternative power supply arrangements however is very vague, significantly out of date and does not support efficient deployment of microgrids for remote customers (as admitted by the EA in previous discussions on this topic). PowerNet are concerned with the proposed reliance limits and the Authority should consider how reliance limits may encourage uneconomic connections in remote regions. Issues are around the rights to deploy alternative power supplies where efficient (and leverage/incentive for customers to adopt efficient behaviour and decision making - remote line charges may be critical), unspecified price-quality obligations, and where microgrids are only temporarily off-grid, how retailing and metering is reconciled. PowerNet would be happy to share its finding on microgrids with the Authority.

Q4. Do you agree with how we have defined the problem, as the need for a more coordinated framework of integrated system operation?

Yes agree, there is uncertainty about what the Electricity Authority might do in future that will likely lead to inefficient investment by EDBs and others. Examples are the EA's indication that they wish to ring-fence distributors out of certain functions, and what they might enable through central data sharing e.g. an efficient smart meter data access platform and/or a flex availability and capabilities registry. This makes it risky for EDBs to progress development of capabilities they may later be prevented from using. Expenditure on discovery and arrangements for flexibility may later be duplicated by an alternative standardised central system that displaces the EDBs development. While this may be more cost effective and consistent and potentially a better alternative, EDBs risk facing inefficient sunk cost for discarded developments, therefore EDBs need to know where we are headed. This situation creates hesitancy, and we can expect to see a range of responses from industry from bullish opportunity seeking to others deferring developments until certainty arises and failing to deliver benefits to customers.

Q5. In your view, what aspects of the Australian and British deliberations around DSO models are relevant to New Zealand?

PowerNet caution that using Baringa to assess UK, Australia and NZ system operational arrangements seems likely to produce similar assessments. Regardless, Hybrid preference is a reasonably obvious conclusion. Having ruled out independent providers (initially as economic but perhaps could arise longer term) then there is effectively a spectrum of the splitting of roles and functions responsibilities between EDBs and the current system operator Transpower. Ultimately both parties are highly likely to provide at least some part of the DSO solution, so hybrid is really a "cover-all" option and the responsibility for each of the roles and functions is the challenge to understand.

The scale of NZs' EDBs is the critical difference which makes comparison difficult. A total TSO option would achieve the maximum available scale but otherwise it seems sensible distributors manage what is happening on their network. The efficiency of smaller EDBs developing and maintaining this capability may be best managed by contracting out services where economics are improved while larger EDBs may gain scale by extending operations beyond their own networks (shared services). It could be argued this creates an alternative hybrid option between DSO - iDSO option (though the TSO would likely still provide part of the solution).

Australia has taken a more industry direct control approach whereas the EA appears to favour service providers competing to find efficient solutions. This perhaps reflects the speed at which Australia has had to adapt to support rapid uptake of solar installations.

Baringa make comment that the more congestion management there is at the lower levels of the network near customers i.e. LV then it would tend to favour shifting more toward a total DSO solution. PowerNet see the future electricity system shifting from central top-down operation to local self-supply leveraging progressively wider area resources to balance surplus and deficits, (ultimately relying on the central large-scale assets via the Transmission grid for the foreseeable future). From this view this weighting toward total DSO comment is particularly pertinent.

Q6. What do you think about the direction of research conducted in New Zealand by bodies such as the ENA, NEG and SIDG on the challenges of preparing to perform DSO functions?

Having been involved in these industry discussions from a Southern EDB perspective we have been impressed with the depth of innovation, international research and collaboration demonstrated under clear intent to deliver the best outcome for our collective customers.

Q7. What is your view about the need for an independent DSO (iDSO)? Should we consider an iDSO now as an option to perform all DSO functions, or a subset of functions related to market facilitation? Or can that decision wait until the market for flexibility services is more developed?

DSO independence is likely not a priority issue. It may support a potentially more critical issue which is scale however the pooling of EDB resources to provide some aspects of the DSO function (appropriate under a certain scale?) appears a better option. Potentially allowing multiple EDBs to develop would allow some competition to develop and demonstrate efficient DSO services. EDBs can also coordinate DSO development in response to varying need which would be hard to do efficiently by standing up an independent DSO. The UK has followed a path of allowing DSOs to develop within EDB equivalents that has led to natural separations occurring over time. A similar wait and see approach could be adopted here without great risk given this precedent from the UK.

Q8. What do you think about the three DSO models proposed by the Authority?

PowerNet has commented above however again emphasise that the total TSO and hybrid options assume a central top-down industry architecture whereas the total DSO would best support localized energy balancing leveraging progressively remote energy resources. PowerNet believe we are travelling toward a future of increasingly decentralised energy sharing and therefore (a weighting of roles and functions toward) a total DSO option is most likely efficient in the long term and therefore suggests the direction we may take shorter term.

Q9. Do you prefer one model over the others?

Taking the view that hybrid DSO represents a spectrum of allocating functions between EDBs and TSO with total DSO and total TSO being essentially extremes at opposite ends, it seems likely that a hybrid DSO effectively covering most possibilities might be most efficient and effective. However, it seems likely that a hybrid approach should be weighted heavily toward total DSO given the extent of decentralisation of energy resources expected especially in the medium to longer term. Total TSO and hybrid options seem more aligned with a centralised top-down energy system whereas total DSO appears to better support the local sharing and coordination of energy resources that is set to increasingly occur within local networks. Potentially a hybrid option creates confusion and complexity for customers and flexibility providers trying to optimise their offers across both EDB DSOs and TSO that may lead to suboptimal outcomes. It seems logical that EDB DSOs may pass through price incentives from the TSO to customers as part of an optimised overall price including local network constraint signals as this reflects the physical flow of energy and services however this would require a careful transition in relationships with the TSO. It is possible this may happen naturally over time to the extent that it provides an efficient solution.

Q10. Given the hybrid model can take several forms, what do you think would be the best allocation of DSO functions between the TSO and one or more distributors as DSOs?

PowerNet would see the monitoring, forecasting and communication of capacity and congestion across its management networks as an extension of its core functions. Attempting these tasks elsewhere would represent an inefficient duplication of capability. Similar considerations apply to

most functions however there would likely be some pooling of resources between EDBs dependant on scale for example procurement of flexibility (especially dispatch markets).

Q11. How would you rank the DSO models in terms of enabling the process of price discovery in the market for flexibility services to approach the wholesale market ideal of security-constrained economic dispatch?

An independent DSO is likely to be most effective at realising efficient price discovery as it would essentially be set up to achieve this. However, PowerNet see standardisation and resource sharing (where limited scale is an issue) as a sensible approach to deliver similar results without the prohibitive cost that has been recognised by Baringa and the EA with this option.

PowerNet thinks that some allocation of roles and functions to the TSO is likely to be efficient however the total TSO has the problem of distance from the networks it would be managing and therefore the weighting of allocations should be overall weighted toward EDBs given the increasingly localised energy services sharing with the increasingly decentralised future electricity system as well as the significant overlap of capabilities and responsibilities that EDBs will require.