Meeting Date: 16 March 2023

WELLINGTON ELECTRICITY PRESENTATION ON DEMAND RESPONSE

SECURITY AND RELIABILITY COUNCIL

This paper introduces a presentation from Wellington Electricity, on their views and experience of Demand Response in the New Zealand power system, as New Zealand transitions to a low emissions economy with increased renewable and intermittent generation.

Note: This paper has been prepared for the purpose of the Security and Reliability Council (SRC). Content should not be interpreted as representing the views or policy of the Electricity Authority except where specifically noted.

Demand Response – a distributor perspective

1.1.1 The secretariat has arranged for Wellington Electricity to present at this meeting on the theme of demand response.

1.1.2 The purpose of the presentation is to provide members with information about distributor experience with demand response, including managing demand response on its network and the extent to which demand response can support New Zealand's capacity and peaking challenges.

1.1.3 Wellington Electricity's presentation (Appendix A) also notes learnings from overseas partnerships and its views on potential regulatory change needed to support understanding and uptake of demand response, from small consumer through to industrial level.

1.1.4 The presentation covers the challenges the industry faces, from Wellington Electricity's perspective, including points of difference with the challenges faced in Australia, where solar generation has experienced accelerated penetration and is a dominant demand response option.

1.1.5 A strong theme in the presentation is the need for the broader industry, including regulators, to act quickly to ensure appropriate settings to both support trials and initiatives already underway and to enable a sequenced, as opposed to reactionary approach.

1.1.6 Through the experience from recent demand response and electric vehicle initiatives, including the *EV connect* project, Wellington Electricity's paper notes expectations of consumers in demand response and its experience engaging with them. This should be of particular interest to members, given the criticality of engaging positively with consumers as a foundation to support demand response uptake.

1.1.7 Staff note that the list of stakeholders (Fig 6) does not appear to include direct involvement of any of the EV manufacturers or importers or aftermarket EV charger importers. Members may wish to ask Wellington Electricity if they were invited, and what reasons were given if they declined.

1.1.8 The presentation also notes smart meter data was of poor quality. Members may wish to ask for more detail and if regulation in this space is needed or if commercial arrangements are sufficient.

1.1.9 The presentation notes the positive impact pre-requisites have made through averting major security issues, particularly in South Australia. Of interest, will be the view expressed in the paper that New Zealand is about five years behind Australia in terms of data access arrangements to support demand response and maximise flexibility services.

1.1.10 The paper refers to two other papers: the Authority's consultation paper on Winter 2023[1], and Wellington Electricity's submission in response[2]. These are not

[1] https://www.ea.govt.nz/assets/dms-assets/31/Driving-efficient-solutions-to-promote-consumer-interests-through-winter-2023.pdf
[2] https://www.ea.govt.nz/assets/dms-assets/31/Wellington-Electricitys-submission-on-Peak-Load-Management-2022-1383026.pdf

essential reading for the purposes of this meeting, but they are included (see footnote) for additional context to this paper.

1.1.11 Wellington Electricity's paper also addresses a number of the questions compiled by the secretariat with member input.

1.1.12 To compliment the paper there will be a short video.

1.1.13 Greg Skelton, Wellington Electricity CEO, will present and be available for questions.

Questions for the SRC to consider

The SRC is asked to consider the following general questions.

Q1. What further information, if any, does the SRC wish to have provided to it?

Q2. What advice, if any, does the SRC wish to provide to the Authority?

Appendix A: Wellington Electricity presentation – Demand Response

28 February 2023

SRC at the Electricity Authority

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To the SRC - Electricity Authority

Wellington Electricity's Approach to Demand Response

Introduction

The SRC has asked Wellington Electricity to provide details of their demand response approach and how we are planning to extend the use of this network tool in the future.

Wellington Electricity Lines Limited (WELL) is an electricity distribution business (EDB) which provides infrastructure and lines services to 173,000 connections in the Wellington, Lower Hutt, Upper Hutt and Porirua cities.

With 400,000 people in our region, it is important to provide a safe, reliable, secure electricity distribution system which is affordable to customers and sustainable for the investors to ensure electricity is delivered to meet the long-term benefits of consumers.

Wellington Electricity's experience managing Demand Response

Wellington Electricity provided a submission on 16 December 2022 in response to The Electricity Authority's paper "Driving efficient solutions to promote consumer interests through winter 2023" published on 25 November 2022.

Our response adds important context to the availability of demand response from hot water ripple control – the context is specific to the Wellington distribution network configuration and operating strategy and may differ with other networks.

WELL has a strategy of using demand management tools (including ripple control and redistributing load around our mesh network) to delay having to invest in building a larger network for as long as possible as determined by the efficiency of our current regulated Price-Quality Path.

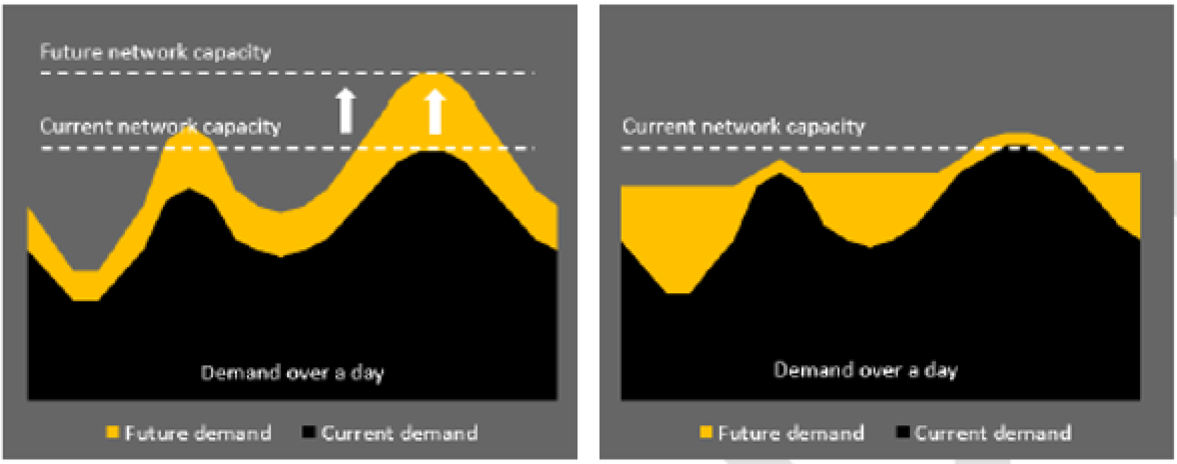

Fig 1 – Shifting new load outside demand period defers network investment costs.

This helps us maintain one of the lowest distribution prices in New Zealand while operating one of the most reliable networks. Practically this means we have designed the network to incorporate the current ripple control demand response capability – we expect to have to use the capability provided by the ripple control demand response during winter peaks.

While we do have some spare capacity available to respond to a grid emergency, and we do make any capacity we aren't already using at the time of a request available to the System Operator, it is limited. If the winter demand peaks are increasing (as indicated by Transpower), then the size of the ripple control response available after our own demand response, may decrease. The development of flexibility services to increase the size of the demand response available to both the grid and distribution networks is therefore essential for maintaining future network security.

Demand response typically moves storage load away from network congestion periods. Traditional load management uses a broadcast signal across the distribution network to manage hot water storage or night store heating elements. Historically, the management of these night loads was used to maintain the operation of thermal plants which are inefficient to start and stop, and so require a load during the lower demand night period.

New developments in electrified transport are also creating Price – Quality discussions where large demand is being dynamically offered in exchange for flexibility in offtake levels to avoid large investments. This is using a dynamic demand response and will unlock capacity for other vehicle charging subject to vendors' acceptance of variability in offtake levels.

Plans for using DER capacity

WELL has been trialling management of DER in industry trials. Our initial work focused on managing EV charging on the distribution network. Our EV Connect project with Genesis Energy was an industry collaboration project co-funded by EECA (LEVCF) involving Policy, Regulation, and other industry participants and interest groups. WELL partnered with GreenSync who are a technology company developing a digitalisation platform for future DER management which is being used successfully in several states of Australia (South Australia, Western Australia, and Queensland).

We also worked with Contact Energy where a highly loaded 11kV feeder on WELL's network was selected to install several solar battery systems to discharge into the network's peak demand period. This was operated through a call system to Contact to charge batteries ahead of the peak demand and then trigger their usage during the peak to lower the feeder demand.

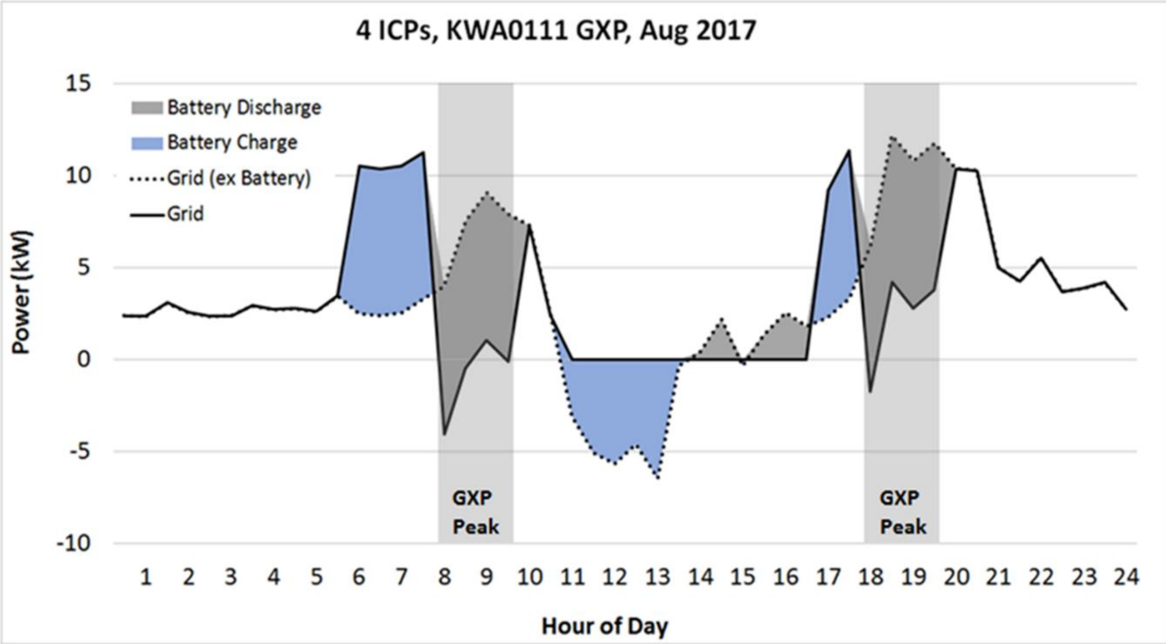

Fig 2 - Contact/WELL Solar-Batt trial on 11kV feeder

While successful, the cost of the install was not economic for Contact to extend the trial. It did underline the principle of the "value chain" where there is a hierarchy of benefits that flow from customer to distributor to transmission to retailer/ generator.

WELL has developed a 30 year investment plan which looks at the electrification needed to decarbonise based on the government's Emissions Reduction Plan. This forecast of expenditure assumes a reduction in cost of $300m by using DER in a coordinated way to reduce capital investment required versus that needed for an unmanaged peak demand.

Existing Demand Response technologies and future options being considered

WELL has 25 ripple injection plants across the network at different frequencies which operate separate load control relays for a third of our consumers. This allows for the management of around 40MW of controllable load which is exercised predominantly in winter when the network loads are high, or when we have a fault. During a fault we can reduce a feeder's load so we can interconnect to the affected area to restore supply from neighbouring feeders while the damage is repaired and the network is returned to its original configuration.

We are currently discussing support from solar-battery companies who have connected to the WELL network. These suppliers are also offering services to the transmission operator, so coordination and commercial agreements are still at an early stage of development.

The EV Connect project includes a technology trial with GreenSync using their Distributed Energy Exchange platform (dex) to aggregate and mange DER. The EV Connect projects also included the development of a Roadmap of how this functionality can be adopted to manage DER in future.

We are a collaborator with the Ara Ake Innovation Project and are working with FutureGrid on LV network visualisation using geographical information system (GIS) and smart meter data. We are also working with ANSA, who, along with FutureGrid, are modelling LV network demand scenarios and capacity considerations related to the gas transition and EV penetration.

Vector Metering owns around 90% of smart meters on the WELL network, so there will be ongoing services they are considering to bring to market once their 2G meters are upgraded to 4G.

Chorus is also looking to make available commercially the point of presence signals from their fibre optic equipment which assists in power restoration planning following a large event.

All of these future systems require additional Capex and Opex investments which are not provided in existing regulatory allowances (as provided by the current Price/Quality path set by the Commerce Commission (Commission) using Part 4 of the Commerce Act). Networks are signalling the increase in investment levels in the next round of Asset Management Plans. This year's Asset Management Plans will outline decarbonisation related investments from increased electrification.

The role of EVs in Demand Response: planned and aspirational

EVs are a large electricity storage device which have capability to provide services beyond their intended transport purpose. Unfortunately, New Zealand is missing this opportunity as it passes by due to the unplanned nature of their rollout.

While solar – battery systems at 5kWh can supply around 25% of a household's daily electricity needs, the larger battery from an EV has the potential to support wider demand response. Our early surveys of customers, conducted in 2017 to assist with the design of an EV tariff, provided some interesting feedback from the initial 100 EV owners in Wellington.

Early adopters were knowledgeable around avoiding charging at peak demand due to their knowledge of the ripple control system, and were positive in their support for EVs being operated outside of the peak period (70%) or having their battery used to support the network (60%), as long as there was a financial recognition of the value this service provided. When asked why this was important, the theme of sustainability was consistently raised.

However, EVs remain invisible to network owners as there is no legislation requiring owners to engage with EDBs, unlike how the current Distributed Generation regulation (from 2003) requires solar installations to be appropriately managed through applications to the EDB provider.

It seems unusual that a 5-7kW solar system needs an application, but a 50, 80 or 100kW battery installation – where the charging or discharging operation of the battery can impact a network's security – does not.

While EVs provide a new demand management capability, we are missing the opportunity. Most new EVs do not have the capability to participate in demand management services: the EV charging functionality does not have the ability to be remotely managed on behalf of customers. EV numbers in Wellington since 2020 have increased dramatically from 1,777 to over 7,800 in two years (according to Waka Kotahi data for battery only vehicles). Experience in Australia has shown that it is cost prohibitive to retrofit EV charging appliances. If we can't get in front of the growth curve to make sure that new EVs can participate in flexibility services, we won't have the demand response needed to provide the forecast savings from deferring network reinforcement.

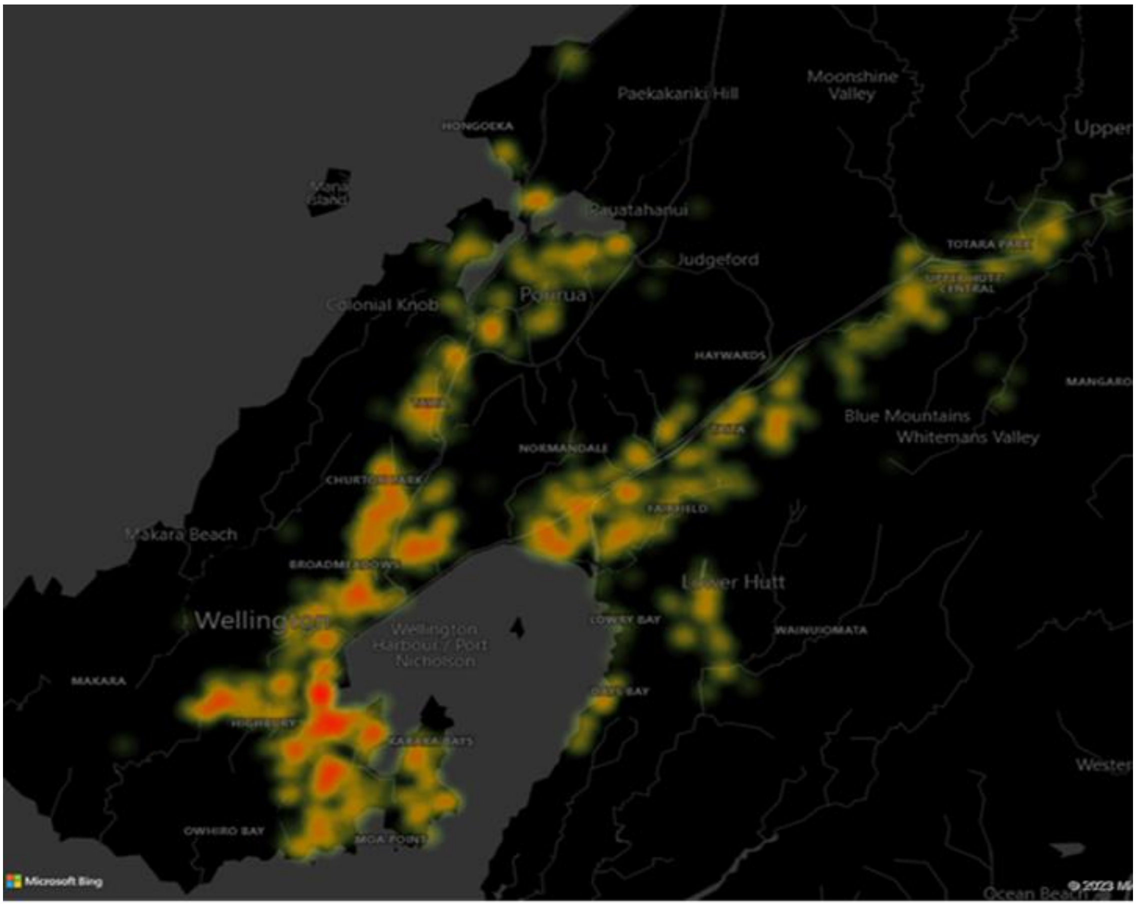

Fig 3 – Heat Map of 7800 EV general locations on the WELL network in 2022

This demand, if it remains unmanaged, will challenge the supply quality customers receive during high load winter evening periods should vehicles all charge during the peak period.

When we established a TOU tariff onto the WELL network in July 2018 we shifted the congestion price to 11c and lowered the off peak price to 2.5c. This is a remarkably strong price signal and with some retailer support, EVs owners can charge their vehicles overnight for a 15c/kWh discount.

However, while we have 7800 vehicles plugging into the network, the recent residential Time of Use tariff introduced in April 2021 is only supported by 40% of the retailers supplying customers on the WELL network. The price signal is not getting through, and only 4% of EV owners in 2021 were on the EV tariff. This makes price signals ineffective for managing demand response from EVs.

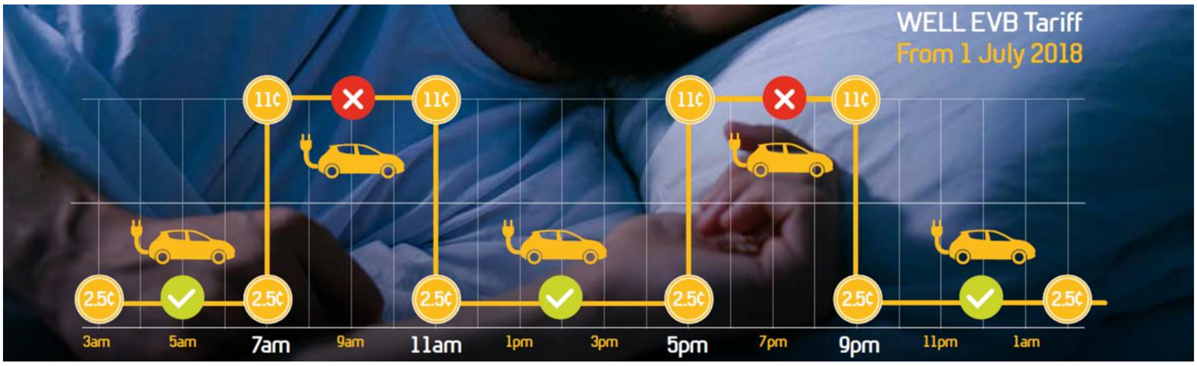

Fig 4 – the TOU EVB Tariff for residential customers providing clear charging price signals

The government Clean Car Rebate/Fee system which came into force at the end of March 2021 also showed some alarming behaviour. While EV purchases of the Tesla Model 3 increased by 1,000 in March, the rebate also led to the sale of 21,000 petrol/diesel utes and SUVs, which avoided the Clean Car tax of $4,500.

A public campaign needs to be run ahead of winter 2023 so customers are educated to move EV charging away from winter congestion periods. Smart meter owners should also be encouraged to provide a service of showing where EVs are being connected (derived from voltage signatures present in smart meter data files). This could help networks focus the public campaign on overloaded areas, helping EDBs keep the lights on for both EV, and more importantly, non-EV consumers.

Fig 5 Customer household savings from vehicle electrification

The benefit of electrification of transport fleets is the savings the removal of fossil fuels makes on the household budget due to the cheaper costs of electricity. This saving will be a benefit to society to assist in New Zealand's decarbonisation and was a strong theme in the EV Connect project.

The aspirational goal from our FutureGrid work this year is to identify EV locations and for the agencies involved in the EV Connect project to support governance requirements to deliver the recommendations outlined in the project roadmap.

Eventually once we are supported with funding so smart distribution transformers can signal a congestion period to connected customers who have signed onto Dynamic Connection Agreements with registered DER for curtailment, then the constraints will be cleared in real time at the distribution level, with payments for this service being returned to the participating customers.

While we wait for the components to do this to be realised, EDBs like WELL will be faced with augmenting networks with battery support at the distribution level as an interim step, pending a DER flexibility market or increased investment in infrastructure at the LV level.

The extent of EDB collaboration occurring to support the decarbonisation transition

The Commission has encouraged EDBs to outline their decarbonisation investment plans to look at what step change in Capex and Opex is required to take on the electrification of transport across the distribution network. Networks are also considering the impact of gas use transitioning to the electricity network.

Collaboration is occurring with the trials and projects WELL has undertaken so we can involve the wider industry and stakeholders in the coordination required to map out and deliver all components needed to provide flexibility services.

Our EV Connect project is an example of this, where 50 stakeholders have been involved in workshops and consultations to deliver a roadmap for EV management.

Fig 6 – Stakeholders involved in the WELL's EV Connect project

Much of the collaboration occurs at working group level with the FlexForum taking up the EV Connect work and developing it further with assistance from MBIE policy and the Commission, Authority, and EECA regulatory support in attendance.

It is unlikely a single part of the sector working in isolation will be able to implement the change needed unless supported by the various regulatory bodies and all industry participants.

Much of the WELL approach is to highlight opportunities for retailers or aggregators or flexibility providers to arrange their customer DER to offer services back to the EDBs, provided the regulators can accommodate the market clearance payments required to orchestrate the LV network with the DER opportunities available.

Original equipment manufacturers will also begin to provide collaboration as smart charger, solar inverter, or EV manufacturers begin to unlock services from their products at a wider scale to support DER markets.

A number of EDBs and generator retailers collaborated with the Boston Consulting Group to take an industry review of the costs of decarbonisation to 2050. The outturn is the document "The Future is Electric" that shows an in-depth view of where regulatory support is required to deliver a decarbonised electricity future for all of NZ. It also showed the central part that flexibility services will play in delivering the demand increase.

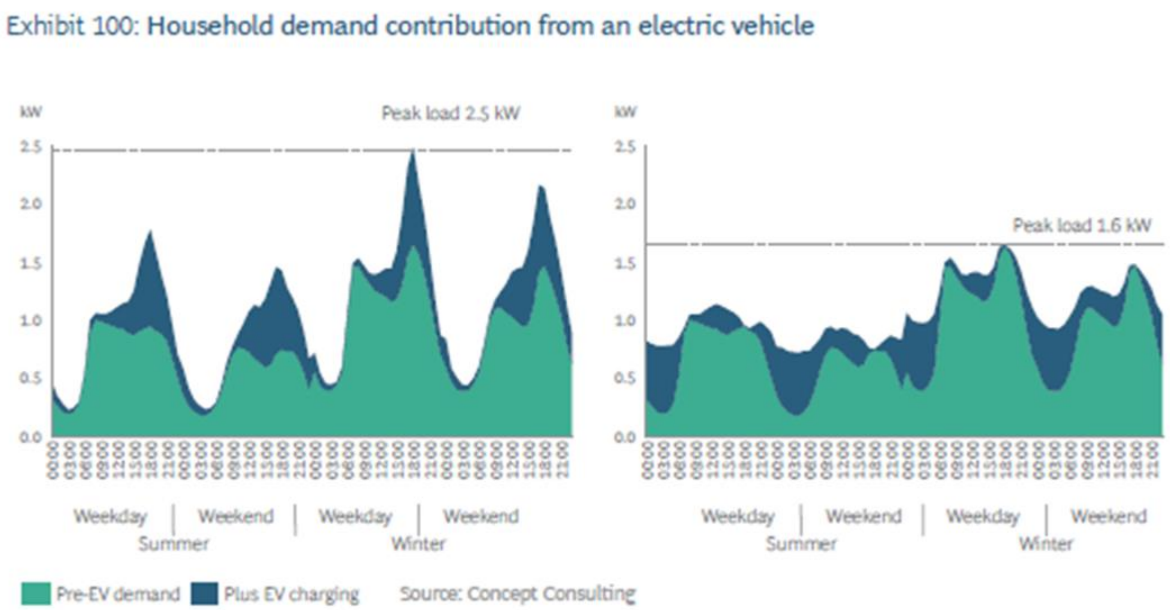

Fig 7 – Industry collaboration: BCG "The Future is Electric" Report. – DR from EV load shifting

On a practical level, WELL is also partnering with the Orion network to trial residential flexibility services. The project includes working with flexibility providers to develop services that DER owners will want to participate in, and a commercial framework to price and trade services. The results of the trial are being shared with the industry via the FlexForum.

Whether the current market settings are right for encouraging DR investment

Market settings will need to evolve ahead of DER or DR investment. Some good work has happened overseas where product standards and specifications require installed devices to have cloud connectivity and the ability to be remotely managed. This standard allows devices to have higher network penetration due to the interoperability they possess and their ability to help stabilise the distribution system. Platforms in South and Western Australia already have 20,000 DER systems connected and 100MW under DR management in each state.

Uncertainty around investment for LV visibility has been solved overseas due to the rapid increase in solar penetration. In South Australia, the Regulator has required the EDB to become the DSO to stabilise the distribution network, to remove the impact devices are having at the transmission level. This has required the registration of DER, and DER to follow operating envelopes. It also requires the provision of five minute data from smart meters so LV Advanced Distribution Management Systems can be established to move and shape demand to stabilise the distribution network.

While most of these market settings have been developed to avoid a threat or a crisis, reliance will be on DER settings being already in place as part of initial connection requirement. Connection requirements included device registration and a connectivity test to ensure the devices could be managed when needed.

At present we don't have the settings in New Zealand which will enable demand response for a rapidly growing EV penetration which will lead to reduced network security. Worsening network security could also create the perception that EVs are bad as they disrupt power quality, leading customers to retain their petrol vehicles and cool the decarbonisation initiative.

Currently regulatory and policy settings remain at trial or proof of concept level and are not shaping in line with lessons from Australia, which is having to rapidly call on DER curtailment to ensure network security of supply.

Roadblocks, Barriers & Solutions

WELL has experienced a number of roadblocks due to the trials and pilots being ahead of supporting regulation, standards, and processes.

We have the advantage of an international shareholder with 26 other utilities across developed regulatory markets. Our largest alignment is with Australia where we lean on the experience of four EDBs, gas networks, and a renewable energy developer. We also compare thinking with Hong Kong Electric and UK Power Networks, which reach over 27 million consumers between them. Some of our earlier work required establishing our own EV fleet and charging stations, ahead of EV adoption in New Zealand. Our experience operating EVs and our learnings from our sister companies have informed our discussions with the industry.

Fig 8 – Early adoption of the WELL EV fleet allowed development of the EV Connect project

The barrier of price signals getting to customers is being resolved as Retailer billing systems get updated so that they can apply more complex pricing methods.

Data access arrangements continued to be developed and there will be smarter ways of identifying DER locations as these systems develop further. We are around five years behind Australia, which has required some rapid changes in regulation in response to crisis events. New Zealand could benefit from this and look to implement similar changes in a sequenced manner rather than reactively.

To get EV data currently, we are required to send a list of streets associated with each of our distribution transformer locations to Waka Kotahi, so that a number of EVs can be put against each transformer indicating where EVs have been registered. We are not, according to Waka Kotahi, allowed any street addresses or other information due to privacy concerns. This is a clear barrier for system development and network planning.

Smart meter data in a form suitable for managing the low voltage network is some time off (with a 4G meter roll out required). When we recently sent a small trial dataset of voltage data to our analysts in Australia, it was found that the NZ data is of a poor quality and it is difficult to derive meaningful information from. The meter providers are trying to address this. Meter providers in Australia have a data standard to manage voltage quality information. Our FutureGrid trial will be leveraging the Australian data quality standard and the industry's learnings from the last five years to close the data gaps. The trial has highlighted that networks do not need a full data set to make informed decisions – a sample data set provides a good representation.

The EV Connect project outlined a roadmap with areas of responsibility across stakeholders. While the steps have been identified, implementation requires a co-ordinated approach across the industry.

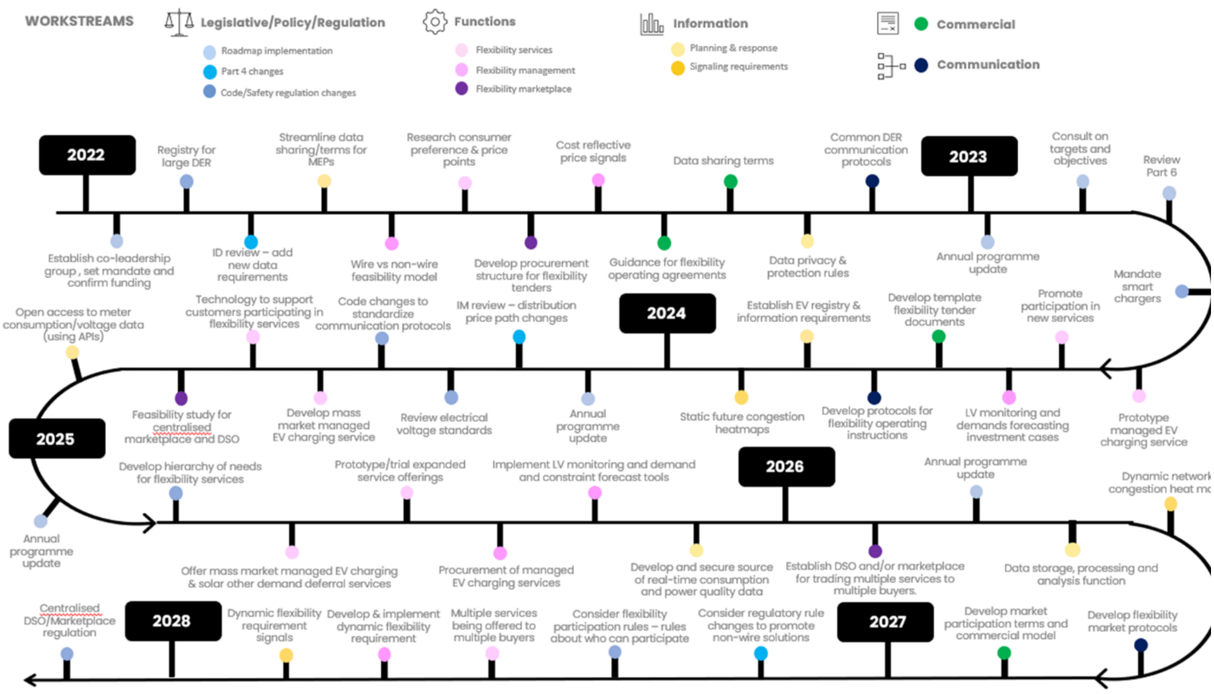

Fig 9 – The Road map from the EV Connect project

Other threats to system security include the ability for individual parties to exercise an opportunistic "overreach", avoiding appropriate coordination. Anecdotally this has happened where the System Operator looking to secure demand side services have not engaged through the EDB but contacted EDB customers directly. This potentially blurs the responsibility of quality targets set by the EDBs to meet Commission expectations, or Consumer Guarantee clarity applied at the distribution level.

Many of these issues and approaches were canvassed with the industry in 2013 by the ENA Working Group on Load Control in response to the drafting of the Authority's Model Use of System Agreement. This working group reached agreement on principles of a hierarchy of needs and recognition of the prioritisation of load management value across the supply system. Most of this alignment came from taking a customer perspective and having wider discussion between Retailers and EDBs. A similar approach has been adopted by ENA Australia.

There are threats of multiple players accessing the same load without a principled and coordinated approach. These uncertainties have been addressed in the Australian model, and New Zealand regulators would be well served to consider some of these constructs to remove uncertainty and achieve early industry alignment.

Other providers, like Thunder Grid are operating a model to maximise EV charging up to the service fuse capacity. While this has benefits to the consumer to defer service main upgrades, it does remove diversity from the network and will bring forward network investment. Visibility of where this is occurring will again be key to ensure network security is not compromised.

Advice the SRC should provide the Authority on Supply security & SO performance

The SRC has already received advice on EV management from Dr Allan Millar regarding making it mandatory for vehicle charging above 2.5kW to be a managed service, to ensure security of supply of the future distribution network. I suggest the SRC review what has become of this recommendation and what has been delivered.

The Authority is in a strong position to ensure that DER is connected securely so that it can participate in flexibility services. The window to ensure that the unmanaged connection of DER does not impact network security will soon close. Connection rates are rapidly increasing and if those devices continue to be uncontrollable, network security will be compromised.

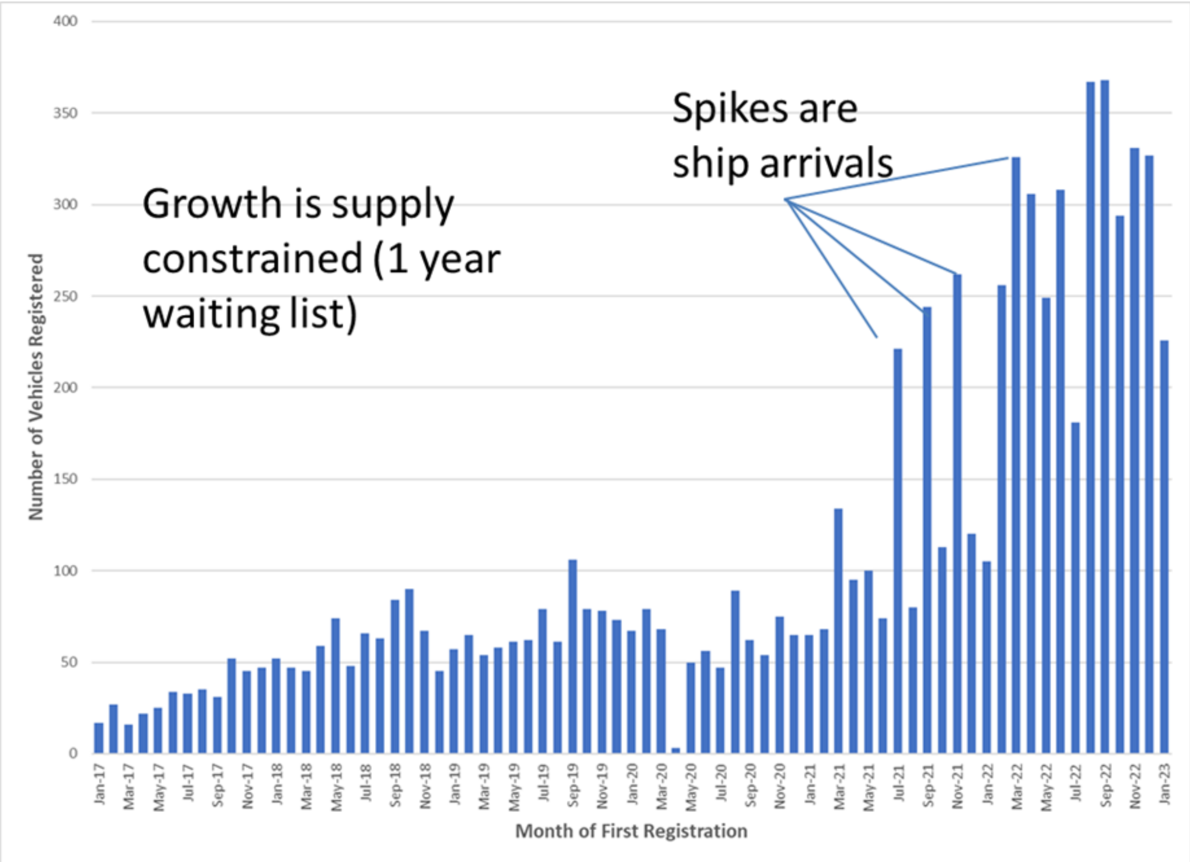

Fig 10 – Trend in EV uptake in Wellington with product supply constraints

There are least regret positions the Authority needs to take – these have been communicated in previous documents the SRC have received.

In the words of Scott Hempling (US Attorney & FERC) the Regulator needs to decide whether they want to remain presiding over existing regulation, or lead new regulation in step with the change which is occurring.

Limitations of Demand Response

DR can be used to manage winter peak demand on the approximately 20 coldest days of the year. This has allowed networks to avoid expensive network reinforcement.

As demand increases beyond managing just the winter peaks, additional network capacity will be required to meet customers' expectations (i.e. remove constraints) and meet the step-change which is occurring.

However, DR does buy time to mange behaviour so that investment is deferred until needed. The drive towards decarbonisation will require new capacity to be built to accommodate the 30 year expected new-demand increase to maintain the efficient use of capital (i.e. not stranding assets every five years due to small capacity steps falling behind the scale of the demand changes). Despite investment removing the distributor's need to use DR (except fault response situations), the DR will remain available for the remaining elements of the value chain.

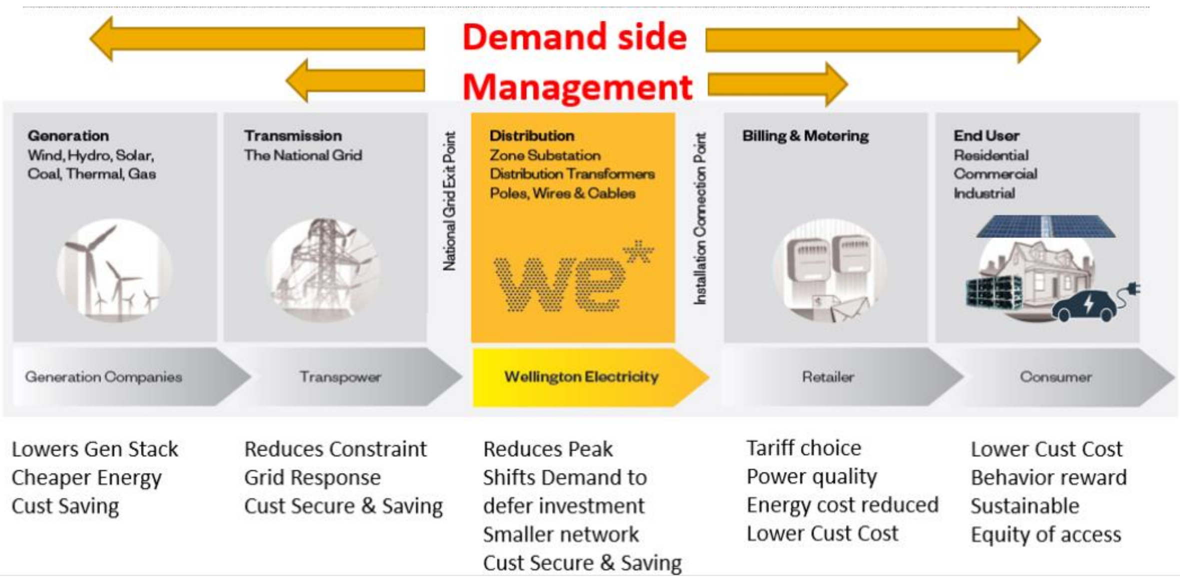

Fig 11 – How EDB demand side management benefits the whole supply chain

The longevity of DR can be promoted through the orchestration of DER storage. Instead of seeing an EV as a load, it can be developed as a household generator, so that a home taking 3kWh over a 4 hour peak can be orchestrated with that demand being supplied from self-supported storage. This brings in a resilience that typically would come at an additional cost to the EDB through network redundancy or interconnection from adjacent network areas.

Storage as a resilience tool opens up market opportunities for flexibility services and residential solar, with batteries being charged ahead of the peak demand periods to be dispatched during those peaks (similar to the trial WELL conducted with Contact). This requires a level of digitalisation to support this as an EV, should it become an ICP, could accept solar from other parts of the network when the vehicle is parked at a different location (i.e. an enabled car parking building).

DR affect at GXP level and coordination with SO

As long as there is a hierarchy of needs maintained as per the 2013 Load Control Management work, then the coordination and collaboration will benefit all supply chain participants with the largest benefit accruing to the consumer in whatever range of market offerings they are incentivised with, noting that from time to time emergency curtailment will still be required so that the lights stay on.

The System Operator is able, through using the hierarchy of control, to contact the EDB for curtailment in the same way as occurs now. The ability for an EDB to orchestrate their networks provides a natural partnership between the SO and EDB by maintaining the “one cook in the kitchen” approach which works well currently and has been adopted by Australian regulators who have TSO and DSO demarcations.

An SO attempting to control DER on the distribution networks creates a security threat for EDBs as they will not have oversight and management of their own network’s security or quality performance. This could negatively impact connected customers (the 10,000 heat pump restoration problem) and require EDBs to invest in additional capacity to provide the SO with headroom to operate the DER.

In a recent example, the SO contracted EDB connected customers into their own DR program when alternatively the constraint could have been resolved by the EDB reconfiguring their 11kV network. This is an inefficient result economically and lacks the communication the industry requires to work in a coordinated manner.

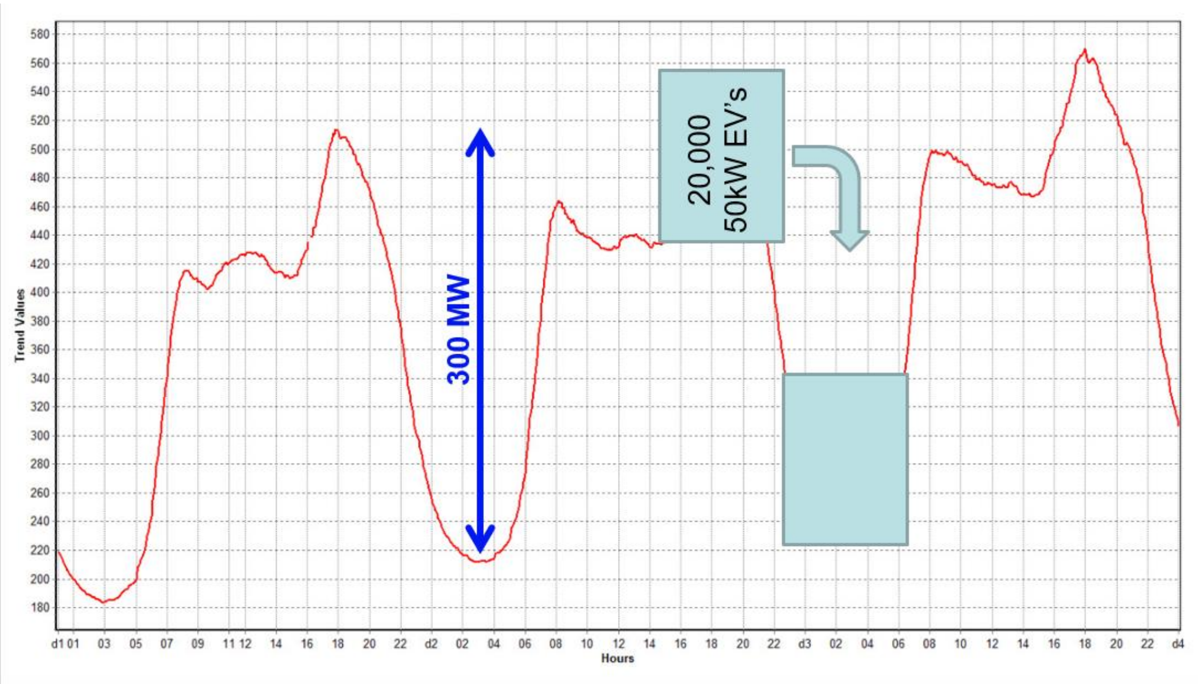

Fig 12 – Total GXP demand shows large opportunity for DR and DER storage off-peak.

Demand Response Failure

WELL has experienced DR failure with hot water control from historic bias relay systems becoming inoperative. This was managed by offering customers to connect to the existing ripple control system to maintain the reduced lines charge they had been receiving as a controlled rate connection.

If the existing demand response capability is forecast to be exceeded, then provided there is sufficient time from this trigger point ahead of the need to invest in higher capacity, then quality of supply will be maintained.

This is a concept being discussed with the Commission – managing investment uncertainty (due to uncertain peak demand growth drivers) by linking investment packages to demand growth trigger points. Regulatory allowances would become available once the growth trigger points are exceeded. The triggers would be set at a point to give networks sufficient lead times to build new capacity.

Fig 13 – If DR fails, then network alternatives will develop, slowing decarbonisation efforts

To avoid outages and maintain security of supply, we expect to have to develop portable battery inverter sets to manage LV continuity during HV maintenance periods (recognising the discontinuance of portable diesel generation). Network batteries will be able to be redeployed to areas requiring LV voltage support.

Eventually there will be sufficient solar-battery systems which can support the network during winter evening peaks, if market constructs support this behaviour.

Community solar being stored in batteries and returned to the network during peak times will support security of supply. This will require significant network modelling and monitoring so that these situations are well signalled for the required response. In some situations, second-life opportunities may exist for used vehicle batteries where the battery's performance for traction is spent but it still has enough capacity to provide network support.

Is Ripple Control sustainably supported by current regulation

WELL has a strong alignment to continue with ripple control and to increase the capacity of the response for two reasons:

1. The local government district plan is signalling a move to greater density of city housing, so demand shifting will be required.
2. Increased demand from existing connections due to the gas transition (specifically hot water heating) will also need load management to maintain security of supply.

A third of residential connections on the Wellington network are using reticulated gas. These 55,000 ICPs need a well-planned transition to electricity. This includes the management of hot water storage as a precedent supported by regulation.

Taking a residential ADMD of 4kW and then adding 1-2 kW for a vehicle charger and an additional 1-2kW to electrify existing gas energy use isn't sustainable on current network designs. Networks are already constrained due historic network design philosophies (i.e. the expectation of decreasing demand due to more efficient devices) and rapid multi-unit developments of traditional single premise quarter acre sections.

Regulation needs to take the lead in this area to ensure the change is managed while maintaining network security.

Overseas experiences from Sister Companies in the DR area.

There is a clear dichotomy between Australia using solar to offset energy from coal fired power stations and the more advanced position New Zealand finds itself in of having an 85% renewable electricity system moving towards providing 95% of total energy from renewable sources (including the eventual transition of transportation onto the electricity system).

The issues of managing the new entrants of solar or EVs onto distribution networks has a common outcome as far as ensuring these devices connect visibly, are registered, and can participate in managed services to allow a secure supply of electricity.

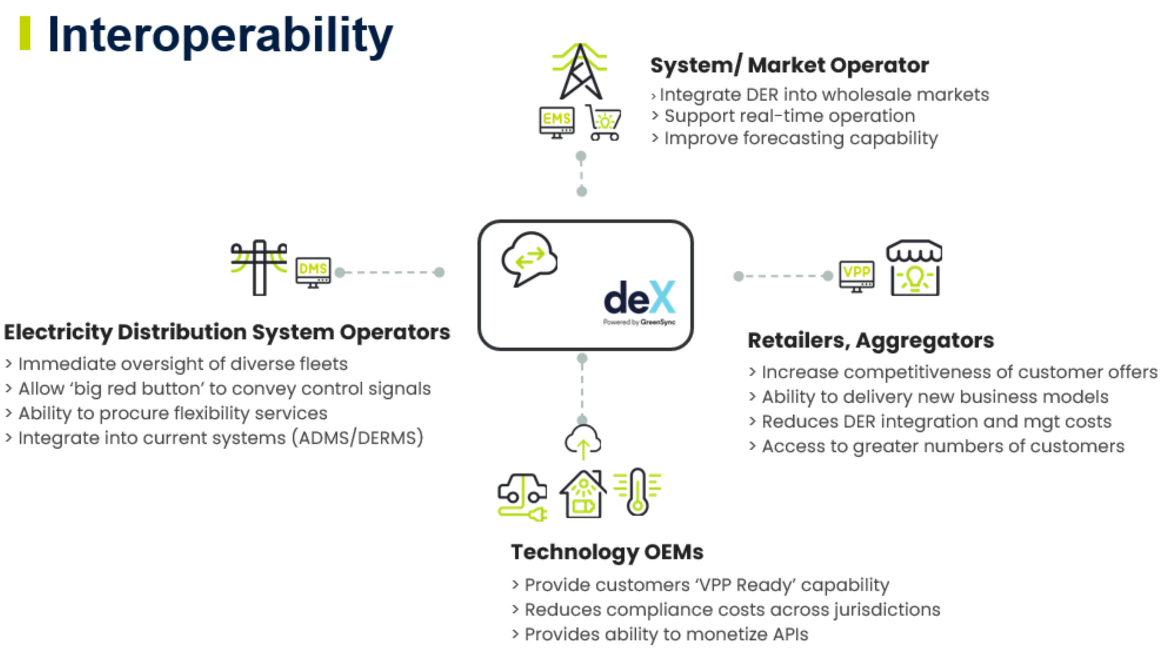

Fig 14 – Digitalisation platforms of DER registration opens DR coordination to participants

These lessons took a while to learn in Australia. Once they reached a crisis point in South Australia with too much solar connected to the distribution network and threatening the stability of the grid, they at least had the standards in place to recover – largely due to inverter specifications which were smart (cloud connected), able to be seen (registered to a platform), and managed (platform operated to stabilise solar injection by turning down or directing inverters to follow injection envelops determined by the EDB to meet both distribution and transmission security requirements).

Funding the development of LV ADMS and DSO capability at the EDB level and making five-minute smart meter information available, has largely pulled security of supply in South Australia from the brink. Now other Australian networks are adopting this approach to manage solar in a stable manner across other states, so the network and transmission security is maintained.

New Zealand is well positioned to learn from this overseas experience and implement similar changes early enough to avoid EVs driving its electricity industry to crisis point in the same way that solar did in South Australia.

For further discussion please do not hesitate to contact the undersigned or WELL's Commercial and Regulatory Manager Scott Scrimgeour at scott.scrimgeour@welectricity.co.nz.

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