

September 2021

Review of Transpower DR programme

Innovation and
Participation
Advisory Group

This slide pack is supporting material to IPAG's memo on Transpower's DR programme

- The IPAG's advice for its review of Transpower's DR programme is set out in two documents:
 - a **covering memo** that summarises IPAG's general observations and recommendations
 - **this slide pack** which provides supporting material to the cover memo, including responses to the six questions the Authority asked the IPAG to respond to.
- The cover memo and the slide pack should be read together.

Things to note

- An additional benefit of this project has been refining the understanding of how Equal Access should be implemented
- Transpower have proactively changed their DR Programme as a direct result of interacting with IPAG which suggests there may be similar opportunities like this for advisory groups in future

Transpower's "DR" programme is principally about the contribution of DER as a network input

DER are small, widely distributed and behave differently to other electricity market resources.

Distributed Energy Resources

Typically connected to roadside power lines, not the big power pylons, and increasingly consumer owned

Mostly electricity, but can include other energy, such as solar heating; hot water

Common examples are:

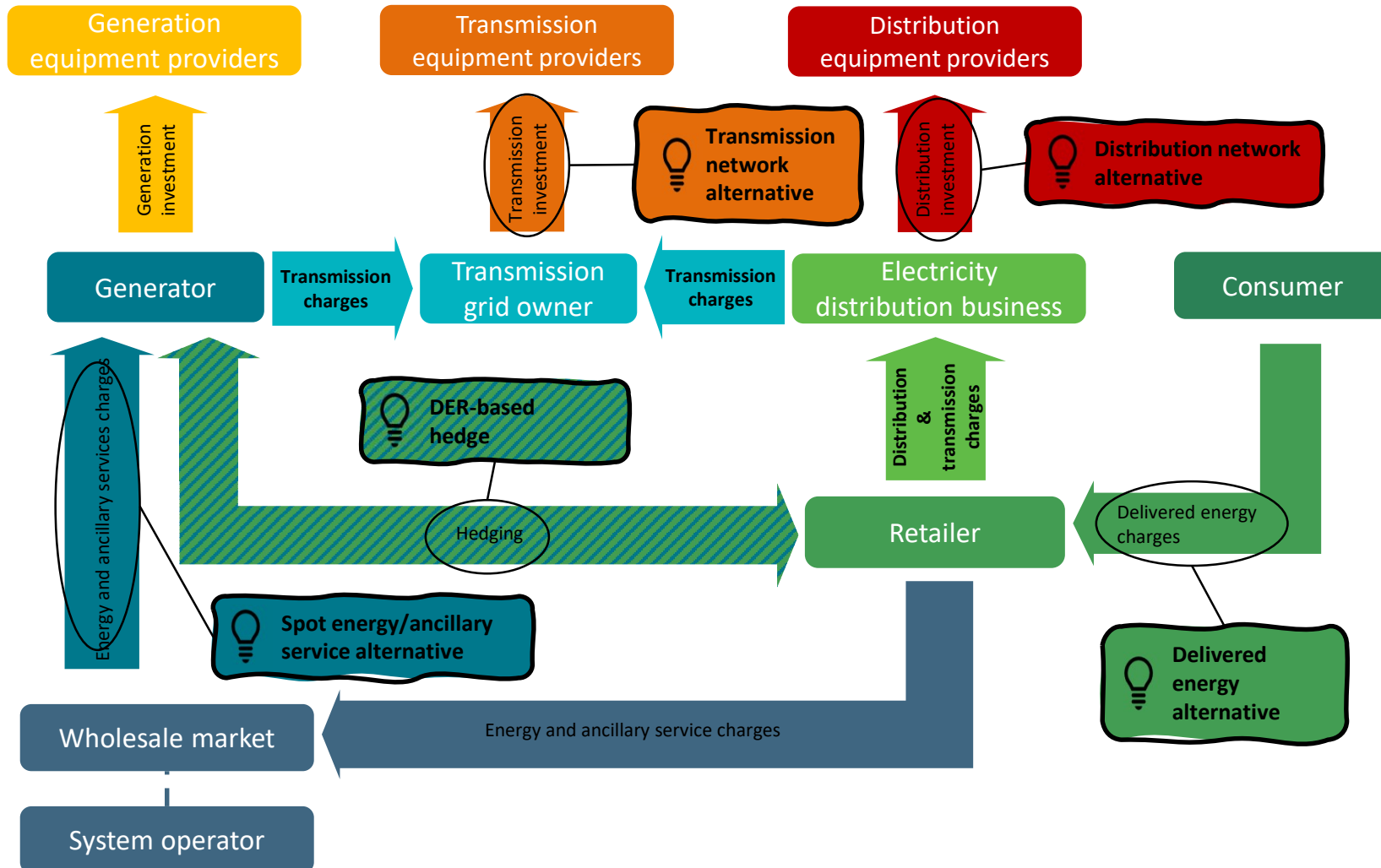
- Rooftop solar panels (photovoltaics PV)
- Storage (such as batteries)
- Electric vehicles
- Controllable demand (consumers turning appliances off and on either manually or pre-programmed, to suit the power system, for a payment)

Key difference between:

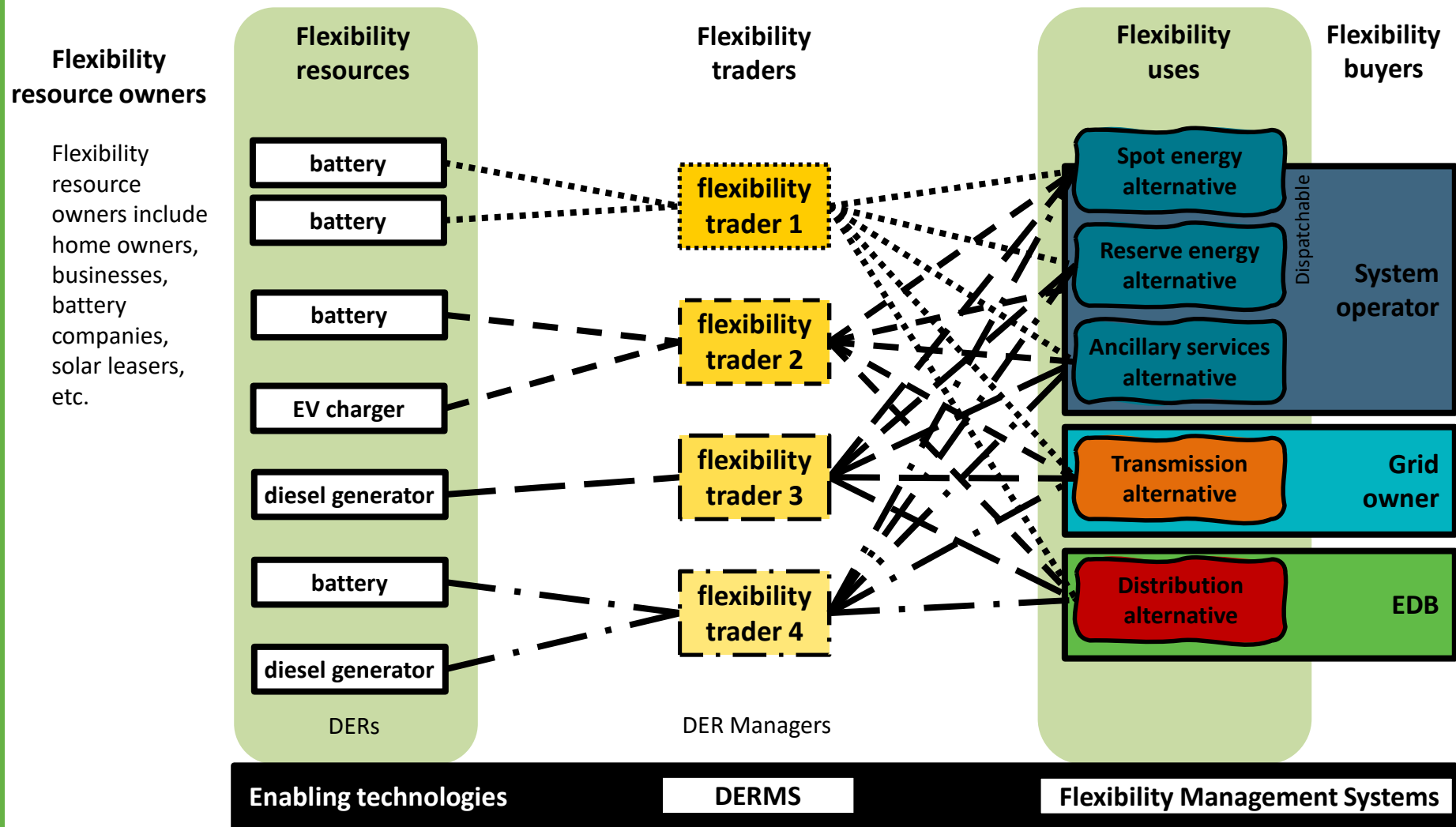
- *Uncontrollable DER (solar, "dumb" EV charging etc) and*
- *Controllable DER (batteries, "smart" EV charging etc)*

Impact of controllable DER is **flexibility** - modifying generation and/or consumption patterns in reaction to an external signal (such as a change in price) to provide a service within the energy system

DER provide an alternative way of delivering existing services – all of which can be monetised and some of which have single buyers



Flexibility services from controllable DER have single buyers and need market design



The focus of IPAGs work is to maximise benefits to consumers

- We want to ensure that consumers are able to take advantage of DER to meet their energy needs in new ways.
- Consumers should be able to decide how they want electricity to support their lifestyles
- Intermediaries can then tailor services that minimise overall cost to the customer and their carbon footprint within these parameters. These services will fall into two broad categories:
 - Continually optimising cost and minimising emissions for the consumer through automated control technology which is constrained by the consumer's lifestyle parameters (which they can continuously reframe) and
 - Offering options to temporarily adjust these lifestyle parameters where DER is used actively both in advance or near real-time so the consumer can benefit by meeting high-value industry needs for flexibility services.

Ultimate beneficiary of equal access is the NZ consumer

- The improvements to Transpower's "DR" programme that IPAG recommends, if applied to all flexibility markets in New Zealand, will save consumers in the order of \$10 billion over the years to 2050 as we decarbonize our electricity system and expand to remove fossil fuels from the economy.

IPAG members responsible for this advice

Members providing this advice:

- John Hancock (Chair)
 - Luke Blincoe
 - Glenn Coates
 - Allan Miller
 - Terry Paddy
 - Tim Rudkin
 - Roxanne Salton
 - Corrie Stobie
 - Scott Willis.
-
- John Rampton and Diego Villalobos Alberú assisted the IPAG as observers from the Commerce Commission.

We took a collaborative approach

- The IPAG would like to thank Transpower for their considerable and constructive engagement with us throughout this project. They have been open and receptive to our suggestions throughout and have developed many proposed changes to the DR programme as a direct response to our findings.
- We have also dealt with many industry stakeholders – EDBs, flexibility buyers and sellers. Everyone has been candid and generous with their time which has helped us enormously and we are grateful to all stakeholders for the time they have spent preparing for and interacting with us.

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Part A: What were we asked to do?

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The Authority requested that IPAG review Transpower's DR programme

- In May 2020, the Electricity Authority (Authority) formally requested that IPAG review the effectiveness of Transpower's Demand Response (DR) programme.
- The Authority requested that the review cover:
 - A summary of the current state of electricity demand response and wider flexibility mechanisms in New Zealand.
 - An assessment of the performance of the Transpower DR programme to date with respect to the Authority's statutory objective, including the promotion of innovation (which links to both the competition and efficiency objectives).
 - Related insights or recommendations regarding the design and operation of the Transpower DR programme.
 - Implications and recommendations for the design and operation of distribution business flexibility markets in New Zealand.
 - An assessment of the effectiveness of the RCP2 allowance as an incentive for the development of flexibility markets.
 - Implications and recommendations for the design and operation of future incentives for transmission and distribution flexibility markets in New Zealand.
- The Authority also noted that it expected IPAG to work closely with Commerce Commission (Commission) staff during this project as Transpower's revenue (from which the DR programme was funded) is set by the Commission.

Part B: IPAG's framework for considering the use of flexibility resources in the NZ electricity industry

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Framework for considering use of flexibility resources

- The IPAG have determined (during their review of Transpower's DR programme) that there is a lack of a clear framework (including consistent terminology) for considering DR and flexibility. This often leads to confusion.
- We have adopted Transpower's terminology clarifications and have integrated them with the internationally recognised concept of flexibility: *modifying generation and/or consumption patterns in reaction to an external signal (such as a change in price) to provide a service within the energy system*
- We have built on our equal access work to develop a framework that we believe will aid understanding and development of flexibility markets in New Zealand. This framework has taken time to emerge, and only became clear after the IPAG had spent considerable time reviewing both Transpower's DR programme and the current state of flexibility in the electricity industry. The framework is dynamic and aims to enable innovation.
- The IPAG's preferred terminology and framework are set out in the following slides. The framework has been guided by the Electricity Authority's statutory objectives.

To understand how flexibility markets work we first need to consider how the electricity market traditionally works



The system operator manages the power system so there is a continuous balance between electricity supply and demand.

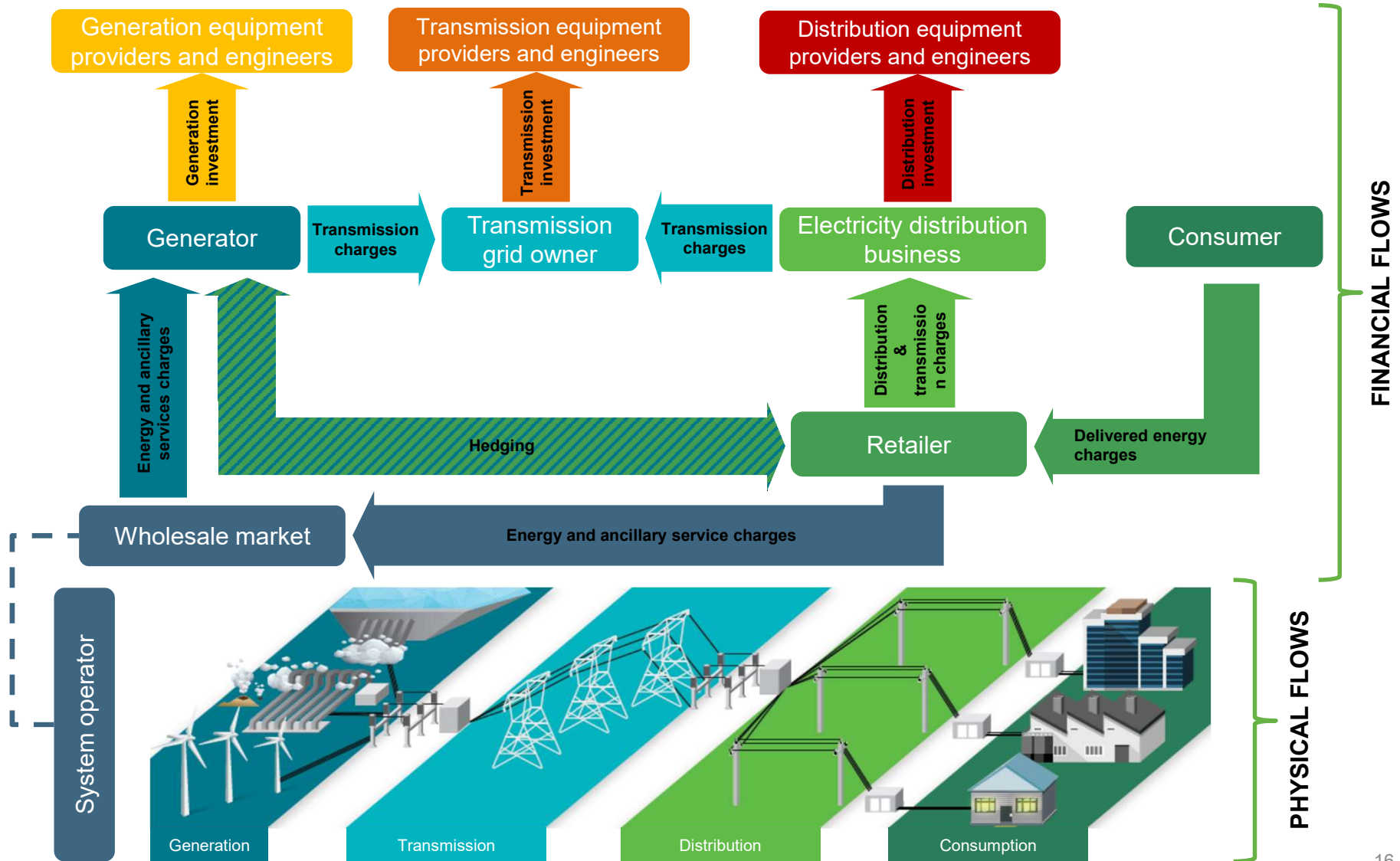
Traditionally, a generator generates electricity which then flows through the transmission and distribution networks to the electricity consumer.

However, this representation of the physical flows is a simplification:

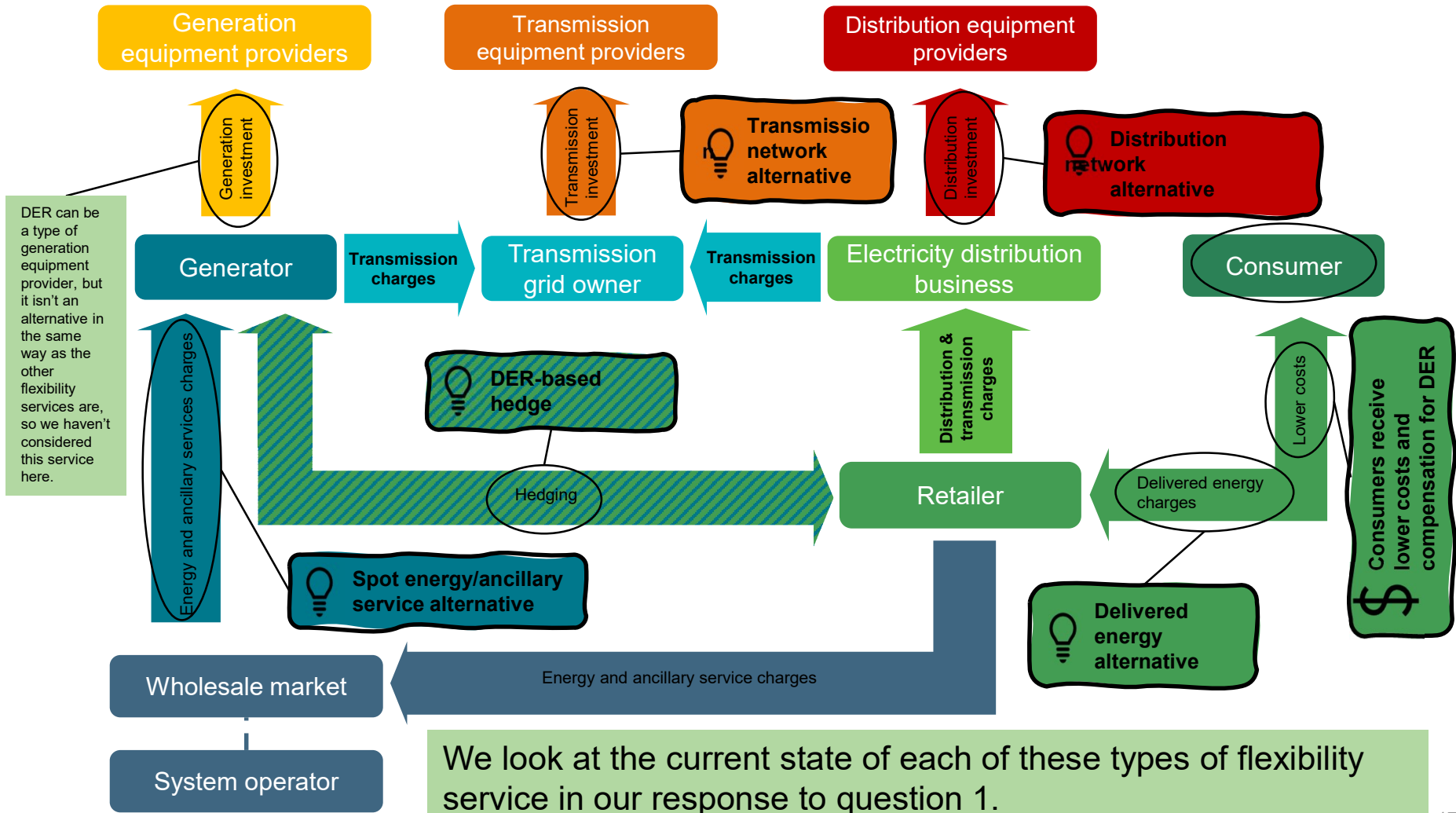
- some consumption is directly connected to the transmission system
- some generation is connected to the distribution system (rather than the transmission system) or even behind-the-meter (on a consumer's premises).

* This diagram is based on a diagram used in the Authority's publication 'Electricity in New Zealand' (p10) (available here: <https://ea.govt.nz/about-us/media-and-publications/electricity-new-zealand/>).

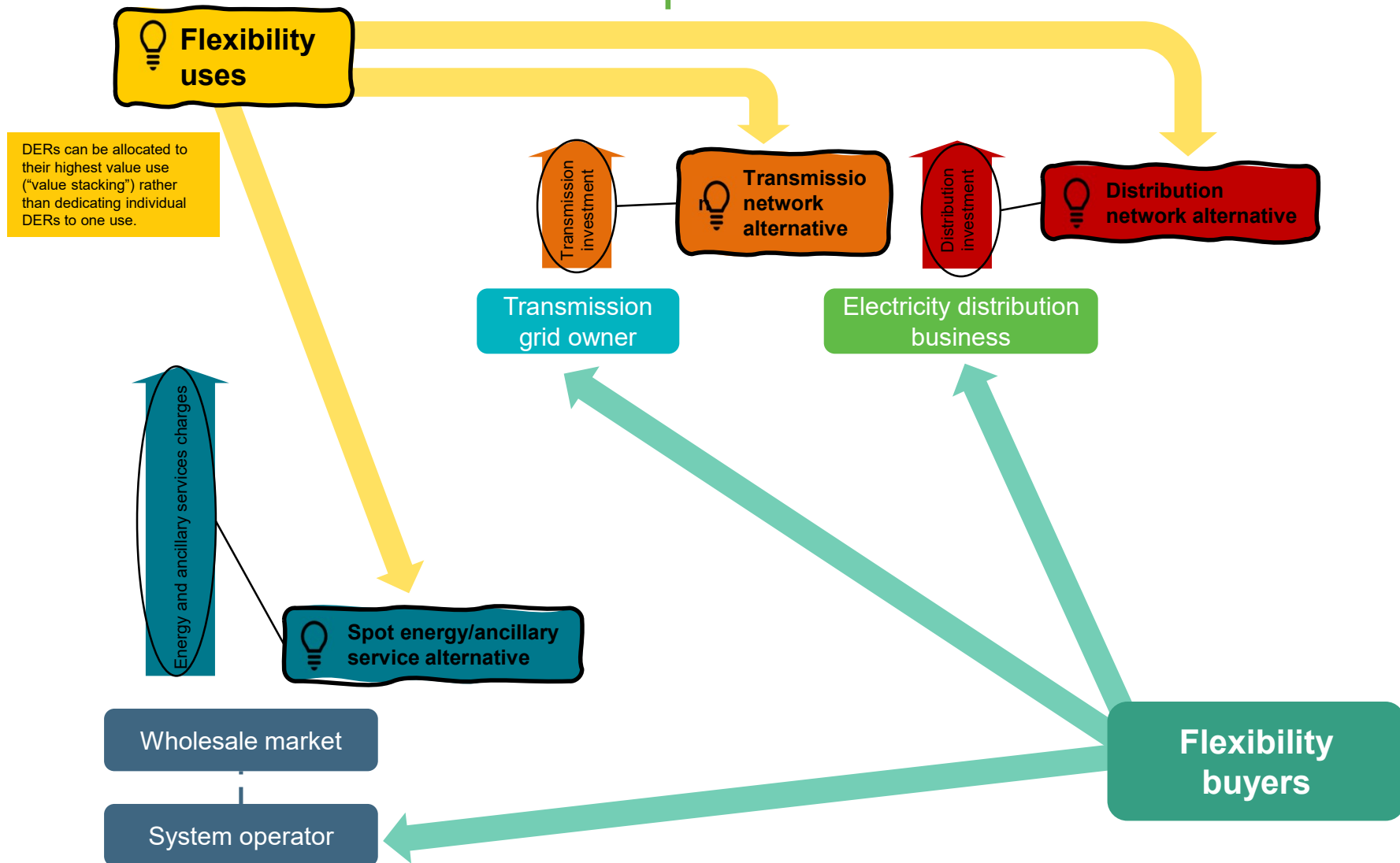
Financial flows in the electricity industry are traditionally linked to physical flows



DER provide an alternative to some existing financial flows



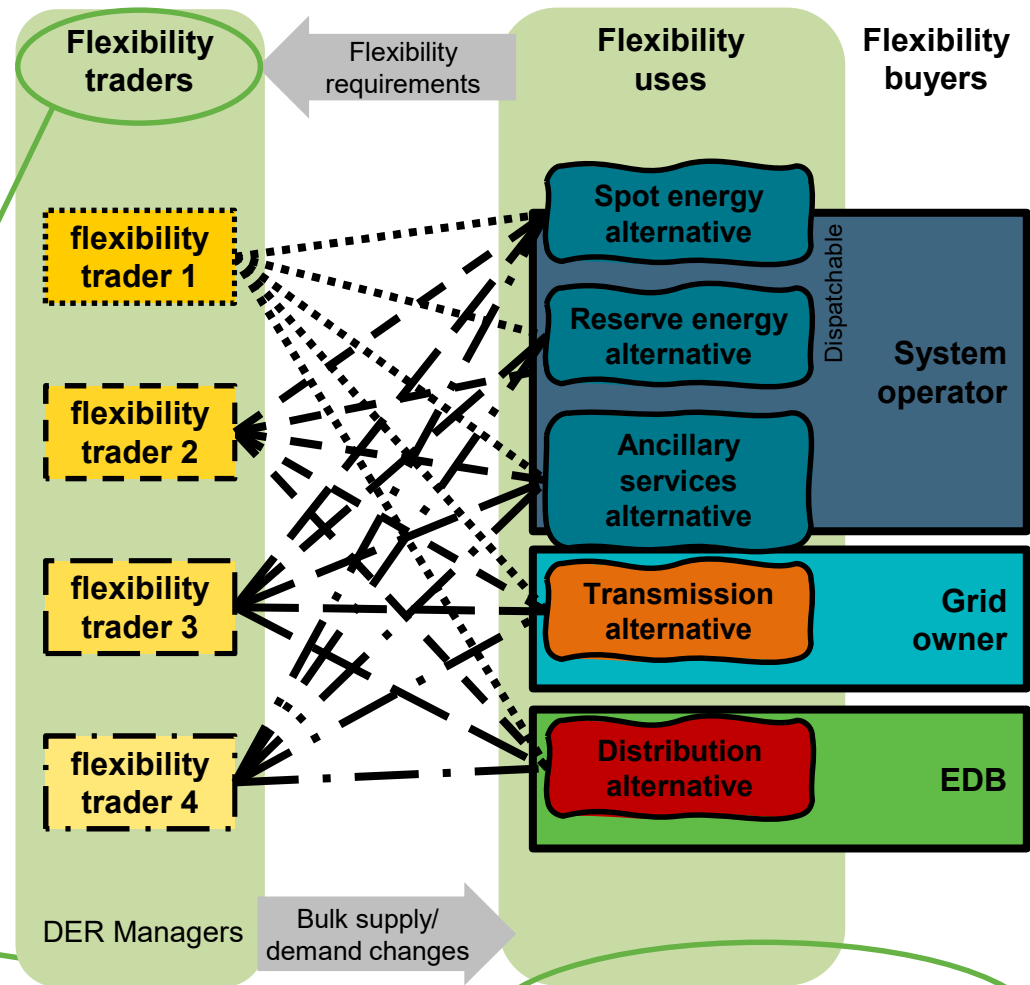
We have focused on the three monopoly buyers of flexibility – the grid owner, EDBs, and the system operator



These flexibility buyers interact with flexibility traders to obtain the flexibility they need

- A flexibility trader is an owner of a DER portfolios who manages their DER portfolio to allocate it to its highest value uses.
- Flexibility traders include commercial aggregators (aggregators who build flexibility portfolios of existing or new DER that it and third parties own (e.g., Enel X)), parties that offer flexibility services using DER they own (e.g., solarZero, EDBs), and parties who are flexibility traders “by accident” (e.g., Contact purchased DER to manage NI reserves but is also using the DER in Transpower’s DR programme).

- Flexibility buyers use a flexibility management system (FMS) to manage their flexibility needs.
- Flexibility management is the business process of identifying the need for, procuring, issuing operating instructions for, and paying for flexibility services.
- FMS is the technology needed for flexibility management.

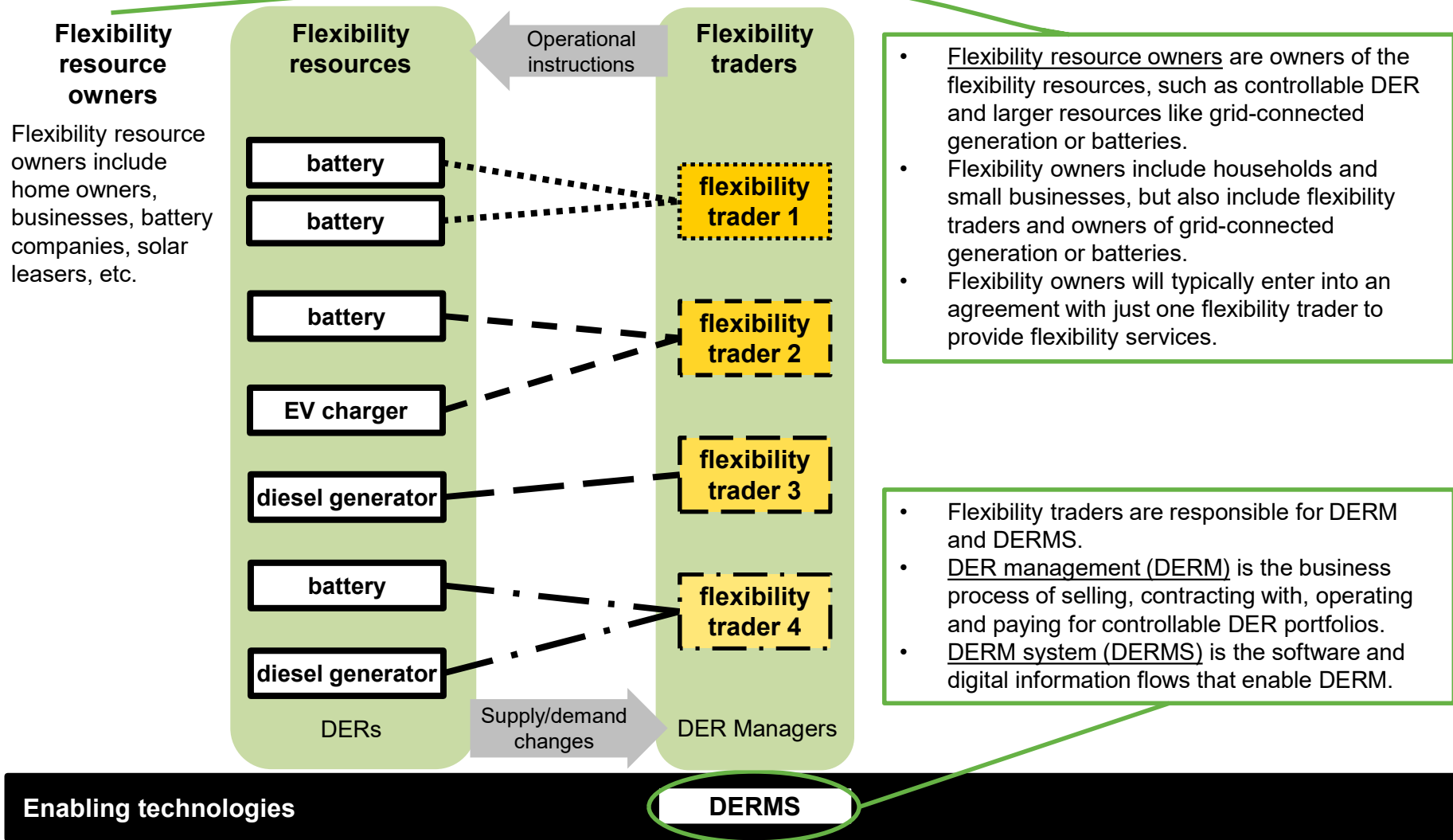


Flexibility Management Systems

We have avoided using the term “aggregator”

- We have avoided using the term “aggregator” here to emphasise that flexibility traders maximise the value of DER by:
 - Offering flexibility from DER that may be owned by 3rd parties and
 - Allocating that DER to its highest value use across all flexibility buyers.
- We note that through the RCP2 DR trial, Transpower referred to distributors and solarZero as “aggregators” because they offered flexibility services by aggregating the actions of a fleet of distributed resources that they own. While this is true in a narrow sense, neither party meets the Authority’s statutory objective which requires those who offer flexibility services to build a portfolio of resources to compete to meet the needs of flexibility buyers rather than simply offering the DER that they control to limited uses.
- We have used the terms “flexibility trader” and “flexibility resource owner” to make clear the role(s) each party plays.

Flexibility traders have agreements with owners of flexibility resources to use these resources to provide flexibility services



- Flexibility resource owners are owners of the flexibility resources, such as controllable DER and larger resources like grid-connected generation or batteries.
- Flexibility owners include households and small businesses, but also include flexibility traders and owners of grid-connected generation or batteries.
- Flexibility owners will typically enter into an agreement with just one flexibility trader to provide flexibility services.

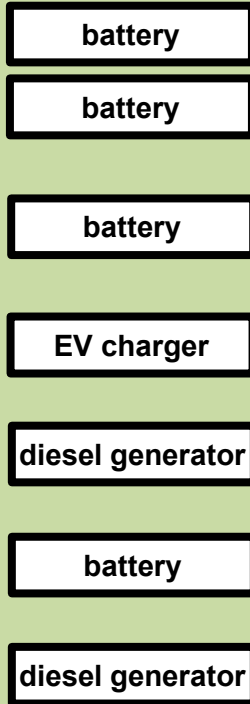
- Flexibility traders are responsible for DERM and DERMS.
- DER management (DERM) is the business process of selling, contracting with, operating and paying for controllable DER portfolios.
- DERM system (DERMS) is the software and digital information flows that enable DERM.

Together these parties make up flexibility markets

Flexibility resource owners

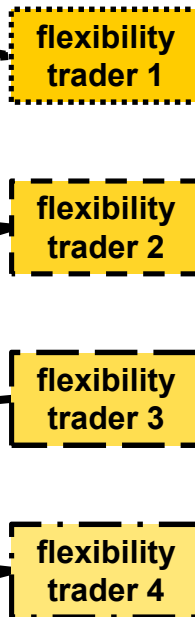
Flexibility resource owners include home owners, businesses, battery companies, solar leasers, etc.

Flexibility resources



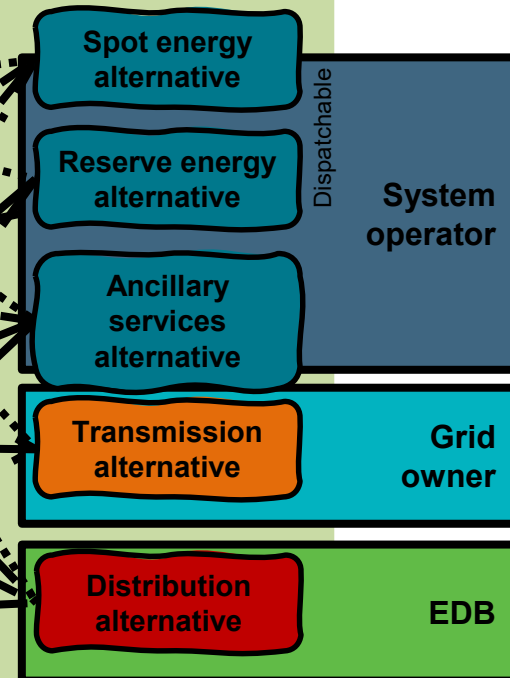
DERs

Flexibility traders

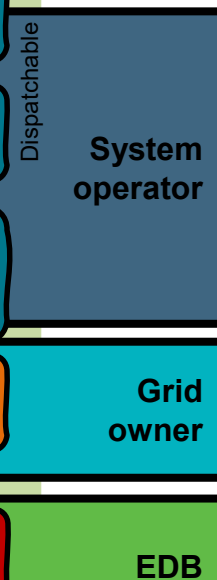


DER Managers

Flexibility uses



Flexibility buyers



Enabling technologies

DERMS

Flexibility management Systems

More detail on the framework is set out elsewhere

- The IPAG's rationale for using this framework is set out in:
 - the IPAG's response to the Authority's questions in Part D of this slide pack
 - in the covering memo.
- Part F of this slide pack is a glossary of terms and abbreviations, and includes definitions of terms used in the framework.

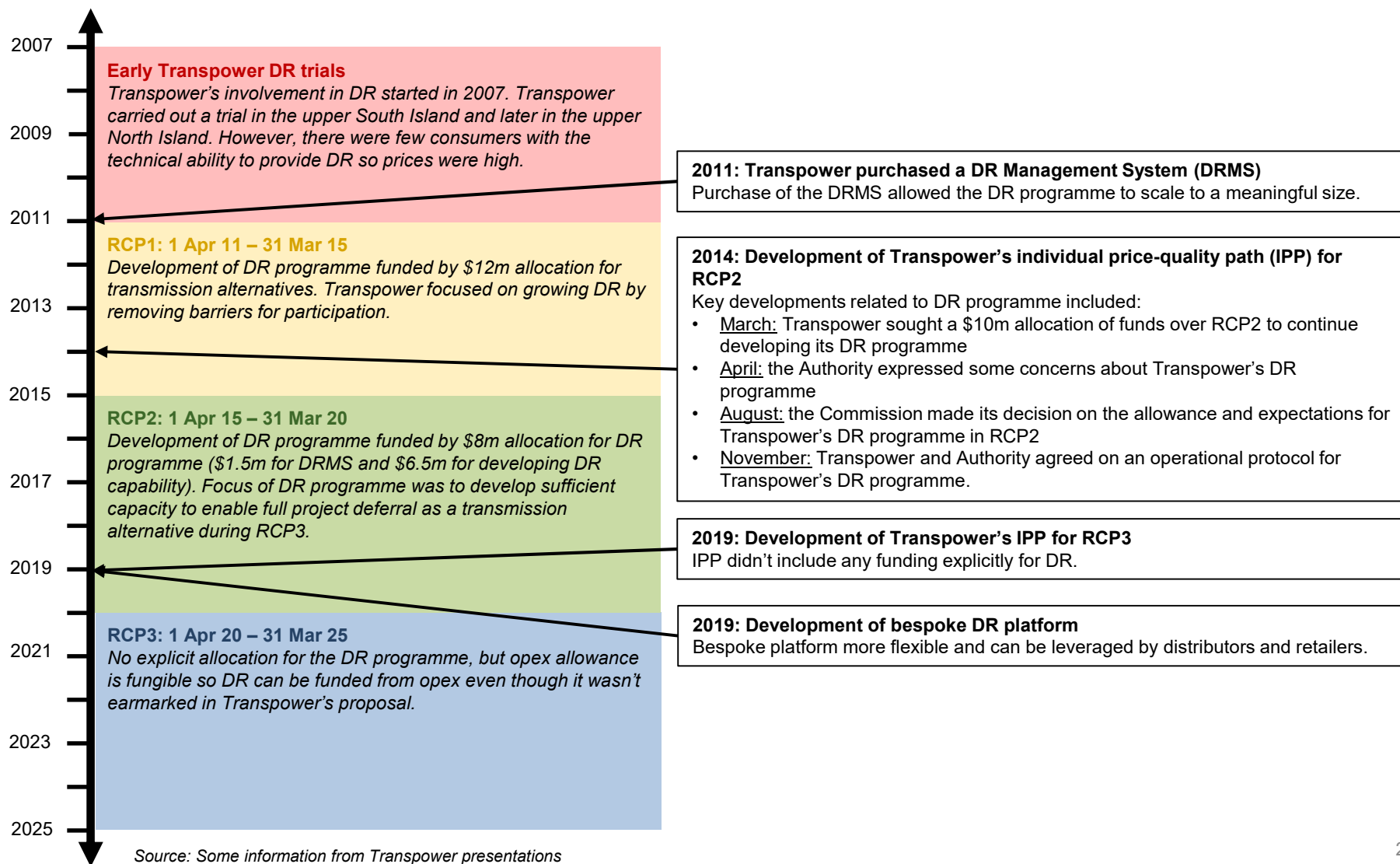
Part C: Introduction to Transpower's DR programme

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Introduction to Transpower's DR programme

1. Brief history of Transpower's DR programme
2. The development of Transpower's DR allowance for RCP2
3. Design of Transpower's DR programme in RCP2

1. Brief history of Transpower's DR programme



2. Transpower's DR programme in RCP2—what Transpower proposed

- In March 2014 Transpower requested that the Commission increase its base capex allowance by \$10 million over RCP2 to develop its DR capability for use as a future transmission alternative.¹
- The \$10 million was made up of:
 - internal staff costs
 - DR programme costs
 - costs of operating and developing its Demand Response Management System (DRMS).
- Transpower hoped to continue work they started in RCP1 in RCP2, which included developing DR capability in regions outside of the upper North Island and to investigate the cost of DR of smaller loads than they had currently worked with.²

¹ Transpower's 4 March 2014 submission on the Commission's RCP2 Issues Paper : https://comcom.govt.nz/_data/assets/pdf_file/0030/78483/Transpower-submission-on-Transpower-RCP2-process-and-issues-paper-3-March-2014.PDF

² p18, *ibid.*

2. Transpower's DR programme in RCP2—Authority concerns

- In April 2014, the Authority wrote to the Commission about concerns it had that Transpower's DR programme may adversely affect the wholesale electricity market.
- These concerns included that Transpower's DR programme:
 - might inefficiently 'crowd out' other uses for DR, and in the longer term, could *'lead competing, commercially funded DR providers to scale back or withdraw from the NZ market'*
 - might lead to inefficient spot market prices
 - could reduce market efficiency by providing side payments
 - could create perceptions of non-impartiality because the system operator was not separated from the transmission asset owner.
- The Authority proposed a series of mitigations for Transpower, should DR funding be granted by the Commission.

2. Transpower's DR programme in RCP2—Authority concerns addressed

- Transpower submitted further developed intentions for the DR programme as part of its submission on the Commission's draft decision on Transpower's individual price-quality path (IPP) for RCP2. These intentions included actions to address the Authority's concerns.
- The Authority subsequently expressed support for the DR programme as a means of deferring transmission investment. However, this support was conditional on the implementation of a DR protocol and integration planning at the start of RCP2.

2. Transpower's DR programme in RCP2—DR operational protocol

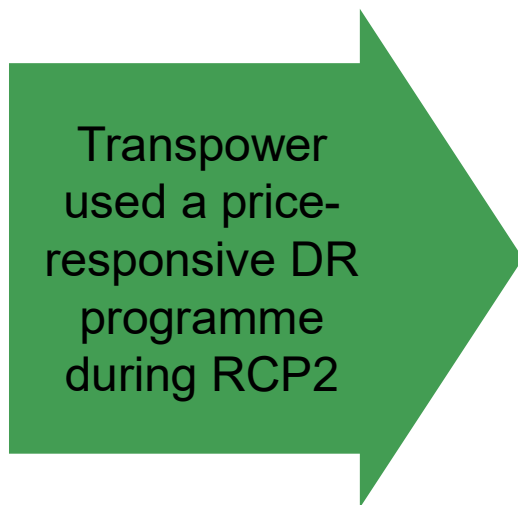
- Transpower and the Authority developed an operational protocol to address Authority concerns about the potential for Transpower's DR programme to adversely affect the wholesale electricity market.
- The purpose of the DR operational protocol was to describe how:
 - Transpower would operate the DR programme
 - Transpower and the Authority would ensure Transpower's development of DR would not adversely affect the wholesale electricity market.
- We discuss the DR operational protocol in more detail in IPAG's response to question 3 where we recommend how the DR operational protocol could be updated.

2. Transpower's DR programme in RCP2—Commission decision

- The Commission's decision allowed \$8m of opex for DR over RCP2—\$1.5m for the demand response management system (DRMS) operating and development costs and \$6.5m for DR programme costs.
- The DR programme costs were not direct funding to defer to any transmission investment, but for developing and growing DR capability.
- The Commission expected “*Transpower to propose business improvements initiatives that will monitor and report to stakeholders on Transpower's progress and compliance with the DR protocol (including commitments Transpower has made), DR activities and demonstration that consumers are obtaining benefits from the investment in DR.*”

3. Design of Transpower's DR programme in RCP2—an overview

- The design of Transpower's DR programme in RCP2 reflected that the programme was in a development phase. Transpower's core focus was developing "sufficient capacity to enable full project deferral as a transmission alternative during RCP3"¹.



Price responsive = low obligation:

- **Pre-contingent** – DR procured in advance (confirmed 2 hours before event)
- **Voluntary** – each DR provider could choose whether to participate in an event
- **Reverse auction** – for each event DR providers bid in a price point
- **Paid-as-bid** – not marginal price.

- Transpower had **previously** used a **non-price responsive programme** – this was **higher obligation** than the price-responsive programme. The non-price responsive programme relied on RFPs with DR providers paid based on availability and other factors.

¹ Transpower, *Demand Response 2020 update*, June 2020, p2.

Part D: IPAG's response to the Authority's questions

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Question 1: A summary of the current state of demand response and wider flexibility mechanisms in New Zealand

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Current state of DER markets considered in five areas

- IPAG used the framework developed in Part B to assess the current state of markets for DER, including controllable DER (flexibility services) as:
 - spot energy/ancillary service alternatives
 - DER-based hedges
 - transmission network alternatives
 - distribution network alternatives
 - delivered energy alternatives.
- To assist in assessing the current state of flexibility services as a distribution network alternative, the Authority wrote to EDBs requesting information on their use of flexibility services.

Current state of markets for DER considered in five areas






- In each area we considered:

<p>Current state</p>	<div style="display: flex; justify-content: space-around;"> <div style="background-color: #00b050; color: white; padding: 5px; text-align: center;">Traders offer DER to provide the service</div> <div style="background-color: #ffcc00; color: black; padding: 5px; text-align: center;">Buyers exist for the service, but no traders currently offer the service</div> <div style="background-color: #ff0000; color: white; padding: 5px; text-align: center;">There is no buyer for this service</div> </div> <ul style="list-style-type: none"> Note that in some cases it may be optimal for the state to be yellow or red. Where the buyer requires <u>controllable</u> DER, the IPAG's preference is for these flexibility services to be provided through a flexibility trader to ensure flexibility resources are allocated to its highest value use(s) across all flexibility markets. This is discussed further on slides [46-48].
<p>Barriers</p>	<ul style="list-style-type: none"> Some barriers (e.g., being a participant) may be necessary in some cases.
<p>Location</p>	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  - on transmission network </div> <div style="text-align: center;">  - on distribution network </div> <div style="text-align: center;">  - behind-the-meter </div> </div> <ul style="list-style-type: none"> Typically behind-the-meter flexibility resources can provide services across the electricity system, while the flexibility resources on the transmission or distribution networks are more limited in the services they can provide.
<p>Stacking potential</p>	<ul style="list-style-type: none"> Potential for DER to be used to provide services to multiple buyers.
<p>Incentives</p>	<ul style="list-style-type: none"> Buyer's incentives to procure DER services vary – incentives include requirements in the Code, Part 4 regulation, freedom, and financial savings.

Spot energy/ancillary service alternatives

The barriers to using flexibility resources to provide spot energy and ancillary services largely relate to the Code and market systems not being set up to enable the use of DER. Some of these barriers may be necessary, but others won't be.

Spot energy/ancillary service alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Spot dispatch	Yellow	Biggest barrier: Need to be a participant. <ul style="list-style-type: none"> Inability to aggregate across retailers and multiple GXPs. Code is technology specific. Minimum offer size. Code is technology specific. Need to be large, centralised and grid connected. 		There are some restrictions on stacking – e.g., if dispatched as IR or FK can't use the same MW for other services. However, generally able to stack with minimal issues.
2. Instantaneous reserve (IR)	Yellow			
3. Extended reserves ¹	Red			
4. Frequency keeping (FK)	Yellow			
5. Voltage support ²	Yellow			
6. Black start ³	Red			

Generator

Energy and ancillary services charges

Wholesale market

System operator







¹ Extended reserves is not an active market at the DER level.
² Currently the SO isn't procuring any voltage support because the reactive equipment available is sufficient for it to meet its PPOs.
³ There is potential to use DER connected at grid level to provide black start, but it will still need to be large and centralised.

Retailer

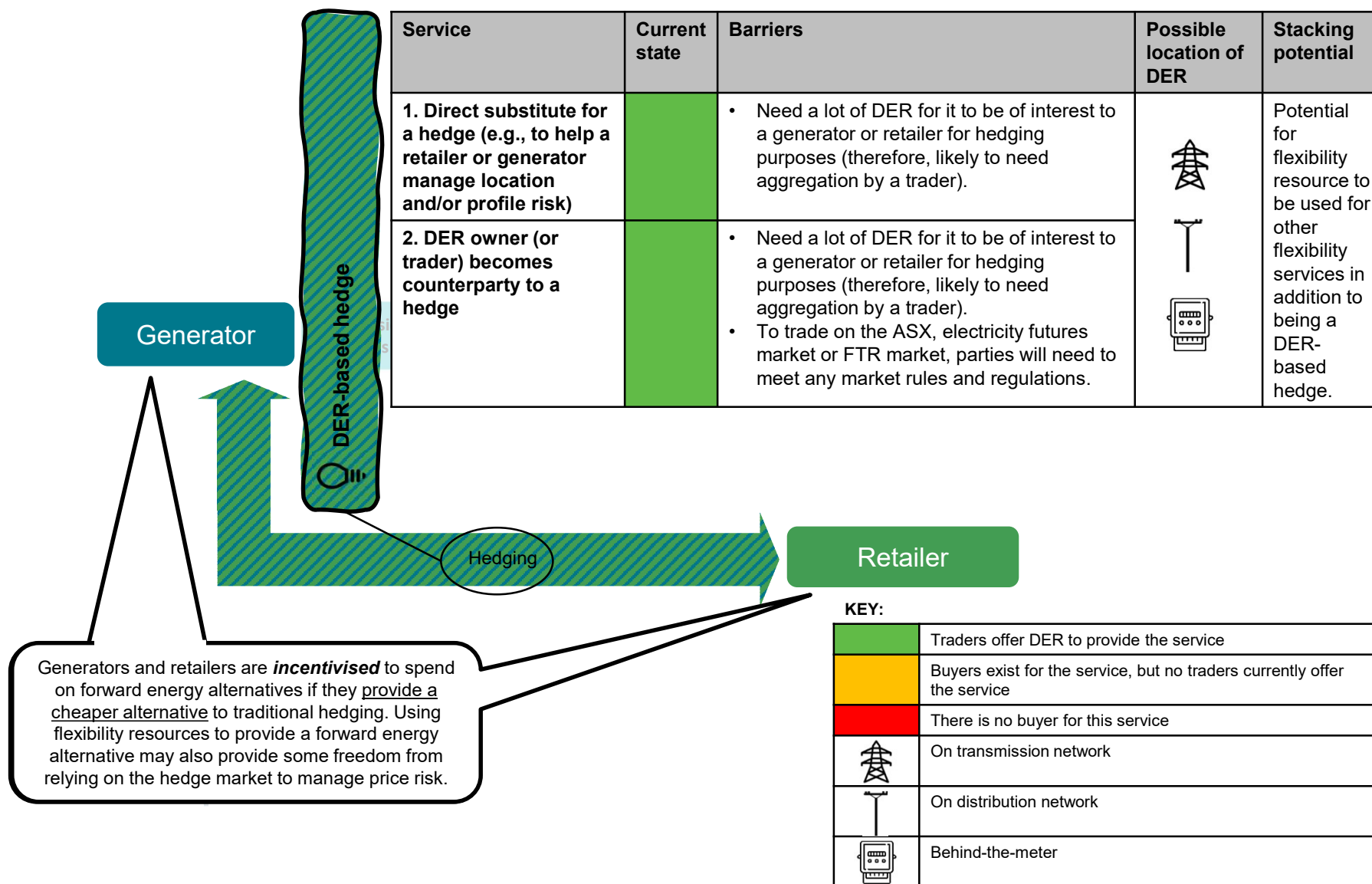
The system operator is **incentivised** to spend on energy and ancillary service alternatives because of the requirements set out in Part 7 of the Code including common quality and dispatch principal performance obligations (PPOs).

Energy and ancillary service charges

KEY:

	Flexibility traders offer DER to provide the service
	Flexibility buyers exist for the service, but no flexibility traders currently offer the service
	There is no flexibility buyer for this service
	On transmission network
	On distribution network
	Behind-the-meter

Alternative forms of hedges



Transmission network alternatives




Transmission equipment providers






Transmission grid owner

Transpower is **incentivised** to spend on transmission network alternatives by the Part 4 regulatory regime. The regulatory regime should incentivise Transpower to spend on transmission network alternatives when this is the optimal choice (i.e., lowest expected lifetime cost) because it aims to align the interests of Transpower with consumers. Incentives are greater for large investments (for which Transpower needs ex-ante approval from the Commerce Commission). How well the Part 4 regulatory regime incentivises Transpower (and EDBs) is considered in response to question 6.

Transmission network alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Transmission investment deferral ¹		<ul style="list-style-type: none"> Economic cost of DER usually higher than Special Protection Schemes (SPS).² 		Potential to be stacked with other flexibility uses (particularly distribution network alternatives).
2. Planned outage backup power				
3. Unplanned outage restoration		<ul style="list-style-type: none"> Needs to be called on quickly.³ 		

KEY:

	Flexibility traders offer DER to provide the service
	Flexibility buyers exist for the service, but no flexibility traders currently offer the service
	There is no flexibility buyer for this service
	On transmission network
	On distribution network
	Behind-the-meter

¹ This service could be provided by any party signed up to Transpower’s DR programme. However, so far it has not been cost-effective to use the Transpower’s DR programme to defer transmission investment.

² In the future SPSs could be designed to call on ‘post-contingent’ DR (DR that can respond quickly (within 1-5 mins)) before the SPS is activated as a last resort.

³ This service could be provided by post-contingent DR but is not possible using ‘pre-contingent’ DR (DR that is called on ahead of time).

Distribution network alternatives

EDBs are *incentivised* to spend on distribution network alternatives by the Part 4 regulatory regime:

- all EDBs face information disclosure requirements, while EDBs that aren't consumer owned also face price-quality control
- EDBs that face price-quality control are likely to face stronger incentives to spend on distribution network alternatives than EDBs that only face information disclosure requirements
- EDBs on a CPP¹ will face more scrutiny than EDBs on a DPP², which may further increase incentives to spend on distribution network alternatives
- EDBs generally have more latitude than Transpower on what they can invest in. How well the Part 4 regulatory regime incentivises EDBs is considered in response to question 6.

¹ CPP – customised price path.

² DPP – default price path.

Distribution equipment providers



Electricity distribution business

Distribution network alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Distribution investment deferral		<ul style="list-style-type: none"> • Regulatory approach has not driven the widespread development of flexibility services • Restricted access to metering data is a barrier to helping identify and manage peaks/voltage • EDBs cannot see what resources are available because the market has not been developed yet. 		Potential to be stacked with other flexibility uses (particularly transmission network alternatives).
2. Planned outage backup power				
3. Unplanned outage restoration				

Current state varies by EDB. Many EDBs are just using legacy ripple control. Some EDBs are trialing flexibility services, mostly at a pre-commercial stage of development and involving resources owned by the EDB. Aurora put out an RFP for the provision of flexibility services for distribution investment deferral. **More information on the current state (with a focus on what some of the flexibility market EDB leaders are doing) is on the next two slides.**

KEY:

	Flexibility traders offer DER to provide the service
	Flexibility buyers exist for the service, but no flexibility traders currently offer the service
	There is no flexibility buyer for this service
	On transmission network
	On distribution network
	Behind-the-meter

Distribution network alternatives—what are EDBs doing? (1 of 2)

- In early 2020 the IPAG asked the Authority to contact all EDBs to ask for information on their current state of flexibility services. All 29 EDBs replied to the information request. There was a wide range of responses indicating that:
 - most EDBs use hot water ripple control for managing peaks in their own networks (as opposed to selling it as a service to other flexibility buyers). Ripple control does not fit within the framework we have developed (see framework diagram on slide 16)
 - a few EDBs offer their hot water ripple control into Transpower’s DR programme and ancillary services market
 - flexibility resources other than ripple control are used but commercial arrangements are still in infancy and most flexibility resources are EDB owned
 - some larger EDBs are trialling flexibility services (mainly to investigate technical feasibility)
 - Many EDBs consider there are several barriers to the adoption of flexibility services
 - EDBs are concerned about grid constraints but aim to manage these with existing technology (such as hot water ripple control).


Distribution network alternatives—what are EDBs doing? (2 of 2)

- Aurora recently concluded an RFP for non-network support in the Upper Clutha where a time and location-specific call for flexibility has resulted in a contract with solarZero as a flexibility trader to build a portfolio over which Aurora has priority call at network peak .
- Vector has engaged directly with DER owners through its mPrest platform which is described as a DERMS but appears also to be a FMS
- Wellington Electricity has been establishing and developing processes and policies to support the development of dynamic connection agreements (DCA) for EV charging. DCA change the style of traditionally passive connection to the distribution network to allow variability required for DER.

Delivered energy alternatives

May include increased PV self consumption and/or time-of-use bill management.

Delivered energy alternative

Service	Current state	Barriers	Possible location of flexibility mechanism	Stacking potential
1. Avoiding or reducing payment to retailer		<ul style="list-style-type: none"> Lack of competition in innovative retail pricing limits the range of pricing options available to consumers. Little incentive to go off the grid because fixed costs are lower than they should be. Consumers lack information and education or don't think it's worth the effort. 		Consumer can use DER to provide other services at the same time.
2. Reliability /resilience		<ul style="list-style-type: none"> Consumers lack information and education or don't think it's worth the effort. 		May not be able to be stacked (e.g., if a consumer uses a battery to provide backup power then it can't be used to provide other services).

Consumers are **incentivised** to spend on delivered energy alternatives to get freedom from the national grid and obtain potential financial savings.




Consumer

Retailer




Delivered energy charges

e.g., backup power.

KEY:

	Traders offer DR to provide the service
	Buyers exist for the service, but no traders currently offer the service
	There is no buyer for this service
	On transmission network
	On distribution network
	Behind-the-meter

Current state of flexibility services in New Zealand—a summary (1 of 2)

	Current state	Observations	Recommendations
 Spot energy/ancillary service alternative		<ul style="list-style-type: none"> - Code changes may be needed in this area to allow more parties to participate. May be a case for introducing different levels of participant. 	<ul style="list-style-type: none"> - Authority to look at introducing new types of participants (e.g., flexibility trader), which may have less strenuous requirements to meet. - Authority to look at Code changes to allow aggregation across retailers and multiple GXP.
 DER-based hedge		<ul style="list-style-type: none"> - Need a lot of DER to be of interest – this is the biggest barrier. - Not clear any change is needed. 	
 Delivered energy alternative		<ul style="list-style-type: none"> - Need innovative retail pricing offers to encourage more use of flexibility services in this area. 	

Note: Transmission and distribution network alternatives are covered on the next slide.



Key:

Flexibility traders offer DR to provide the service

Flexibility buyers exist for the service, but no flexibility traders currently offer the service.

There is no flexibility buyer for this service

Current state of flexibility services in New Zealand—a summary (2 of 2)

	Current state	Observations	Recommendations
 Transmission network alternative		<ul style="list-style-type: none"> - Transpower has developed its DR programme for use as a transmission network alternative. - Transpower's DR programme hasn't been used to defer transmission investment yet as there have been cheaper alternatives available (e.g., special protection schemes (SPS)). - Observations on the design of Transpower's DR programme are considered later in these slides. 	
 Distribution network alternative		<ul style="list-style-type: none"> - Most EDBs using legacy ripple control to manage constraints and investment pressures. - There are several trials into new technologies. - EDBs note that key barriers to investing in flexibility services relate to economic viability, cost of trials, information availability, technology, and regulation. - Overall, not much has happened in this space. 	<ul style="list-style-type: none"> - The Authority needs to develop initiatives to incentivise EDBs to buy flexibility services. This is discussed further in response to question 6.

Key:

Flexibility traders offer DR to provide the service.

Flexibility buyers exist for the service, but no flexibility traders currently offer the service.

There is no flexibility buyer for this service.

Question 2: An assessment of the performance of the Transpower DR programme to date with respect to the Authority's statutory objective

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The Authority's statutory objective and DR principles

- The Authority's statutory objective:
To promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.
- The Authority has asked IPAG to include consideration of the promotion of innovation (which links to both the competition and efficiency objectives).
- The Authority has *Guiding regulatory principles for demand response* (DR principles), which were last updated in 2018. The DR principles are “intended to be a useful and pragmatic guide to encourage and promote the best use of demand response for the long-term benefit of consumers”.
- The four DR principles (best-possible incentives, openness, choice, and transparency) may provide some guidance on the performance of the Transpower DR programme with respect to the Authority's statutory objective.

What does this all mean for the performance of Transpower's DR programme with respect to the Authority's statutory objective?

Statutory objective	IPAG observations on Transpower's DR programme
Competition	<ul style="list-style-type: none"> • Concerned that the use of regulatory funding to develop Transpower's DRMS provides Transpower with an advantage over other flexibility traders because the incremental cost of supporting other users is very low and therefore, all else equal, it can provide competitive aggregation and DERMS at short-run marginal cost, while other flexibility traders need to earn long-run marginal price.
Reliability	<ul style="list-style-type: none"> • Promotes reliability when used for managing outages. • Development of post-contingent¹ DR has potential to improve reliability by providing an alternative when reliability issues arise.
Efficiency	<ul style="list-style-type: none"> • Concerned that Transpower's position in the DERM part of the flexibility market may lead to flexibility resources (e.g., DER) not being allocated to their highest value use. • Provides a transmission alternative, which has potential to be economically efficient, but due to n-1 security on transmission network it's usually cheaper to use a special protection scheme (SPS). • Transpower has been innovative, which may increase efficiency, but Transpower's use of regulated funds may have dissuaded other parties from entering flexibility markets. The diagram on slide 46 shows the benefits of DER deployment in a competitive market.

¹ 'Post-contingent' DR is DR that can respond quickly (within 1-5 mins) .

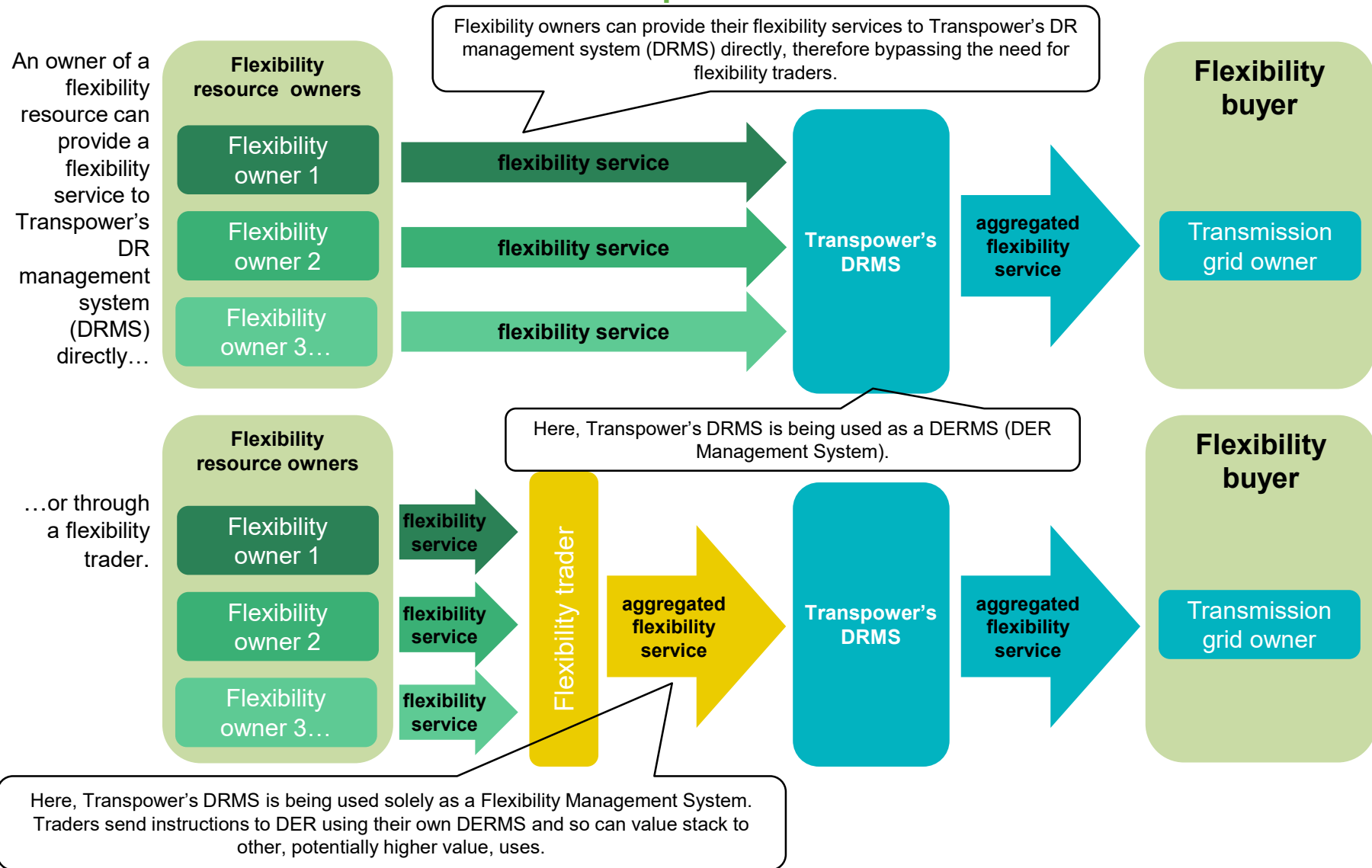
The DR principles need to be updated

- IPAG considers that the Authority's DR principles need to be updated to reflect the terminology in IPAG's flexibility framework (introduced in part B of this slide pack).

Recommendation:

The IPAG recommends that the Authority update its "Demand Response Guiding Principles" to reflect the terminology in IPAG's flexibility framework. IPAG suggest that the principles be renamed "Guiding Principles for Flexibility Markets".

The design of Transpower's DR programme can lock DER up for a single use, restricting value stacking and competition



Transpower should not carry out DERM as Grid Owner

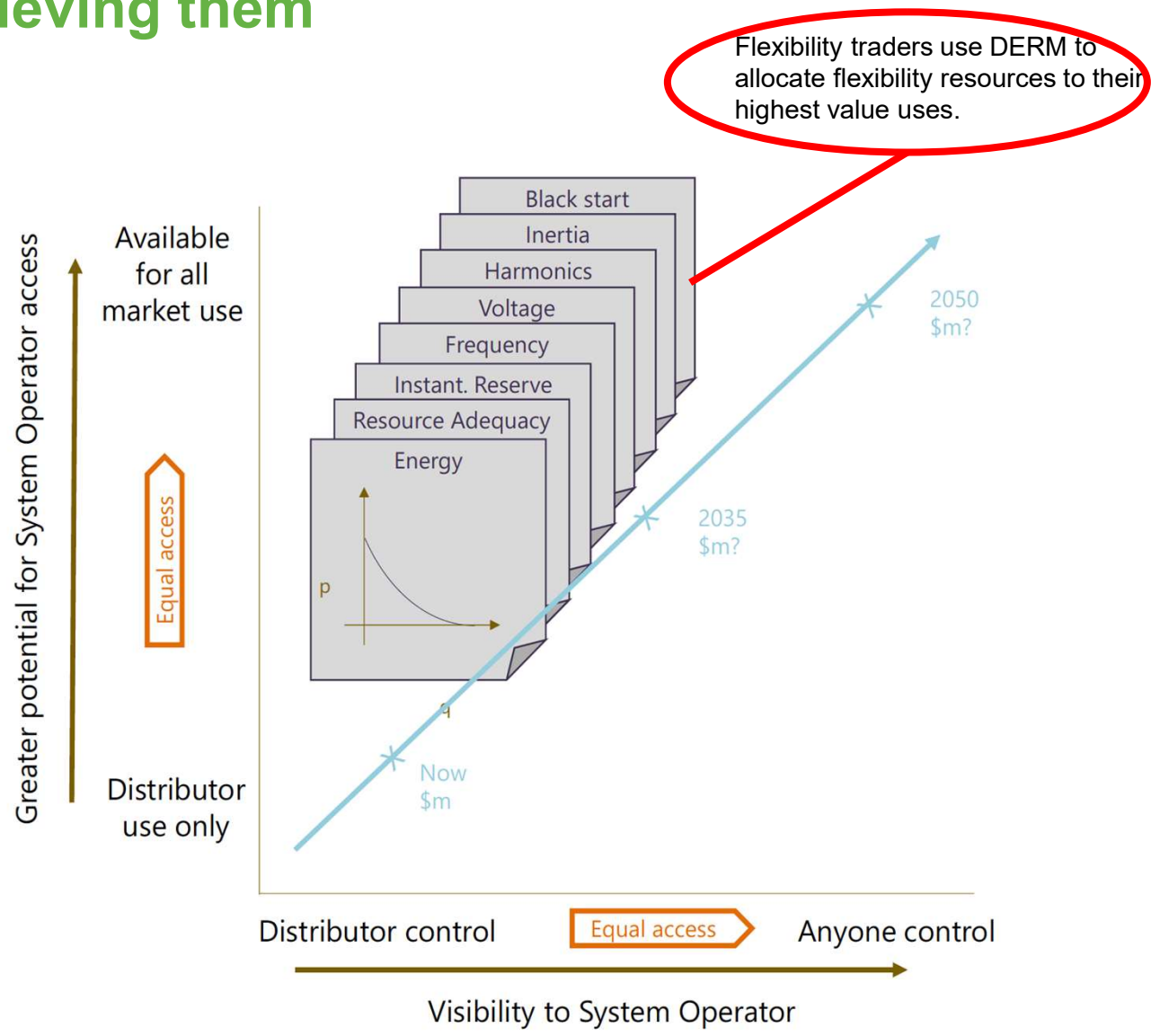
- The IPAG has concerns about Transpower positioning itself in the DERM part of flexibility markets. We consider that the grid owner (and EDBs and the system operator) should not carry out DERM because it may mean that flexibility resources (e.g., DER) are not allocated to their highest value use (or uses).
- The IPAG raised this point in its April 2019 *Equal Access* advice—the IPAG noted that if individual flexibility owners are required to deal directly with Transpower then they would have to develop an understanding of, and enter into, commercial arrangements with all other flexibility buyers to maximise the value of their DER. The transaction costs would be too high for most flexibility owners to do this, so they would effectively limit the use of their flexibility to deferring and de-risking investment by the grid owner.
- The economic value of DER is substantially higher if it can be allocated to its highest value use (or uses when value stacking is possible) across all flexibility markets. This is shown in the diagram on the next slide (sourced from Sapere’s 2020 report to the System Operator *Distributed Energy Resources – Understanding the potential*)

DER have Jekyll and Hyde characteristics – both creating problems and relieving them

Embedded DER supply (particularly solar) provides energy but potentially congests distribution and transmission and exacerbates need for market peaking and firming

Resource adequacy is the use of DER (particularly dispatchable demand and embedded battery storage) to defer or avoid investment in distribution, transmission and peaking generation

Some ancillary services can also be provided by DER



Removing barriers to the efficient deployment of DER is worth \$1 billion annually to NZ by 2050

Value stream (million)	2020	2035	2050	Additive
Energy Arbitrage (small-scale DER)	\$3	\$21	\$70	Yes
Resource Adequacy	\$24	\$588	\$861	Yes
Instantaneous Reserve	\$0	\$20	\$20	Yes
Frequency Keeping	\$0	\$1	\$0	Yes
Voltage	\$0	\$10	\$14	No
Harmonics	\$0	-\$1	-\$7	Yes
Simulated Inertia	\$0	\$21	\$85	Yes
Black Start	\$0	\$0	\$0	Yes
Total	\$27	\$650	\$1,029	

We find that the greatest potential contribution of DER is to resource adequacy. This is mainly due to avoiding investments in gas-fired generation, transmission and distribution infrastructure that would otherwise be required to support the increase in peak demand resulting from greater electrification of the New Zealand economy over the next decades

Sapere's calculations for "resource adequacy" benefits include separate value streams for avoided investment in distribution, transmission and peaking generation

Source: *Distributed Energy Resources – Understanding the potential*, Sapere for the System Operator, July 2020

Most DER projects do not make economic sense if dedicated to a single use – investors need to “value stack”

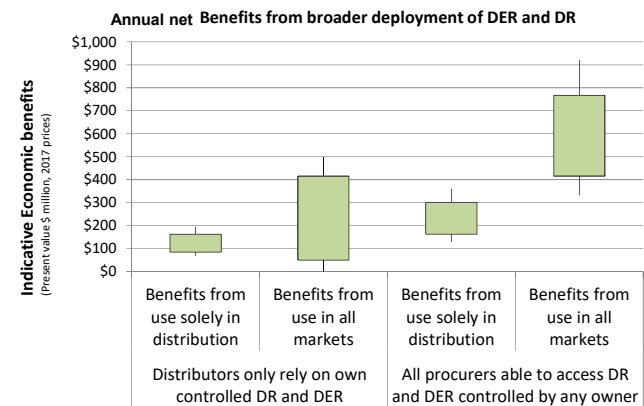
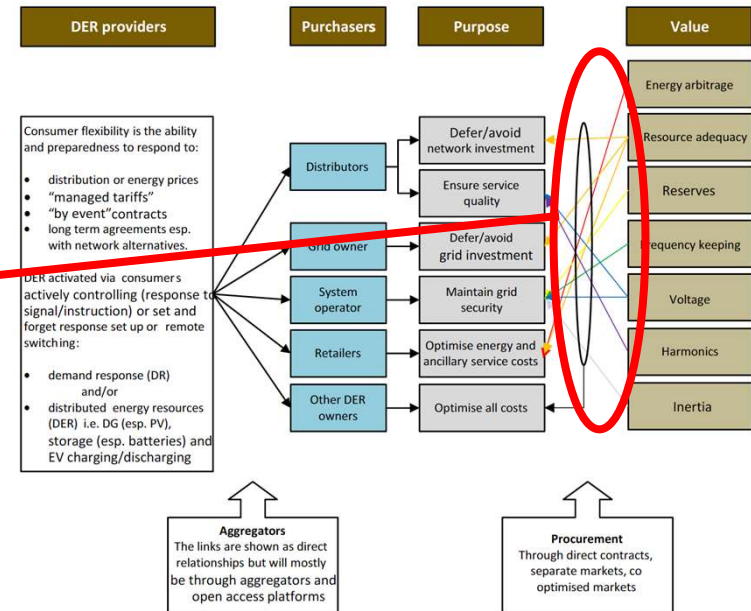
Most DER investments are not economic if they are only used for one purpose – energy arbitrage, distribution investment deferral etc

Most DER can be used for different purposes at different times

If the value of each potential use of DER was monetised then many projects would be economic today

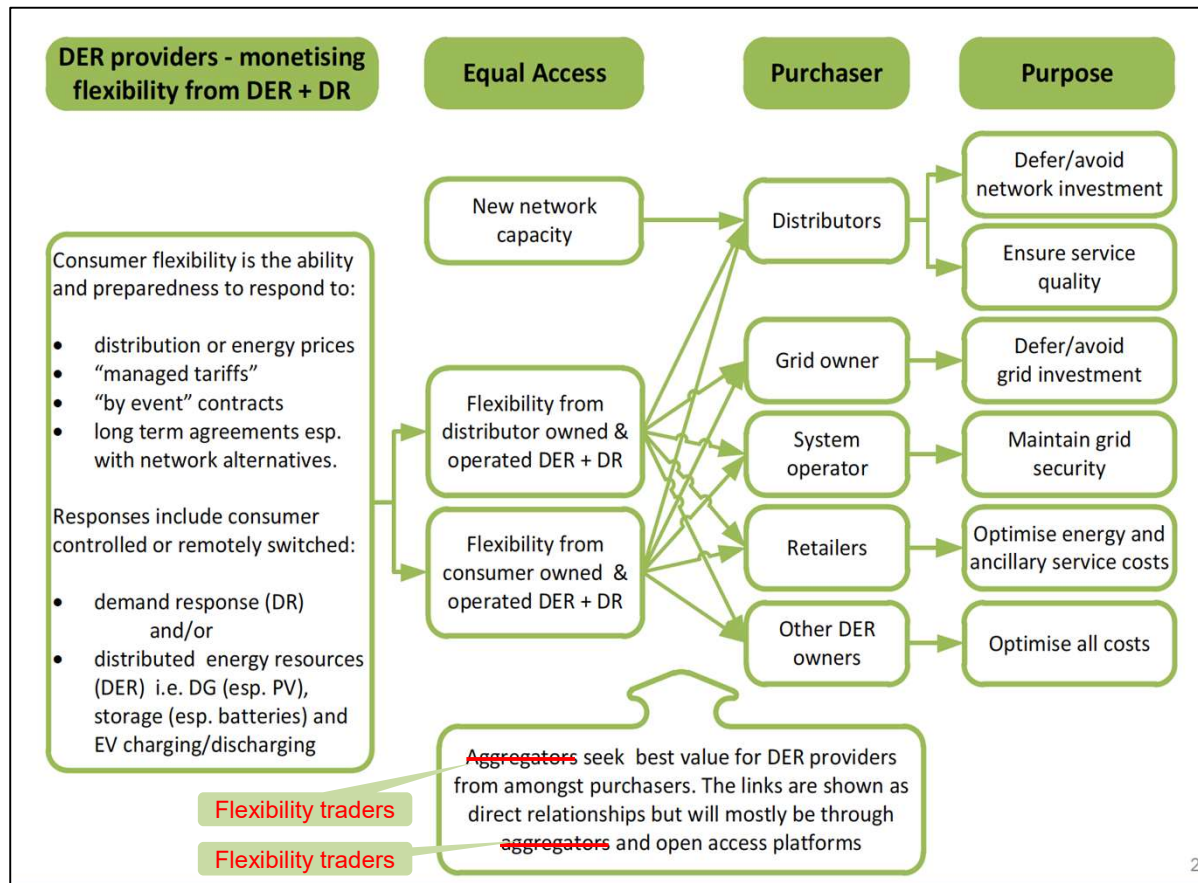
Shortcomings in the Transpower DR programme and the lack of markets for non-network alternatives for distributors means that consumers are already paying more for reliable electricity supply than they could be

This inefficiency will cost in the 10s of billions of dollars over the next 30 years if not remedied



IPAG's Equal Access report highlighted the role of flexibility traders for maximising the value of DER

- The chart below is also from the IPAG's Equal Access report. It highlights the role that “aggregators” have for maximising the value of DER. We have changed the terminology in this report (we think *flexibility traders* is now a more appropriate term), but the reasoning still stands.



Related party transaction rules may be required to ensure Transpower's DERM is operated independently of its regulated service (1 of 2)

- Transpower could own an unregulated subsidiary who sells flexibility services to flexibility buyers by aggregating DER (i.e., is a flexibility trader). However, this would have to be at arm's length of the regulated network if it is to be consistent with the Authority's Statutory Objective.
- Transpower would only be able to buy flexibility services from the subsidiary if it is selected in a fully competitive process on the same terms as any other potential flexibility trader.
- We consider that Transpower's DERM service should be subject to the same related party transaction rules that the Commerce Commission (Commission) imposes on EDBs to ensure that Transpower's DERM service is operated independently of the regulated network. However, such a rule change may not be necessary if Transpower does this voluntarily.

Related party transaction rules may be required to ensure Transpower's DERM is operated independently of its regulated service (2 of 2)

- Transpower has confirmed that they will not offer services in a way that creates competition issues. Transpower will not price services for FMS and DERMS in a way that impedes competition for these services or inhibits the development of a marketplace for flexibility managers and flexibility traders.
- In the near-term, Transpower have said they would value the opportunity to work with the IPAG and the EA on the development of standard procurement methodologies for procuring flexibility across the industry.

Recommendation:

The IPAG recommends that the Authority monitor what progress Transpower makes on its commitment to not price services for FMS and DERMS in a way that impedes competition for these services or inhibits the development of a marketplace for flexibility managers and flexibility traders.

If the Authority believes that Transpower's "DR" programme is distorting markets for flexibility and flexibility management, then the Authority, with the Commerce Commission, could consider imposing on Transpower the same related party transaction rules that are already imposed on EDBs.

DERMS are not the same as FMS

- Transpower's platform for managing their DR programme is capable of managing individual DER as well as managing offers from flexibility traders. It is both a DERMS (supporting flexibility aggregation) and an FMS (supporting the procurement of flexibility as a non-network solution).
- Conceptually the function of DERMS and FMS are similar as they both issue instructions, validate compliance, and calculate payments for suppliers. However,
 - an FMS does not control devices – it is only a commercial tool to manage the procurement of flexibility for the flexibility buyer and are indifferent to how that outcome is achieved
 - a DERMS is used by flexibility traders to meet the outcomes set by flexibility buyer's FMS.

IPAG is concerned about Transpower offering DERMS in competition with other flexibility traders

- The market for DERMS is not a natural monopoly. The IPAG has concerns about a monopoly network provider (such as Transpower as grid owner) offering DERMS in competition with other flexibility traders.
- The Transpower DR platform has largely been paid for by the regulated grid owner. The incremental cost of using it to support other users would be very low and other, things being equal, would allow Transpower to offer competitive aggregation and DERMS services at short run marginal cost—always undercutting third party service providers who would need to recover the cost of their capital investment and price at long run marginal cost.
- The consequence of this would be crowding out of potential competitors for both aggregation and DERMS services.

IPAG is concerned that Transpower could crowd out third party FMS service providers

- Management of flexibility as a non-network solution is a monopoly function of a network owner. The Commerce Commission has explained how their regime creates incentives on EDBs and Transpower to minimise the cost of carrying out these functions, just as it does all other costs.
- While we accept this, FMS services are a competitive market, procured by network owners to allow them to manage flexibility. If a network owner builds their own solution and allocates the full cost of the solution to its regulated business, then, as with DERMS, it could price at incremental cost and crowd out third party service providers.

Cost allocation rules may be needed for Transpower

- In addition to our recommendation about related party transactions, we note that the Commerce Commission requires EDBs to allocate the costs of assets used for both regulated and unregulated purposes proportionately between those activities. Combined with the incentive to minimise costs for the regulated business, these rules simulate the incentives that a competitive service provider would face if a network self-supplies services that could be procured competitively.
- Transpower have committed to ensuring that their FMS and DERMS business unit is appropriately structured to ensure that costs are allocated in ways that do not create competition concerns.
- Transpower already applies activity-based cost allocation for FMS and DERMS activities. They are currently reviewing this method to ensure it is consistent with cost allocation methods required of other network businesses.

Recommendation:

The IPAG recommends that the Authority monitor what progress Transpower makes on its commitment to ensure that costs are allocated in ways that do not create competition concerns.

If the Authority believes that TP's DR programme is distorting markets for flexibility and flexibility management, then the Authority, with the Commerce Commission, could consider imposing on Transpower the same cost allocation rules that are already imposed on EDBs.



Spotlight: how the Commerce Commission thinks about Transpower's allocation of costs it incurs in delivering unregulated services

DR-related costs: where these costs are incurred in procuring network support services (e.g., deferring capex through DR), it is appropriate that they are allocated to the regulated service.

Costs related to other unregulated activities: where Transpower engages in unregulated activities, then these costs should not be allocated to the regulated service. The Commission are not currently aware that Transpower engages in unregulated activities other than performing the system operator functions, which is not part of the regulated service.

Transpower's regime does not have the same cost allocation rules as those applying to EDBs. Historically, Transpower has not engaged in unregulated activities (except the system operator functions). The Commission continue to monitor this and plan to review the rules in their next Input Methodologies (IM) Review, which will likely start in 2021 and needs to finish by the end of 2022.

Question 3: Insights or recommendations regarding the design and operation of the Transpower DR programme

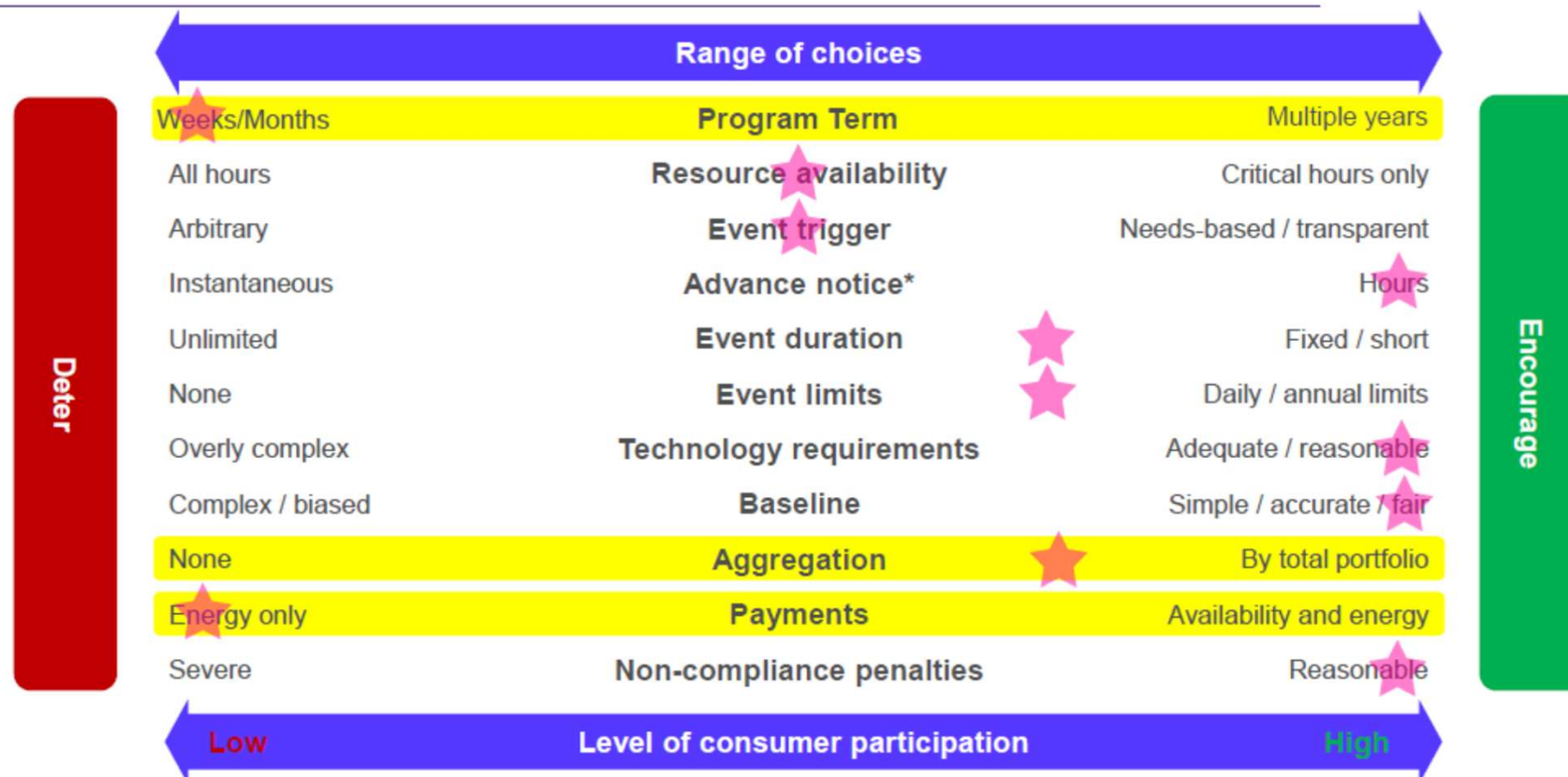
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Observations of Transpower's DR programme

- IPAG's observations and insights of Transpower's DR programme in relation to where it fits in flexibility markets are discussed in response to question 2 above. In this section we focus on other design attributes of Transpower's DR programme.
- Transpower's DR programme has many positive design attributes. For example, the offer/dispatch/verification process is well set out and there is a low cost to participate.
- However, there are some design attributes that IPAG is concerned with. Enel X raised some of these concerns in a presentation to the IPAG. The diagram on the next slide shows Enel X's view of the design attributes of Transpower's DR programme.

Enel X's view of Transpower's DR programme

Transpower Demand Response



*should be the minimum that is needed for the service

The pink stars are Enel X's assessment of whether the current state encourages or deters participation of DER. The following slide explains how the highlighted columns deter DER participation.

IPAG's key concerns are around duration, availability payments, and aggregation

- The key concerns that IPAG has with the design of Transpower's DR programme based on Enel X's assessment are that:
 - the ***duration is too short***, leading to a lack of surety for flexibility traders and flexibility owners. This means that flexibility traders are not encouraged to develop flexibility portfolios and flexibility owners are not encouraged to invest in flexibility resources
 - a ***lack of an availability payment*** which does not encourage flexibility traders to develop flexibility portfolios and flexibility owners to invest in flexibility resources. This means that while Transpower's DR programme does a good job at tapping into existing flexibility resources it does not encourage investment in new flexibility resources.
 - ***Transpower has acquired flexibility services directly off flexibility owners*** rather than through flexibility traders—IPAG's concern with this practice is discussed in IPAG's response to question 2, above.

Transpower's DR programme over RCP2 was only a trial to develop DR capability

- Many stakeholders seem to have strong views about Transpower's DR programme over RCP2, but often are unaware that Transpower's DR programme was in a trial phase over RCP2.
- Because Transpower's DR programme was only a trial over RCP2, Transpower was focussed on attracting participation of existing flexibility resources ("shaking the tree") rather than encouraging the building of portfolios of new flexibility resources.
- IPAG believe the Transpower DR programme in RCP2 has provided a useful confirmation of the opportunity for DER and other flexibility resources for all network owners.
- Transpower has noted in its interactions with the IPAG that what Transpower's DERM and/or flexibility management will look like in the future will not necessarily reflect the structure of the Transpower DR programme in RCP2.

Transpower's plans for grid support contracts

Transmission deferral opportunities identified in the TPR

DR Opportunity	Grid Need	Need Date
Wiri supply supply capacity	Transformer overload	Customer Decision
Tauranga / Mount Maunganui regional supply	Line overload	2023-2025
Rotorua – Tarukenga transmission capacity	Line overload	Inv. Ongoing
Lower Waitaki transmission and supply capacity	Line and Transformer overload	Inv. Ongoing
Studholme supply security	Transformer overload	Customer Decision
Frankton transmission and supply capacity	Line and Transformer overload	Inv. Ongoing
Orari and Rangitata bussing	Voltage stability	2027-2030

Full list: <https://www.transpower.co.nz/keeping-you-connected/industry/transmission-alternatives>

Just as it always has done for Grid Support, Transpower needs to express a need (in outcome terms), tender for it and contract for it – in some cases DER-based solutions will be the most economic – as with Aurora's Upper Clutha tender

The DR Operational Protocol needs to be updated (1 of 2)

- As noted in Part C, the Authority and Transpower signed a DR operational protocol in November 2014 to address Authority concerns about the potential for Transpower's DR programme to adversely affect the wholesale electricity market.
- The purpose of the DR protocol was to describe how:
 - Transpower would develop and operate the DR programme
 - Transpower and the Authority would ensure Transpower's development of DR would not adversely affect the wholesale electricity market.
- The DR protocol is effectively a non-binding memorandum of understanding.
- IPAG consider that it is timely for the Authority and Transpower to amend/update the DR protocol because:
 - the DR protocol is out-of-date—it is focussed on the development of Transpower's DR programme rather than the operation of the programme
 - the concerns that the Authority had with Transpower's DR programme may have changed since the DR protocol was signed.

The DR Operational Protocol needs to be updated (2 of 2)

- IPAG consider the DR protocol could be changed to:
 - reflect the current phase of Transpower’s DR programme for use as a transmission alternative
 - reflect the terminology in the IPAG’s flexibility framework (set out in Part B of this slide pack)
 - reflect the potential use of Transpower’s DERMS by other parties (particularly EDBs)
 - align with the cost allocation and related party rules faced by EDBs
 - be consistent with the Authority’s current DR principles (or updated flexibility principles as recommended in Recommendation 1).

Recommendation:

The IPAG recommends that Transpower updates the “Demand Response Operational Protocol” signed between the Authority and Transpower in 2014 to be a “Flexibility Management Operational Protocol”. The Operational Protocol should be updated to reflect new terminology and to reflect that Transpower is moving out of a development phase for its flexibility management. The IPAG has included some possible changes to the DR protocol in Appendix 1 of its slide pack.

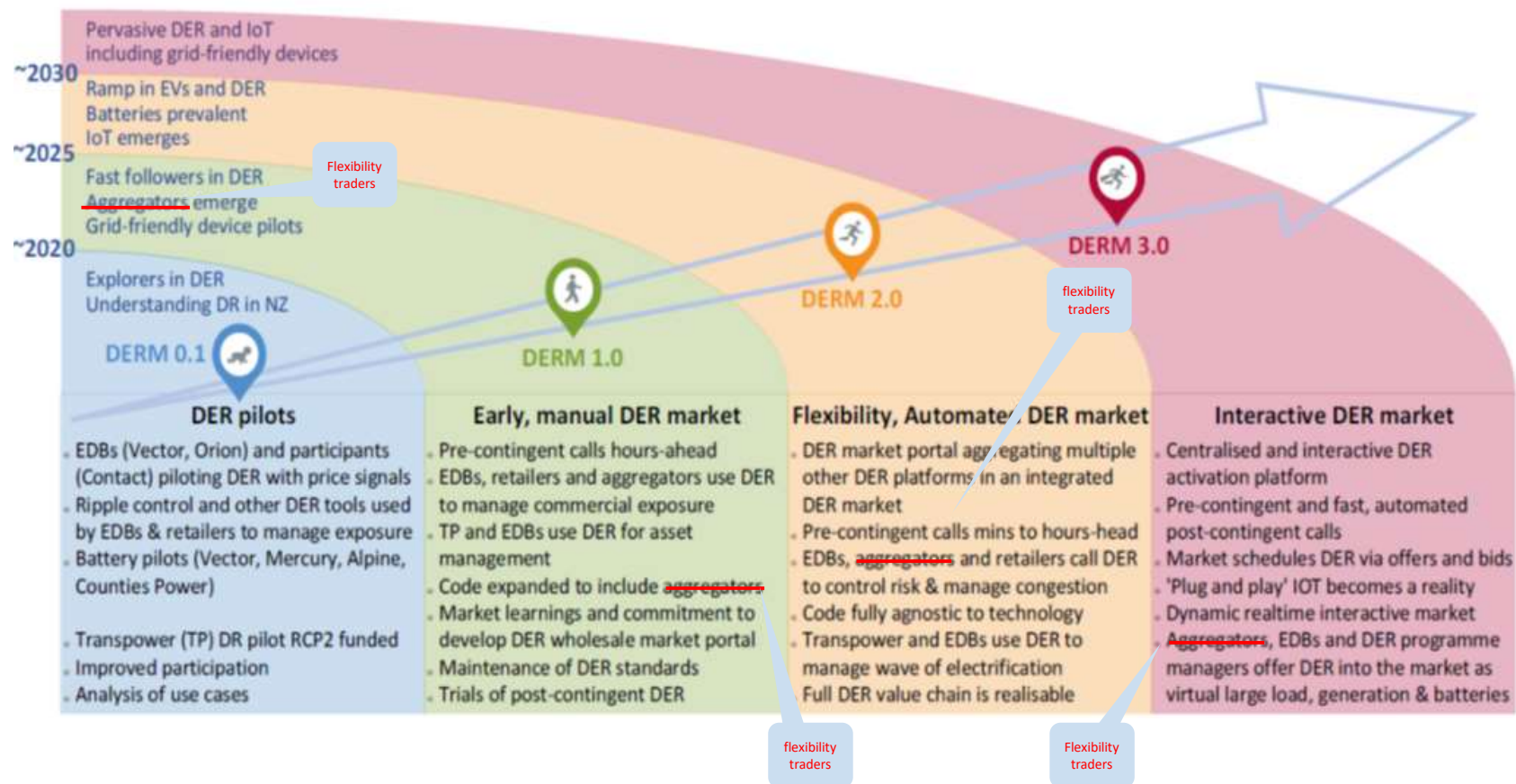
Question 4: Implications and recommendations for the design and operation of distribution business flexibility markets in New Zealand

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NZ is in the early stages of developing flexibility markets as a distribution alternative

- As shown in response to question 1, the development of flexibility markets as a distribution alternative has only just started in New Zealand.
- Transpower has developed a useful diagram showing the evolution of the flexibility markets in New Zealand (on the next slide).
- Currently we are in the blue portion of Transpower's diagram (DERM 0.1 – DER pilots) in regards to flexibility services being used by EDBs as a distribution alternative.

Some EDBs have developed flexibility pilots, but we need to keep moving along the continuum



- Our response to question 6 considers how EDBs should be incentivised to investigate and develop the use of flexibility services as a distribution alternative.

IPAG has concerns about some aspects of Vector and Wellington Electricity's trials

- The trials conducted by Vector, Wellington Electricity and others may be helpful for all EDBs to learn from
- There is a risk that all 29 distributors run independent trials and don't learn from one another. The insights from trials need to be developed into good industry practice and embedded in all EDBs routine operations if consumers are to benefit from them
- While we understand that distributors are currently just carrying out pilots, IPAG's concern is that consumers will not benefit if direct control of DER by distributors becomes part of their long term arrangements for flexibility management.

There was only one EDB that has awarded a contract to a flexibility trader as a network alternative

- Aurora have gone one step further than Vector and Wellington Electricity by going to market with their needs in terms of outcomes and inviting solutions without prescribing how those solutions are delivered.*
- However, there is still room for improvement: the results of Aurora's tender is that the EDB sole-sourced flexibility in the Upper Clutha for an initial period. In time solarZero and other DER providers should be able to compete to allocate DER on the network to its highest value use
- A more mature model could include Aurora using standard pricing to indicate needs and any DER provider (including solarZero) being able to respond to it

* Glenn Coates (General Manager Asset Management and Planning at Aurora) and Allan Miller (Project Manager for Aurora's Upper Clutha project) are members of IPAG

Establishment and availability payments needed for supply-side of market to develop (1 of 2)

- Transpower's DR programme was focussed on “shaking the tree” in RCP2 by engaging existing DER.
- Transpower's DR programme relies on event-based payments but does not make payments that would underwrite location-specific new investment.
- For the supply-side of flexibility markets to develop it is essential that establishment or availability payments are available to flexibility traders:
 - an *establishment payment* is paid by a flexibility buyer to a flexibility trader for developing the ability to provide flexibility to the flexibility buyer when needed
 - an *availability payment* is paid by a flexibility buyer to a flexibility trader for having flexibility resource available to provide flexibility to the flexibility buyer when needed.

Establishment and availability payments needed for supply-side of market to develop (2 of 2)

- Establishment and availability payments will ensure the building of flexibility portfolios of new DER to provide flexibility services where they are needed rather than relying solely on existing DER.
- Transpower has indicated that the future of their DR programme would be awards of a (specific type of) Grid Support Contract (GSC) which could accommodate establishment and/or availability payments.
- IPAG consider that rather than leaving the form of offer to GSCs open, a standard form would be beneficial as it would make it easier for flexibility traders to interact with various flexibility buyers using a consistent form.

Recommendation:

The IPAG recommends that the Authority require Transpower to work with Aurora and the EDBs more generally to agree a standard offer for procuring flexibility as a “non-network” solution and enforce the use of this standard notionally for procuring non-network inputs through default agreements.

Transpower's DR programme has provided clarity about how networks can use DER

- As a direct result of Transpower's DR Programme trials, Transpower have clarified that it is more important for buyers of flexibility services to have access to competitive markets for flexibility services than it is for them to directly control DER.
- As a result, Transpower have made a commitment to not offer services in a way that creates competition issues. The solution proposed by Transpower addresses IPAG's concerns without needing regulatory intervention.
- There may be scope for distributors to follow this example, but given the number of them and differences in their perspectives, it may be necessary to regulate to ensure that consumers are not disadvantaged if their EDB does not, or is late to, propose such a solution.

Recommendation:

The IPAG recommends that the Authority seeks assurances from EDBs that, like Transpower, they will not distort markets for flexibility and flexibility management. If EDBs do not provide such assurances, and do not demonstrate that they are not distorting markets, the Authority and Commerce Commission should regulate through ringfencing.

Question 5: An assessment of the effectiveness of the RCP2 allowance as an incentive for the development of flexibility markets

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Transpower's RCP2 allowance led to Transpower developing DR capability, but an allowance probably not most effective way of incentivising EDBs

- Transpower's RCP2 allowance has led to Transpower doing work in the flexibility space (which the EDBs haven't until very recently). This is a positive, although in hindsight EDBs have a greater need for flexibility services than Transpower does.
- Transpower is also committing to doing work on flexibility services in RCP3 which may not have happened otherwise.
- However, the IPAG don't think that giving EDBs an allowance to develop flexibility capability is the most effective way of incentivising EDBs – this is because:
 - the need for funding isn't as great now due to the learning Transpower has done— EDBs don't need funding to replicate what Transpower has done, but rather incentives to learn from what Transpower has done
 - **the RCP2 allowance has allowed Transpower to develop capability that may have given them an advantage in competitive markets—we don't want to do the same with EDBs.**

Given the lack of progress in distribution flexibility markets, EDBs do need some incentives

- The responses we received from EDBs made it clear that they do not understand the value of flexibility as a network alternative or why they should explore it under the regulatory regime – or that they consider ripple control to be the optimal non-network solution.
- Our analysis is explicit that ripple control is not an optimal non-network solution: dedicated ripple control for network support is more expensive than individual hot water controls (DERs) that can be allocated to the highest value flexibility use by a flexibility broker.
- What these incentives could look like are considered in response to question 6

Question 6: Implications and recommendations for the design and operation of future incentives for transmission and distribution flexibility markets in New Zealand

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What incentives do parties have to buy flexibility services?

Monopolies
 – regulation may be needed to ensure efficient incentives

Parties in relatively competitive markets
 – pricing likely to be a key incentive (but some rules/regulations may be needed)

Flexibility use	Spot energy/ ancillary service alternative	Transmission network alternative	Distribution network alternative	DER-based hedge	Delivered energy alternative
Flexibility buyer	System operator	Transmission grid owner	Electricity distribution business	Generator Retailer	Consumer
What type of incentive?	Regulatory – Code	Regulatory – Part 4	Regulatory – Part 4	Financial	Financial (and freedom)

The role of Part 4 in incentivising Transpower and EDBs to spend on flexibility services

- The Commerce Commission has a role under Part 4 of the Commerce Act to regulate Transpower (as grid owner) and EDBs.
 - Transpower and all EDBs are subject to information disclosure requirements.
 - Transpower and EDBs that aren't consumer-owned are also subject to price quality controls – Transpower has an individual price path (IPP), while EDBs are either on a default price-quality path (DPP) or customised price-quality path (CPP).
 - In setting these requirements the Commission aims to align Transpower and the EDB's interests with those of consumers, which should incentivise them to invest and operate efficiently.
- The Part 4 regulations should encourage an EDB (or Transpower) to buy flexibility services to provide network services when this is the most efficient option.

EDBs have made little progress on the development of flexibility services

- As noted in response to question 1, the IPAG considers that, in general, EDBs have made little progress on the investigation and development of using flexibility services as a distribution alternative.
- Many EDBs (particularly the small consumer-owned EDBs) seem to consider the use of flexibility services is difficult and that traditional resources are adequate for network management. Capability within EDBs is likely to affect the lack of progress.
- However, progress has been made by some EDBs including Aurora, Orion, Vector, and Wellington Electricity.

IPAG considers that incentives are needed to encourage EDBs to use flexibility services

- Given the lack of progress to-date, IPAG considers that further incentives are needed to encourage (or even require) EDBs to use flexibility services.
- As noted in response to question 5, IPAG considers that a lump sum allowance (as Transpower received during RCP2) would not be the most effective means of incentivising EDBs to use flexibility services.
- The IPAG has considered the pros and cons of different types of incentives:
 - Some soft incentives, such as nudging EDBs to act and providing education on the benefits of flexibility investment, are really important; but it may be necessary to provide a further push.
 - This may include requiring EDBs to disclose what progress they have made in investigating or investing in flexibility services as network alternatives
 - An even stronger incentive could be to link each EDB's regulated revenue to their progress on investing in flexibility, however this may be burdensome to the Commerce Commission, could result in perverse outcomes and would only be able to be applied to EDBs who's revenue is regulated (i.e., those that aren't owned by their consumers).

IPAG believes a mix of incentives is needed

Recommendation:

The IPAG recommends that the Authority and Commerce Commission develop processes to nudge EDBs to invest in flexibility and education for EDBs on how to invest in flexibility.

The IPAG recommends the Authority and Commerce Commission consider whether EDBs should be required to report on their progress on investing in flexibility services in their information disclosure and/or link each EDB's regulated revenue to their progress on investing in flexibility.

Part E: Summary of recommendations

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The IPAG has six important and urgent recommendations

1. The IPAG recommends that the Authority monitor what progress Transpower makes on its commitment to not price services for FMS and DERMS in a way that impedes competition for these services or inhibits the development of a marketplace for flexibility managers and flexibility traders. If the Authority believes that Transpower's "DR" programme is distorting markets for flexibility and flexibility management, then the Authority, with the Commerce Commission, could consider imposing on Transpower the same related party transaction rules that are already imposed on EDBs.
2. The IPAG recommends that the Authority monitor what progress Transpower makes on its commitment to ensure that costs are allocated in ways that do not create competition concerns. If the Authority believes that TP's DR programme is distorting markets for flexibility and flexibility management, then the Authority, with the Commerce Commission, could consider imposing on Transpower the same cost allocation rules that are already imposed on EDBs.
3. The IPAG recommends that the Authority seeks assurances from EDBs that, like Transpower, they will not distort markets for flexibility and flexibility management. If EDBs do not provide such assurances, and do not demonstrate that they are not distorting markets, the Authority and Commerce Commission should regulate through ringfencing.
4. The IPAG recommends that the Authority and Commerce Commission develop processes to nudge EDBs to invest in flexibility and education for EDBs on how to invest in flexibility.
5. The IPAG recommends the Authority and Commerce Commission consider whether EDBs should be required to report on their progress on investing in flexibility services in their information disclosure and/or link each EDB's regulated revenue to their progress on investing in flexibility.
6. Rather than leaving the form of offer to GSCs open, the IPAG recommends the Authority require Transpower to work with Aurora and the EDBs more generally to agree a standard offer form for procuring flexibility as a "non-network" solution and enforce the use of this standard nationally for procuring non-network inputs through default agreements.

The IPAG has two important but not urgent recommendations

1. The IPAG recommend that the Authority update its “Demand Response Guiding Principles” to reflect IPAG’s suggested terminology so that they are “Guiding Principles for Flexibility Markets”.
2. The IPAG recommend that Transpower update the “Demand Response Operational Protocol” signed between the Authority and Transpower in November 2014 to be a “Flexibility Management Operational Protocol”. The Operational Protocol should be updated to reflect new terminology and to reflect that Transpower is moving out of a development phase for its flexibility management.

Medium term recommendations

1. If nudging is not sufficient to trigger change in EDB behaviour, then the IPAG recommends the Authority, with the Commerce Commission, consider whether EDB Directors should be required to warrant that they have fully explored flexibility as an alternative to all material (>\$5m) network investments and link each EDB's regulated revenue to their progress on investing in flexibility. The Authority and Commerce Commission would need to make clear to EDBs that this exploration should include considering how they can move away from sub-optimal use of ripple control.
2. When DER penetration is sufficient to compete directly with main frame generation, IPAG recommends the Authority review the Code to ensure there are no barriers to flexibility traders offering DER based service to any wholesale market value stream. In particular, we recommend the Authority:
 - look at introducing new types of participants (e.g., flexibility trader), which may have less strenuous requirements to meet.
 - look at Code changes to allow aggregation across retailers and multiple GXPs.

Part F: Glossary of terms and abbreviations

Innovation and
Participation
Advisory Group

Glossary of terms and abbreviations (1 of 2)

Authority	Electricity Authority
Commission	Commerce Commission
Controllable DER	DER whose output of consumption can be turned up or down on demand. For example, diesel generation, batteries, and controllable EV charges, but not intermittent renewable generation like wind or solar.
CPP	An EDB's customised price-quality path (set by the Commission).
DER	Distributed energy resources – small-scale, distribution-embedded assets that either reduce load or inject more power. Assets could be generation (like solar panels), storage (like batteries), or automated load management devices.
DERM	Distributed energy resources (DER) management – the business process of selling, contracting with, operating and paying for <u>controllable</u> DER portfolios.
DERMS	Distributed energy resources management system – the software and digital information flows that enable DERM.
DPP	An EDB's default price-quality path (set by the Commission).
DR	Demand response
DRMS	Demand response management system
EDB	Electricity distribution business
Flexibility	Modifying generation and/or consumption patterns in reaction to an external signal (such as a change in price) to provide a service within the energy system
Flexibility buyers	Parties with flexibility needs that contract with flexibility traders to obtain flexibility (e.g., system operator, grid owner, or an EDB).
Flexibility management	The business process of identifying need for, procuring, issuing operating instructions, and paying for flexibility services.

Glossary of terms and abbreviations (2 of 2)

Flexibility management systems (FMS)	The technology that allows the flexibility buyer to forecast the need for, procure, manage contract for, issue instructions to, check and reward flexibility providers.
Flexibility markets	Mechanisms for matching and rewarding sellers of controllable supply or demand on instruction or in response to prices.
Flexibility owners	Owners of flexibility resources.
Flexibility resources	DER and larger resources like grid-connected generation or batteries.
Flexibility traders	<p>Owners of DER portfolios who manage their DER portfolio to allocate it to its highest value uses. Flexibility traders interact with flexibility buyers to provide the flexibility that they require. Flexibility traders include:</p> <ul style="list-style-type: none"> • commercial aggregators (aggregators who build flexibility portfolios of existing or new DER that it and third parties own) (e.g., Enel X) • parties that offer flexibility services using DER they own only (i.e., they don't aggregate DER owned by several parties) (e.g., solarZero and EDBs) • parties who are flexibility sellers "by accident" – that is, a party that procured DER for one purpose but is now also using this DER to provide other services (e.g., Contact's purchase of DER to manage NI reserves which they have also used in Transpower's DR programme).
Flexibility uses	Needs for flexibility including energy, ancillary services, transmission investment deferral, distribution investment deferral, outage restoration and construction risk management.
GIT	Grid Investment Test
IPP	Transpower's individual price-quality path (set by the Commission).
RCP1	Transpower's regulatory control period 1 (1 April 2011 – 31 March 2015)
RCP2	Transpower's regulatory control period 2 (1 April 2015 – 31 March 2020)
RCP3	Transpower's regulatory control period 3 (1 April 2020 – 31 March 2025)

End