

FlexForum: Setting the Scene

Session 1: setting the scene for workshops on integrating DER

Pre-reading

shared 27 January 2022

Welcome, introductions and ground rules

People attending the session

- The participants (see table) who have agreed to be directly involved in the process
- Geoff Sharples & Aparna Narang will facilitate the session
- Craig Evans & Matt Smith are providing secretariat support for the process

*Cristiano Marantes, Jonathan Young & Pam Walkin from Ara Ake

Shay Brazier (Revolve Energy)
John Campbell (Our Energy)
Jason Christini-Crawford (Ecotricity)
Glenn Coates (Aurora Energy)
Sam Elder - Orion Energy
Ray Hardy (Wellington Electricity)
Ed Harvey (EVNex)
Jenny Van der Merwe - Kāinga Ora
Terry Paddy (Cortexo)
Buddhika Rajapakse (Mercury)
Mark Toner/James Tipping (Vector)
Gareth Williams (SolarZero)
Fiona Wiseman (Trustpower/Manawa Energy)

Proposed Ground Rules for today and the workshop series

Preparation

- Read the materials provided in advance of the session to help us collectively make the most of our group discussions

Representation

- One representative per organisation to enable a safe space for open dialogue & equal airtime across organisations

Day of Participation

- The group collectively owns the agenda and outcomes
- Format is facilitated discussion with order of speakers based on “raised hand”, air time used and contribution
- Engage as industry experts and peers, and, be explicit when representing a corporate view
- Learn by listening, debate actively and enjoy the discussion

Post Session

- Chatham House Rules: Participants can freely use the information received, but information may not be attributed to a particular participant

Session focus: purpose, goal and discussion topics, engagement and logistics

Purpose – agree the purpose and goal

- agree the goal and outcome of this process and what success might look like
- agree the purpose of this process
- agree the discussion roadmap based on the purpose

Engagement – a plan to involve and inform people not in the room

- engagement approach and plan
- stakeholder mapping

Logistics – when, where, how

- frequency, location of sessions
- operation of process and funding

Proposed outcome of this session

At the end of this session, we want to be able to say...

1. We agree on the purpose and goal of the process
2. We have a discussion roadmap
3. We have agreed the participants and have an engagement plan to include and inform the people not in the room
4. We have agreed the logistics of the process and how the sessions will operate

Purpose – agree the purpose, goal and outcome and discussion roadmap

Engagement – a plan to involve and inform people not in the room

Logistics – when, where, how

Context: setting the scene and building a shared understanding

Agreeing the goal and outcome of this process

The goal and outcome has been revised with input from the initial session

We want to be able to say that the process led to the Aotearoa New Zealand electricity sector taking the practical and scalable steps for integrating DER into distribution networks, the electricity system and market to maximise the value of DER

To do this we need to....


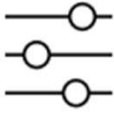






- **Identify the practical and scalable steps** required to effectively integrate DER and maximise the value of DER
- **Use an inclusive, collaborative and accessible process** to build a broad consensus and commitment to collaborate across all stakeholders for those practical and scalable steps
- **Follow through with action by taking the steps** required to integrate DER by participating in multi-party pilots to test findings and ideas in the real world, and by continuing the discussion as we learn

A future state and what success could look like

Integrating DER into distribution networks, the electricity system and market to maximise the value of that DER is necessary for households and businesses:

- to readily connect and use DER - EVs, solar, battery storage, smart equipment, energy management system etc - with no or minimal restriction
- can deliver the full value their DER can provide for their own benefit and across the electricity supply chain when and where it is needed, thereby making investment in DER more financially attractive, more likely, and so accelerating electrification and decarbonisation
- avoid as significant increases in electricity prices by minimising the transmission, distribution and large scale generation capacity investments to cater to the uplift in electricity use and peak demand from electrification
- avoid worsening reliability and quality of supply outcomes by avoiding overloading of low voltage networks from ongoing uptake of EVs and solar
- benefit from a more resilient electricity system more able to maintain supply in the face of more frequent and more adverse weather events
- to be confident about investing in electrification to support the accelerated reduction in carbon emissions because electricity networks, system and markets are prepared for the rapid uptake of DER and electrification.

Success aligns with regulatory ambitions for success by 2030

Distributed energy resources integration and investment	 <p>All consumers benefit from efficient investments in distributed energy resources, not just those who invest in them</p>  <p>Supports consumers' ability to participate, control their energy use, and contribute to NZ emission reduction</p>	 <p>Provides value to consumers by ensuring distribution network settings are fit for the future, support competition and as a result, provide more choice for consumers</p>  <p>Competition between distributed energy resources and established technology solutions is enabled</p>
Efficient network infrastructure investment and operation	 <p>Right investment in electricity infrastructure made in the right place at the right time.</p>  <p>Better signals of the true cost of network use, and better use of the grid and regional distribution network</p>	 <p>Captures the benefits of new technology and innovation, and ensures better investment in transmission distribution and generation</p>  <p>Lower costs for consumers</p>

Agreeing the purpose of this process

The purpose has been revised with input from the initial session...

To achieve the goal, the purpose of the process is twofold

1. identify the practical and scalable steps needed to integrate DER into distribution networks, the electricity supply chain and electricity markets, and maximise the value of DER
 2. build a broad consensus across the electricity sector for taking the practical and scalable steps
- *...practical and scalable steps needed to integrate DER* is about emphasising tangible outcomes and purposeful actions
 - *...into distribution networks* is because that is where the DER is
 - *...the electricity supply chain and electricity markets* is because the electricity system is a set of interrelated and mutually dependent parts which should not be considered in isolation
 - *...and maximise* refers to aggregate net economic, environmental and social benefits
 - *...the value of DER* reflects a broad meaning of value to recognise that network users, (ie, the customer and so-called behind-the-meter activities), distributors, and the wider electricity supply chain make decisions for monetary and non-monetary reasons
 - *...build a broad consensus* requires the process be inclusive, robust and for the common good, not immediate commercial interest of those directly involved

What does '*...practical steps needed to integrate DER*' practically mean?

The practical steps needed to integrate DER is meant to focus the process on the practicalities of product development and identifying **what** services DER can provide to **who**, **when**, **where**, **how** and for **how much**

The key outputs from a process which specifies what, who, when, where, how and how much would be:

- defining standard specifications for the services available from DER (relevant to what and who)
- knowing the technical and physical factors which determine those specifications, and whether a factor might need to be altered (relevant to what, when and where)
- defining standard processes for DER owners, distributors, flexibility suppliers and other electricity market participants to use (or transact) DER services (relevant to when, where, how, and how much)

Standard product specifications and processes for transacting services are the critical and necessary condition for:

- commercialising the value of DER, creating a market for the services available from DER and maximising the value of DER for DER owners and the electricity supply chain
- maintaining safe, reliable and affordable electricity networks and electricity system.

What, to who, when, where, how and how much can inform the discussion roadmap (1)

The product specifications (ie, **the what**) will be informed by things like:

- DER capability and performance
- how network design and operation determines connection to and use of the network
- planning and investment practices, particularly the operational response options to current and forecast network conditions

Who purchases the product will be informed by things like:

- the nature of the product and whether it adds value given network, system or market conditions to distributors, retailers, aggregators etc
- the alternatives available to participants across the supply chain
- the ease of procuring the flexibility service

What, to who, when, where, how and how much can inform a discussion roadmap (2)

When the product is wanted will be informed by things like:

- the network, system and market conditions at a current or future point in time that a DER service could solve
- buyer visibility of network, system and market conditions for a time period (eg, does a distributor have data to forecast network constraints or to see and respond to current conditions?)
- DER owner visibility of buyer requirements for a time period, ie information about the location of need for DER services...

Where the product is wanted will be informed by things like:

- the network, system and market conditions at specific location that a DER service could solve
- buyer visibility of network, system and market conditions at that location
- DER owner visibility of buyer requirements for that location

What, to who, when, where, how and how much can inform a discussion roadmap (3)

How the product is transacted will be informed by things like:

- processes for deployment and dispatch of DER services
- terms of trade, procurement and contracting

How much the product is worth will be informed by things like:

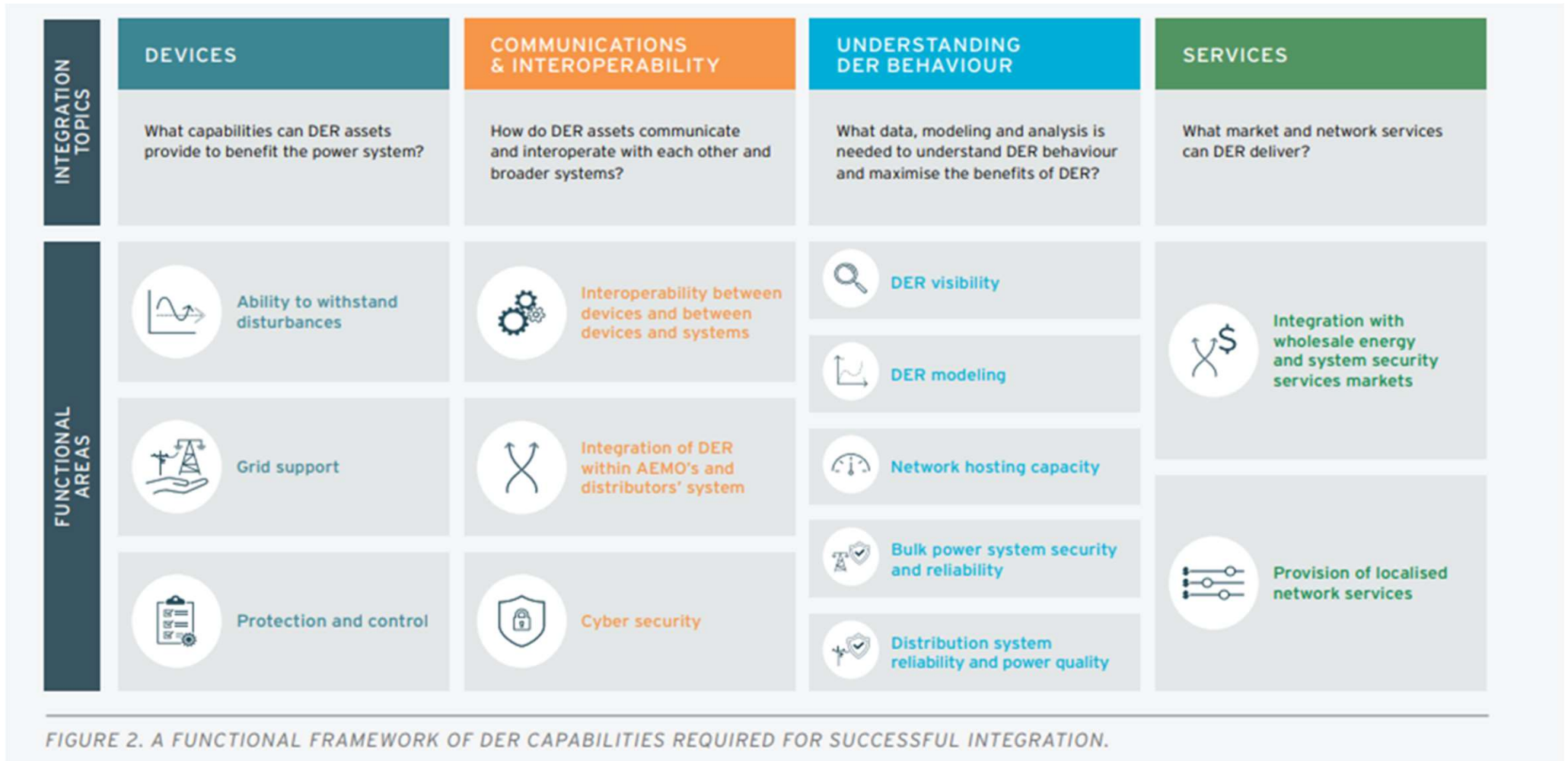
- the cost of responding to current or forecast network, system and market conditions
- the alternatives for responding to network, system and market conditions

A starting point for the list of discussion topics

What	When	Where	How	How much
DER potential	Buyer visibility of conditions & need	Buyer visibility of conditions & need	Deployment & dispatch requirements	Negotiated or administered pricing
Network design & operation/conditions	Seller visibility of place of need	Seller visibility of time of need	Procurement approaches	
Connection requirements			Terms of trade	
Network planning & investment				
System & market operation/conditions				

To **who** is a function of the product specifications (ie, the what), current or forecast network, system and market conditions (ie, when & where), the ability to procure the service (ie, how), and the options available (ie, how much)

Alternative framework for identifying topics for discussion roadmap



Source: ARENA, February 2021, State of Distributed Energy Resources Technology Integration Report, at <https://arena.gov.au/assets/2021/02/state-of-distributed-energy-resources-technology-integration-report.pdf>

Aligning the goal and outcome, the purpose and the discussion topics

The goal is for the Aotearoa New Zealand electricity sector to start taking practical and scalable steps to integrate DER into distribution networks, the electricity system and market and maximise the value of that DER

- working out how to practically integrate DER is necessary to achieve the desired future state
- an inclusive, collaborative and accessible process is necessary to build a broad consensus across all stakeholders to achieve the desired future state
- a commitment ongoing action, including multi-party pilots to test findings and ideas in the real world, is necessary to achieve the desired future state

The purpose is to identify the practical steps and build a broad consensus for taking those steps

- this means identifying what services DER can provide to who, when, where, how and for how much and using an inclusive process that builds buy-in

The discussion topics provide a structure for:

- defining standard specifications for the services available from DER
- knowing the technical and physical factors which determine those specifications
- defining standard processes for transacting services from DER

Purpose – agree the purpose, goal and outcome and discussion roadmap

Engagement – a plan to involve and inform people not in the room

Logistics – when, where, how

Context: setting the scene and building a shared understanding

The goal requires an engagement approach which builds broad support

The goal requires an inclusive, collaborative, and accessible process which builds broad consensus across all stakeholders for adopting and acting on the practical and scalable steps identified through the process

Without taking years...

The proposed engagement approach is designed to balance the need for prompt action and the need to build broad support

- a cross-sector group with diverse interests directly **involved** in the process having the detailed conversation needed to reach the outcome
- actively trying to **include** people outside the room in the process by providing multiple ways for them to participate in and contribute to the conversation and outcome
- routinely and publicly sharing updates on the emerging conclusions of the process to **inform** people outside the room of progress and direction of travel

People involved in the group – should anyone else be in the room?

Two major criteria were used for deciding who is directly involved in the process

- the group is able to produce a robust and unbiased outcome which can achieve broad support from the wider electricity sector, and regulatory and government decision-makers...this led to trying to involve people who bring diversity of view, experience and cross-sector perspective on the topic (ie, not too few)
- the group is a manageable size (ie, not too many in total or from a sectoral interest)

The goldilocks number means there are some interests not in the room

Which people not in the room need to be included in the process to obtain broad support

The engagement activities proposed for involving, including and informing people are outlined next. The activities reflect the stakeholder mapping plus some considerations

- this process is a product development and technical exercise
- this is the beginning. DER and flexibility services will not be integrated in a day. There will be much more engagement, consultation, stakeholder and customer research before things are settled

Including people not in the room

These are the ways people not in the room would be included in the process and contribute to the conversation and outcome – the intention is to provide multiple options for people to see what is going on and contribute to thinking while it is fresh

- Announcement and ongoing updates
 - write to key stakeholders informing them of the process, purpose and expected outcome, and how they can participate and contribute
 - provide regular updates (eg, monthly) on progress to a mailing list (created by asking people to signup for updates) and on a Flexforum website/page
- Use a Flexforum micro-website/page to host workshop materials – pre-reading, on-the-day presentations, session notes – for people to follow along on the journey
 - materials would be published asap (ie, 2-3 days) following each session to provide transparency and immediacy
 - the workshop notes would not be attributed to any one member of the group
- Request input on the challenges and questions being discussed by the group
 - invite practitioners and experts to share their perspective on issues and questions being discussed
 - use surveys of interested parties to obtain wider perspectives on specific issues and questions
 - provide a comments function (or email to the secretariat) on the Flexforum webpage for people to share their perspective on the views outlined in the session notes
- Hold open forums at stage gates to check in and get wider input
 - Conclude with a Pitch day to launch the conclusions and describe the next steps

Stakeholder mapping

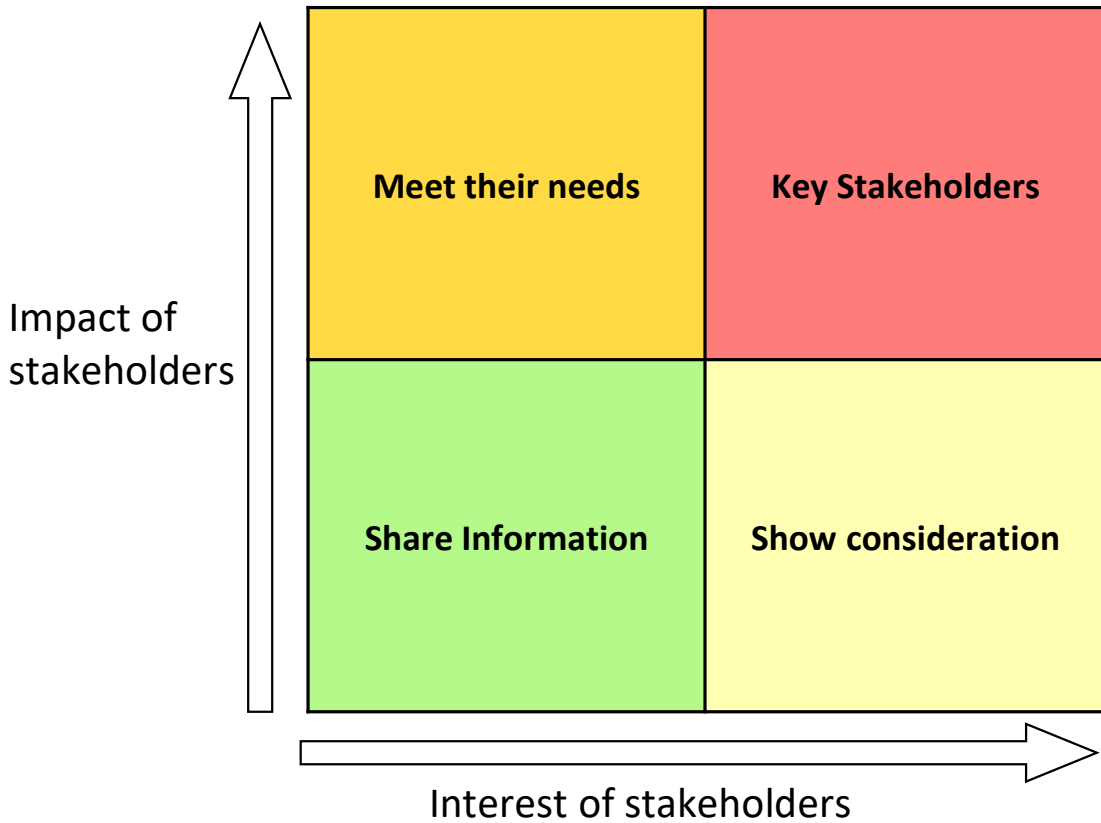
The stakeholder mapping uses a set of personas reflecting 'roles' across the electricity supply chain

A best fit approach was used as there is no bright line distinguishing personas or organisations

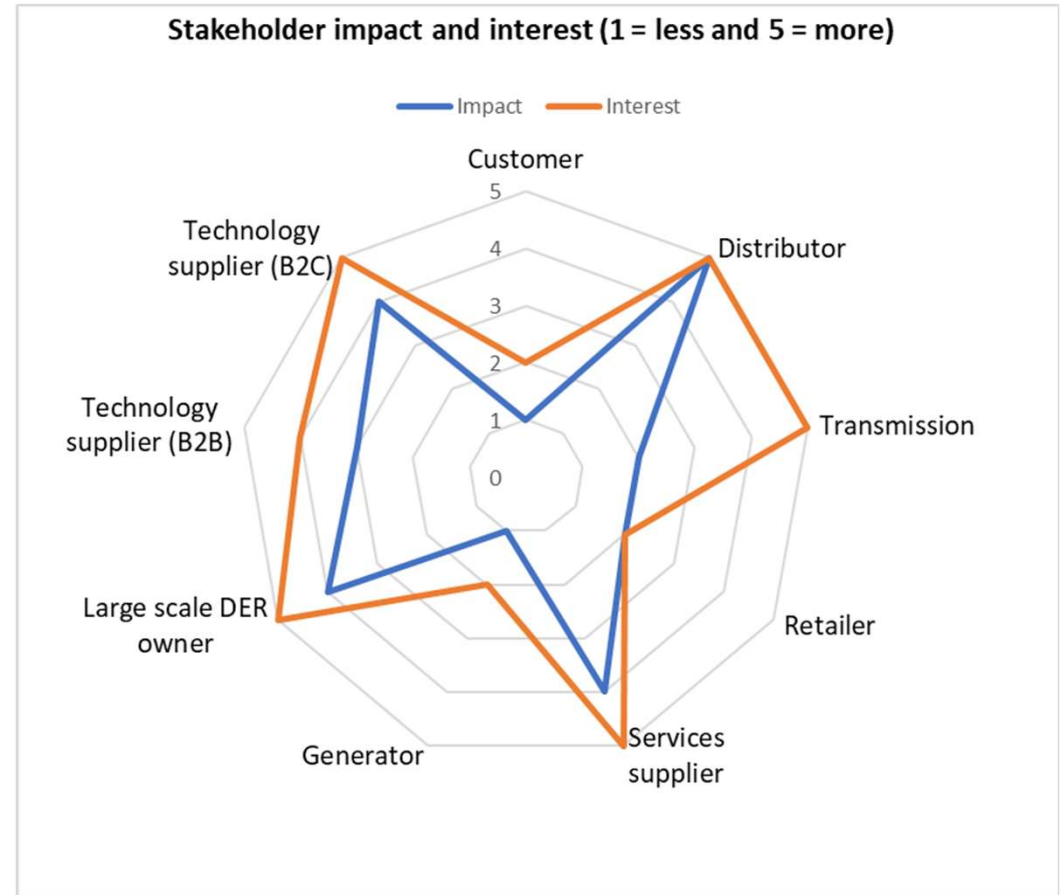
Stakeholders were mapped against a stakeholder quadrant considering their impact and interest in identifying **what** services DER can provide to **who**, **when**, **where**, **how** and for **how much**

Persona	Description
Customer	Household, commercial & industrial. May own DER
Network operator	Distributors: South Island/North Island; large/small; urban/rural Transmission: Transpower
Retailer	On-sells electricity: large/small customer base
Services supplier	B2C focus: customer experience, electricity-related services eg, peer-to-peer, load aggregation
Generator	Grid connected generation
Large scale DER owner	Distributed generation and flexible load
Technology supplier (B2B)	B2B technology focus: SCADA platforms; communications; metering equipment
Technology supplier (B2C)	Electric vehicles/EV charging; PV; battery storage; inverters; intelligent devices ²²

Stakeholder quadrant and indicative mapping of interest and impact of personas/stakeholders



www.stakeholdermap.com



Illustrative mapping of impact and interest

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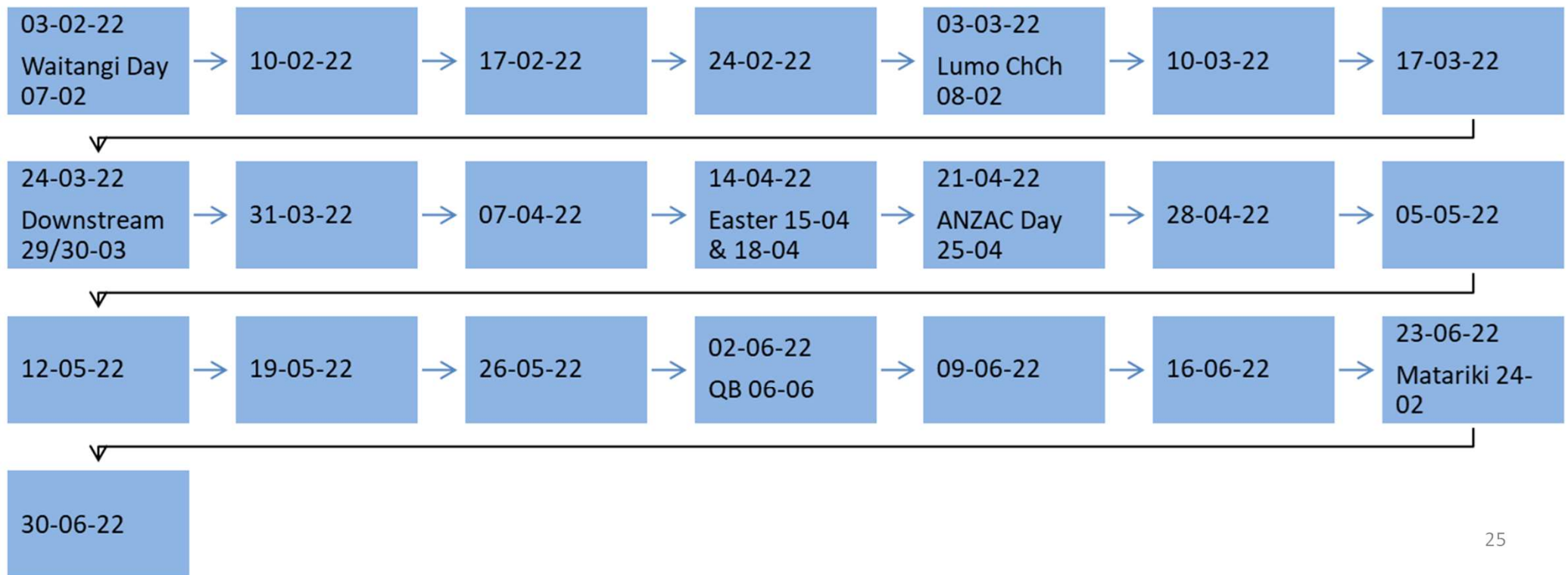
Logistics – when, where, how

Context: setting the scene and building a shared understanding

When - frequency of sessions

There are:

- 21 weeks between Thursday 3 February and Thursday 30 June
- 13 participants in the group
- 11 topics identified in the starting list for the discussion roadmap (slide 16)
- a lot of people and perspectives to include
- Omicron



Where - location of sessions

Members of the flexforum are evenly spread across the country: 4 Wellington, 4 Auckland, 4 Christchurch/Dunedin & 1 Tauranga

- suggested criteria for in-person sessions are convenient flight links for people travelling and space for up to 25 people

Virtual sessions will be used while at the red setting of the covid-19 protection framework

How – what ‘formal’ documentation of participation is needed

The proposed ground rules (slide 4) describe the basic expectations for participation

Formal terms of reference for the group could be prepared describing the goal, purpose, membership, conduct, contributions, treatment of intellectual property and commercial considerations

Do you want this?

How – funding the process

The Flexforum is intended to be a coalition of equals committed to achieving the goal by delivering the purpose

Without a 'lead' entity, the delivery of the Flexforum process will require the time and expertise of the participants, plus:

- **independent facilitation** so a neutral party to guide the discussion and ensure all perspectives are explored
- **independent secretariat support** so a neutral party produces content to support the discussion, records the insights and conclusions of the discussions, and provides a central point for engagement and wider input to the process
- **event management** support to organise each workshop and any public forums (eg, time and place, catering etc)
- **technical advice or outside perspectives** on a topic, potentially requiring an honorarium for the expert

Delivering these activities will require in-kind and financial contributions without the level of support being perceived as meaning more or less influence

Purpose – agree the purpose, goal and outcome and discussion roadmap

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Context: setting the scene and building a shared understanding

Context: setting the scene and building a shared understanding

This content is intended to provoke thinking on the proposed discussion topics and to help set the scene for subsequent discussions. It is not comprehensive, potentially not even correct, yet quite interesting

What is the scene now?

- Macro-scene. Aggregate trends and expectations for DER, electricity demand and supply and network capacity
- Micro-scene. What is DER? How is DER affecting operation of distribution networks

Stocktake of thinking on integrating DER

- Who has done what so far? How relevant is it to this exercise?

Building a shared understanding

- A glossary of terms and concepts

Macro-scene – aggregate electricity supply and demand trends

Several parties are producing useful forecasts of aggregate trends and expectations for DER, electricity demand and supply and network capacity

For example, Transpower

- [Whakamana i Te Mauri Hiko](#), March 2020
- [A Roadmap for Electrification](#), February 2021
- [NZGP1 Scenarios Update](#), December 2021

Less information is available on the potential impact on the low voltage distribution networks where much of the expected DER will be connected

Figure 3: Gross energy demand

(TWh, Accelerated Electrification)

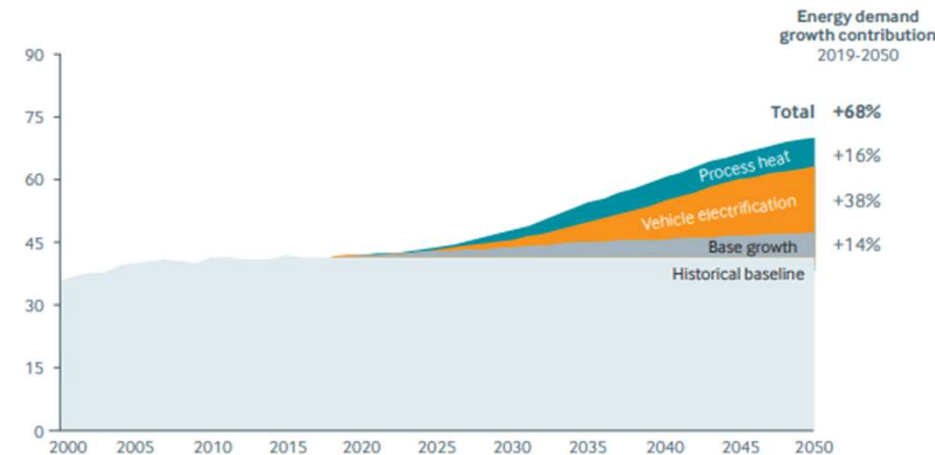


Table 1 lists some of the more important parameters reflected in the EDGS 2019 demand scenarios:

EDGS 2019 assumptions for demand scenarios					
Scenario	Reference	Growth	Global	Environmental	Disruptive
Grid energy demand					
2019 electricity demand, TWh	39	39	39	39	39
2050 electricity demand, TWh	57 ↑43%	65 ↑64%	47 ↑18%	67 ↑68%	71 ↑78%
Base demand growth, pa	0.8%	1.2%	0.2%	0.9%	0.7%
Process heat demand, TWh	1.5	1.9	1.2	6.5	13.3
Electric vehicles demand, TWh ³	4.1 (44%/13%)	5.0 (44%/13%)	3.2 (44%/13%)	7.6 (74%/45%)	7.6 (74%/45%)
Solar PV output, TWh ⁴	2.3 (22%) ⁵	2.8 (27%)	0.9 (9%)	4.6 (45%)	4.6 (45%)
Tiwai smelter closure	No	No	No	No	No
Grid peak demand					
2019 peak demand, GW	6.3	6.3	6.3	6.3	6.3
2050 peak demand, GW	8.5 ↑34%	9.8 ↑56%	7.1 ↑12%	9.6 ↑53%	10.2 ↑62%

Table 1 – Some important parameters for each of the EDGS 2019 demand scenarios

Southern California Edison Pathway 2045 report highlights the importance of DER integration

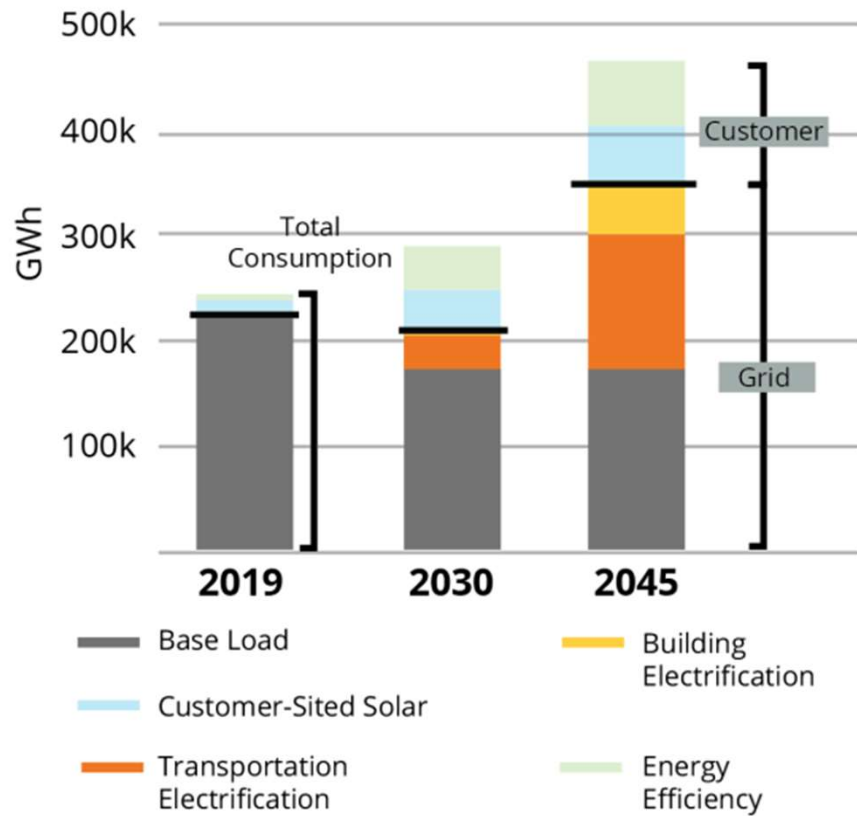
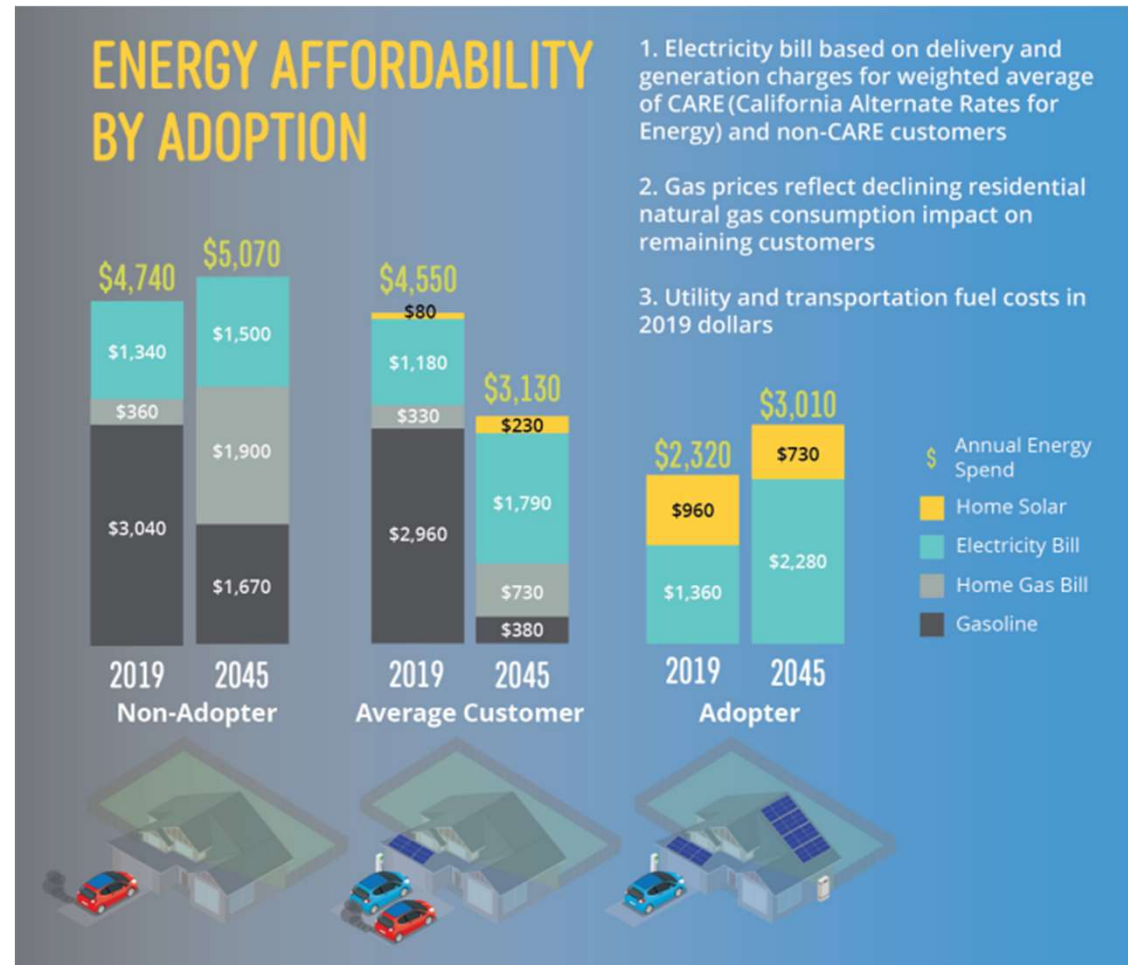


Figure 5: Increased demand is met through grid and customer-sited (distributed) resources

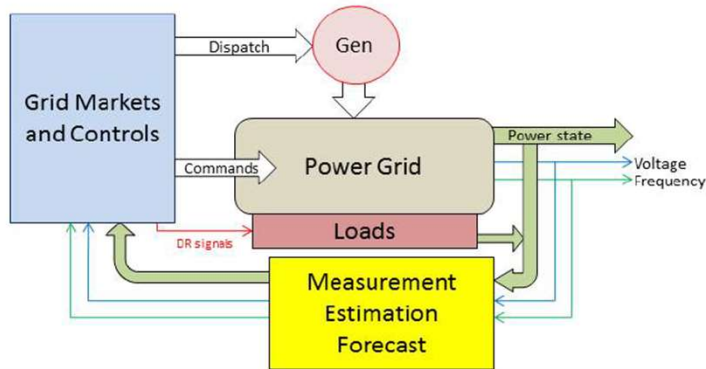
Source: <https://www.edison.com/home/our-perspective/pathway-2045.html>



The fundamentals of security constrained dispatch will need to evolve with uptake and integration of DER

Source: [Pacific Northwest National Labs: A Reference Model for Distribution Grid Control in the 21st Century](#)

The fundamental control paradigm for the 20th Century grid was dynamic balancing of generation and load in a load-following manner by dispatching generation, subject to limits on system frequency and voltage levels. In practice this meant control of grid power state.



The evolving paradigm for grid control in the 21st Century is dynamic balancing of generation, load and DER in a hybrid source-and-load following manner by dispatching some generation, and using storage and load reduction, subject to bounds on system frequency, voltage levels, and DER capacities. In practice, this means control /coordination of grid power state, energy state, and load state.

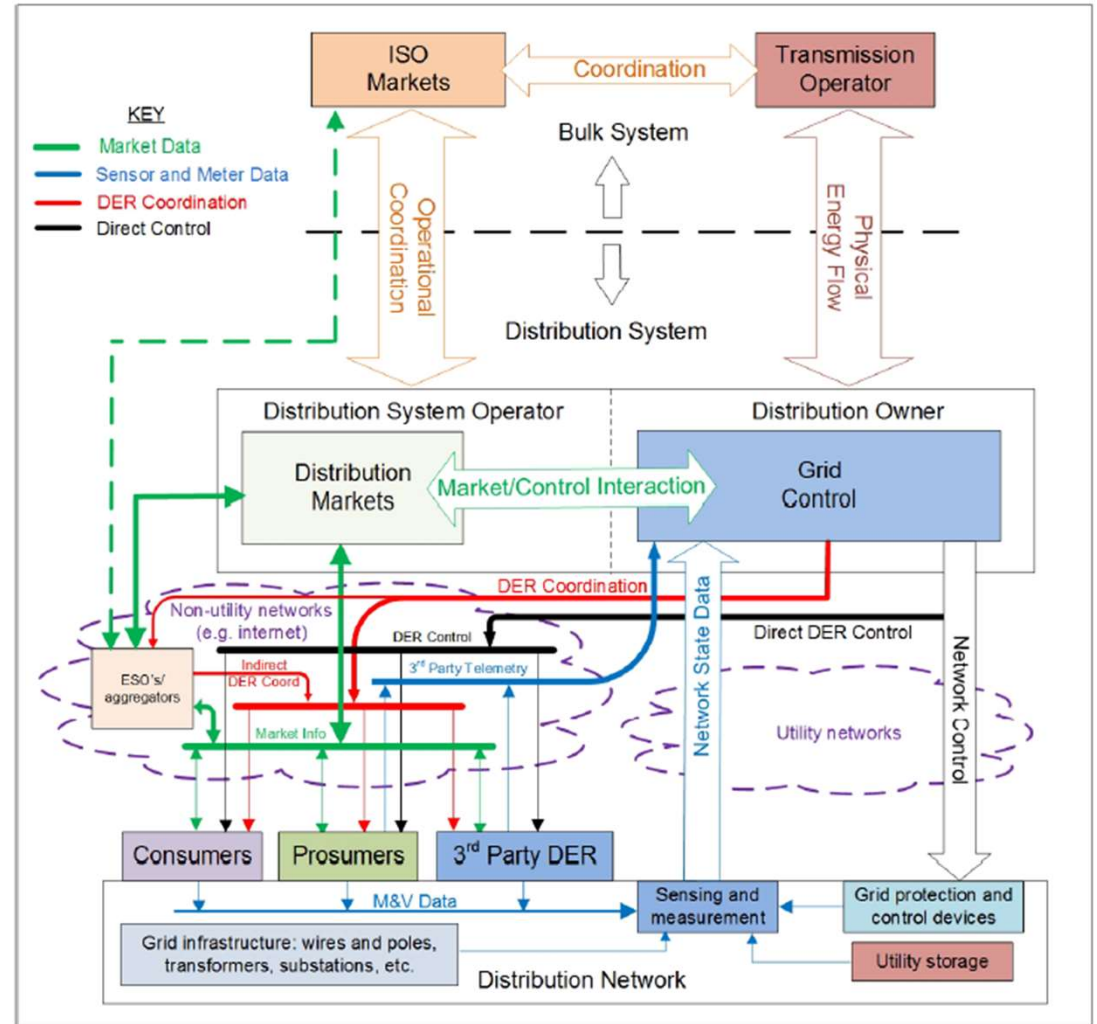
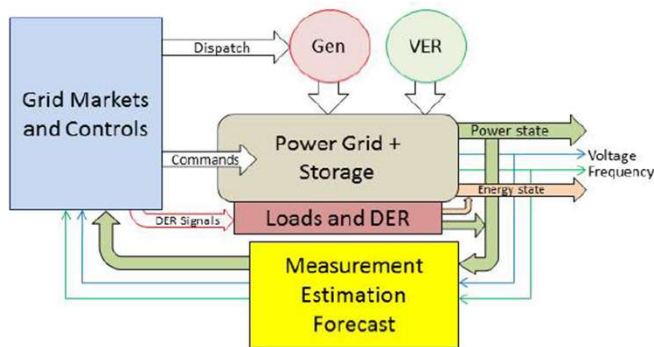


Figure 2. Advanced Distribution Reference Model Control Environment

What is DER?

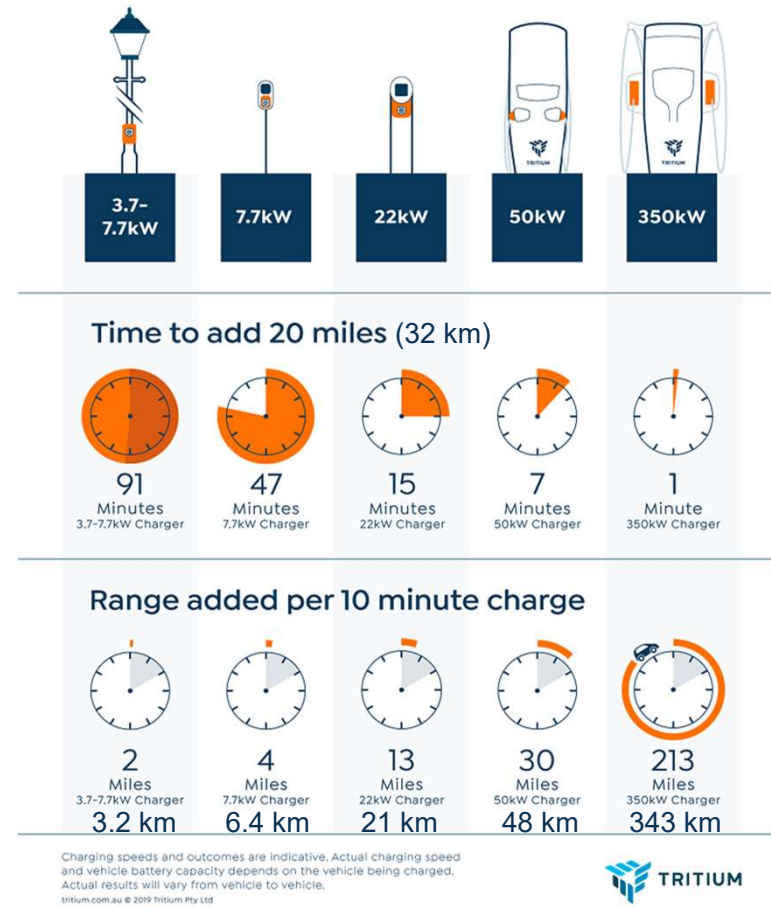
DER is a device connected to the local distribution network that can either use, produce or store electricity to provide an electricity-related service to the customer or within the electricity supply chain

- *...a device connected to the local distribution network* includes all electricity using or producing devices and equipment from solar PV to toasters
- *...that can either use, produce or store electricity* means the device will be using the network service to perform its primary function, whether to transport electricity produced from the sun or cooking bread
- *...to provide an electricity-related service to the customer or within the electricity supply chain* focuses on the electricity-related services available from the device providing the distinction between DER and devices which cannot supply electricity-related services (eg, most toasters).

Basic DER facts - electric vehicles

EV AC Onboard Charger Rating

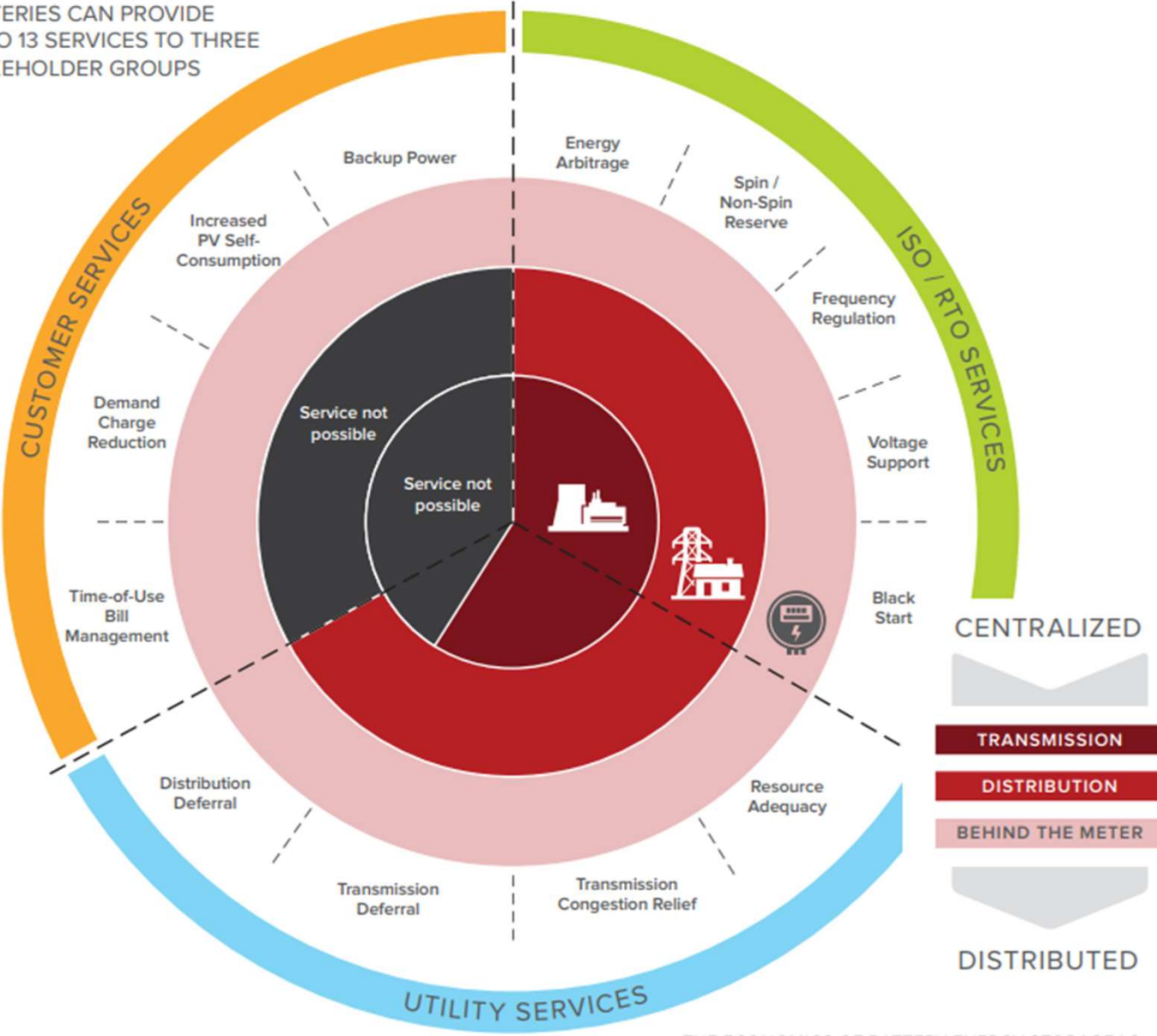
Renault Zoe Q	43	Mercedes EQA 250	11	Peugeot e-Traveller	7.4
Lucid Air	22	Mercedes EQC	11	Renault Kangoo	7.4
Nissan Ariya	22	Mercedes EQV 300	11	Vauxhall Corsa-e	7.4
Porsche Taycan	22	Mini Electric	11	Vauxhall Vivaro-e Life	7.4
Renault Zoe	22	Polestar 2 LRDM	11	Hyundai Ioniq	7.2
Renault Zoe ZE50	22	Porsche Taycan	11	Kia e-Niro	7.2
Smart EQ	22	Renault Magane E-Tech	11	Kia Soul EV	7.2
Tesla MS	22	Tesla Cybertruck	11	Seat Mii	7.2
Tesla MS	16.5	Tesla M3 LR	11	Skoda Citigo	7.2
Tesla MXLR	16.5	Tesla M3 SR	11	Skoda Enyaq	7.2
Audi e-tron	11	Tesla MY LR	11	Volkswagen e-Up!	7.2
Audi e-tron GTRS	11	Vauxhall Corsa e (optional)	11	Volkswagen eGolf	7.2
BMW i3 & i3s	11	Vauxhall Mokka-e	11	VW ID.3 Pure	7.2
BMW i4	11	Vauxhall Vivaro e	11	BMW i3 pre-2016	7
BMW iX	11	Volvo XC40	11	Hyundai Kona	7
BMW iX3	11	VW ID.3 Pro	11	SAIC MAXUS e Deliver 3	7
CUPRA Born	11	VW ID.4 1st	11	Honda E	6.6
Fiat 500e	11	Citroen e-C4	7.4	Lexus UX 300e	6.6
Ford Mustang Mach-E	11	Citroen e-SpaceTourer	7.4	Mazda MX-30	6.6
Hyundai Kona	11	DS 3 Crossback	7.4	MG MGS LR	6.6
IONIQ5	11	Mercedes EQC	7.4	MG ZS EV	6.6
Jaguar I-Pace	11	Peugeot e-2008	7.4	Nissan ENV200	6.6
Kia eNiro 4+	11	Peugeot e-208	7.4	Nissan Leaf	6.6
Kia EV6 LR	11	Peugeot e-Rifter	7.4		



Sources: EV AC onboard charger rating image sourced from <https://viridianev.co.uk/> and EV charger capacity and range added image sourced from <https://tritiumcharging.com/>

Basic DER facts - battery storage

BATTERIES CAN PROVIDE UP TO 13 SERVICES TO THREE STAKEHOLDER GROUPS



Source: [RMI-TheEconomicsOfBatteryEnergyStorage-FullReport-FINAL.pdf](#)

Micro-scene – practical operation of distribution networks

How do distribution networks work?

This [Managing Distribution “in a nutshell”](#), presentation to IPAG, June 2018, was a useful overview for people without an electrical engineering degree

These USA-sourced distribution systems and planning training materials provide a comprehensive distribution systems 101 - <https://emp.lbl.gov/publications/southeast-regional-training>

Stocktake of thinking on integrating DER

A stocktake of thinking on integrating DER from Aotearoa New Zealand and selected international reference points is presented in a separate document shared with this pre-reading

The stocktake is provided as a work in progress. Resources and references can be added through the process

A glossary of terms and concepts

A glossary will help build a shared understanding of the practicalities of integrating DER and flexibility services

- terms and concepts identified and defined through the discussion will be recorded in the glossary

An example of what the glossary could look like is provided next. The actual glossary will be presented in a more user friendly format

- the example is meant to highlight the lexicographical challenge and importance of having a shared understanding of terminology and concepts

One example for the glossary of terms and concepts

Term	Meaning (and source)	Status
Distributed energy resources	<p>Distributed Energy Resources (DERs) – small-scale, distribution-connected assets that either reduce load or export more power – whether generation (like solar panels), storage (like batteries), or automated load management devices.</p> <p>IPAG review of the Transpower demand response scheme, see page 5 at https://www.ea.govt.nz/assets/dms-assets/28/Transpower-DR-programme-review-memo.pdf</p>	<ul style="list-style-type: none"> • New • Being discussed • Agreed
Distributed energy resources	<p>Distributed energy resource (such as solar PV, distributed generation, electric vehicles, batteries, home energy management systems, and includes demand response)</p> <p>ENA Network transformation roadmap, page 1 at https://www.ena.org.nz/resources/publications/document/483</p>	
Distributed energy resources	<p>Distributed energy resources, or ‘DER’, are smaller–scale devices that can either use, generate, or store electricity and form a part of the local distribution system, which serves homes and businesses. DER can include renewable generation, energy storage, electric vehicles (EVs), and technology to manage load at the premises. These resources operate for the purpose of supplying all or a portion of the customer’s electric load and may also be capable of supplying power into the system or alternatively providing a load management service for customers.</p> <p>Western Australia DER Roadmap, Glossary, page 76 at https://www.brighterenergyfuture.wa.gov.au/wp-content/uploads/2020/10/DER-Roadmap_April2020.pdf</p>	

end