

FlexForum: session IV

Pre-reading for 17 March 2022 session

Shared 11 March 2022

Session overview – topics and decisions

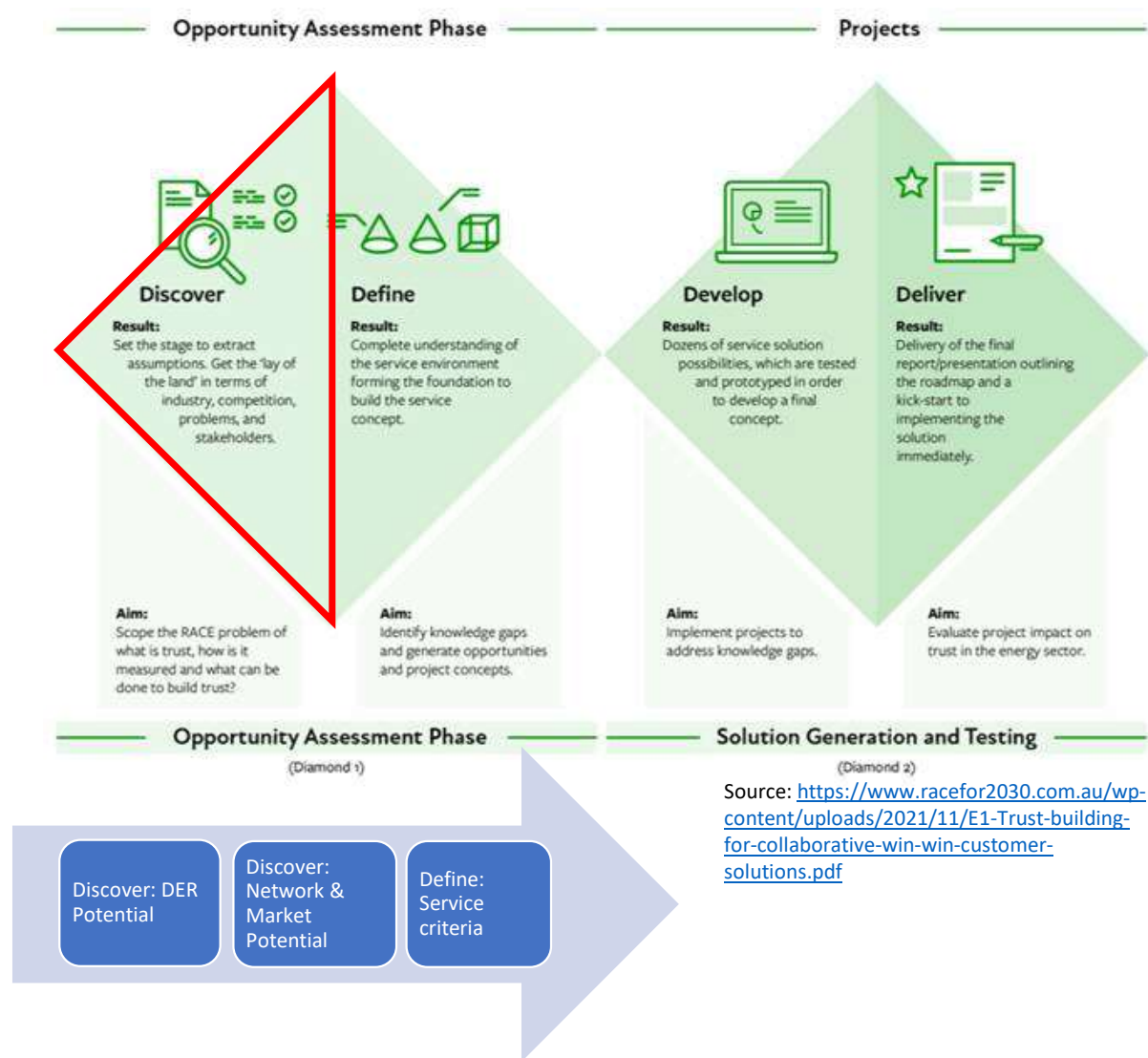
Three main topics

1. Network & Market potential. Discussion roadmap topic 2
 - a) No decision
2. Workplan, engagement and communications planning
 - a) Approve proposed workplan
3. Administration – governance, budget and funding
 - a) Update

Discussion roadmap: starting with discover and define stages

Workshop focus is discovering Network & Market potential (ie, the buyer side)

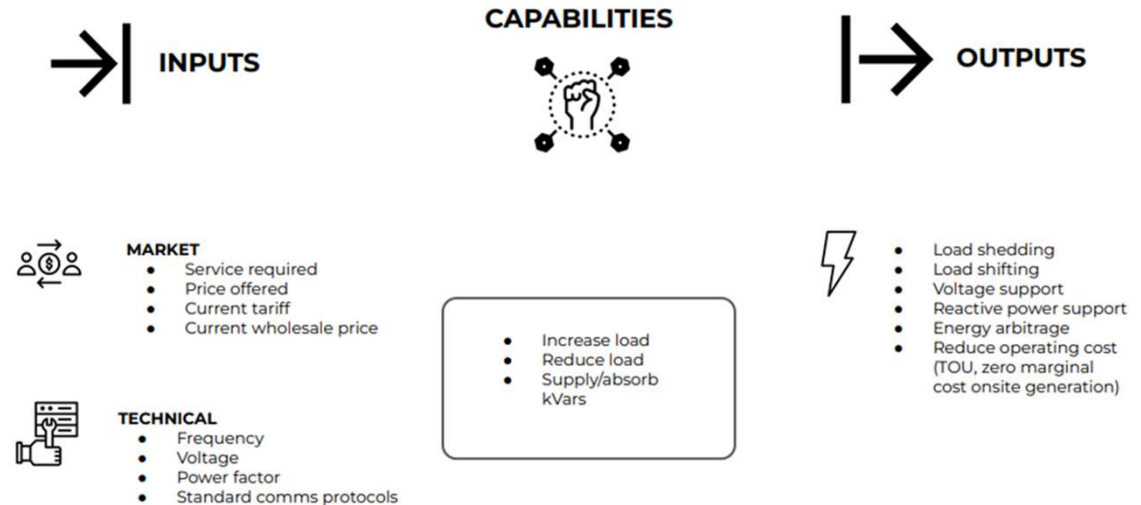
- mirror of discussion of DER potential (ie, the seller side)
- From the viewpoint of a Network Operator with a range of specific operational needs, what are the characteristics of the services required to satisfy those needs?
- From the viewpoint of a Market Participant with a range of specific market needs, what are the characteristics of the services required to satisfy those needs?



Focus of Network & Market potential discussion

Network operator and market participant perspectives of the performance criteria and associated conditions requiring a network/market response:

1. distribution network
2. transmission network and System Operator
3. Market Participant



Source: revolve

The focus is...

What outputs do Network Operators & Market Participants need to respond to network/market conditions

- What network and market conditions require a response? For example, high spot prices, frequency excursions, thermal constraints...
- What are the characteristics (or performance criteria) of the response given the conditions?
- What information is used to determine the response is needed and what signal is needed to initiate the response?

Network operator and market participant responses to network & market conditions can be delivered as a service providing a potential DER revenue stream

Sapere listed these network and market value streams in two separate reports

- Energy arbitrage
- Resource adequacy (generation)
- Resource adequacy (network)
- Ancillary services (system-level and distribution)
 - Instantaneous reserve
 - Frequency keeping
 - Voltage
 - Harmonics
 - Inertia
 - Black start

Table 2: DER capability matrix for 2035

	Frequency keeping	Instantaneous reserve	Resource adequacy – offset thermal peaking	Resource adequacy – offset lines and transmission	Voltage management	Harmonic filtering	Inertia	Resource adequacy – hydro firming
EV storage	✓	✓	✓	✓	X	Cost	✓	X
EV storage + PV	✓	✓	✓	✓	✓	Cost	✓	✓
Demand response - residential	X	✓	✓	✓	X	Cost	✓	X
Battery - residential	✓	✓	✓	✓	✓	Cost	✓	X
Battery - commercial	✓	✓	✓	✓	✓	Cost	✓	X

Sapere has produced 2 separate reports identifying value streams / services which could be supplied using DER.

- Sapere, Distributed energy resources – understanding the potential, July 2020, https://www.transpower.co.nz/sites/default/files/publications/resources/Distributed%20Energy%20Resources%20-%20Understanding%20the%20potential%20-%20main%20report%20-%20final_0.pdf
- Sapere, Cost-benefit analysis of distributed energy resources in New Zealand, A report for the Electricity Authority, September 2021, at <https://www.ea.govt.nz/assets/dms-assets/28/Cost-benefit-analysis-of-distributed-energy-resources-in-New-Zealand-Sapere-Research-Group-final-13September.pdf>

Network/market conditions have different response characteristics

Examples...

- Contingency reserves (generation adequacy) requires capability to reduce load in <15 minutes for up to 60 minutes
 - procured by the System Operator for the power system
- Voltage support (ancillary service) requires capability to raise/lower load in <60 seconds for seconds to minutes
 - procured by the System Operator for the power system and distributors for their networks
- Network and Generation capacity (adequacy) requires capability to reduce load in <60 minutes for 2-4 hours
 - procured by the grid owner and distributors

Criteria for ancillary services currently [procured by the System Operator](#) are defined under the Code

Demand Side Management Strategies	Grid Services	Description of Building Change	Key Characteristics	
Efficiency	Generation: Energy	Persistent reduction in load. Interval data may be needed for M&V purposes. This is not a dispatchable service.	Duration	Continuous
	Generation: Capacity		Load Change	Long term decrease
	T&D: Non-Wires Solutions		Response Time	N/A
Shed Load	Contingency Reserves	Load reduction for a short time to make up for a shortfall in generation.	Duration	Up to 1 hr
	Generation: Energy	Load reduction during peak periods in response to grid constraints or based on time-of-use (TOU) pricing structures.	Load Change	Short term decrease
	Generation: Capacity		Response Time	<15 min
T&D: Non-Wires Solutions	Event Frequency		20 times per year	
Shift Load	Generation: Capacity	Load shifting from peak to off-peak periods in response to grid constraints or based on TOU pricing structures.	Duration	2 to 4 hrs
	T&D: Non-Wires Solutions		Load Change	Short term shift
	Contingency Reserves		Response Time	<1 hour
Modulate Load	Frequency Regulation	Load modulation in real time to closely follow grid signals. Advanced telemetry is required for output signal transmission to grid operator; must also be able to receive automatic control signal.	Event Frequency	<100 hrs per yr/seasonal
	Voltage Support		Duration	Up to 1 hr
	Ramping		Load Change	Short term shift
Generate	Ramping	Distributed generation of electricity to dispatch to the grid in response to grid signals. This requires a generator or battery and controls.	Response Time	<15 min
	Generation: Energy		Event Frequency	20 times per year
	Generation: Capacity		Duration	2 to 4 hrs
	T&D: Non-Wires Solutions	Distributed generation of electricity for use onsite and, when available, feeding excess electricity to the grid. This is not a dispatchable service, though metered data is needed.	Load Change	Short term shift
	Generation: Energy		Response Time	N/A
	Generation: Capacity		Event Frequency	Daily
	T&D: Non-Wires Solutions		Duration	Seconds to minutes
	Generation: Energy		Load Change	Rapid increase/decrease
	Generation: Capacity		Response Time	<1 min
	T&D: Non-Wires Solutions		Event Frequency	Continuous
	Generation: Energy		Duration	Sub-seconds to seconds
	Generation: Capacity		Load Change	Rapid increase/decrease
	T&D: Non-Wires Solutions		Response Time	Sub-seconds to seconds
	Generation: Energy		Event Frequency	Continuous
	Generation: Capacity		Duration	Seconds to minutes
	T&D: Non-Wires Solutions		Load Change	Rapid increase/decrease
	Generation: Energy		Response Time	Seconds to minutes
	Generation: Capacity		Event Frequency	Continuous
	T&D: Non-Wires Solutions		Duration	Seconds to minutes
	Generation: Energy		Load Change	Rapid dispatch
	Generation: Capacity		Response Time	Seconds to minutes
	T&D: Non-Wires Solutions		Event Frequency	Daily
	Generation: Energy		Duration	2 to 4 hrs
	Generation: Capacity		Load Change	Dispatch/negative load
	T&D: Non-Wires Solutions		Response Time	<1 hour
	Generation: Energy		Event Frequency	<100 hrs per yr/seasonal
	Generation: Capacity		Duration	Entire generation period
	T&D: Non-Wires Solutions		Load Change	Reduction/negative load
	Generation: Energy		Response Time	N/A
	Generation: Capacity		Event Frequency	Daily

Source: Locational value of distributed energy resources, February 2021, at https://eta-publications.lbl.gov/sites/default/files/lbnl_locational_value_der_2021_02_08.pdf, see Appendix B

Examples of the conditions and criteria for procuring network adequacy services

Aurora ROI for non-network electricity capacity support options in the upper Clutha area, August 2019

Capacity support for Upper Clutha Region. Supplied by 2 x 66kV lines from Cromwell GXP (serving Wanaka & surrounding area)

Seeking 1 MW up to 30 MW with minimum bid of 100 kW for several hours

- Manage loading in contingency situations (e.g. 1 circuit experiences an outage coincident with peak load)
- Delay or avoid upgrade to transformers

DG or DR (single site or aggregated)

<https://www.auroraenergy.co.nz/assets/Files/Disclosures/Information-Disclosures/ROI-Non-Network-Electricity-Capacity-Support-Options-Upper-Clutha-Area-FINAL-27-8-2019.pdf> (33 pages)

Powerco ROI for network support options for the Coromandel region, March 2021

Capacity support for the north of Tairua on the Coromandel Peninsula. Supplied by 66kV circuits from the Kopu GXP to Tairua, Whitianga and Coromandel zone substations.

Seeking backup supply and peak reduction across three locations

- Manage loading in contingency situations (e.g. 1 circuit experiences an outage coincident with peak load)
- Delay or avoid upgrade to sub-transmission circuits or substation equipment

DG or DR (single site or aggregated). 10-20 year contract term

<https://www.powerco.co.nz/-/media/project/powerco/powerco-documents/community-partnerships/network-support-options.pdf>

(12 pages)

Vector ROI for non-wires alternative in wider Warkworth region, January 2022

Capacity support for Warkworth region. Supplied by 2 long 33kV circuits from the Wellsford GXP.

Seeking 3-5 MW with a 1MW minimum block

- Manage loading in contingency situations (e.g. 1 circuit experiences an outage coincident with peak load)
- Delay or avoid upgrade to sub-transmission circuits or substation equipment

DG or DR (single site or aggregated).

From winter 2023 for up to 10 years

https://blob-static.vector.co.nz/blob/vector/media/news-articles/roi_nonwiresalternative_warkworth_17january2022.pdf

(17 pages)

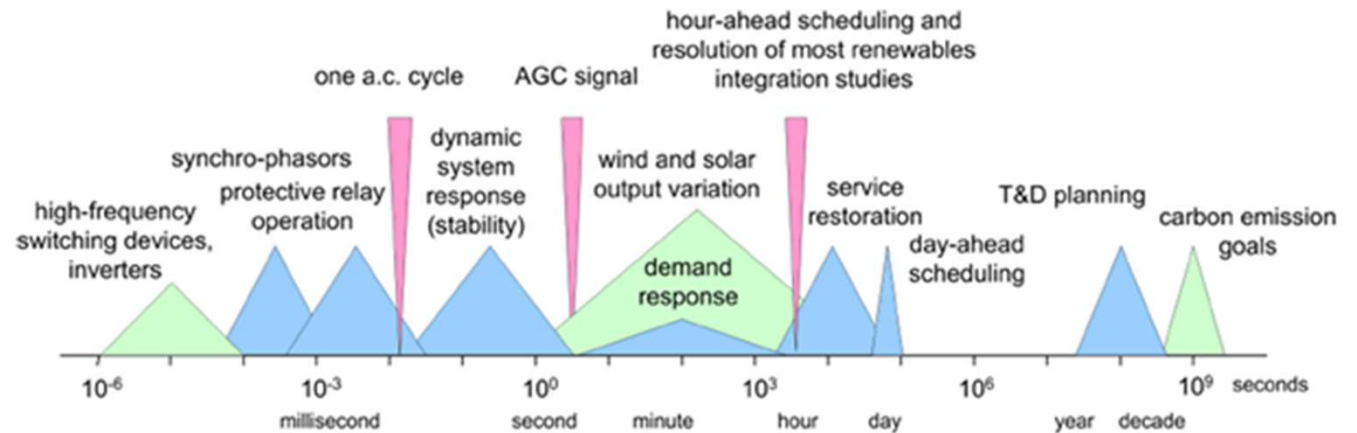
The planning horizon and immediacy and duration of the operational response drive visibility, data, and communications requirements

In general there are reactive (short-term) and pro-active (long-term) planning horizons which drive network and market operation and asset management

- reactive responses to fast-changing conditions require operational decisions using more real-time visibility, data availability, and automated systems
- proactive responses to foreseeable conditions require forecasting and planning decisions using historical data

The planning and operational time horizons determine the options for procurement and dispatch of services, including those delivered using DER

Figure 21: Grid Operational Time Periods



Source: CIEE/ A. von Meier

Proposed FlexForum workplan

Objectives

1. Identify the minimum specifications of the services that DER can provide, to who, when, where, how and for how much
2. Identify the practical, scalable, and no regrets steps to use the services that DER can provide
3. Support ongoing learning and collaboration across the electricity sector on real world deployment of solutions to realise the benefits of DER, including identifying and resolving barriers.

Focus Area	Objective	Questions to answer	Target output	Effort
A. Flexibility needs <i>What and why (drivers)</i>	1	DER potential & Network and Market potential <ul style="list-style-type: none"> • What are the energy system needs and value drivers for flexibility? • What response is required to meet the need? • What assets can provide that response? 	See examples slide	Low
B. Product definitions <i>What and how (technical requirements)</i>	1	High level requirements for need cases and value drivers <ul style="list-style-type: none"> • What are the existing/future products used to meet the energy system needs? • What are the high-level technical parameters and requirements of these products? 	See examples slide	Low
C. Market access and participation <i>Who and how (commercial)</i>	1	Contracting principles <ul style="list-style-type: none"> • Who facilitates the markets/access to value streams? • Who can participate in the markets? • How are these markets managed (contractual/technical/platform/settlement) and how might this evolve? • How can each party maximise access and participation in flexibility? 	TBC	High
D. Market opportunities <i>Where and for how much</i>	1	Payment and compensation mechanisms <ul style="list-style-type: none"> • What is the indicative value and variation between services by location? • How are the opportunities for flexibility evaluated and signaled in a transparent way across the electricity system? • What factors into optimisation and value stacking against these value streams? • Where are there likely to be conflicts/synergies and how are they managed? 	TBC	High
E. Practical, scalable and least-regret steps	2, 3	Implementation <ul style="list-style-type: none"> • What are the existing opportunities for flexibility we can promote? • What are the enablers (e.g. visibility) for using emerging/future flexibility products? • What are the key learnings and actions that individual parties or the sector can take forward? • Can any principles for market development can be agreed now? 	Report summarizing learning and recommendations	Medium
F. Support ongoing learning and collaboration	3	Delivery and next steps <ul style="list-style-type: none"> • Where are there remaining knowledge gaps/opportunities to explore potential solutions? • Which of these could the FlexForum members address through further research/ demonstration projects and how are these funded? • What is the best way to coordinate and drive progress across NZ going forward? 	Project briefs for members to take forward Agreed next steps for the group and/or members	Medium

Timeline

	Meeting 0 (17-12)	1 (03-02)	2 (17-02)	3 (03-03)	4 (17-03)	5 (31-03)	6 (14-04)		7 (28-04)		8 (12-05)	9 (26-05)	10 (09-06)	
Topic	Dec	Feb		March			April		May			June		
Governance	Draft TOR	Agree TOR and budget					Mid point review					Establish next steps	Wrap up	
Engagement			Stakeholder mapping				Workshop prep	Engagement workshop				Event prep		Dissemination event
A. Flexibility needs <i>What and why (drivers)</i>				DER potential (a provider view)	Network & Market potential (a purchaser view)	Value streams and capability			Seek feedback	Address feedback				
B. Product definitions <i>What and how (technical requirements)</i>					Need cases	High level requirements			Seek feedback	Address feedback				
C. Market access and participation <i>Who and how (commercial)</i>							Contracting principles				Seek feedback	Address feedback		
D. Market opportunities <i>Where and for how much</i>										Payment & compensation	Seek feedback	Address feedback		
E. Practical, scalable and least-regret steps											Implementation			
F. Support ongoing learning and collaboration												Establish next steps	Bring it together	Seek feedback

Key questions:

- The timeline is ambitious. Is it realistic for the group to resolve the questions and get input (ie, engagement) in the time allowed?
- Is anything missing from the topic list?
- Are sufficient resources available across the group to deliver the outputs?
- Is the engagement approach aligned with the purpose and goal?
- Is the suggested engagement logistically possible?

Example outputs

A. Flexibility needs

DSO flexibility needs and products summary

Flexibility Products	Reinforcement Deferral	Planned Maintenance	Unplanned Interruptions	
			Pre-Fault Response	Post-Fault Response
Value Drivers	The present value of deferring capital expenditure	Managing unplanned interruption risk during planned maintenance	Customer Interruption (CI) and Minutes Lost (CML) incentives	Avoided cost of temporary generation and potentially CMLs
2023 Flexibility Potential (MW)	206	Available to eligible DER capacity		
High-Level Requirements	Location Specific	Yes		
	Response Time	30 mins maximum		<10 mins preferred, 30 mins maximum
	Response Duration	Full availability window – case dependent. Pro-rated payment if available for part of window		3 hours. Pro-rated payment if available for part of window
	DER Type	Generation, Storage and Load Reduction		Generation and Storage

<https://smartgrid.ukpowernetworks.co.uk/wp-content/uploads/2019/11/futuresmart-flexibility-roadmap.pdf>

B. Product definition Flexibility needs example

Service Parameter	DNO Flexibility Products				
	Sustain	Secure (Scheduled)	Secure (Dispatched)	Dynamic	Restore
When required?	Scheduled forecast overload	Pre-fault / peak shaving		Network abnormality / planned outage	Network Abnormality
Risk to Network	Low	Medium		High	High
Utilisation Certainty	High	High		Low	Low
Frequency of Use*	High	Medium		Low	Low
Minimum Flexible Capacity	0-50kW				
Minimum Utilisation Duration Capability	30 mins				
Minimum Utilisation	15 - 30 mins				
Maximum Ramping Period	N/A	N/A	<15 mins	<15 mins	<15 mins
Availability Agreement Period	N/A	Contract stage	Week ahead	Contract stage if applicable	Contract stage if applicable
Utilisation Instruction Notification Period	Scheduled in advance**	Contract stage	Real Time	Real Time	Real Time

* Frequency is location specific defined at the point of procurement

** Utilisation requirements may differ to schedule and be instructed in real time

<https://www.energynetworks.org/industry-hub/resource-library/open-networks-2020-ws1a-p3-final-implementation-plan.pdf>

Focus Area

Relevant material

C. Market access and participation

Who and how (commercial)

https://www.ofgem.gov.uk/sites/default/files/docs/2019/09/ofgem_fi_flexibility_platforms_in_electricity_markets.pdf
https://smartgrid.ukpowernetworks.co.uk/wp-content/uploads/2019/11/UKPN_Flex_Consultation_Responses.pdf

D. Market opportunities

Where and for how much

<https://www.energynetworks.org/assets/images/Resource%20library/ON20-WS1A-P1%20CEM%20Tool%20v1.0.xlsm.zip>

Engagement and communications planning update

Update

- FlexForum webpage demonstration (on-the-day)
- A stakeholder engagement plan is being developed – details depend on the workplan

Example engagement activities:

- **Targeted Workshop:** 2-3 hour virtual workshop, providing an overview of progress to date, potential impact/benefit to workshop participants, and seek input and feedback into the key outcomes presented.
- **Seek Feedback:** One-to-one or one-to-many engagements on specific areas of focus/interest/ area of expertise, with the clear objective of providing targeted and curated information, gaining buy in and seeking feedback on specific areas of expertise/interest.
- **Key Outcome Updates:** Providing curated and targeted updates to key stakeholders on progress to date, next steps and opportunities for engagement and feedback.

Administration – governance, budget & funding

Update. No specific content