

Flexforum: session IV 17-03-22 notes

When	900 – 1200, Thursday 17 March 2022
Where	Virtual
Who	Shay Brazier (ReVolve Energy), John Campbell (Our Energy), Jason Christini-Crawford (Electricity) [apology], Glenn Coates (Aurora), Jenny Van der Merwe (Kāinga Ora), Terry Paddy (Cortexo), Eric Pyle (solarZero), Buddhika Rajapakse (Mercury), Tom Rose (EVNex), Ray Hardy (Wellington Electricity), Quintin Tahau (Transpower), James Tipping (Vector), Evie Trolove, (Orion), Glen Baxter (Ara Ake), Fiona Wiseman (Trustpower/Manawa) Scott Scrimgeour (Wellington Electricity) Guests: Steve Heinen (Vector) Facilitator: Geoff Sharples Secretariat: Craig Evans, Matt Smith

Session notes

Three topics were discussed:

1. Network and Market potential
2. Workplan, engagement and communications planning
3. Administration – governance, budget, and funding

Agenda overview

The group agreed the agenda.

Topic 1: Network and Market potential

The group discussed perspectives on the outputs or requirements of network and market participants to respond to specific conditions (eg, high spot prices, thermal constraints etc) and the characteristics (performance criteria) of a response to conditions.

- Scott Scrimgeour, Ray Hardy, & Glenn Coates, provided a network perspective

- Buddhika Rajapakse, provided a market and system operation perspective.

The insights from the discussion of network potential were:

- Networks will experience material increases to load and peak demand over the coming decades due to a combination of electrification, particularly of transport and heating, plus population and economic growth. Context and local circumstances are critical. Each region has its own mix of drivers.
- The challenge is the timing of the increases to load/peaks as the timing/lumpiness of load growth is very uncertain, despite the ability to forecast load/peaks in 2050 with reasonable confidence.
- Translating the load/peak forecasts into network investment requires making choices about when to build new infrastructure taking account of the ability to deliver (there is finite amount of people and equipment), whether an investment will be needed long-term, keeping the network service affordable and maintaining security and reliability.
- Two main issues which could be managed by using capability of DER to complement investment to expand network capacity.
 - Long term forecast constraints– the network operator will need solutions which can assist with rapid network growth while maintaining security and reliability.
 - while upsizing the network to provide the capacity needed to meet the new load/peak requirements (ie, helping to keep up). DER can provide an interim/tactical solution while feasibility, planning, design and construction is undertaken for a traditional solution
 - managing uncertainty about the extent/duration of the load/peak requirements (ie, helping to avoid over-building). DER can create short term tactical options providing more time for long term solutions to be investigated
 - keeping costs down. DER can provide the opportunity to deliver more energy over the same assets - increased asset utilisation leads to lower per unit costs and eases the level of construction activity in a strong growth environment. DER may also represent a lower cost solution.
 - Customer connection constraints. Unanticipated, large new/expanded connections – the network operator will need solutions to manage one-off localised step change increases in load/peak requirements, probably due to new/expanded capacity requirements of a single connection. A local version of the rapid network growth issue
- The capability of DER (ie, flexibility) is expected to complement, not replace, traditional network investment in five areas.
 1. Capacity shortfall – not enough capacity to connect new load or distributed generation resulting in thermal constraints and/or voltage constraints

2. Inadequate security of supply – insufficient capacity to restore load following a contingent event resulting in thermal/voltage constraints and longer/more frequent unplanned outages
 3. Inadequate resilience – supply is dependent on distribution assets that have a common mode failure risk, eg, earthquake, flooding, bushfire resulting in thermal/voltage constraints and longer/more frequent unplanned outages
 4. Poor reliability – network configuration is negatively impacting reliability, ie, network design is increasingly less fit-for-purpose given use (eg, long feeders into remote areas, limited back-feed options) resulting in longer/more frequent unplanned outages
 5. Poor power quality – network configuration and/or customer equipment negatively impacting power quality (eg, network design not suited to reverse power flows from PV or increased reactive power from connection of more electric motors), typically resulting in voltage problems or harmonic distortion
- The value of flexibility services to the network operator depends on the nature of the constraint/issue (ie, short term or long term). The value of flexibility services will be recognised through the interaction between charges (price signals) and direct contracts to obtain targeted responses.¹
 - for short term constraints, the short run marginal cost of solutions ranges from \$200 to \$1000+ a kW a year. Arbitrage of distribution charges does not tend to reflect the value to the network of the specific situation (at that time, in that location). Typical day/night tariff structures provide a \$100-\$200 kW a year benefit for shifting load from day to night. Distribution charges are unlikely to attract the response needed. Location specific short-term constraints have the highest value opportunity. However, the mis-match between opportunity and DER asset life is why value stacking is really important for DER owners
 - for long-term constraints, the long run marginal cost of solutions ranges from \$50 to \$200 a kW a year. Distribution charges can provide sufficient incentive, but are unlikely to ever be sufficiently sophisticated to achieve managing of demand to a daily profile, eg, creating diversity/smoothing of profiles to avoid manufactured peaks. Long-term shaping of demand is important, but generally a lower value opportunity
 - Regulatory settings matter. The Input methodology review is very important for unlocking the capability of DER.

¹ Note: the \$/kW/year figures referenced are indicative only and vary by network topography and demographic.

- Locational load management is technically possible, but distributors do not currently have the capability and do not have confidence the regulatory settings will provide a commercial return on any investment in that capability.
- Regulatory settings are backwards looking unless there is a overarching step change. The funding envelope assumes historical practice is the best guide to future spending. As such there is no opex allowance available for flexibility services or R&D without forgoing spending elsewhere
- A key question to answer is how the efficiency criteria will be applied to investments which are too soon or on the wrong thing – both these outcomes will occur given distributors are dealing with new and changing circumstances.
- 10 things to consider when thinking about using the capability of DER to manage network needs.
 - System growth is about 15% of network investment.
 - Security is paramount – network operators must keep lights on whatever.
 - a material proportion of households in Aotearoa New Zealand are providing hot water control to their local distributor. This is world leading access to ‘flexibility’.
 - Residential connections represent about 40% of peak demand. Don’t forget about small and medium enterprises and commercial connections.
 - Not all loads can be deferred, houses need lights, data centres need aircon etc. This data and analytics and understanding important.
 - Value stacking between distribution and transmission. Transmission costs are a pass through, and there is an opportunity to provide distributors with reasons to make good choices about reducing transmission costs.
 - Value stacking – identify what can be stacked and what cannot, and ensure stacking opportunities are complementary eg, a low voltage feeder value proposition may not complement transmission proposition etc
 - Deferment – Deferment – most DER defer wires projects, but do not permanently replace.
 - Asset management plans are published annually, and clearly describe all constraints. The AMPs can be harnessed to engage with distributors
 - Synergies are key. To achieve these, distributors need partners and need to form strong customer relationships.

The insights from the discussion of market potential were:

- The potential for DER participation in markets increases with smart devices able to respond to instructions/incentives. There is a general expectation that DER will be supporting market/system operation.

- The need or performance requirements for participation in markets for various market/system services – generation, reserves, frequency, voltage – have been formalised in regulation or are well known through experience.

Product	Description	Response speed	Response duration
Frequency - 6sec reserves	Arrest the fall of system frequency when a large generator trips.	<6s	60s minimum
Frequency – 60sec reserves	Support the recovery of frequency back to normal after 6s reserves	<60s	15min minimum
Frequency – very fast reserves (future)	Very fast response to arrest the fall of system frequency, typically seen in markets with higher asynchronous renewables like wind, solar	<2s	~60s
Frequency keeping	Maintains system frequency close to 50 Hz, filling in brief mismatches of supply and demand.	<1s	Continuous
Voltage support	Support grid voltage to remain at nominal levels by producing or consuming reactive power	<1s (if dynamic)	Minutes to hours
Generation	Supplant grid generation, grid battery storage and/or financial contracts in managing market price volatility.	MWs per minute ramping, though faster is better	30 minute trading period to hours

Don't forget the customer

- Customers – households and business – will need to buy-in to the idea of flexibility services. Hot water control is very familiar to households; but will this familiarity translate to requests to manage EV charging? How hard will the electricity sector need to work to get people on board?
 - Local trials suggest early adopters/leaders are comfortable with load management, but this may not be representative.
 - UK research suggests an important factor is the ability of the customer to override control, even though this ability was rarely used.
 - Distributors are being steered in direction of not being customer contact. Conversation needed with retailers and flex suppliers about how they can create value propositions and build on signals from inputs. The key is to make value

accessible to third parties to develop customer propositions and for the electricity sector (party buying the service) to then work with suppliers to ensure outcomes are good for customer and energy system.

Topic 2: Workplan, engagement and communications planning

The group approved the workplan, noting it would be refined through the process.

Feedback on the draft workplan was:

- Focus on outputs which meet the purpose of the group and move the national conversation along. This means emphasising topics relating to contracting principles and payment and compensation mechanisms. Perhaps use case studies to assist with understanding the practical and scalable steps.
- Don't under-estimate the value of producing standardised technical requirements and 'product' specifications. But don't expect to provide all the detail
- Keep an eye on what people want, even if the answer is to highlight that the question needs to be considered to understand requirements for market access/participation. For example, most DER owners/operators, don't want to talk to the distributor, indicating some principles could be required for how people want to engage.

Topic 3. Administration – governance, budget and funding

The group discussed governance, budget and funding matters.

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