

FlexForum: session III

Pre-reading for 3 March 2022 session

Shared 24 February 2022

Session overview – topics and decisions

Three main topics

1. DER potential. Discussion roadmap topic 1
 - a) No decision
2. Stakeholder engagement
 - a) Approve the stakeholder engagement plan to inform and involve stakeholders
3. Administration – governance, budget and funding

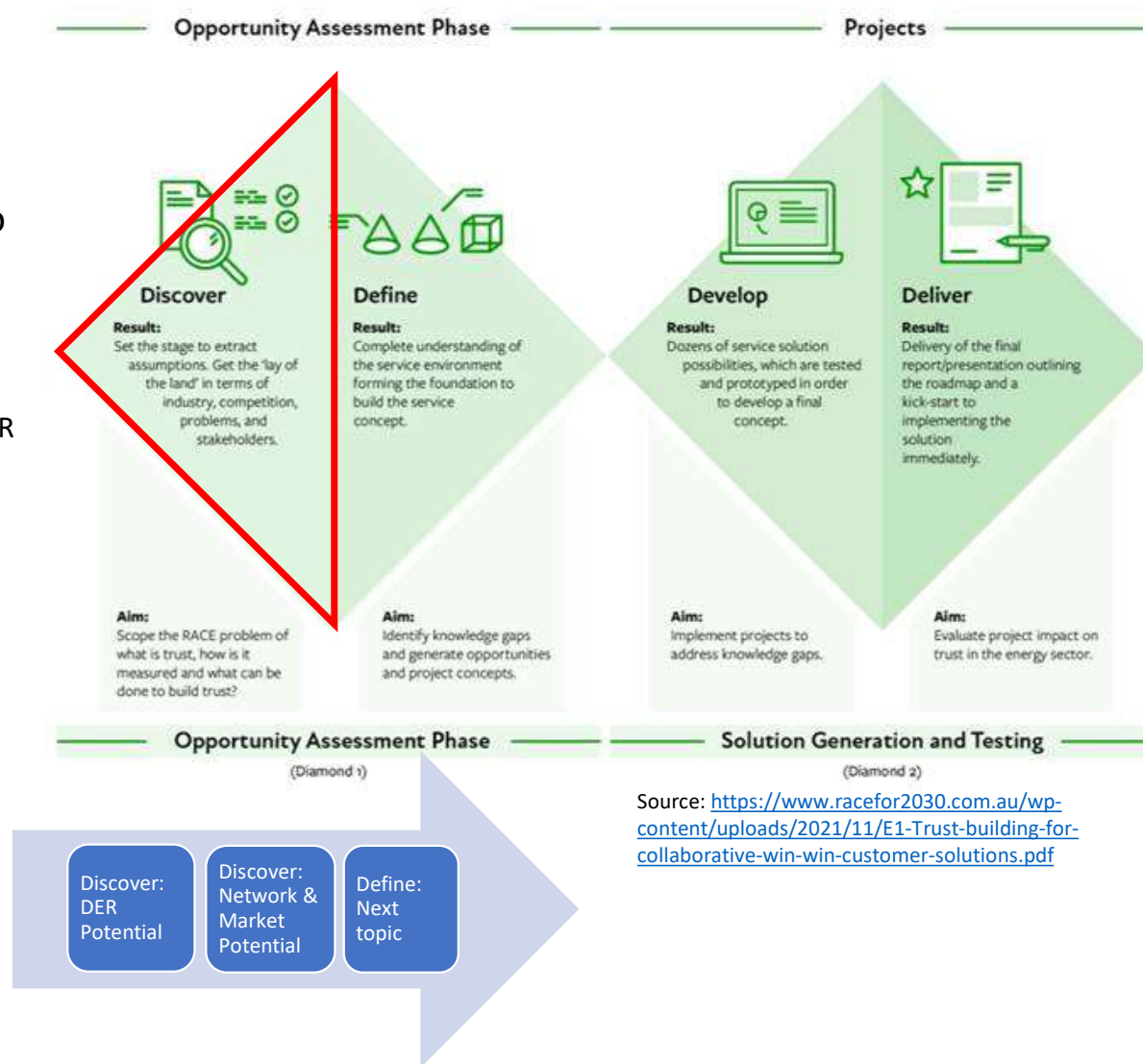
Discussion roadmap: starting with discover and define stages

Workshop focus is discovering DER potential

- Use actual examples (anonymised as necessary) to describe DER potential, both realised and unrealised, current and future
 - Potential includes the DER owner use case(s), the electricity sector use case(s) and characteristics of the DER accessing the network (eg, capacity, automatic voltage regulation)
- Focus of discussion. From the viewpoint of a DER owner with the potential to provide a range of services, and absent any regulatory hurdles, what practical arrangements need to be in place for the DER owner to transact those services?

What would a DER owner need to transact services?

Next session: same question from the viewpoint of network operators & market participants



Presentations and Discussions: DER potential from the perspective of DER owners

3 group members will describe actual examples of deploying and utilising DER from the customer/owner perspective:

1. hospitality complex microgrid
2. multi-unit residential complex
3. single home
4. EV chargers
5. distributed generation and C&I customers

The examples are to support discovery of:

- the expectations and decisions of a DER owner investing in the DER (a financial consideration)
- awareness of and access to electricity-sector related value streams for additional returns from DER (a financial consideration)
- the underlying DER characteristics that are currently under-utilised (or not enabled/deployed) by customers (a technical consideration)

Examples of DER potential

HOSPITALITY COMPLEX MICROGRID. Grid connected at the end of a long feeder

DER installed

- 130kVA/230kWh battery
- 200kWp of PV
- 9 x ground source heat pump units for water and space heating (centrally controllable)
- EV charging

Capability (realised and unrealised)

- Able to operate autonomously from the grid.
- Modification of load profile in response to TOU tariffs and zero marginal cost onsite generation
- Curtailment of energy generation
- Provision of load shedding and shifting
- Supply/absorb kVARs

MULTI-UNIT RESIDENTIAL. Grid connected in an urban area. 20 x residential units on a customer network

DER installed

- 40kWp of PV (distributed across customer network)
- 2 x central air source heat pump units for hot water (centrally controlled)
- Space heating on load shedding circuit
- EV charging (centrally controlled for communal use)

Capability (realised and unrealised)

- Modification of load profile in response to TOU tariffs and zero marginal cost onsite generation
- Curtailment of energy generation
- Provision of load shedding and shifting

SINGLE HOME. Grid connected in an urban area

DER installed

- 3.6kVA/6kWh battery
- 4.2kWp of PV
- Controllable Hot water heating
- Controllable EV charging

Capability (realised and unrealised)

- Able to operate autonomously from the grid.
- Modification of load profile in response to TOU tariffs and zero marginal cost onsite generation
- Curtailment of energy generation
- Provision of load shedding and shifting
- Supply/absorb kVARs

Examples of DER potential (continued)

RESIDENTIAL EV chargers. Grid connected in urban / suburban / rural contexts

- 7.4kW chargers
- Not at all interested in DER, just purchased to charge their car
- Price (installation and ongoing use) the overwhelming decision factor

Capability (realised and unrealised)

- Modification of load profile in response to TOU tariffs and zero marginal cost onsite generation
- Provision of load shedding and shifting
- Key example would be winter evening when charging / cooking / heating all at once
- Also peak coincident with tariff changes (everyone starts at 9pm)

COMMERCIAL EV chargers

- Grid connected
- Up to ~50 chargers, 7kW (32A single phase) and / or 22kW (32A three phase)
- Interested in sticking to commercial supply arrangement, unlikely to be aware of DER potential (though some are)

Capability (realised and unrealised)

- Modification of load profile in response to commercial tariff
- Provision of load shedding and shifting
- Key example would be 8am winter morning when staff plug in but building is heating








AGGREGATED EV chargers. Aggregators can control larger fleets where the individual owners aren't interested in getting involved

- Current scale is of the order of 1000s within NZ
- Energy use is of the order of 1MWh / day, mostly in the evening and at night
- Median usage in an individual charging session is ~12kWh, so ~90mins at 7kW

Capability (realised and unrealised)

- Modification of load profile in response to a signal
- Provision of load shedding and shifting

DER potential – a DER owner perspective identified by a UK network business

Distributed Generator	Battery Storage	Large Commercial Energy User	Flex Aggregator	System Operator	Local Authority	Residential Customer
						
<ul style="list-style-type: none"> • Ellie operates solar PV assets in Ipswich, with a total installed capacity of 20MW • She likes the ability to connect to the network quickly and easily – her flexible connection is efficient, with an acceptable level of curtailment • Her goal is to export as much renewable power as possible to maximise her revenue and reduce the carbon intensity of the local network 	<ul style="list-style-type: none"> • Raj owns a 15MW Battery Storage asset in SPN located close to a GSP, and he is planning to connect a second asset • He wants to know how he can optimise his asset across both the ESO and DSO in a coordinated way • He is seeking better visibility of network data to allow more accurate estimates for opportunities for his assets, and to support decision-making on future development opportunities 	<ul style="list-style-type: none"> • Nick manages a cold chain logistics firm that operates several large refrigerated warehouses • Security of supply is critical, and early notice of any outages or disruptions to supply are important • He is willing to reduce his load at peak times if it allows him to generate income and help the transition to net zero 	<ul style="list-style-type: none"> • Flex Co is an energy platform which aggregates and optimises residential and business LCTs • They want to drive decarbonisation by providing a route-to-market for a portfolio of flex • They use network data to understand more about network needs and analyse network congestion to understand where their response could be most impactful 	<ul style="list-style-type: none"> • ESO balances the transmission network in real time • The amount of flex connected to the distribution network is growing, but is not accessible via the BM or Ancillary Services markets • ESO would like to access that flex in a coordinated way • Collaborating with all participants of the energy system encourages a more resilient, balanced transmission network 	<ul style="list-style-type: none"> • Steve is a local authority planner. • He is keen to deliver on new policies and higher standards for carbon reduction of new-build homes, so that his community benefits • He'd would welcome input from his DSO and some support on how to optimise LA planning from his DSO • He is also on the board of the community energy community team. 	<ul style="list-style-type: none"> • Amy is an EV & heat pump owner (through the UKPN foundation) who lives in the outskirts of London • She is passionate about climate change and using low carbon technologies • Amy uses an aggregator and is on her supplier's agile electricity tariff

Source: UK Power Networks, Our DSO strategy – a summary for stakeholders, available at <https://d16qag4vfpk8c6.cloudfront.net/app/uploads/2021/12/Appendix-18-Our-DSO-Strategy.pdf>

DER potential – example of expectations of a large energy user & an aggregator

These are two of seven DER owner snapshots developed by UK Power Networks. See pages 18-25 of the UK Power Networks DSO strategy for the rest.


The snapshots outline the expectations of households, businesses, investors etc for their DER and energy needs



Large Energy User: Nick
 Nick manages a cold chain logistics firm that operates several large refrigerated warehouses – security of supply is critical. He is keen to make use of distributed generation if it can reduce his energy bills and is willing to reduce his load at peak times where possible if it allows him to generate income and support the transition to net zero.

	Customer wants and needs	DSO Services
Connecting customers	<ul style="list-style-type: none"> I need a reliable connection with security of supply in order to power my business I want to make use of distributed generation across my sites to reduce my energy bills I want to avoid expensive kit in order to provide flexibility services I need my new facility to be connected quickly and at low cost 	<ul style="list-style-type: none"> Range of access products and DUoS tariff options to enable firm access for demand and options to connect distributed generation cheaply Pre-application connections services Open data that allow large users to optimise their capacity requests for new connections Coordinated planning with the ESO to accommodate cost-effectively significant new industrial loads (e.g. data centres) on the network
Operational customers	<ul style="list-style-type: none"> I want to generate income from providing demand side response services, but need optionality so as not to impact my business I want service providers to be able to provide simple and easy access to ESO/DSO markets, with service conflicts managed I need to keep my operating costs down, and so want market interaction to be simple and easy 	<ul style="list-style-type: none"> A range of flexibility product designs Ability to trade flexibility services through an easy, digitally enabled, regional market aligned to national standards and coordinated with ESO markets Close to real time scheduling to provide optionality Provision of open data such as outage schedules that allow large users to optimise their operations

"I want to be able to provide DSR whilst delivering savings, revenues and sustainability"

Aggregator
 Flex Co is an energy platform which aggregates and optimises residential and business customer assets to introduce new flex into the system. They are looking to trade a portfolio of flex in a live DSO market. They want to understand more about network needs and analyse network congestion to understand where their response could be most impactful.

	Customer wants and needs	DSO Services
Connecting customers	<ul style="list-style-type: none"> We need access to financial incentives that reflect network constraints, so that our customers can make money from being flexible We need information about network constraints and locations where we should acquire new customers to access flexibility We need reliable forecast data to inform our investment in future services 	<ul style="list-style-type: none"> Range of innovative access products and DUoS tariffs that provide incentives for customers Range of flexibility products informed by engagement regarding customer needs that I can build into my customer propositions Interactive data portal, incorporating DFES, network capacity heat-map publication and self-serve curtailment assessments
Operational customers	<ul style="list-style-type: none"> We need accurate, regular data to identify how to optimize our customer portfolio We don't want to have to commit our flexibility until close to real-time We want a simple market design with aligned market timelines, and coordination between system operators and markets We want an automated digital portal or API to exchange data and dispatch instructions 	<ul style="list-style-type: none"> Provision of open data such as outage schedules that allow large users to optimise their operations Ability to trade flexibility services through an easy, digitally enabled, regional market aligned to national standards and coordinated with ESO markets Close to real time scheduling to provide optionality Easy, low-cost integration of systems for market, dispatch and network data flows (e.g. through APIs)

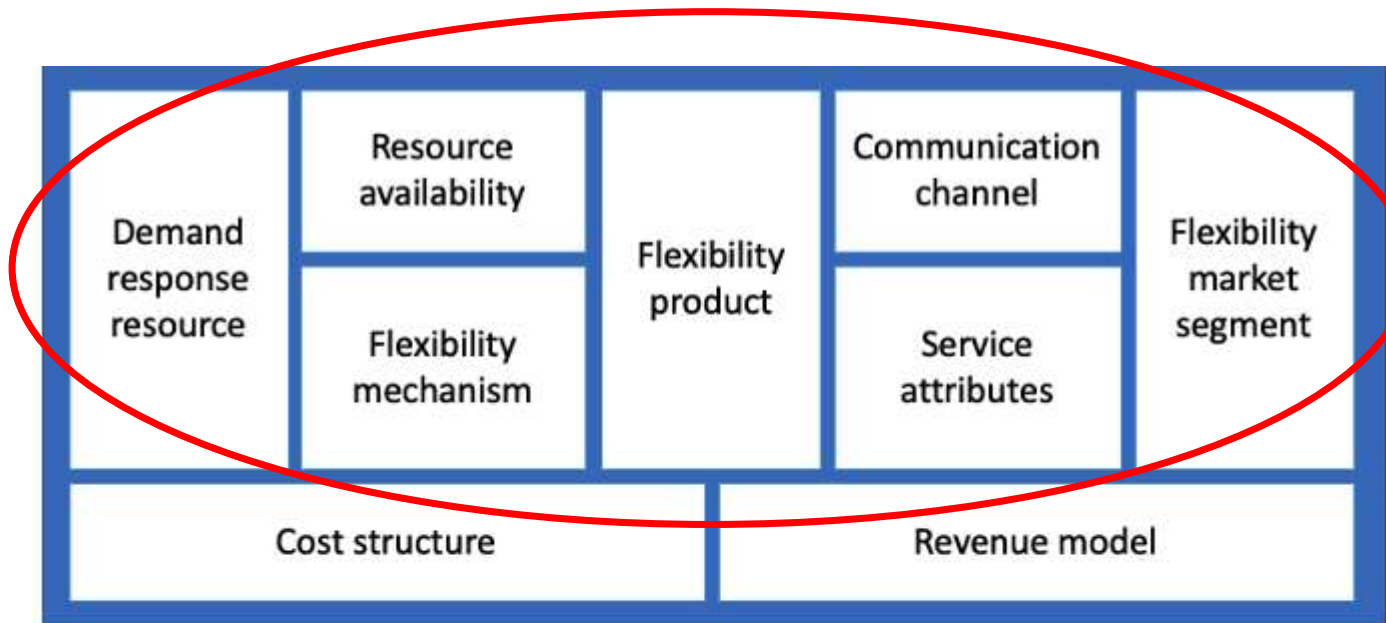
"We want to provide our customer portfolio with ways to minimise their energy costs by flexing their demand or generation"



Source: UK Power Networks, Our DSO strategy – a summary for stakeholders, available at <https://d16qag4vfpk8c6.cloudfront.net/app/uploads/2021/12/Appendix-18-Our-DSO-Strategy.pdf>

Breakdown of the components for delivering value from flexibility services

- Demand response resource = DERs and their potential
- Flexibility market segment = Buyer of DER Services [Customer, Network, and/or Wholesale Market]
- Flexibility product = products that address use cases/need cases for market segments
- Resource availability = when / where
- Flexibility mechanism = how resource(s) deliver the load change for a flexibility product
- Communication channel = signalling need / instructions / market
- Service attributes = technical performance requirements

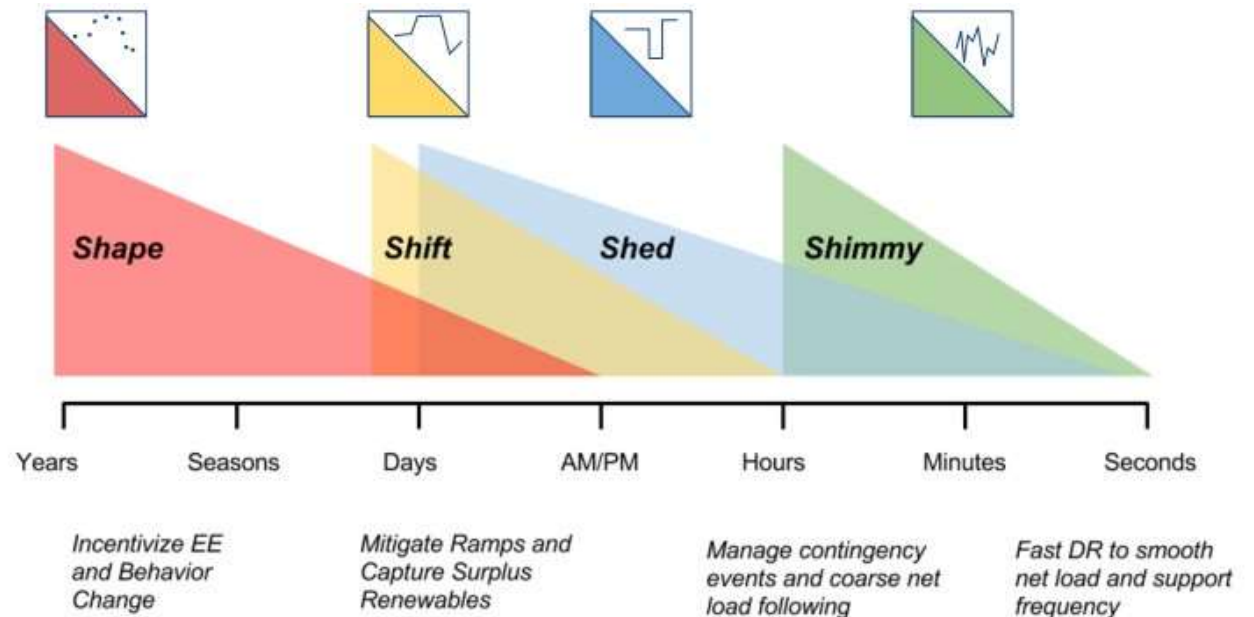


Source: Race for 2030, Flexible demand and demand control, October 2021, at: <https://www.racefor2030.com.au/wp-content/uploads/2021/11/B4-Opportunity-Assessment-Rapid-Review.pdf>.

Defining the fundamental features of flexibility services – technical characteristics

A DER's ability to alter the demand profile results in groups of different potential flexibility services:

- Shape—Moving demand routinely according to a standard long-term pattern
- Shift—Moving demand sporadically in response to an external signal
- Shed—Switching off equipment
- Shimmy—Moving demand over very short timescales in response to an external signal



Sources of value given technical characteristics

Table 6. Contribution of flexible demand capability to value stream.

	Wholesale Market & Grid- scale Renewable Support	Network Investment Savings	Contingency & Emergency Reserve	Distribution Network Support	Frequency Control Ancillary Services
Shift	H	MH	L	ML	NA
Shape	MH	MH	L	ML	NA
Shed	ML	H	H	L	ML (Lower only)
Shimmy	NA	NA	NA	H	H

Key: H = high, MH = moderately high, ML = moderately low, L = low, NA = not applicable.

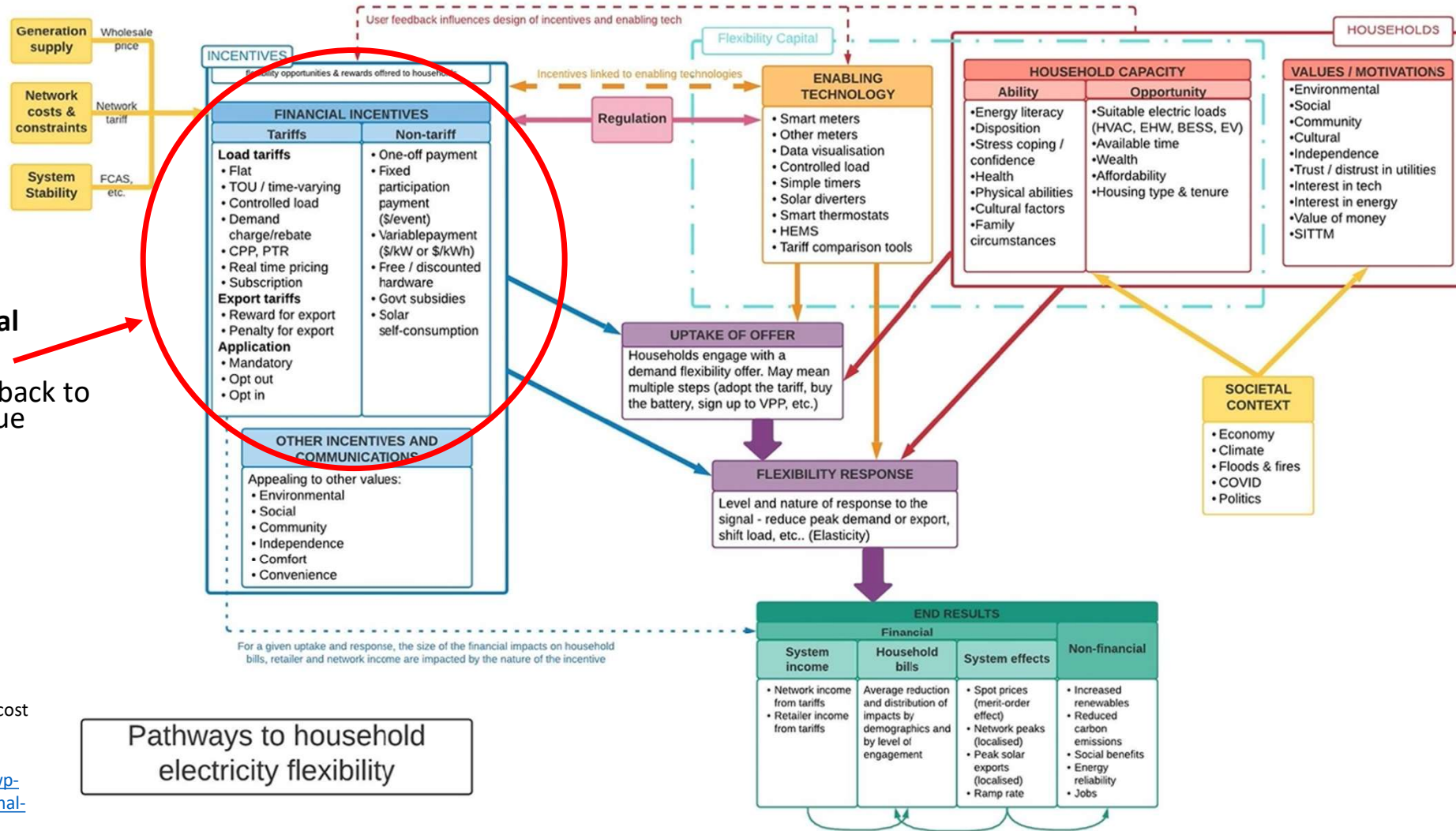
These electricity supply chain value streams must align with the DER owner use case and value stream

More detail on DER performance characteristics required to provide flexibility

Table 1. Summary of performance metrics and typical values for FD services.

Metric (units)	Shape	Shift	Shed	Shimmy
capacity (watts)	permanent load change	cyclical load change	one-off/event load reduction	continuous change in load
energy (watt-hours)	no net change in consumption, increased VRE consumption	no net change in consumption (in principle), increased VRE consumption	reduction in net consumption (except with embedded generation cases)	no change to net energy balance over the duration of response
notice period (time)	days–months	hours–days (needs price/ VRE forecasts)	minutes–hours	seconds–minutes (usually automated)
response time (time)	N/A	minutes	minutes	seconds–minutes
response duration (time)	N/A	hours	hours	seconds–minutes (regulation) minutes–hours (load-following)
physical availability (activations/time)	permanent	a few times per day or per week	depends on FD asset	continuous or multiple times per day
carbon abatement	increased VRE utilisation	increased VRE utilisation	reduced peaking thermal (fossil fuel) capacity requirement	reduction in other (fossil fuel) ancillary service sources

Financial pathways to realising DER potential



Source: Race for 2030, Rewarding flexible demand: Customer friendly cost reflective tariffs and incentives, November 2021, at <https://www.racefor2030.com.au/wp-content/uploads/2022/02/H4-OA-final-report-17.11.21.pdf>

Stakeholder engagement needs to align to the FlexForum goal and purpose

The FlexForum goal is to create a set of actions to integrate DER into the electricity system and markets to maximise the benefits for Aotearoa New Zealand

The FlexForum purpose [includes] ... building a broad consensus across the electricity sector and other interests for the set of actions to integrate and maximise the value of DER

The engagement activities required to deliver this purpose depend on the purpose – INFORM or INVOLVE

Engagement type	INFORM	INFORM & INVOLVE
Purpose	No input needed: <ul style="list-style-type: none"> • updates on progress • presenting final outputs 	Input needed: <ul style="list-style-type: none"> • test ideas and conclusions • build confidence
Content needed	Session materials	<ul style="list-style-type: none"> • Materials with questions and relevant context • Emerging conclusions
Delivery	<ul style="list-style-type: none"> • Dedicated webpage hosted by Ara Ake • Industry groups • Mail-outs 	<ul style="list-style-type: none"> • Industry groups and direct approaches • Targeted workshops during the process • Surveys during the process

Key stakeholders and expected value of engagement

The stakeholder mapping exercise – see following page - makes assumptions about the expected value of engagement

Stakeholders in the inform category are not expected to have a high interest or influence over the FlexForum outputs

- engagement activities targeting these stakeholders will inform via webpage, email updates, communications through industry groups and final output

Stakeholders in the involve category are expected to have a high interest and influence over the industry and wider endorsement of the FlexForum outputs, including the outputs being adopted and used. Engagement activities targeting these stakeholders will be more active

- input is needed to create ownership in the outputs and make it more likely they are used
- input is needed to build confidence, particularly that of non-traditional industry participants. Engagement only via industry groups will exclude key stakeholders
- input is needed to achieve quick regulatory and policy acceptance of the outputs and quick regulatory action (if needed) – does everyone who was not in the room agree will be asked early on

Proposed engagement activities

The proposed engagement activities are...

Inform

- announcement. Write to key stakeholders informing them of the process, purpose and expected outcome
- 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
- provide regular updates (eg, after each session) on progress to a mailing list (created by asking people to signup for updates) and on a FlexForum website/page
- use industry associations and groups to share content

Involve

- request input on the challenges, questions and potential solutions being discussed by the group via industry lobby groups and other channels based on engagement need
 - via in-person discussions with key stakeholders involving the group or part of the group
 - via open workshops at stage gates or to get specific input from a stakeholder group(s)
 - via written feedback to a specific question or topic (potentially via surveys)
 - via a comments function on the FlexForum webpage
- conclude with a Pitch day to launch the conclusions and describe the next steps