19 April 2024

Electricity Authority
Wellington
New Zealand

Email: FSR@ea.govt.nz , subject "Consultation Paper—The future operation of New Zealand's power system"

Submission – The future operation of New Zealand's power system

1. Orion New Zealand Limited (Orion) welcomes the opportunity to make a submission on *The future operation of New Zealand's power system.*

Introduction

2. As you will be aware, we own and operate the electricity distribution infrastructure in Central Canterbury, including Ōtautahi Christchurch. Our network is both rural and urban and extends over 8,000 square kilometres from the Waimakariri River in the north to the Rakaia River in the south; from the Canterbury coast to Arthur's Pass. We deliver electricity to more than 225,000 homes and businesses and are New Zealand's third largest Electricity Distribution Business (EDB).
3. Orion's Group Purpose of "Powering a cleaner and brighter future with our community" is central to all we do. As Aotearoa New Zealand transitions to a low carbon economy, the energy sector has a critical part to play. Orion has established its purpose to be a vital player in that transition for our community and our region. We are focused on helping our community realise its dreams for a future that is new, better, and more sustainable over the long term.
4. The transition towards net-zero emissions is driving a need for more demand-side flexibility and to support the integration of intermittent renewables and efficient development of electricity networks. Consumer and distributed energy resources such as electric vehicle batteries will play a crucial role in our future energy system and could give our community more agency in how and when they use their electricity.

Orion New Zealand Ltd
565 Wairakei Road
PO Box 13896
Christchurch 8141
+64 3 363 9898
oriongroup.co.nz

Distribution system operation at Orion

5. Our network operations team utilises load management regularly to minimise peak load and maintain security for our network, and to provide load management assistance to Upper South Island EDBs. The operating systems to support this are described in Table 4.6.4 of our 2024 Asset Management Plan.
6. To complement our existing tools, which are critical to system security, we are developing innovative technical and commercial solutions to enable alternative solutions for customers.
7. Our Resi-flex project partnered with Wellington Electricity aims to incentivise flexibility from residential consumers by exploring commercial mechanisms in collaboration with flexibility stakeholders. The project recently closed an expression of interest for partners to co-design and trial these mechanisms which will provide more spatially and temporally granular signals.
8. We recently announced a partnership with Ecotricity to deliver a contracted flexibility service in the Lincoln area to meet growing electricity demand. This service goes live on 1 May 2024 and builds on knowledge developed as a delivery partner in the FlexTalk trial.
9. Information on other initiatives, including automatic power restoration system and network visibility and insights, is available at https://www.oriongroup.co.nz/corporate/innovation/.

Collaborating to increase momentum

10. Orion is actively working with customers and stakeholders across the energy sector through a range of initiatives, both strategic and practical.
11. Through our involvement in the FlexForum, Electricity Networks Aotearoa (ENA), EEA FlexTalk project and other industry wide forums and programmes, we are coordinating to unlock the value of flexibility to consumers and the wider energy system.
12. Building on our work with the South Island Distribution Group on Distribution System Operation, we are now leading a project through the ENA Future Network Forum to define the roles and functions to enable distributed flexibility.
13. A discussion paper on the roles and functions to enable distributed flexibility will be finalised shortly. Several engagement events with widespread involvement from EDBs and Transpower have supported the development of the paper and built understanding and alignment across the sector.
14. In the next stage of the project, we plan to consider the different industry architecture that could enable roles and functions to be fulfilled. This will inform what capabilities and potential coordination could be required of EDBs to support distribution system operation and unlock whole-of-system value from distributed energy resources, stimulating progress towards

these.

15. We recognise the need for collective action and innovation to ensure customers have access to the information they need to make informed decisions about how they operate their energy resources. We support the FlexForum's unique role in facilitating collaboration across the energy ecosystem to make flexibility easier for households, businesses, and communities.

Comments on future operation of the power system

16. Orion submits that the Authority should consider whether a whole-of-energy system perspective is appropriate, rather than a whole-of-power system perspective, given the power system is tightly linked to other energy vectors in New Zealand, such as gas, coal and biomass.
17. We encourage the Authority to support industry-led and consumer-focused exploration of solutions, especially through collaborative forums such as the ENA and FlexForum
18. Orion urges the Authority to support and partner with the industry to explore, develop and deploy solutions that support distribution system operation to inform which models best enable coordination
19. We encourage the Authority to work with the Commerce Commission and government bodies to ensure EDBs receive suitable allowances and have short-term regulatory certainty to facilitate the development of new capabilities to meet evolving system and consumer needs.
20. We submit that a similar approach to Great Britain may be appropriate, where transition options are kept open while exploring longer-term arrangements, building consensus on preferred pathways and optimal arrangements to fulfil emerging roles and functions.

Concluding comments

21. Thank you again for the opportunity to provide this submission. We do not consider any part of our submission to be confidential.
22. If you have any questions please contact Evie Trolove, Head of Market and Customer Innovation at Orion.

Yours sincerely

Evie Trolove
Head of Market and Customer Innovation

Annexure A

Submitter	Orion New Zealand Limited
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.	
Orion considers majority of Section 3 to accurately summarise existing arrangements and suggest recognising several further existing arrangements. While there may not be a directly equivalent role to system operation as mentioned in Table 1, the operation of the distribution system is critical to many distributors, and their customers, and some existing capabilities would be considered as distribution system operation roles or functions in other jurisdictions. In addition to load management mentioned, distributors use a range of mechanisms to enable operation. Although the products, services or tools used across these modes are evolving and may not be used by all EDBs, there are sufficient case studies of each being used in the power system at present. To categorise these mechanisms, the ENA Future Network Forum project on *Roles and Functions to enable distributed flexibility* has defined four enablement modes and has shown how these enablement modes support operation through several case studies. • **Price mode** e.g. control period demand, time of use. • **Contract mode** e.g. procured flexibility services or contractually agreed flexible connections/dynamic operating envelops • **Utility mode** e.g. direct control of DER, such as ripple hot water load management • **Emergency mode** e.g. coordinating responses to emergencies on the distribution network, as well as to those on the transmission network[1] as defined in 3.48 (b) vi We submit that it is worth recognising the role of price and contracts (such as flexibility services or flexible connections) in section 3.48 (b) as ways that some distribution network operators operate. We also suggest broadening the definition of 3.48 (b) (vi) to acknowledge that an equivalent function can be undertaken to coordinate emergencies on the distribution network.	
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.	
Orion has identified the following drivers in addition to the key drivers already captured. We suggest the following drivers be recognised separately or incorporated into the existing drivers:	

[1] *This includes distributors obligations to Transpower under the Code*

- **Consumer behaviour:** In addition to changes in consumer technology, the behaviour of customers using that technology is a key driver. Consumer awareness, attitudes and trust will impact power system operation e.g. democratisation, social licence, energy literacy, environmental concerns. The Consumer Advocacy Council's consumer behaviour survey 2023[2] and Resi-Flex Public Report (The Consumer and Stakeholder Lens, 2023)[3] provide excellent insight to inform this driver.
- **Market dynamics**: increasing value of flexibility is increasing competition for flexibility resources. In the short term, market drivers of demand and network peak will likely be aligned (synergies). Resi-flex analysis by Concept Consulting shows this may diverge in future.
- **Forecast complexity**: as devices become more flexible and respond to multiple value streams, it will become increasingly challenging to forecast these in operational timeframes to support system operation and planning timescales to inform investment.

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

Key Driver 1: changes in generation tech

EY's International Literature Review Key Driver 3 (page 12) recognised that DER pose both a potential challenge and an opportunity for new system services. In relation to section 4.7 (pg 26), we note that the deployment of Inverter Based Resources (IBR) poses a number of technical challenges but also offer solutions to some. Inertial Based Control (IBC) or Inertia Emulation technologies using IBRs and Battery Energy Storage Systems (BESS) can supplement the inertia loss (4.10) via synthetic inertia. Due to their fast ramp rates can also in parallel, help mitigate variability and intermittency (4.11) providing the resource need in 4.16.

Key driver 2: Changes in consumer technology

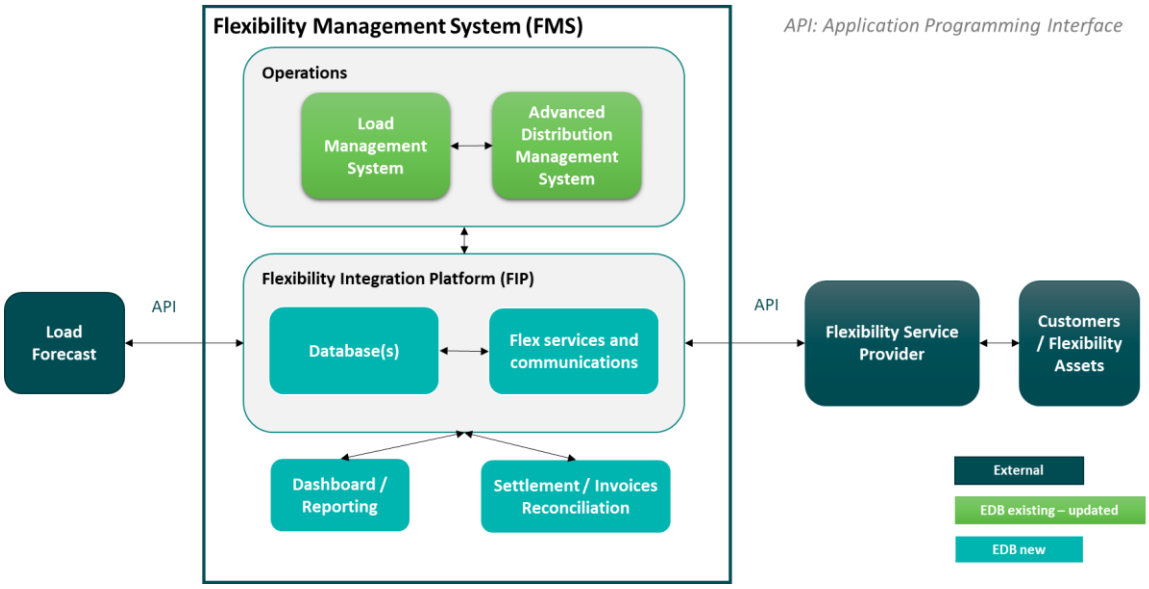
An important technological change in households to recognise is smart meters. Newer models of smart meters have remote dynamic load control capability, which enables hot water loads to be managed. This functionality has been demonstrated by several retailers in NZ who are now offering customers hot water management services. As these offerings increase, coordination is required to ensure that customer service levels are maintained (hot water stays hot), operation and planning forecasts remain accurate across the power system and obligations to respond in emergency situations are clear.

This key driver is currently described with a strong focus on household. However, other segments of electricity consumers are also facing significant technology changes worth noting. For example, process heat customers as they look to transition from coal technology to electrical or biomass solutions, or commercial consumers transitioning to electric vehicles or adopting roof top solar.

Key driver 3: Changes in operational tech

[2] https://www.cac.org.nz/our-work/surveys/consumer-behaviour-survey-2023
[3] https://www.oriongroup.co.nz/assets/Company/Innovation/Resi-Flex-Public-Report_Release-1.pdf

This section currently focuses on the operational technology required from a consumer or flexibility supplier perspective. A significant driver to recognise is the operational technology required to enable distribution system operation. For example, the flexibility management systems required to enable dispatch of local flexibility service, or to calculate and communicate dynamic operating envelops. An example of the systems architecture for Orion's Lincoln Flexibility Service (Winter 2024 minimum viable product which builds on existing systems and integrates with an external flexibility service provider) is shown below:



Section 4.33 recognises that the high-level infrastructure architecture has yet to be established. For reference, the ENA Future Networks Forum project on *Roles and functions to enable distribution flexibility* will consider different industry architecture arrangements during stage 2 (starting mid-2025) and the implications of these from an EDB's perspective.

Section 4.34 indicates that most of the present operational controls are not automated or communicated in real time. This is not the case for hot water ripple control, which is automated and managed in real-time based on load limits which can be set as static or dynamically allocated between EDBs (as is managed by the Upper South Island Load Manager)[4].

Key driver 4: Changes in information technology (digitisation and digitalisation)

4.38 indicates that most DER will be monitored and controlled through IoT devices. While true in the long term and for new DER, many flexible loads on the distribution network are currently controlled using ripple relays and are not IoT capable (e.g. hot water cylinders). As a result, smart meter data combined with accurate registry information on these assets is essential to ensure visibility of devices and expected usage patterns on the distribution network.

[4] https://www.oriongroup.co.nz/assets/Company/Corporate-publications/Orion-Asset-Management-Plan-2024.pdf Section 7.17 outlines the role of the Upper South Island Load Manager

Section 4.39 notes that DER with IoT functionality will eventually provide more granular and real-time data, enabling operators to rely on data-driven, automated and artificial intelligence control architecture for network reliability and optimised system operation. While robust cybersecurity and data privacy practices will be crucial to the stability of the power system (4.42), there is no discussion about the challenges faced when the data / communications are degraded or not there.

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

Increase visibility of DER for distributors (including operational use), to ensure planning and operational forecasts remain accurate and use of resources can be coordinated.

- This is required to ensure the integrity of operational load forecasts is maintained (at a distribution and across the wider power system) as DER and flexibility increase
- Distributors may have visibility of the asset but not of how it is being used / whether it is being controlled by other parties
- Smart meter data (consumption and network operation data) is a key enabler for identifying network constraints and being able to coordinate operations.
- We acknowledge that customers also require visibility of network conditions from ourselves to support coordination. Distributors are developing tools to support this.[5]

Clarify requirements for flexibility suppliers during emergencies to maintain the security of the power system at a national and distribution level.

- Orion welcomes recent discussions with the Authority regarding appropriate arrangements for distribution 'flexibility traders' to ensure visibility of flexible resources and coordination requirements, particularly in an emergency.
- As noted in Orion's response to the EA's consultation on Proposed changes to the default distributor agreement template[6]*: "There is one final issue that we would like to raise and that relates to the current wording of Schedule 8 of the DDA which deals with Local Management. We have been further considering this Schedule in light of the recent "Addendum to dynamic load control service memo". It is not clear to us under clause S8.2 who is the party entitled to control load … with the higher priority rank as specified in clause S8.1. Clause S8.1 does not rank the parties, rather it ranks functions. Our submission is that this Schedule needs to be revisited. It is important that the DDA recognises distributors' use of hot water control to prevent an emergency at distribution level in addition to its use by distributors in a grid emergency. To this end, distributors need to maintain adequate visibility and management of hot water."*

[5] https://www.oriongroup.co.nz/customers/connecting-your-solar-or-diesel-generation/load-growth-map/ and https://www.powerco.co.nz/get-connected/utility-scale-generation

[6] https://www.oriongroup.co.nz/assets/Company/Submissions/Final-Orion-submission-on-DDA-Amendments-Nov-23.pdf

General comments on this section of the consultation paper

This section focused a lot on DOEs as a tool to manage congestion (5.8, 5.9, 5.15). While a valuable tool, this is one of many mechanisms that can enable distribution system operation. As outlined in our response to question 1, the ENA FNF roles and functions have defined four enablement modes that can be used to support coordinated operation of flexible resources connected to the distribution network.

Section 5.9 notes the discussion around the extent to which distribution system operators are needed. The ENA Future Network Forum project on roles and functions to enable distributed flexibility is the first New Zealand wide initiative between EDBs on this topic. The project will collaboratively define future roles and functions to enable distribution system operation and unlock whole-of-system value. The project is in the first stage which is focused on building alignment on the definition of potential roles and functions. Following this stage, the project aims to progress to a stage 2 and consider different industry architecture to fulfil these roles and the impact of those arrangement on distributors.

Flexibility stakeholder barriers and enablers

Section 5.16 seeks input from new players in the markets for flexibility to share barriers to participation. Barriers and enablers from the perspective of 17 flexibility stakeholders (identified through interviews and surveys) were published by Orion and Wellington Electricity in their Phase 1 Resi-Flex Project report in 2023.[7]

[7] https://www.oriongroup.co.nz/assets/Company/Innovation/Resi-Flex-Public-Report_Release-1.pdf pages 18-23 and 38-39.

ENABLERS (WANTS & NEEDS)	PRIORITY AREA (FACTORS FOR EDBs TO CONSIDER)	DESCRIPTION
CUSTOMER VALUE	REDUCE UPFRONT COSTS BARRIER	Value from flexibility should support consumer investments in smart DER. In the future, standardised roll-out of 'smart devices' could contribute to lower costs.
	SIMPLE SOLUTIONS FOR THE END CONSUMER	The EDB mechanisms should allow the end consumer experience to be simple, even if industry signals are complex or data rich.
	CREATE VALUE FOR ALL CONSUMERS	The commercial mechanisms should support whole-of-system value, directly benefiting those who participate, while reducing the cost to serve all consumers.
MARKET STIMULATION	SUFFICIENT REAL VALUE	EDB value must be sufficient for flexibility suppliers to package alongside their wider offerings.
	ACCESSIBLE	Commercial mechanisms additional to distribution pricing (or priced-based flexibility) should enable open market that can attract a liquid pool of resources.
	ENABLING OTHER EDB VALUE STREAMS	DERs can provide value to EDBs other than energy injected / curtailed. Therefore, flexibility commercial mechanism design should consider the full set of value from DERs stimulated.
	COLLABORATIVE	The market is emergent. Co-design including pilots and trials will promote innovation and optimise solutions.
	SCALABLE	Pilots or first contracts should be designed with scalability in mind to maximise investment.
COMMERCIAL MECHANISMS	VALUE STACK ACCESSIBILITY	Design should optimise ability of flexibility suppliers to work across the value stack.
	PREDICTABILITY OF EVENTS	Payment structures should reflect real network needs and desired responses (e.g., "events" related to the real world and/or have good notice (hours) provided).
	USABILITY FOR PRODUCTS AND FULFILMENT	Mechanisms must be usable by flexibility suppliers. This requires listening to their needs and building complexity over time.
	PREDICTABILITY OF VALUE	Predictable long term customer value, notified to the market with early notice, allows products to be priced and positioned.
	TENURE AND FREQUENCY / VOLUME OF OFFERS	Long term (5yrs+) and a volume of offers that justifies building portfolios, customer sign ups, asset installs and drives investment.
OPERATIONAL EFFICIENCY	CONSISTENCY ACROSS EDBs	Consistent, standard processes for procurement, fulfilment, and approach to constraints/pricing.
	OPERATIONALLY EFFICIENT	Standardised interfaces and automated data exchange appropriate to need/ service.

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

Orion has been closely monitoring developments overseas, particularly in Great Britain (GB) and Australia. A summary of insightful developments relevant to system operation in NZ is shared below:

Great Britain

Significant innovation funding has given GB networks the capacity and developed the capability to advance distribution system operation through new tool and services.

- In 2019, the Energy Network Association published a report which mapped innovation projects to Distribution System Operation functions to identify opportunities[8]. The report identified 138 innovation projects related to DSO. The value of the projects is shown in Figure 10 below, with a significant investment in network operation from 2010.

[8] https://www.energynetworks.org/assets/images/Resource%20library/ON20-WS3-Innovation%20Trials%20Final%20Report%20(PUBLISHED).pdf?1713174352

- While NZ can learn from overseas experience, a 'safe to fail' environment, time and money is required to accelerate the development of local capability, integration of novel methods and technologies to implement these. Additionally, New Zealand has its own contextual differences (including existing systems such as ripple, a nodal wholesale electricity market, different regulatory framework) which require solutions to be adapted and create opportunities for different solutions.

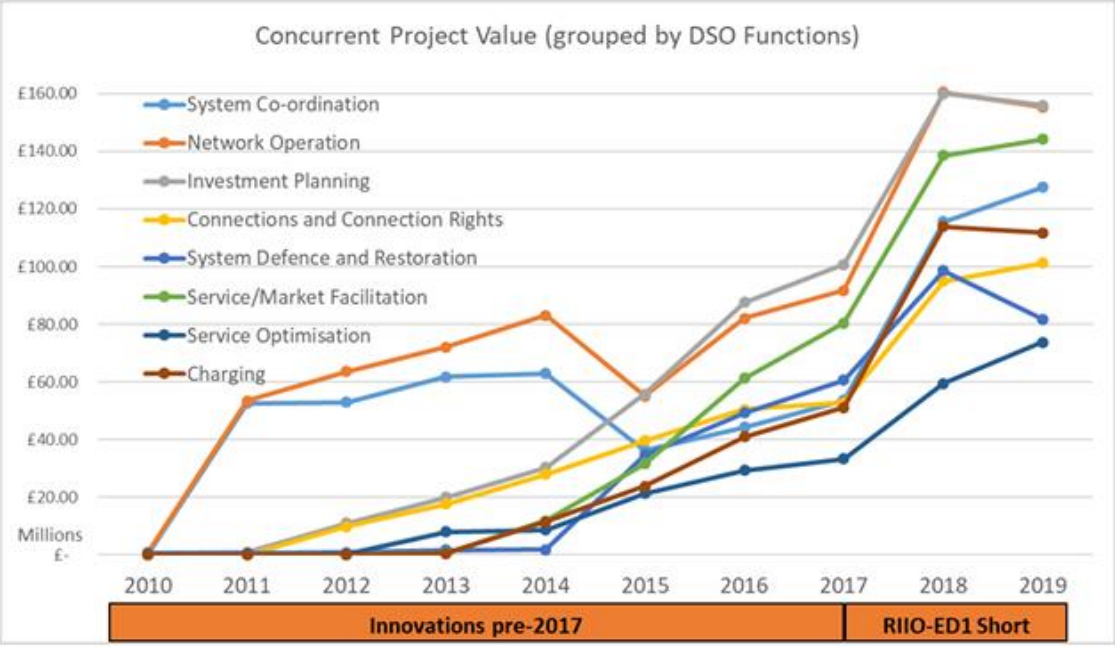


Figure 10 Value of DSO Innovation Activities Running Concurrently up to 2019 by DSO Functions

Distribution system operation roles and functions have been clearly defined, and the allocation of roles adjusted as consensus on transition pathways has emerged

- As noted in the above figure, the exploration of distribution system operation roles and functions started taking place in 2010 with early innovation projects.
- EY's Literature Review provides a useful summary of developments through the ENA's Open Networks Programme and Ofgem reforms.
- Ofgem have defined distribution system operation expectations in their **DSO Incentive Governance Document**[9]. This defined 3 roles and baseline expectations, with an incentive framework intended to evaluate performance for distribution system operation

9 https://careershub.nationalgrid.co.uk/members/modules/jobV2/download.php?record=j3dkmJ4Sin7ks37KqwaR7SoRrlglic8jKdPSaDRDdgrh7s4Dl.pdf

Role	Activity
Role 1: Planning and network development	1.1. Plan efficiently in the context of uncertainty, taking account of whole system outcomes, and promote planning data availability.
Role 2: Network operation	2.1. Promote operational network visibility and data availability
	2.2. Facilitate efficient dispatch of distribution flexibility services
Role 3: Market development	3.1. Provide accurate, user-friendly and comprehensive market information
	3.2. Embed simple, fair and transparent rules and processes for procuring distribution flexibility services

- Since the EY literature review was finalised for the EA, Ofgem published their decision paper on **Future of local energy institutions and governance**[10] following their call for input which looked at several different model options for enduring arrangements[11].
- The key components of Ofgem's proposed package of reforms were:
    - **Energy system planning:** Introduce new Regional System Planners ("RSP(s)") to ensure there is accountability for regional energy system planning. The Future System Operator (FSO) will be the delivery body for this role.
    - **Market facilitation of flexible resources**: Assign a market facilitation function to a single entity with sufficient expertise and capability, to deliver more accessible, transparent and coordinated flexibility markets. Both the FSO and Elexon were identified as credible candidates for this role.
    - **Real time operations**: Keep real time operations within the distribution network operators (DNOs), ensuring clear accountability for network reliability
- While it is too early to conclude whether similar allocation of roles for market facilitation and energy system planning would be appropriate in NZ, we can draw insight from the rationale supporting their decision regarding real-time operations which states:
    - "DNOs will remain responsible for real time operations, ensuring that accountability for reliability and safety sits with one entity. There will be **no requirement for DNOs to create legally separate or independent DSOs."**
    - "In our Consultation we proposed that real time operations should remain with DNOs. This **ensures** that accountability for network reliability and safety sits with one entity. We explained that we did not think **requiring legal or ownership separation of DSOs addresses the issues** we identified in the Call for Input. We also explained that requiring further separation was not aligned with our function first approach to reform, and that **we did not believe it was justified due to the complexity, time, and cost involved**. We did however **suggest that improvements are required on operational transparency and coordination."**

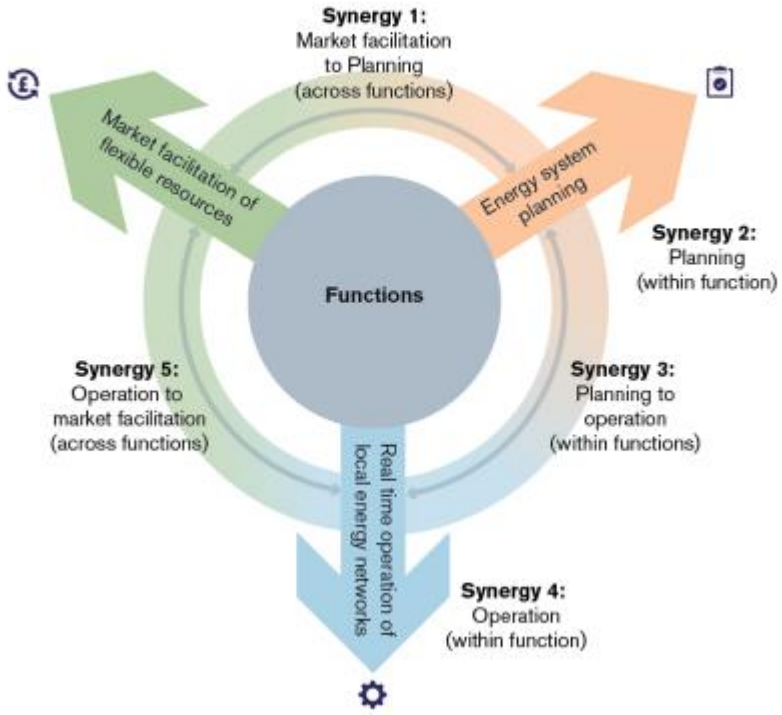
[10] https://www.ofgem.gov.uk/sites/default/files/2023-11/Future%20of%20local%20energy%20institutions%20and%20governance%20decision.pdf
[11] https://www.ofgem.gov.uk/publications/call-input-future-local-energy-institutions-and-governance

- "We asked stakeholders if they agreed that DNOs should retain responsibility for real time operations. **There was strong support for this, with a significant majority of respondents agreeing**. Stakeholders agreed with the rationale we set out, recognising the importance of DNOs being responsible for reliability and safety, and that restructuring is likely to be very disruptive and present a risk to reliability and safety. **"**

- In Ofgem' call for input, they recognised the synergies between the roles and functions that had been defined, as shown in the figure below.

Call for Input – Future of local energy institutions and governance

Figure 1: Summary of functional synergies within and across functions.



- Ofgem also published a call for input on the **Future of Distributed Flexibility**[12] and the role of a **common digital energy infrastructure** to facilitate increased flexibility market liquidity. This proposed a common digital energy infrastructure for flexibility markets and several archetypes for this.

- NZ can draw insight from this process, options considered and consultation responses[13] from global leaders in local flexibility markets

[12] https://www.ofgem.gov.uk/sites/default/files/2023-07/Distributed%20Flex%20CFI%20Response%20Letter.pdf
[13] https://www.ofgem.gov.uk/sites/default/files/2023-07/Non%20Confidential%20Responses%20to%20the%20CFI.zip

- For example, the Energy Networks Association submitted that: "**It is too early to define a timeline for the development of an exchange or platform** especially since there is no consensus of the "product definition" and Regardless of a decision on the final infrastructure archetype, there will continue to be a near to medium-term (2-5 years) need to ensure that market facilitation supported by network companies adequately meet the government and regulatory policy requirements of the DESNZ and Ofgem."
- UK Power Networks response noted: "We would s**upport the transition of the current system into the "medium" archetype over time** and would seek to engage the Flex supply sector in discussions over the most appropriate time frame and model for delivery. There are **low-regrets initiatives, which could and should advance quickly:**
  - Central asset register
  - Open Networks activity to standardise products, processes and interfaces
  - More sharing of data between System Operators
  - Leaders like UK Power Networks pressing ahead with technology enhancements (e.g. to enable day-ahead flex procurement) that deliver immediate benefits and establish learning
  - Harmonisation of data models in line with some open standards"
- UKPN also states:
  - "We must **avoid the risk that this consultation (in combination with others) creates uncertainty** which impedes progress. In particular, UK Power Networks needs to invest in technology in order to deliver its commitments around network investment deferral but is also keen to avoid stranded costs."
  - "At this, still **formative stage in the evolution of flex markets, the risk of foreclosing innovation is high**, if a standard, unitary approach is imposed too early and there is also the inevitable risk associated with any major, new, public ICT project."

Australia

ARENA's Distributed Energy Integration Programme[14] includes a range of workstreams including dynamic operating envelops, access and pricing and interoperability. They regularly publish regular updates which are relevant to power system operation.

AusGrid's project EDITH provides insight into dynamic pricing and DOEs to enable flexibility. Their Knowledge Share Report on Network Support (A comparison of current and emerging solutions)[15] outlines relevant case studies that support system operation.

[14] https://arena.gov.au/knowledge-innovation/distributed-energy-integration-program/

[15] https://cdn.ausgrid.com.au/-/media/Documents/About-us/Future-Grid/Edith/Project-Edith-Knowledge-Sharing-Report-2.pdf?rev=5045c84d1ec241a5ac81c89546549828

In summary, key insights for the NZ context are:

- Facilitate innovation to develop and deploy solutions that support distribution system operation and explore different models to enable coordination
- A variety of solutions can be implemented in parallel (multi-modal approach) to enable flexibility, including price, contracts, standards etc.
- Aid progress by providing suitable allowances and regulatory certainty in the short-medium term for EDBs to develop relevant capabilities / meet customer expectations
- Keep transition options open while exploring longer-term arrangements and building consensus on preferred pathways and optimal arrangements to fulfil roles and functions
- Carefully balance standardisation with innovation – exploration of options and alignment on solutions should be encouraged before regulation.

Key differences to recognise are:

- In GB, distribution pricing and connections charges are more tightly regulated, therefore local flexibility markets and flexible connections (contract mode) have been used more extensively by DNOs to address distribution network needs as opposed to distribution use of system charges (price mode).
- In Australia, issues have largely been driven due to solar PV and solutions such as dynamic operating envelops have largely been applied to generation rather than load (although small trials are underway).[16]

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.

While existing power system obligations in New Zealand provide some level of assurance and guidance for DER and IBR-based generation, there are gaps and challenges which need to be addressed to fully support their uptake and integration into the grid. The gaps and challenges include:

- **Flexibility and Curtailment**: Flexible connection arrangements and curtailment measures, which have been introduced in Australian and the UK jurisdictions to enable faster and more customer-focused connections, are not fully utilised or standardised in New Zealand. Aligning obligations with these practices could facilitate the uptake of DER and IBR-based generation.
- **System Studies Requirements:** There is currently a gap for DER under 1 MW, which suggests that system studies requirements may need to be revised to bridge this gap and provide clearer guidance for DER integration across different scales. Particularly where there is or could be the potential for localised clustering of DER whose cumulative impact is greater than that of 1 MW.
- **LV DER and IBR-based generation**: To varying degrees, compliance with AS/NZS 4777 is relied upon by distributors as the assurance that connections of LV DER and IBR-based generation are meeting their obligations. With increasing IBR technologies on the grid there a need to recognise and expand the application of AS/NZS 4777 and a consideration

[16] https://arena.gov.au/assets/2023/02/deip-ceo-forum-feb-2023.pdf

of alignment with National Renewable Energy Laboratory grid performance standards in some cases where they could provide benefit.

- **Standards for EV Chargers and V2G**: Appropriate standards for EV chargers and V2G need to be considered to support the integration of EVs into the grid
- **Testing and Verification:** There may be a need for stricter testing and verification requirements for DER and IBR-based generation to ensure compliance with performance standards and grid stability requirements. This includes verifying stability, updating settings, and ensuring proper restoration procedures after shutdowns.

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.

Coordination of operations

Orion maintains a load management system and the Upper South Island (USI) load management system, which Orion operates in collaboration with other electricity distributors in the upper South Island. The USI load management system is a dedicated SCADA system run independently of our load management and network management systems. Two redundant servers take information from Orion, Transpower and other USI distributors' SCADA systems, monitor the total USI system load and send targets to the various distributors' ripple control systems to control USI total load to an overall target. This cooperative venture supports power system operation and provides a number of significant benefits both to Transpower and to each of the participating distributors.

Refer to Q4 for our recommendation to increase the level of coordination of operation across the power system.

Coordination of network planning and investment

While there are synergies between network planning and operation, we have provided a brief overview of how we support coordination in the area, recognising the focus of the Future Security and Resilience programme is real-time operation.

Orion will increasingly play a coordination role in network planning and investment through the development of local **future energy scenarios**, transparent **network investment plans,** contributing to **local area energy planning** and enabling efficient investment **through connections**. We are leveraging insight from other jurisdictions to advance our approach and adapt methods that we can apply in our context.

Future Energy Scenarios

- Orion and many other EDBs are in the process of enhancing their network planning approaches. To assist our planning in an environment that is uncertain and evolving, we have developed five future energy scenarios describe plausible futures in 2050, and the pathways for reaching those.
- As well as disaggregating national scenarios, including Transpower's Whakamana I Te Mauri Hiko, and Climate Change Commission modelling, and leveraging this insight to inform our scenario inputs, we conducted extensive consultation and engagement

activities, including detailed discussions with key local and national stakeholders, to refine scenario inputs, assumptions and ensure 'place-based' factors were considered.

- Analysing the spread between the different scenarios shows which drivers our scenarios are most sensitive to changing. This helps to inform where Orion needs to invest more effort into research and innovation to reduce the unknowns, and where there is confidence to invest to meet our customers' needs.

Network investment plans

A simplified view of our network development process from our 2024 AMP is below:

Figure 6.4.1 Orion process for making future-focussed investment decisions

Coordination on network investment is facilitated through key documents like our Asset Management Plan, but also through relationships across the sector. For example:

- We engage with Transpower for large load and generation connections via their Concept Questionnaire Assessment process, which might go through further Transpower stage gates depending on the likelihood of the connection going ahead. We meet with Transpower quarterly to discuss these and other items.
- In addition, the Network Development team meet with Transpower annually to provide input to Transpower's annual planning process, and we provide feedback to Transpower consultations.
- Regular engagement with retailers and flexibility suppliers and sharing of data

Local area energy planning

- While it is not yet a formal framework, we are supporting local area energy planning (LAEP), leveraging best practice guidance from the UK[17]. NZ can use this as a framework to support more coordinated planning and investment, including with councils.

Connections

Coordination with customers, between distributors and with Transpower regarding connections can also support the power system to operate effectively. For example, alignment of connection standards, connections products like flexible connections or DOEs, and encouraging efficient investment. The ENA's Future Networks Forum is also leading initiatives in this area to increase coordination across the sector.

[17] https://es.catapult.org.uk/tools-and-labs/local-area-energy-planning/

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.

As noted in our response to Q5, real and perceived conflicts of interest were thoroughly considered by Ofgem through their consultation on **Future of local energy institutions and governance**[18] which can provide some insight in the New Zealand context.

Section 5.52 b notes that some behavioural status quo bias toward increasing the size of the network rather than relying on non-network solutions. A major challenge not recognised in the section is the market maturity and liquidity of flexible resources. For example, when networks seek out non-network solutions, the flexible capacity may not exist and either requires investment in new assets or recruitment of customer resources which can be time consuming and uncertain. This lack of market liquidity has also been an issue in GB, where innovation funding has helped to stimulate investment and increase confidence in potential revenue streams.

In 5.52 b(i) this conflict of interest needs to be balanced with clarity around performance obligations and risk. For example, if a network operator selected an experimental solution, and failed to deliver, there would need to be an appropriate transfer of risk to the service provider or network operator for a decision to implement a higher risk solution. For the Lincoln Flexibility Service, we did not implement performance obligations on the flexibility supplier and therefore retain the risk of service non-delivery. This was an intentional decision to avoid barriers to entry for new flexibility suppliers. We would expect this to change as the market matures. This need for clear accountability was recognised by Ofgem's in their decision on Future of Local Energy Institutions (section 5.3) as shown in our response to Q5.

In 5.52 b(ii) a potential conflict noted is the procurement of non-network solutions in-house. This can be mitigated by ensuring that non-network investment decisions are transparent and be assessed independently or challenged. We believe information disclosure requirements appropriately mitigate this risk.

5.52 b(iii) notes it will become increasingly difficult to evaluate whether decisions made by a regulated business are efficient. This can be mitigated through aligned methodologies. As an example, during Resi-Flex Orion and Wellington Electricity commissioned Concept Consulting to develop a commercial framework and spreadsheet to determine the 'payment budget' for a specific deferred investment. This will help EDBs assess whether the flexibility service is economically efficient and within the payment budget compared to network investment. The commercial value model has been shared with other EDBs via the ENA and there is interest in developing a common methodology to support investment decisions.

[18] https://www.ofgem.gov.uk/sites/default/files/2023-11/Future%20of%20local%20energy%20institutions%20and%20governance%20decision.pdf

An Assessment of Alternative DSO Governance Models by NERA for Scottish and Southern Electricity Networks in 2022[19] conducted a top-down assessment of the cost and benefit of separation between DNO and DSO. It reported that the potential benefits from DSO separation are negligible and that the main possible benefits arise from the avoidance of conflicts of interest. It reported "*these benefits are likely to be extremely small, mainly because regulatory mechanisms already exist to mitigate any such conflicts of interest.".*

NERA also reported that "*DSO separation would interfere with achieving net zero, by absorbing substantial time and resources needed to achieve net zero and make transition to net zero more costly.".* In conclusion, their recommendation was to pursue ring-fencing "*…to help **avoid the perception** of conflicts of interest, giving DERs greater confidence in flexibility markets. It will allow time for DNOs to develop their DSO capabilities in the coming years, without the loss of management time that would be caused by more severe business separation. It also leaves **open the option** for Ofgem and government to pursue other separation options in the future, if evidence emerges that conflicts of interest exist, and the benefits of separation are material."*

While there are contextual differences in in NZ, the cost vs benefit of mitigating real or perceived conflicts of interest should be considered. There are existing synergies between some roles and functions and unbundling of roles in the New Zealand context would be even more complex as hot water load management has enabled deferment of network investment for several decades. As other parties look to manage these loads, careful coordination in planning and operational timescale is needed to prioritise positive outcomes for consumers, including service levels, secure electricity supply and efficient network investment.

Initially, a principles based approach to mitigate conflicts of interest (including transparent decision making already required through the Information Disclosures) would support innovative models to emerge, keeping options open while the market matures.

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.

Many distributors, including Orion are observing changing in how their networks are used. To respond to these changes in a smart and efficient way, new capabilities are needed. It's critical that the regulatory frameworks support development of this capability to assist this transition and exploration of new models – this will enable the sector to lift its capability, provide insight/evidence to inform further assessment and increase the likelihood of industry alignment on future arrangements to achieve system operation.

This aligns with the approach published by Ofgem, which recognises that industry exploration (divergent thinking or keeping options open) is an appropriate and important step before building consensus on approaches. This process took over 8 years in Great Britain, with early stages

19 https://www.nera.com/content/dam/nera/publications/2022/2022.03.21_NERA_Report_DSO%20Strategy_for_publication.pdf

supported by innovation and a shared vision set out by the government and regulators (Smart Systems and Flexibility Plan).

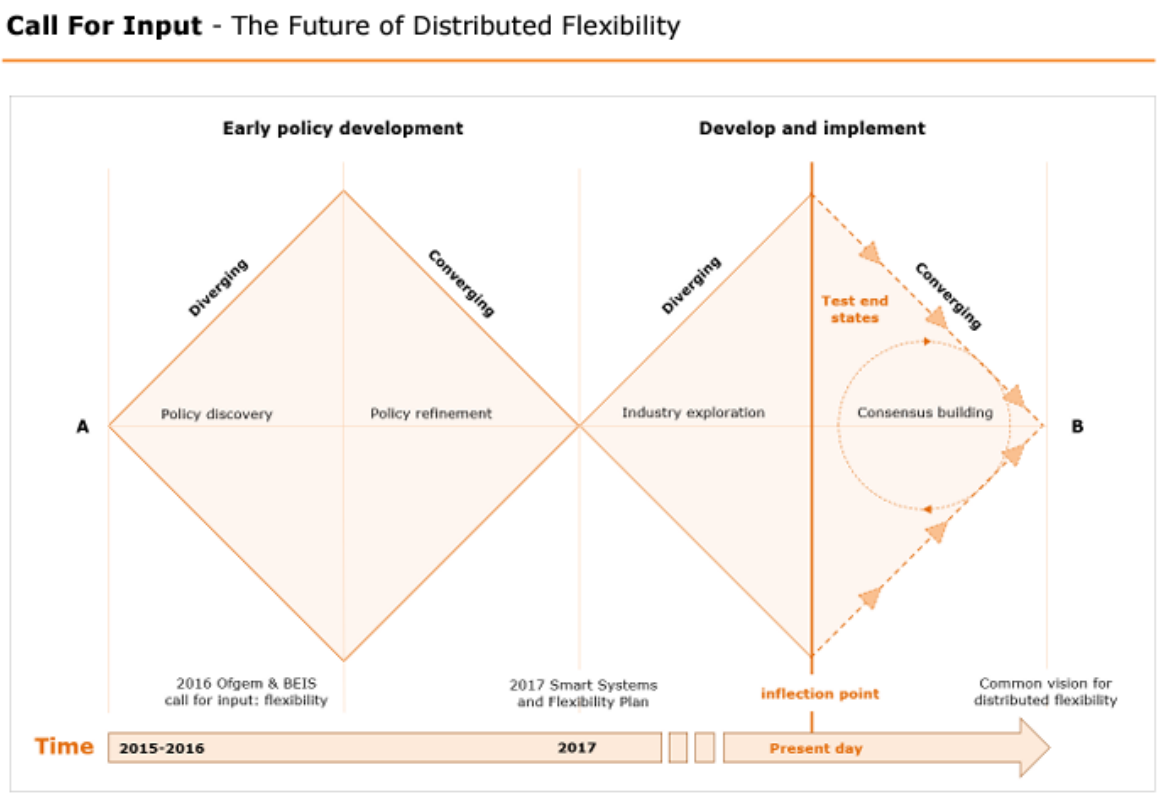


Figure 1. 'Design thinking double diamond' timeline of flexibility policy and industry delivery since 2015.[20]

Additionally, we support the following recommendations from the Market Development Advisory Group's price discovery in a renewables-based electricity system, which recognised the need to explore and develop fit for purpose solutions that support coordinated system operation:

- 5 - Develop design and trial tools to enable security constrained economic dispatch on the distribution network
- 19 – Ensure distribution network capacity is reflected in wholesale DSF dispatch

As noted in the EY literature review report (Key Response 1, page 13), *"various new and enhance system capabilities are needed to efficiently manage an increasingly distributed electricity system."*. New Zealand is on a similar journey to other jurisdictions where we are "considering the most appropriate roles" which is a pre-requisite before considering how those capabilities are fulfilled and governed. Significant innovation funding in the UK and Australia has stimulated flexibility markets, building capability in people, systems and by supporting initiatives that would otherwise be uneconomic. Similar investment is required in NZ to stimulate flexibility, including flexibility suppliers until the market matures.

In the same driver (page 14), the description states that “NZ is not yet at the stage of trialling or implementing market places for flexibility and DER at scale.” While this may be the case for contracted flexibility services, New Zealand distributors have a strong history of enabling flexibility through price (e.g. control period demand) and ripple at scale. Additionally, Orion have recently procured flexibility in Lincoln, leveraging knowledge shared by other networks about their experience and are preparing to implement this service in winter.

We submit that the Authority should stimulate exploration and development of emerging models to support power system operation and avoid taking immediate intervention in the short-medium term. In parallel, there are least regrets actions which the Authority can take to support better coordination regardless of which models emerge, including:

- Stimulate innovation and exploration of solutions
- Support collaborative action across the sector and alignment on terminology
- Streamline data access and sharing
- DER / inverter standards
- Ensure appropriate standards for DER operation and visibility
- Supporting definition of roles/functions and exploration of industry architecture to fulfil those

An area it is to early for the Authority to decide on is the potential separation of network ownership and network operation.