April 2019

Advice on creating equal access to electricity networks

INNOVATION AND PARTICIPATION ADVISORY GROUP (IPAG)

IPAG members responsible for this advice

Members providing this advice:

- John Hancock (Chair)
- Luke Blincoe
- Glenn Coates
- Allan Miller
- Terry Paddy
- Stephen Peterson
- Tim Rudkin
- Diego Villalobos Alberú – *Observer*, *Commerce Commission*

Former members involved in developing this advice:

- *Lindsay Cowley (former Chair)*
- *George Block (former member)*
- *Jennifer Cherrington-Mowat (former member)*
- *Melanie Lynn (former member)*
- *Rod Snodgrass (former member)*

Summary

- The democratisation of the electricity industry is underway. We have an opportunity to build on a proud record of technological innovation and service to consumers. It is critical the sector is engaged to ensure all consumers can participate and receive benefits.
- Distributed Energy Resources (DER – ie, solar, battery storage and automated demand response) investment is happening in NZ, albeit at a slower pace than other countries. The lesson is the DER market has to be allowed to develop.
- The rise of DER can cause technical problems for networks, and this is already occurring.
- Using DER itself to help alleviate these problems is already viable to some extent. Open and equal network access for DER will help further.
- To accommodate the impact of DER and its potential use in network management, industry participants – in particular distributors – and regulators will need to respond with a sense of urgency, starting in 2019.
- IPAG urges the wider electricity industry to engage in the discussions and collaborations that will help us progress the implementation pathways.

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market-led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways.

The question

- In November 2017, the Electricity Authority Board requested the Equal access project be added to the IPAG's 2017/2018 work plan
- Specific focus was requested on:
  - Whether the operation of the existing equal access framework for transmission and distribution networks is sufficiently effective at promoting competition, efficiency and reliability for the long-term benefit of consumers. This may involve, for example, establishing the current feasibility for competitive supply of network support services
  - Potential options to strengthen the equal access framework to further promote competition, reliability and efficiency in the provision of electricity and electricity-related services, including network support services
  - The design, costs and benefits of any changes (regulations or market facilitation measures) identified to strengthen the equal access framework
- The IPAG advice was guided by the Electricity Authority's statutory objective. It was also guided by the Authority's regulatory strategy and code amendment principles (see Appendix 1).

About equal access

- Equal access is about freeing up investment in DER, and making buying and selling DER easy
- IPAG understands equal access to mean:

  'equal' access to transmission and distribution networks by parties wanting to use those networks and to buy or sell services made possible through coordination of DER
- In this context, the focus for IPAG has been on:

  the ability of individual technically compliant DER owners and groups of DER owners to trade the flexibility at their site to any beneficiary in competition with other potential providers.
- This includes distributors selling their controlled DER into the contestable market, and DER in the contestable market being made available to supply distribution services
- This does not preclude DER owners from simply optimising their assets to get the lowest cost of supply for themselves.

Design principles

- The IPAG endorses the durability of the current market design but emphasises the importance of minimising transaction costs and lags in its operation
- The IPAG wants to emphasise the importance of:
  - Speed of rule changes
  - Effectiveness of rule enforcement and breach processes
  - Establishment of default arrangements and standards
  - Use of pilots to establish new operation practices
- The IPAG considers access arrangements at the distribution level (especially access for consumer-owned DER) will need to evolve radically for DER to maximise the long-term benefit of consumers. Changes will be needed to terms of network access, approaches to procuring network inputs, and to the availability of network and market information.

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways.

Problem statements

1. Key network information is not collected and/or made available to DER providers
2. Providers and procurers of DER can't see DER "market" information
3. Technical specifications are not consistent or in some cases adhered to
4. Transaction costs for facilitating DER trade are high
5. Distribution pricing does not signal the cost of DER to network operation (congestion and voltage excursions for example) or its value to distributors
6. Distributors are not confident DER can assist with service quality or is viable as a network alternative
7. Part 4 Incentives appear to be poorly understood
8. Distributors' DER investments are treated as regulated capital, but the planning and operating services provided are contestable
9. Distributors may misallocate costs and revenues
10. Distributors may favour in-house or related-party solutions
11. Distributors may favour network solutions
12. Distributors may restrict technologies or network users
13. Security and reliability at risk if DER use by transmission and distribution in conflict.

IPAG identified 13 desired outcomes

1. Distributors to have greater visibility (monitoring) of the performance of their low-voltage networks, both current status and forward-looking information, so they are better able to:
   - manage reliability with greater penetration of DER
   - specify needs that could be obtained from a third party to support network management
2. DER owners have ready access to information of locations and network need, so they can identify where they could assist if coordinated effectively with the distribution network operator
3. Procurers and providers have confidence the connection standards and protocols for use are consistent and appropriate for network standards to be maintained where DER is deployed
4. Reduced transaction costs to ease trade between procurers (especially distributors) and DER providers

   Mechanisms that give visible access of prices to DER providers and standing offers for DER from distributors in order to facilitate trade

Continues on next page

13 desired outcomes *(continued)*

5. Mechanisms for contracting and paying for DER that support its use as network alternatives
   - Distribution prices and standing offer payments that reflect network conditions and costs in order that users of the network make informed decisions
6. Distributors have skills and capability to coordinate DER, delivered through a contestable framework to provide network reliability or network alternatives
   - Distributors to recognise and plan for the less firm nature of DER to allow network operations to be supported by DER
7. Part 4 incentives are well understood and/or effectively complemented with other incentives
8. A contestable framework should treat distributors and third-party DER investments neutrally to maximise distribution benefits and limit unintended consequences

Continues on next page

13 desired outcomes *(continued)*

9. Distributors allocate costs and revenues efficiently between the regulated service and their contestable (unregulated) business activities
10. Distribution services are delivered using an efficient mix of providers
11. Distribution services are delivered using an efficient mix of network and non-network alternatives
12. Network users are confident that they are not subject to unfair connection and operation restrictions, and have a fair opportunity to challenge decisions
13. Contractual arrangements develop in a way that reliability is not undermined by multiple calls on single DER by multiple procurers of DER.

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways.

About DER

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

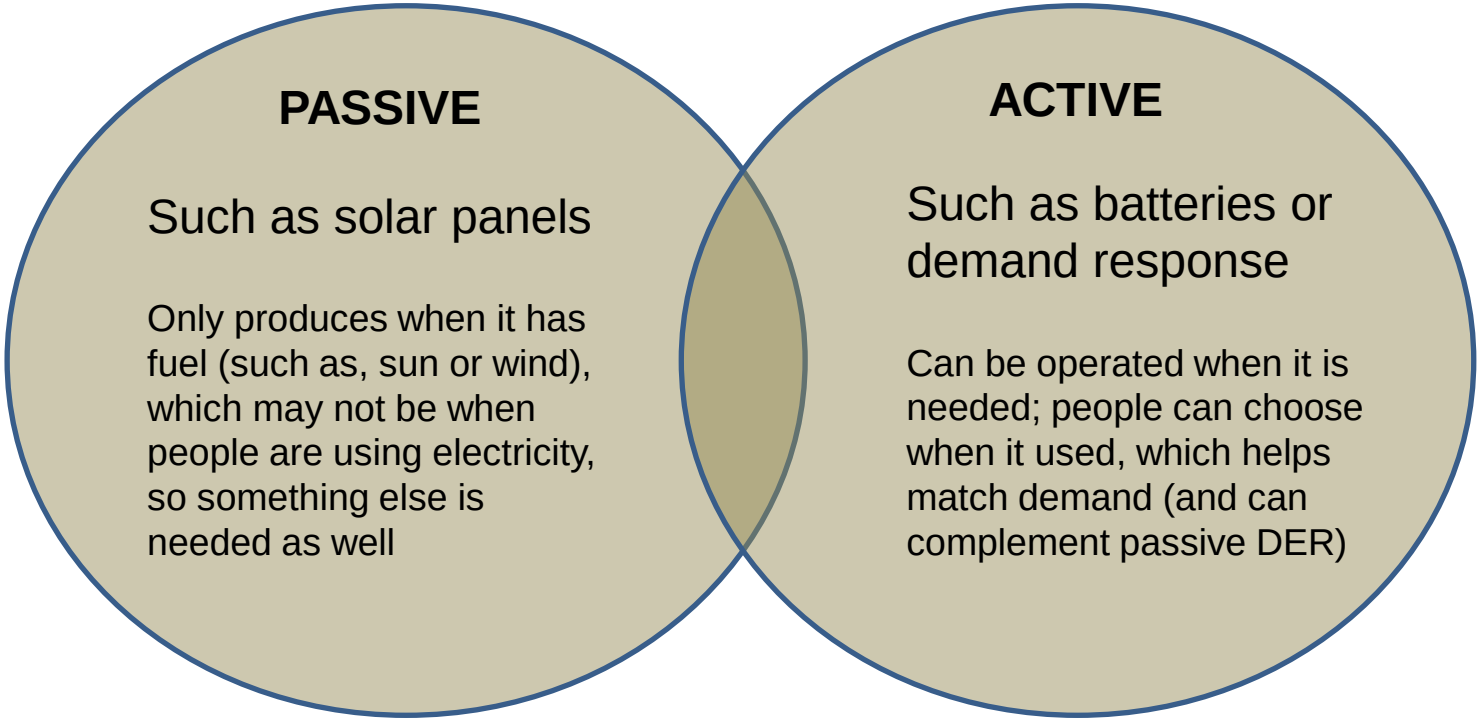
Common examples are:

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

When plugged in, electric vehicles (EVs) can be accessed as a combination of a battery and programmable demand response

Active and passive DER

Distributed Energy Resources



DER is only useful to assist network operation or any other role to the extent it is coordinated and predictable

DER both causes problems and offers solutions

Problems

- DER creates two-way flows on a power system that is predominantly designed to generate power at big power stations and transport it long distances across power lines
  - DER can reverse voltage profiles and raise voltage above limits
  - DER can overload distribution lines – for example EV charging
- DER can replace large-scale generation dispatched under the wholesale market rules but has different operating characteristics
- As more DER comes into the power system it can become less reliable, causing either expensive options to fix or requiring limits on how much DER can be deployed

Benefits

- DER can be designed to be controlled, and can be programmed or automated
- DER can contribute to the decarbonisation of the electricity system
- DER can potentially provide services back to the power system that have traditionally been provided by large generators or power lines
- But, this needs some coordination.

How to realise the full value of DER investment

DER offers potential
DER could potentially provide electricity services across the supply chain that are traditionally provided by large generators or power lines

More participation
More providers of DER and services, beyond current electricity companies, and will compete with the current electricity companies

Identification of need and coordination
The solution lies in finding new ways to match those who can provide services (and get paid for the services provided) with those who need them, while ensuring the power system is still available and remains reliable for those who need it.

We need a DER services market, with technical participation rules

Most consumers will spend money on DER technology when the benefits are **certain** and they have **choice and control**

Technology uptake will be inhibited until there is a **level-playing field for DER**

Which comes first?

Distributors will need to impose limits or minimum standards for DER technology that is **coordinated** to ensure the reliability of the power system

Regulators will **not be able to ease hard rules** on the electricity industry, which may include DER providers, unless consumer benefits are certain and the system is reliable

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market-led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways.

Building a DER services market

- For exchange to occur, providers of DER (sellers) and procurers of DER (buyers) need a platform or forum or exchange where they can identify the opportunities, see the prospective value, meet and trade
- Making the best use of DER requires full engagement by all participants through each phase of designing the market
- A pragmatic evolution of the approach to facilitating equal access will lead to a better solution
- We advocate the use of market trials and customer engagement to reduce the chance of unintended consequences if aiming for the full solution at the outset.

Continues on next page

Building a DER services market

- The value of easy access, low-cost trading to make the most of resources like DER is well-established.

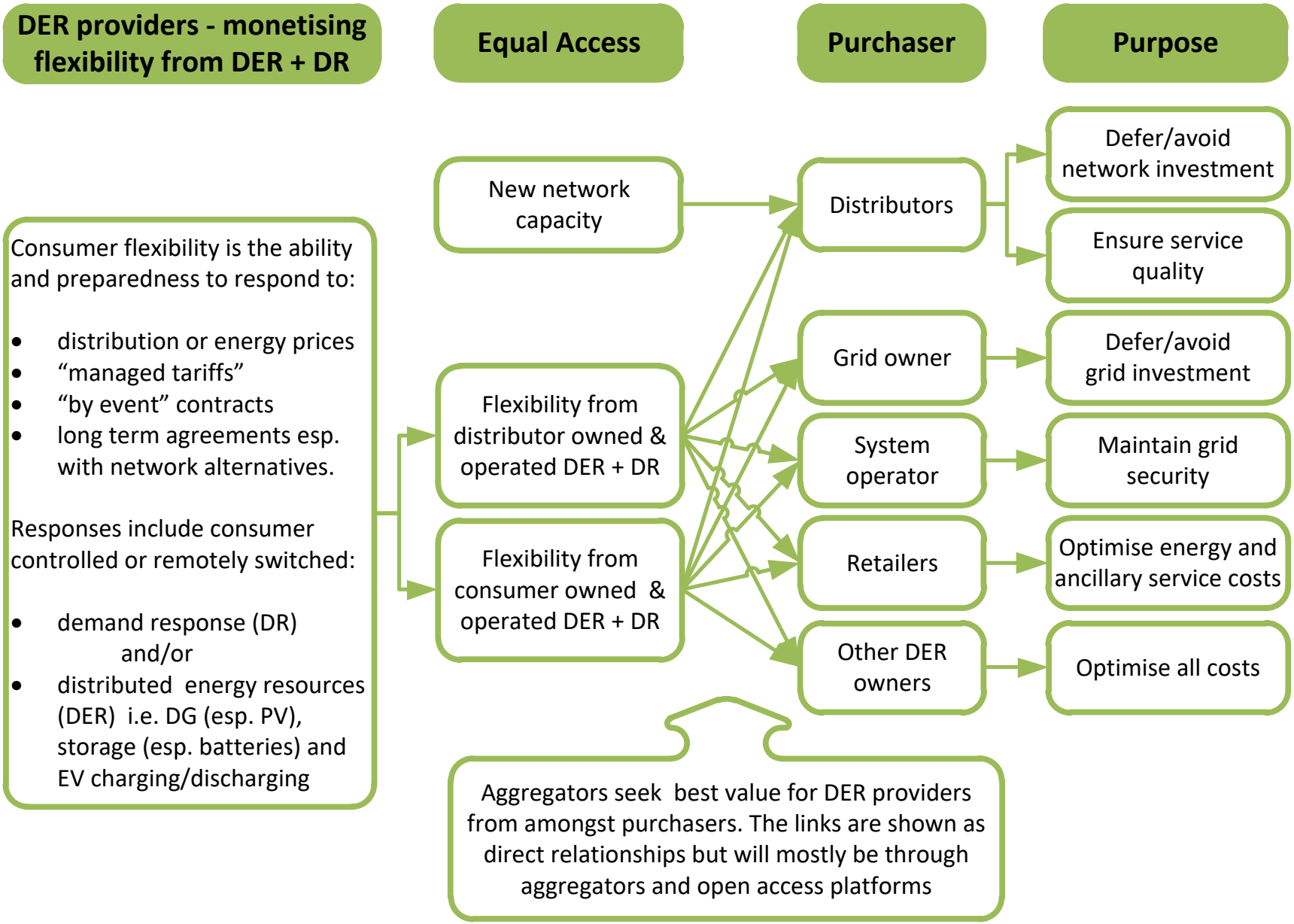
Parties will find the efficient solution where the right to undertake an activity can be negotiated at a low cost.

Continues on next page

Building a DER services market

- A DER services market requires pricing, incentives, engineering and trade
- The diagram *(on the following page)* shows how a fully functioning DER market with equal access would work:
  - Some DER providers may be passive in managing their resources and may cause increased congestion or voltage problems on the network
  - Other DER providers will be more engaged and look to monetise their resources, by selling that flexibility to the highest bidder
  - Purchasers include distributors, the grid owner, system operator, retailers and other DER owners, with a variety of purposes on their minds
  - Aggregators will likely interpose themselves between individual DER owners and purchasers, matching the flexibility on offer with the purchasers and the prices they are prepared to pay.

A fully functioning DER services market



Need for contractual arrangements

- In a spot market the transaction is simple: one party wants; another supplies. Once money is exchanged for goods there is little scope for dispute; a written contract is not needed. If one party is unhappy, they will transact elsewhere next time. Spot markets are largely self-policing.

  Spot markets are best for simple, low-value transactions, such as buying a newspaper or taking a taxi.

- Things become trickier when the parties have arrangements that are costly to enter and exit, and there is a specified delivery time. Take a property lease, for instance. A business that is evicted from its premises might not quickly find a suitable replacement. Equally, if a tenant leaves, the landlord might not find a replacement straight away. Each could threaten the other in a bid for a better rent.

  In this case a long-term contract that specifies the rent, the tenure and use of the property is best for both parties.

- The contracts could either be standardised and traded on an exchange, or bilaterally negotiated.

  (Source: Economist, 27 July 2017, Coase's theory of the firm)

Role of distributors in developing equal access

Equal access is about activity at the distribution level, and therefore distributors have a strong part to play in leading the evolution. Change also requires involvement of other industry participants and regulators.

- Distributors will need to take action first, because a DER market needs more data about network conditions. Other parties will need to contribute and participate
- It is a big change and, in addition to more data, distributors will require more resources and greater analytical ability
- It will be preferable for distributors to develop processes themselves
- Historically, industry-led processes have not been fast, so oversight is important
- The Authority and Commission will need to provide oversight, monitor progress, ensure accountability and have consequences for inaction.

Action needs to start now

- Action to create equal access needs to be taken now, both to:
  - realise the long-term benefit to consumers of efficient investment in DER
  - minimise the cost of implementation.
- Back-of-the envelope calculations indicate that benefits could quickly become large (in the order of $500 million – see page 33) with an early and efficient uptake of DER

  Delaying action will create significant costs to consumers, particularly from uncoordinated or constrained investment in DER.

- All those involved – industry, Authority and Commission – need to act now to reduce barriers to equal access. This is critical to ensure we see competition in, reliable supply by, and efficient operation of, the electricity industry for the long-term benefit of consumers.

Continues on next page

Action needs to start now

- The changes will accelerate and we have the lessons from other markets of what has to be done when the changes reach critical mass.

  The AEMO forecast by 2025 all South Australia demand (on a low-demand day) could be met by rooftop PV, with active management required by 2021/2022. That growth in PV has been driven by subsidies but the lesson is that arrangements need to be in place as soon as possible so that when the growth comes distributors, in particular, are not caught out.

- We expect the rate of DER investment will be orders of magnitude greater than traditional electricity infrastructure investment – acting with urgency to remove barriers to equal access will increase the benefits and avoids the costs

- Failure to take action is likely to lead to increased costs to consumers from either lower service quality or increased network provision costs in future.

Source:
Australian Energy Market Operator, South Australian Electricity Report, November 2017, page 2.

Many factors to address

- This project has shown the challenge of developing equal access is not a single problem. There are a range of factors that create a difficult and complex issue.
- IPAG broke the problem down into 13 distinct problems, based on matters raised in:
  - Consultation on the Commerce Commission's *Input methodologies review decisions Topic paper 3: The future impact of emerging technologies in the energy sector,* 20 December 2016
  - Electricity Authority *Enabling mass market participation in the electricity market: How can we promote innovation and participation consultation paper,* 30 May 2017
  - Intelligence gathered from retailers, distributors and innovators by IPAG and provided by the IPAG members.
- It has been made clear to the IPAG that what we propose will challenge the level of information gathered by some distributors, tax their analytic capability and expose a need for greater expertise. For example, future-looking heat maps seem a simple idea but require a lot of data about the network, consumers, and DER location, as well as analysis and therefore effort.

Phased DER market building process

Industry-led reform of equal access arrangements

PHASE 1	INFORMATION - Distributor communication of need (eg using “heat maps”); standing offers (some trades executed) and common connection and operation standards – discernible progress in 2019
PHASE 2	STANDARDISED CONTRACTS - Bilateral DER flexibility contracts commonplace (especially longer term for network alternatives)
PHASE 3	CONTROL SYSTEMS - Control systems for DER flexibility are integrated into a common approach

Continues on next page

Phased DER market building process – notes

- We should allow equal access to evolve pragmatically and avoid over-complicating it in early stages
- Therefore, phase 1 is viewed as a low-cost, no-regrets step
- Distributors should be able to deliver on phase 1 now even if it is done at a very basic level
- Legacy arrangements must be considered – for example, ripple control

- Heat maps are a way of showing areas of potential congestion or voltage issues
- Assume DER may be aggregated and deployed in wholesale value streams in the contestable market (for example, frequency)
- Assume connection and operation standards are updated to include DER and 2-way flows
- Phases to establish “flexibility” contracting mechanisms for distribution level value streams (deferral, outage management etc)

Regulatory and access regime change

- The problems and solutions for developing equal access are covered by a range of bodies, and associated legislation and regulations.
- Regulations will need to be flexible and dynamic in fast-changing market conditions.

Regulation of the distribution line service	Participation of distribution business in retail and wholesale electricity markets	Connection and use arrangements to access the network service	Industry voluntary arrangements (including industry-led reforms)
Commerce Act 1986 (Part 4)	**Electricity Industry Act 2010**	**Industry Participation Code**	**Self-governance**
Defines the line service to be subject to monopoly regulation, and applies monopoly regulation on suppliers of line services	Establishes business separation, governance arrangements and other arm's length rules to govern how distribution business participate in retail and wholesale markets	Establishes distribution network access arrangements with the objective of promoting competition, reliability and efficiency	There are voluntary arrangements for: • Retailers, aggregators and non-household consumers to access distribution networks • Industry lead approach to reform distribution network pricing

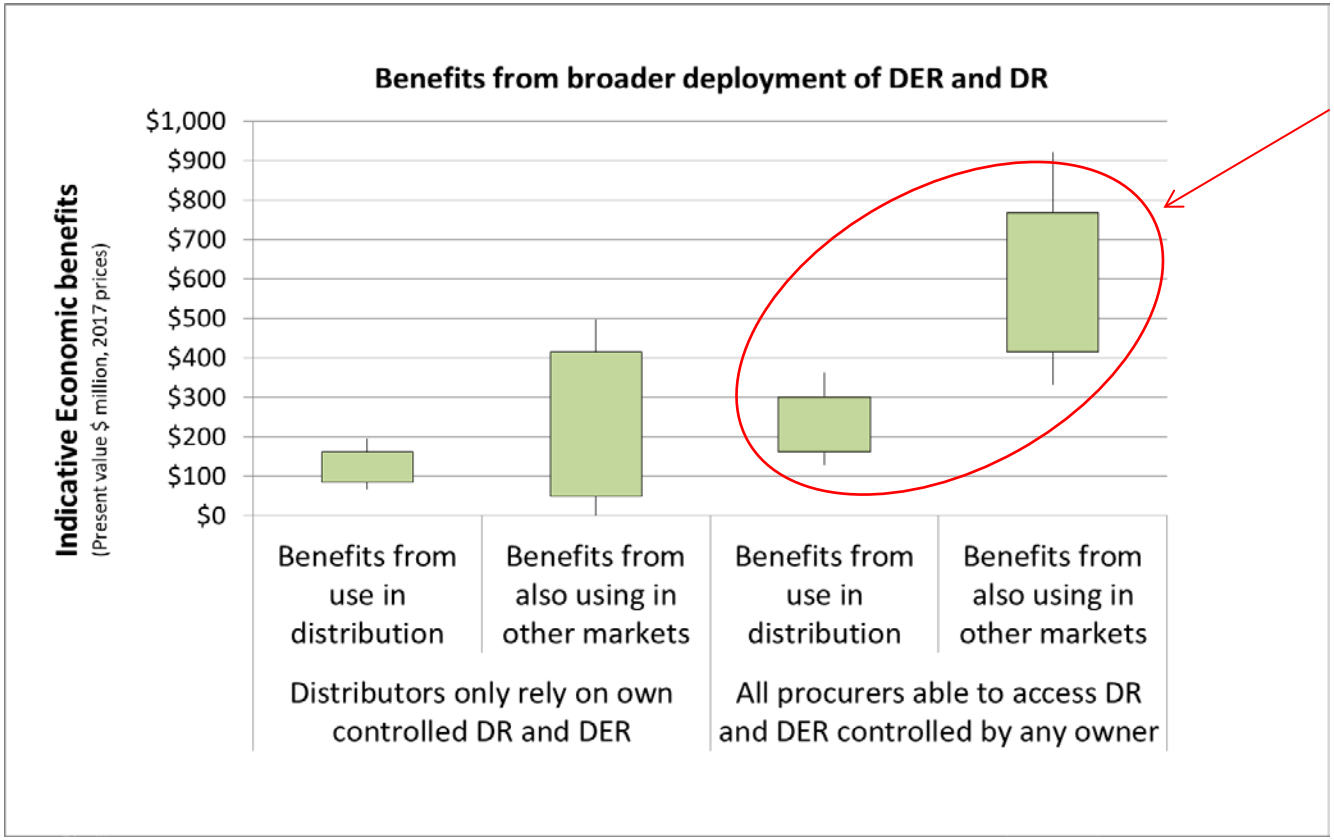
Continues on next page

Regulatory and access regime change *(continued)*

Decentralised energy trends require evolving third-party or open-access arrangements to distribution networks.

- DER owners will want to use distribution networks. This will require an efficient connection and/or use of system arrangement that works for DER owners and distribution businesses
- Distribution businesses may face conflicts if they seek to become active participants in markets where competitors rely on accessing the distribution network.

DER services market – benefits analysis



We want to get to here

Building a DER services market increases the benefits from DER

Source: Modelling completed for the IPAG. For further detail see IPAG July 2018 meeting papers, Economic efficiency benefits from equal access

- LHS boxes: assume **less/slower investment in DER** because only distributor-owned DER is used to supply flexibility across the supply chain
- RHS boxes: assume **more/faster investment in DER** because all parties freely invest in DER and supply flexibility across the supply chain

Equal access delivers greater benefits by promoting more and faster DER investment

- Equal access will likely result in more and faster investment in DER by opening two revenue streams to DER owners:
  - DER supplying distribution and transmission-level flexibility services, placing competitive pressure on traditional network solutions (outcome is cheaper and more reliable networks)
  - DER supplying energy, ancillary and consumer-facing services, placing competitive pressure on large-scale generation (outcome is cheaper energy)

But, incentives to change could be muted

- Unlocking benefits from equal access requires building a DER services market to match buyers and sellers, but incentives to unlock benefits could be muted:
  - There is a lack of information to hold distributors to account for the quality of supply of their LV network, eg, supplying within regulated limits*
  - Distributors in particular will incur effort and costs supporting the building, testing, maintaining and operating of a DER services market, eg, run tender processes
  - Distributors can still benefit from reducing costs by maintaining their business as usual approaches, eg, reliance on their own developed DER solutions
- There is a case for regulators to strengthen incentives on distributors to support building a DER services market, for example:
  - Making sure that LV network performance data can, and is, collected as part of business as usual activities
  - Making sure that distributors are appropriately remunerated for the extra effort and efficient costs
  - Working together with distributors to encourage positive change and monitor

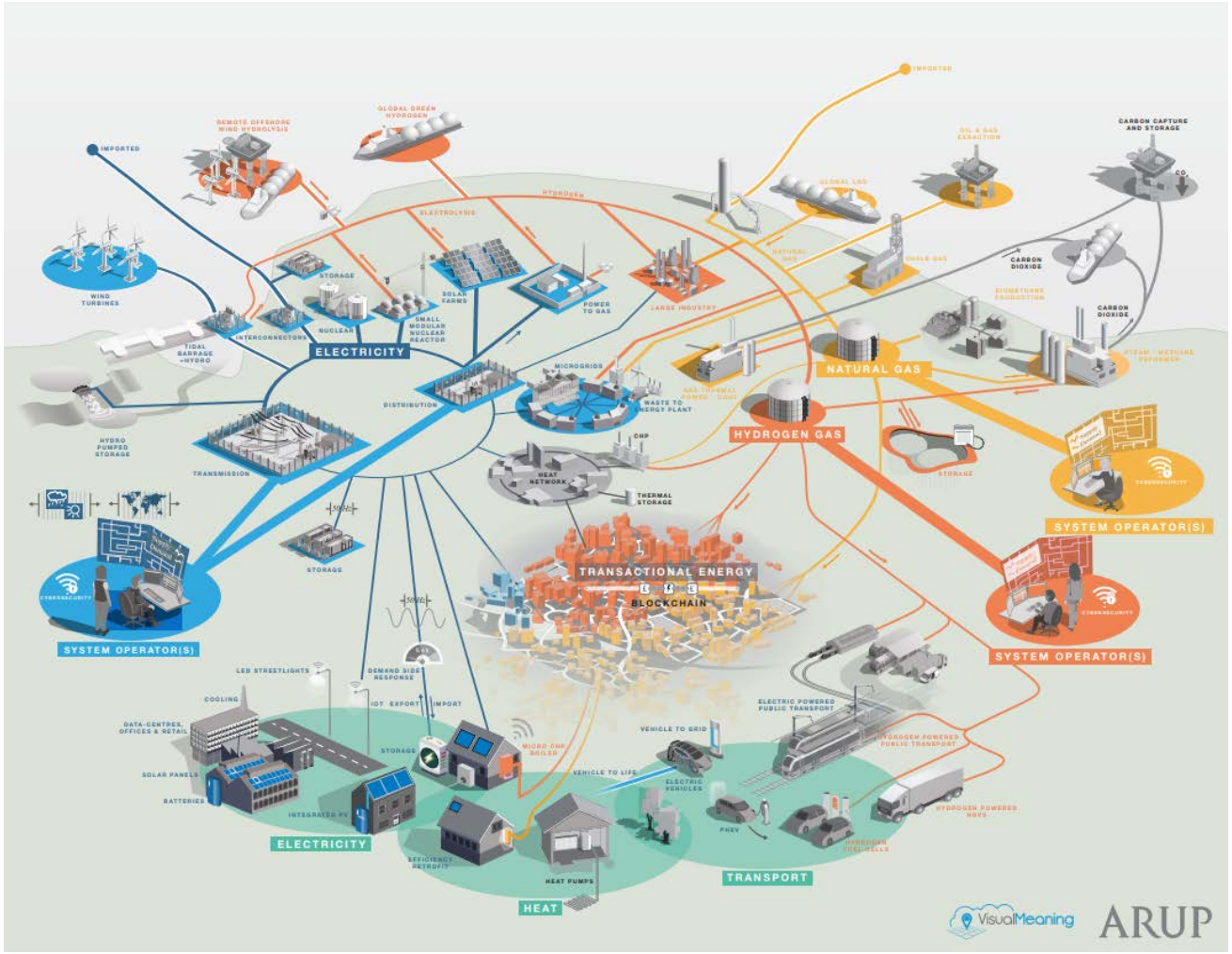
**See, clause 28 of the Electricity (Safety) Supply Regulations 2010*

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways.

Lessons from overseas

Experience in other jurisdictions shows equal access for DER is central to the operation of electricity systems and we need to act to accommodate it



ARUP (an international engineering firm) writes:

The energy system of 2035 will be more decentralised, disaggregated and multivector.

Demand-side response and batteries are widespread in commercial and residential property and have shifted the load profile of demand and generation.

Distribution networks are managing their own systems, becoming Distribution System Operators (DSOs).

Investment in reinforcing the network has shifted to integrated distributed solutions.

The distribution network has had to be reinforced due to the adoption of electric vehicles (EVs) and heat pumps.

Source: Arup, Energy systems – A view from 2035 (Source: www.arup.com)

DER Market development – UK, US and Australia

UK, US and Australia are all working on the introduction and development of Equal Access markets:

- Establishment of new platforms to facilitate innovation and participation:
  - Australian Energy Market Operator
  - Tabors, Caramanis *et al,* USA
  - UK Power Networks establishment of “platform” (see next page)
- Amendments to existing (wholesale) markets to facilitate DER participation:
  - New York ISO and REV
  - NERC (North America Electricity Reliability Corporation) standard P1547 revision, Hz/Volt technical requirements
  - California/Mid-Continent ISOs development of ramping/flexibility products
- Examples of DER participation within existing wholesale markets (VPPs):
  - Sonnenbatterie, USA and Europe.

UK Power Networks Roadmap

The UK Power Networks Roadmap provides a model for evolving equal access.

Distributor-led platform roadmap:

PLATFORM PHASE 1 → Distributor/DSO communication of need (e.g., heat maps like http://nationalmap.gov.au/renewables/), DER registration of interest, contract/pricing structures

PLATFORM PHASE 2 → DER flexibility contracts are settled through the platform

PLATFORM PHASE 3 → Control systems for DER flexibility are integrated into the platform

Presumes DER will be integrated with wholesale value streams, such as Hz.

So, this roadmap is focused on establishing "flexibility" contracting mechanisms for distribution-centric value streams (deferral, outage management, and so on).

Timing:

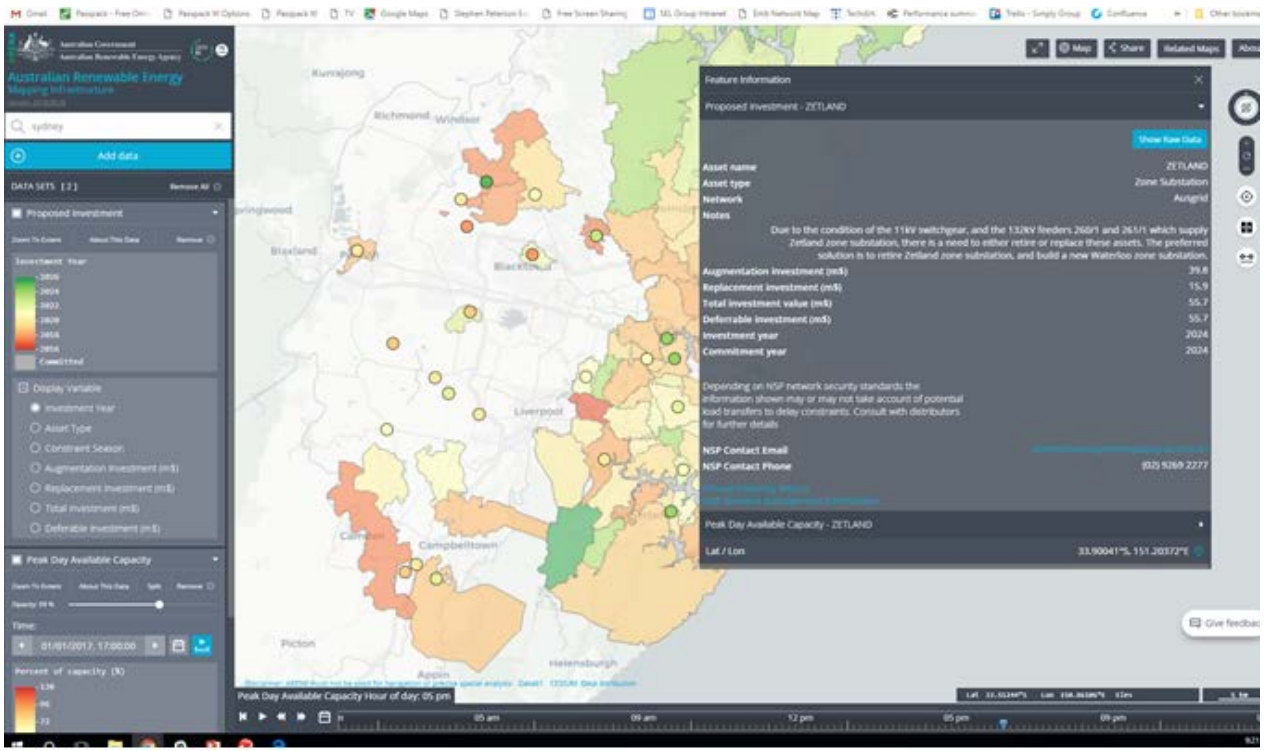
- Q3 2018 – publish sites where DER could offer services
- Q1 2019 – invitation for DER to tender for services
- Q2 2019 – successful bidders are notified
- Q4 2019 – start using contracted DER.

Source: UK Power Networks, Flexibility Roadmap

Heat maps as a tool

- Heat maps are a tool for identifying DER market opportunities, on the principle that transparency of opportunity facilitates greater participation
- They are used in UK and Australia to catalogue network congestion and DER opportunities in simple and accessible formats.

For example: AREMI is a website for map-based access to Australian spatial data relevant to the Renewable Energy industry (below and right).
Source: nationalmap.gov.au/renewables



Available Distribution Capacity – 'Firm substation capacity' (determined by the local reliability criteria), minus the forecast peak demand at the Zone Substation level

Annual Deferral Value – (expressed in $/kVA/year) is the planned investments that are potentially deferrable. In addition, the amount of network support (in MVA) from demand management or renewable energy required in a given year to achieve a successful deferral is calculated

Peak Day Available Capacity – load as percentage of asset capacity for each hour of the peak day in the lowest level of the network each area with potentially deferrable investment.

DER progress

- Work to develop DER in New Zealand is increasing, but it is inhibited by an absence of a coordinated equal access regime.
- Activities to date include:
  - On one distributor's network a peer-to-peer trading platform exists to allow matching of solar panel owners with willing purchasers of excess solar electricity in local areas.
  - A retailer is trialling aggregation and remote control of batteries in response to distribution price signals
  - A distributor is trialing a 1 MW battery to better understand the impact of the commercial application of battery storage technology
  - A firm aggregates the electricity used by industrial and commercial consumers across the country which it sells into the instantaneous reserve market. The consumers supplying the demand-response reduce their consumption or take their operations off the grid for short periods of time
  - The grid owner operates a demand-response programme that enables consumers to be paid to reduce the electricity they use for a period of time when asked. The grid owner benefits from access to flexible ways to reduce congestion on the grid at peak times. This allows the grid owner to reduce or postpone investment in the grid.

Transmission and distribution may compete

Transmission and distribution may compete for the same DER with issues for security and reliability.

- The transmission system might require DER for security, and the same DER might be needed by distributors for reliability and security
- Other users, such as generators or retailers, may also want to use DER in the electricity spot market
- Security and reliability could be compromised if the transmission operator, distributor and other parties do not have visibility of individual DER capability and commitment
- It is possible the problem statements 8–12 (see section later in this document) could also apply to Transpower, as a regulated entity.

Contents

- What were we asked to do?
- What are the problems and desired outcomes?
- What is DER?
- A market led evolution to equal access is needed to realise DER benefits
- Nationally and internationally DER is being harnessed
- The implementation pathways

Implementation pathways – Introduction

The IPAG has developed **implementation pathways**, with assistance of Authority and the Commission staff, which:

- assign responsibility for taking actions necessary to deliver desired outcomes to ultimately open up access for all DER providers and procurers to trade
- identify where the Authority, the Commission or both should hold themselves or other parties accountable for taking action.

Each implementation pathway identifies the party responsible for taking the actions, and the party which will provide oversight of progress.

The implementation pathways are presented in the following three sections:

- an overview section
- the list of actions, grouped according to timeframe
- the full logic for each.

Implementation pathways – Process

To develop the implementation pathways, the IPAG:

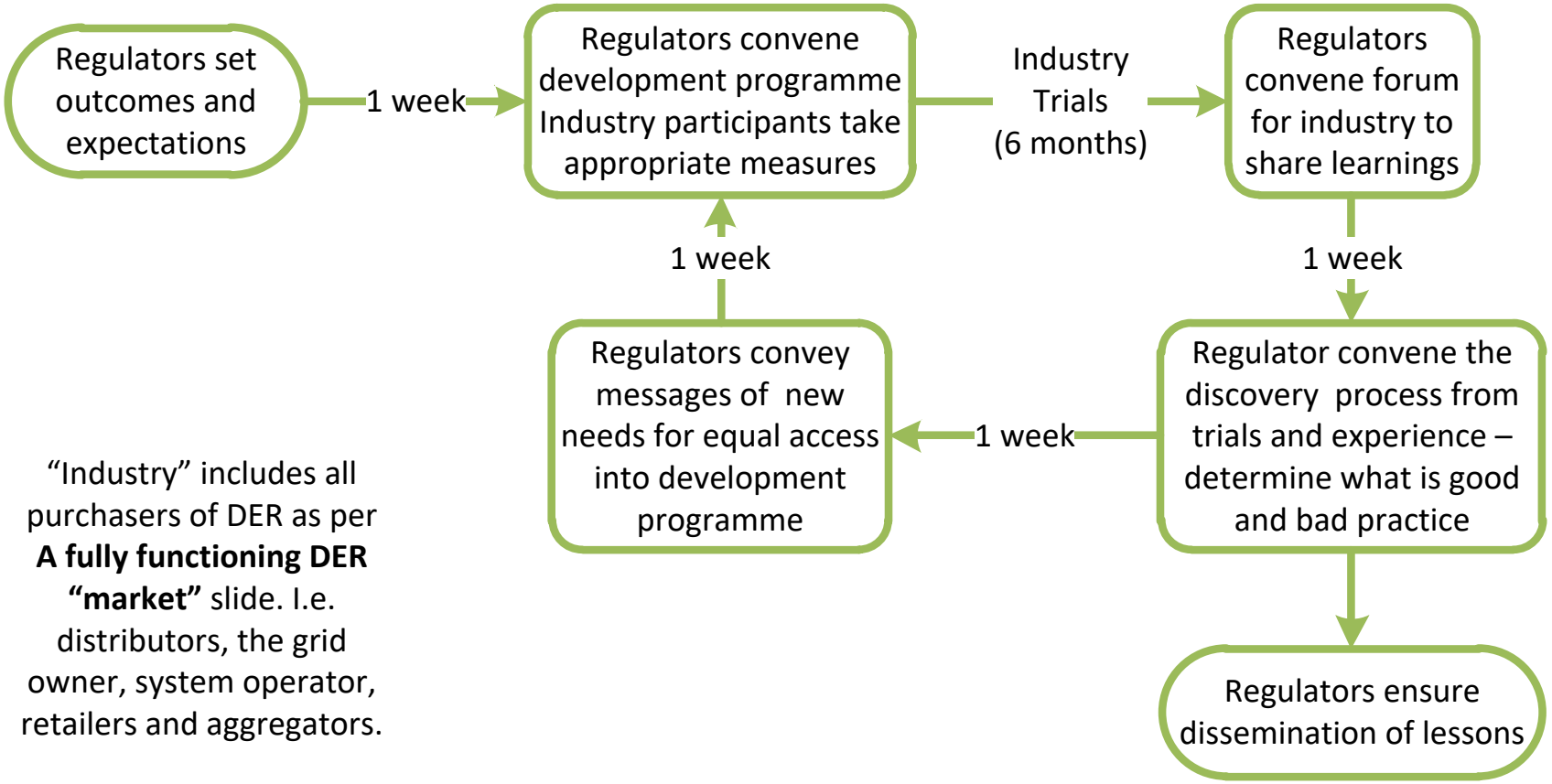
- began by identifying a number of **problem areas**, with both a potential future state and current behaviours
- then identified **desired outcomes** to be achieved by addressing the identified problems
- identified **a series of actions** to achieve the desired outcomes.

Each action:

- starts with what is practicable now (phase 1)
- then builds incrementally towards creating an environment that supports networks being used for buying and selling of DER services (choice), maintaining or improving reliability of supply, and putting downward pressure on supply chain costs.

A model for collaboration

Pragmatic evolution of a DER services market should involve trial and error and feedback loops



"Industry" includes all purchasers of DER as per **A fully functioning DER "market"** slide. I.e. distributors, the grid owner, system operator, retailers and aggregators.

Highest priority implementation pathways

1	The Authority to publish an equal access development programme by June 2019 which sets out the tasks, priorities and milestones, and includes an engagement approach characterised by collaboration between regulators and participants and continuous trial-based evolution
2	The Authority to ensure all distributors to publish a plan of how they will build their network performance data set
5	The Authority to publish guidance for distributors to report on export congestion (s6.3(2)(da)) by June 2019, and report on distributor progress by December 2019
14	The Authority to ensure the distribution pricing principles provide appropriate guidance for providers and procurers of DER by June 2019
24	The Authority and Commission to report annually on the performance of the equal access framework, and progress with implementing the actions required to achieve the desired outcomes
25	The Authority and Commission to develop a dashboard showing measures of progress towards equal access , including complaints.

Implementation pathways for action Q3 2019

7	The Commission and Authority to encourage distributors to collaborate in finding the most efficient way of capturing and publishing utilisation data. The Authority and Commission to report on progress by September 2019.
8	The Authority to work with distributors and data users to identify what data is required to support a DER market, and make sure accessible data is available to DER suppliers. The Authority should report publicly on progress by September 2019.
10	The Authority to encourage distributors to make available 'standing offer' price information for DER. The Authority to report on its progress by September 2019.
11	The Authority to identify how to establish a register of DER which is available to supply services. The Authority should report on its progress by September 2019.
19	Authority to work with a sample of distributors and DER suppliers to develop options how distributors could contract with DER to support network alternatives. Review progress September 2019. Implement by December 2019.
20	Electricity Authority and Commerce Commission to provide guidance to distributors and DER providers on trialling contestable frameworks. Authority and the Commission to report on progress by September 2019
23	Electricity Authority and Commerce Commission to develop a joint work programme to investigate potential efficiency and competition implications from: DER being treated as regulated capital; risks from misallocation of costs and revenues; risks from favouring in-house, related party or network solutions; and risks from restricting technologies and network users. This will include developing and costing options to mitigate any efficiency and competition harm identified.

Implementation pathways for action end of 2019

4	The Authority to integrate hosting capacity capability into Part 6. Gazette Code amendment in 2019, and report on distributor progress by December 2019.
9	The Authority and Commission to support distributors in providing accessible information on current or expected network investment needs in Asset Management Plans. A preferred option identified by December 2019.
12	The Authority to oversee the Electrical Engineers Association (EEA) and stakeholders to develop common technical codes for deployment and common standards for connection of DER.
13	The Authority to require adoption of the common standards by all distributors. The Authority should report on its progress by September 2019.
15	The Authority to determine how to provide DER installations with standard and default distribution connection and use of system agreements.
16	The Authority to encourage interested procurers (especially distributors) and active DER providers to develop arrangements for trade.
18	The Authority to support ENA to develop systems to signal the presence and cost of congestion within networks. Authority to report progress by December 2019.
21	The Authority to develop a reporting framework for distributors and DER suppliers to report results of trials. The Authority to establish a portal for sharing experience by December 2019.
22	Commerce Commission undertake an information campaign on Part 4 incentives including publicising relevant case studies as part of the DPP reset – late 2019.

Implementation pathways for action in 2020

6	The Authority to enable parties to access data. Develop effective backstop arrangements, subject to advice from the IPAG.
26	The Commission to reinforce its expectations of the treatment of costs and revenues for regulated service under the Commerce Commission Part 4 regime via an annual review of practices and penalties for rule-breakers.
27	The Commission to require distributor Directors to sign an annual declaration to investigate the use of DER for network alternatives. The best opportunities to trial and learn might be small-scale.
29	The Authority to report publicly the results of Transpower's trial Demand-Response programme, including technical details of what worked and what didn't work. Intention of informing future iterations of Transpower's programme ahead of RCP2.

From 2020

3	The Commerce Commission to ensure distributors report annually on progress in fulfilling action 1.1.
17	The Authority progress towards distribution pricing that will reflect the cost of DER on the network. In 2020, review distribution pricing reforms and explore the use of contracts for DER with long-term appetite for a single schedule of prices.
28	The Commission and Authority to note the merit of aligning equal access at network level with transmission, including a longer term vision for similar principles to apply for both transmission and network companies.

Implementation pathways – Logic

- As indicated, IPAG has derived implementation pathways after an assessment of problem statements, desired outcomes and actions
- The following section shows the full logic for each.

1 – Networks need to gather more information so they and DER providers can identify needs

Problem – Network information
Distributors use what could be described as static approaches to manage the lower voltage parts of their network. They may not have sufficient network information to effectively coordinate DER with the distribution network service as the level of DER on the network increases. There is a specific issue of potential constraints on distributors accessing feeder-level data from consumer metering in addition to shortfalls in data collected in the first place The lack of information also hampers networks' ability to understand how DER could be used to run the network better. This issue arises in the context of both network planning with the potential to use long term contracted DER as a network alternative and operational management for reliability purposes. This information may be required to support the move to more cost-reflective distribution pricing as well.
Desired outcomes – Reliability, efficiency and competition
Distributors to have greater visibility (monitoring) of the performance of their low-voltage networks, both current status and forward-looking information, so they are better able to: • manage reliability with greater penetration of DER, and • specify needs that could be obtained from a third party to support network management.

1 – Networks need to gather more information so they and DER providers can identify needs

Actions
1.1 Distributors to obtain granular network information at sub-transmission and HV level and, building on the practices for providing network information at that level, establish an ICP-level understanding of the network, that is, build the same dataset at the LV level so the network understands its congestion and voltage position. What you could expect to see is: o At the upper end of lines (above feeder level) distributor to install monitoring devices or contract with other parties to capture a large range of electrical performance measures at appropriate or selected feeder transformers o For the rest of the lines (feeder level) distributors to capture voltage information, for example 10-minute average information (not necessarily real-time) for several connections on the feeder. 1.2 Distributors to develop an understanding of the ability of the network to accommodate increases in DER for the purposes of understanding the implications of the growth in DER and also the potential for deploying DER to support the network (that is, network hosting capacity). 1.3 Distributors to publish utilisation of the network in both directions by transformer (or other critical network locations). This should take the form of near real time monitoring and long term projections of potential congestion.

1 – Networks need to gather more information so they and DER providers can identify needs

Implementation pathways *(Note – Numbers flow across issues)*
1. The Authority to publish an equal access development programme by June 2019 which sets out the tasks, priorities and milestones, and includes an engagement approach characterised by collaboration between regulators and participants and continuous trial-based evolution.
2. The Authority ensure all distributors have a plan by June 2019 of how they will build their data set – especially on the low-voltage network, so they have an ICP level understanding of the performance of their network.
3. The Commission to ensure distributors report annually information necessary for interested parties to understand distributor progress with delivering action 1.1.
4. The Authority to amend the Code to integrate hosting capacity capability into Part 6. The Authority to gazette the Code amendment in 2019 and report on distributor progress implementing the requirements by December 2019.
5. The Authority to publish guidance on expectations regarding meeting requirements on distributors to report on export congestion under Part 6 of the Code (s6.3(2)(da)). The Authority to publish guidance by June 2019, and report on distributor progress implementing the requirements by December 2019
6. The Authority to develop effective arrangements enabling parties operating across the supply chain to access data. The Authority has requested the IPAG provide advice relating to access to data
7. The Commission and Authority to encourage and support distributors to collaborate in finding the most efficient way of capturing and publishing utilisation data. The Authority and Commission should report publicly on progress on how this will be achieved by September 2019

2 – More information on needs and standing offers has to be made available for a DER "market" to open up

Problem – DER "market" information
Information that would give third-party DER providers a sense of where DER investment and deployment could provide benefits on the distribution networks or how much they would be paid is not accessible. This applies in the case of long-term support as an alternative to network investment or as short-term operational support, that is, for reliability.
Desired outcomes – Reliability, efficiency and competition
DER owners have ready access to information of locations and network need so they can identify where they could assist if coordinated effectively with the distribution network operator. (See also transaction costs in issue 4 below).
Actions
2.1 Distributors to publish signals of need where and when network issues are expected or occurring. This could take the form of a heat map that is openly accessible and contains relevant and timely information. It could show near-real-time needs – as distinct from long-term projections of potential congestion where network alternatives may have a role. 2.2 Distributors to also publish indicative standing offers for long-term network investment deferral opportunities. (See also distribution pricing and transaction costs below.) 2.3 Distributors to use requests for proposals for non-network solutions in a timely fashion to enable third parties time to develop and prepare non-network alternatives (for example, see Powerco recent market making https://www.powerco.co.nz/about-us/your-view/current-consultations/). 2.4 The Authority to ensure creation of a register of DER to signal location, availability and capability in providing services.

2 – More information on needs and standing offers has to be made available for a DER “market” to open up

Implementation pathways *(Note – Numbers flow across issues)*
8. The Authority to work with a sample of distributors and interested data users to identify what data and information is required to support a DER market, and take steps to make sure that accessible and user friendly data/information becomes available to DER suppliers. The Authority should report publicly on progress on how this will be achieved by September 2019 and thereafter.
9. The Authority and Commission to support distributors to collaborate to develop a consistent approach to providing accessible information on current or expected network investment needs in Asset Management Plans. A preferred option should be identified by December 2019.
10. The Authority to encourage distributors to make available ‘standing offer’ price information for DER to support longer term alternatives to network investment. (The Authority might work with a sample of distributors to test the concept and an approach initially. This will lead to prioritisation of the most material opportunities in 2019).The Authority to report on its progress on how it plans to do this by September 2019.
11. The Authority to identify how to establish a register of DER which is available to supply services. (The initial register could be established for a sample of regions to test the concept.) The Authority should report on its progress on how it plans to do this by September 2019.

3 – Common technical specifications must be clear and consistent for the use of DER to develop

Problem – Technical specification
Distributors and third-party owners of DER require clear and consistent specification to ensure DER entering the network meets appropriate network code. This includes where DER is utilised for network support or any other purpose.
Desired Outcomes – Reliability, efficiency and competition
Procurers and providers to have confidence the connection standards and protocols for use are consistent and appropriate in order for network code to be maintained where DER is deployed.
Actions
3.1 Have a common code for DER connection across all networks. 3.2 Standards for DER to ensure their connection will not cause network issues, including safety concerns. 3.3 Distributors to develop an industry standard connection information pack. 3.4 Industry to develop common protocols for deployment of DER for any purpose across any network.
Implementation pathways *(Note – Numbers flow across issues)*
12. The Authority to oversee and support the Electrical Engineers Association (EEA) and interested stakeholders to develop common technical codes for deployment and common standards for connection of DER. 13. The Authority to require adoption of the common standards by all distributors. The Authority should report on its progress by September 2019.

4 – The cost of identifying needs and potential value (transaction costs) is too high for trade to flourish

Problem – Transaction costs
High transaction costs can impede trading between procurers (especially distributors) and suppliers of DER services.
Desired outcomes – Efficiency and competition
Reduced transaction costs to ease trade between procurers (especially distributors) and DER providers Mechanisms that give visible access of prices to DER providers and standing offers for DER from distributors in order to facilitate trade.
Actions
4.1 Industry to develop consistent contracting and/or pricing approaches for DER. 4.2 Industry to develop standardised information exchange protocols for distributors to communicate price information to DER providers. 4.3 Authority to hold back from pushing for development of substantial platforms and allow the development of more simple formats for signalling prices and availability between buyers and sellers of DER initially.
Implementation pathways *(Note – Numbers flow across issues)*
14. The Authority to ensure the distribution pricing principles or equivalent provide appropriate guidance for providers and procurers of DER by June 2019. 15. The Authority to determine how to provide DER installations with standard and default distribution connection and use of system agreements. 16. The Authority to encourage interested procurers (especially distributors) and active DER providers to develop arrangements for trade.

5 – Distribution pricing does not signal the cost DER places on the network, or the mitigating value of it

Problem – Distribution pricing
Current forms of distribution pricing may not signal opportunities for DER to provide operational support or serve as network alternatives.
Desired outcomes – Efficiency and competition
Distribution prices that reflect network conditions and costs in order that users of the network make informed decisions. Mechanisms for contracting and pricing DER that support its use as network alternatives.
Actions
5.1 Authority to reinforce the message that cost-reflective prices are an important step in the transformation to an efficient transactive network with widespread uptake and use of DER (that is, they are not an optional, nice-to-have feature of a well-functioning market). 5.2 Distributors to obtain and make available improved network data to inform pricing reform (as described in issues 1 and 2 above). 5.3 Distributors to make price structures such as network load control tariffs participant and technology neutral. 5.4 Distributors to identify what is required by DER suppliers to support development of a market for contracting support for DER as a network alternative. (As discussed in issue 4 above.)

5 – Distribution pricing does not signal the cost DER places on the network, or the mitigating value of it

Implementation pathways *(Note – Numbers flow across issues)*
17. The Authority to continue with its progress towards distribution pricing that will reflect the cost of DER on the network and, as a consequence, the opportunity for DER to provide distribution services. Review distribution pricing reforms and explore the use of contracts for DER with long term appetite for a single schedule of prices
18. The Authority to encourage and support ENA to develop distributor systems required to be able to signal the presence of, and cost of, congestion within networks. Authority to report progress by December 2019.
19. Authority to work with a sample of distributors and DER suppliers to develop options how distributors could contract with DER to support network alternatives. Review progress September 2019. Implement by December 2019. (See also implementation pathway 9.)

6 – Distributors seem hesitant to rely on DER to provide regulated services or network alternatives

Problem – Uncertainty

Distributors do not yet have the evidence that coordinated DER delivered through a contestable framework can provide network reliability or serve as an alternative to network investment.

Desired Outcomes – Reliability and Efficiency

Distributors have skills and capability to coordinate DER, delivered through a contestable framework to provide network reliability or network alternatives.

Distributors to recognise and plan for the less-firm nature of DER to allow network operations to be supported by DER.

Actions

6.1 Participants have a secure environment for experimentation to develop, test and implement delivery of products and services within contestable frameworks

- Distributors and DER providers to trial a contestable framework, for example to test heat maps and DER response to prices, verify service provision, explore contractual arrangements, and inform contracting principles and sharing of lessons learned.

Implementation pathways *(Note – Numbers flow across issues)*

20. Electricity Authority and Commerce Commission to provide guidance to distributors and DER providers on how they are able to trial contestable frameworks. This will include guidance on how quality standards apply, as well as on other relevant aspects of the broader regime. Authority and the Commission to report on progress by September 2019.

21. The Authority to develop a reporting framework for distributors and DER suppliers to report results of trials, including technical details and what worked and didn't work. The Authority to establish a portal for sharing evolving best practices around the use of non-firm DER (that is, the use of stochastic techniques rather than a deterministic approach) and firm DER by December 2019.

7 – Part 4 incentives for using DER for regulated services and network alternatives may not be well understood

Problem – Part 4 Incentives
Part 4 incentives may be complex, or misunderstood. This may lead distributors to focus on in-house solutions, without using a contestable framework or not use DER as a network alternative at all.
Desired outcomes – Efficiency
Part 4 incentives are well understood and/or effectively complemented with other incentives.
Actions
7.1 Commission to actively improve distributors' understanding of the workings of and incentives available in its Part 4 regime. 7.2 Commission and distributors to provide for greater transparency and involvement regarding investment decisions.
Implementation pathways *(Note – Numbers flow across issues)*
22. Commerce Commission undertake an information campaign on Part 4 incentives including publicising relevant case studies as part of communications around the DPP reset – late 2019.

8 – Distributors' own investment in DER is treated as regulated capital rather than contestable

Problem – Distributors' DER and regulated service

Distributors' DER investments are treated as regulated capital, but the planning and operating services provided are contestable and should be treated accordingly. Not doing this could result in unintended consequences (such as, implicitly favouring distributors' DER over third-party DER).

Network solutions for solving constraints and treatment could be any of the following combinations:

Supplier	Solution	Accounting treatment	Regulatory result
Internal resources	Traditional tech	Capex	In RAB
	New tech	Capex	In RAB
External supplier(s)	Traditional tech	Capex	In RAB
	New tech	Capex	In RAB
	Traditional tech	Opex (lease arrangement)	Regulatory opex
	New tech	Opex	Regulatory opex

Desired outcomes – Efficiency and Competition

A contestable framework should treat distributors' and third-party DER investments neutrally to maximise distribution benefits and limit unintended consequences**.**

9 to 12 – Questions over whether distributors treat their own and competing DER equally

Problem – The distributors' DER and regulated service
9. **Distributors may misallocate costs and revenues** – Distributors might not be constrained in allocating costs and revenues between emerging contestable markets and the regulated distribution service
10. **Distributors may favour in-house or related party solutions** – Distributors may not be incentivised to explore non-internal or related-party options to deliver the distribution service.
11. **Distributors may favour network solutions** – Distributors may not be incentivised to explore non-network alternatives to delivering network support.
12. **Distributors may restrict technologies or network users** – Distributors could place restrictive connection and operation standards for the use of DER without recourse.
Desired outcomes – Efficiency and Competition
9. Distributors allocate costs and revenues efficiently between the regulated service and their contestable (unregulated) business activities.
10. Distribution services are delivered using an efficient mix of providers.
11. Distribution services are delivered using an efficient mix of network and non-network alternatives.
12. Network users are confident that they are not subject to unfair connection and operation restrictions, and have a fair opportunity to challenge decisions.

Actions – Problems 8 to 12

Actions
8.1 Commerce Commission to monitor the application of the cost allocation and related parties rules and report regularly on performance.
8.2 The Authority to monitor the operation of the equal access framework and report on the impact on competition and efficiency outcomes from distributors' involvement in contestable markets.
8.3 Authority to extend default distribution connection and use of system agreements for all types of network users. (See lines 3 and 4 above and matching recommendations.)
8.4 The Authority and Commission will promote and publicise good and bad behaviour, for example, cost allocation, related-party transactions or connection requirements.
8.5 The Authority and Commission will develop and apply principles for publication of decisions relating to investigations (including timeliness) with the outcome being to develop precedent and case law.
8.6 The Authority will provide a mechanism for parties to raise equal access concerns and the ability to escalate issues to a regulator. The mechanism will allow timely resolution of issues.
8.7 The Authority and Commission will make greater use of reputation incentives (for example, meet with distribution boards when problems emerge).
8.9 Commission and distributors to provide for greater transparency and stakeholder involvement regarding investment decisions. (See also action 7.2 above.)
8.10 Authority and Commission to develop standards of conduct for DER participants with equal access principles with accountability and consequences for non-compliance, for example mandatory minimum fines.

Implementation pathways – Problems 8 to 12

Implementation pathways *(Note – Numbers flow across issues)*

23. Electricity Authority and Commerce Commission to develop a joint work programme by early 2020 to investigate potential efficiency and competition implications from:
    - DER being treated as regulated capital;
    - risks from misallocation of costs and revenues;
    - risks from favouring in-house, related party or network solutions; and
    - risks from restricting technologies and network users. This will include developing and costing options to mitigate any efficiency and competition harm identified. For example, this could include greater flexibility for the Commission and/or the Authority to amend cost allocation or apply corporate separation where proportionate.

24. The Authority and Commission to report annually on the performance of the equal access framework, and progress with implementing the actions required to achieve the desired outcomes – June 2019.

25. The Authority and Commission to develop a dashboard showing measures of progress towards equal access , including complaints – June 2019.

26. The Commission to reinforce its expectations of the treatment of costs and revenues for regulated service under the Part 4 regime via an annual review of practices and penalties to those who break the rules – 2020.

27. The Commission to require distributor Directors to sign an annual declaration in respect of the distributors' disclosures of the extent of their efforts to investigate the use of DER for network alternatives. Any link to scale should be carefully thought through. The best opportunities to trial and learn might be small scale so this is not a place for a *de minimis* – 2020.

13 – DER access to Transmission is treated differently from access to distribution network

Problem – Alignment between distribution and transmission
The point has been made repeatedly that DER has the potential to serve multiple users with different objectives. Coordination is especially required for access between the transmission operator and the distribution operator, so they aren't at cross purposes when either calls on DER. If arrangements result in both trying to access the same DER across similar periods, security and reliability on both transmission and distribution networks could be compromised.
Desired outcomes – Efficiency and Competition
Contractual arrangements develop in a way that reliability is not undermined by multiple, conflicting calls on its use. This is a coordination challenge between procurers of DER, and it is addressed in items 2, 4 and 5.

Continues on next page

13 – DER access to transmission is treated differently from access to distribution networks

Actions
13.1 Transpower and distributors will effectively share information and coordinate on network status or aspects of operation with the potential to affect the other.
13.2 Industry (including Transpower) to develop consistent contracting and pricing principles for DER that ensure that DER is allocated and used to the highest value need (addresses issues 2 and 4)
13.3 Authority to reinforce the message that cost-reflective prices are an important step in the transformation to an efficient transactive network with widespread uptake and use of DER (that is, they are not an optional, nice-to-have feature of a well-functioning market)
13.4 Participants (including Transpower) have a secure environment for experimentation to develop, test and implement delivery of products and services within contestable frameworks
13.5 Actions 8.1−8.10 above apply
Implementation pathways *(Note – Numbers flow across issues)*
28. The Commission and Authority to note the merit of aligning equal access at network level with transmission, including a longer term vision for similar principles to apply for both transmission and network companies.
29. The Authority to report publicly the results of Transpower's trial Demand-Response programme, including technical details of what worked and what didn't work. There is the intention of informing future iteration of Transpower's programme ahead of RCP3. The reporting should include specific recommendations for distributors.

About IPAG

- The Innovation and Participation Advisory Group (IPAG) provides advice and recommendations to the Authority on issues specifically related to new technologies and business models, and consumer participation.
- It may advise the development of the Code or market facilitation measures.
- IPAG was established in 2017.

Appendix 1: Guiding documents

The IPAG took into account relevant Electricity Authority publications:

- the regulatory strategy principles
- the Code amendment principles.

The solutions range in how quickly they can be implemented, because of:

- What is possible under today's regulation or legislation; or
- What requires change in the Code, the input methodologies or even the Acts.

Regulatory strategy principles

The Electricity Authority's published regulatory strategy principles:

- As far as possible, adopt regulatory arrangements that move the problem over time to a situation where the first-best solution can be adopted
- Where possible, avoid 'one size fits all' approaches to regulation when regulating parties that may exit the regulated activity
- Adopt regulatory approaches that, over time, reveal more about the true nature of the problem and the true constraints on regulatory intervention, so more effective regulation can be designed over time as the regulatory problem and regulatory constraints are better understood. The aim is to address the cause, not the symptom
- As much as possible, avoid the slippery slope of ever-more-intrusive interventions arising from poorly designed regulatory interventions
- Avoid regulatory interventions that are not likely to be credible when adverse events occur

Continues on next page

Regulatory strategy principles (continued)

- Strive to achieve regulatory predictability, because this is particularly important when regulating high-capital-investment industries such as electricity.

These regulatory strategy principles are designed to complement the Authority's overall approach to its role, which places an emphasis on consumer choice, a coherent holistic market design and competition to deliver efficient outcomes, supplemented by effective monitoring of market outcomes and wide dissemination of information.

Code amendment principles

The Authority and its advisory groups have regard to the following Code amendment principles:

- Lawfulness
- Clearly identified efficiency gain or market or regulatory failure
- Quantitative assessment
- Preference for small-scale ‘trial and error’ options
- Preference for greater competition
- Preference for market solutions
- Preference for flexibility to allow innovation
- Preference for non-descriptive options
- Risk reporting.

Reference: Electricity Authority, *Consultation Charter,* 20 December 2010