vector submission

EECA green paper – improving the performance of EV chargers

contents

executive summary

We welcome the opportunity to submit in response to EECA's EV charging green paper and we welcome further opportunities to meet with and engage with EECA to inform and support continued work for efficient electrification. As identified by EECA smart EV charging is a significant opportunity for New Zealand consumers and the affordable electrification of transport.

This is because, by managing EV-driven peak demand, smart EV charging can help make the most of our existing infrastructure and avoid unnecessary capital investment – the cost of which is recovered from consumers in their electricity bill. The impact of EV uptake will be concentrated on our electricity networks. Complex and granular, networks are like the capillaries of our electricity system and play a crucial role in the system as a whole achieving its mission in connecting consumers to electricity.

The benefits of network optimisation driven by smart EV charging will be significant. Our modelling estimates that new demand could increase the peak demand experienced on the network by around 150% if this new demand isn't managed. When demand management – such as smart EV charging – is utilised – this peak demand increase could be reduced by two thirds. With a higher peak demand comes a need to invest in more network capacity. Inefficient capital investment increases electricity bills for every electricity consumer.

This is true for inefficient investment across our electricity system – all of which flows through into a consumer's electricity bill. Smart EV charging however can also increase utilisation of infrastructure across the system – for instance by aligning demand to the times when more renewable generation is available, offsetting the need to invest in peaking generation. By helping to 'defeat the peak' smart EV charging can enable a secure transition to greater renewables. Implementing the settings for smart EV charging and demand response capability can also unlock new competitive markets and flexibility services.

We support regulating for a standard for smart EV charging to enable this. In defining the scope of this standard, necessary functionalities need to be included without unnecessarily constraining emerging markets and services. Defining what is in scope of a regulated standard and what is not, will be important in maintaining this balance. Functionalities which enable dynamic and remote charging; default off-peak charging; voltage control and open communications protocols are important functionalities which should be included in a regulated standard.

Whilst a necessary first step, regulating for a smart EV charging standard will not by itself unlock the full benefits of smart EV charging. Chargers ultimately need to be connected to a demand management platform for dynamic management, and consumers need to choose to use a charging device. We consequently recommend that regulation is partnered with an incentive or subsidy to tilt consumers in favour of using a charging device (which further to regulation would include smart functionalities).

Incentives have a further role to play in supporting participation in demand management platforms – and we recognise and support that some retailers are already offering pricing to incentivise EV driven peak management. However, for consumers to choose such services they need to have a smart charger. Overall we do not see incentives and regulations as being mutually exclusive – rather, they are mutually reinforcing. We further recommend pathways that can encourage enrolment in demand management at a process level. As a bare minimum first step, processes also need to be in place to ensure that an EV is registered to an ICP with a local network. This is crucial for efficient network planning and could be achieved at virtually zero cost today.

the burning platform

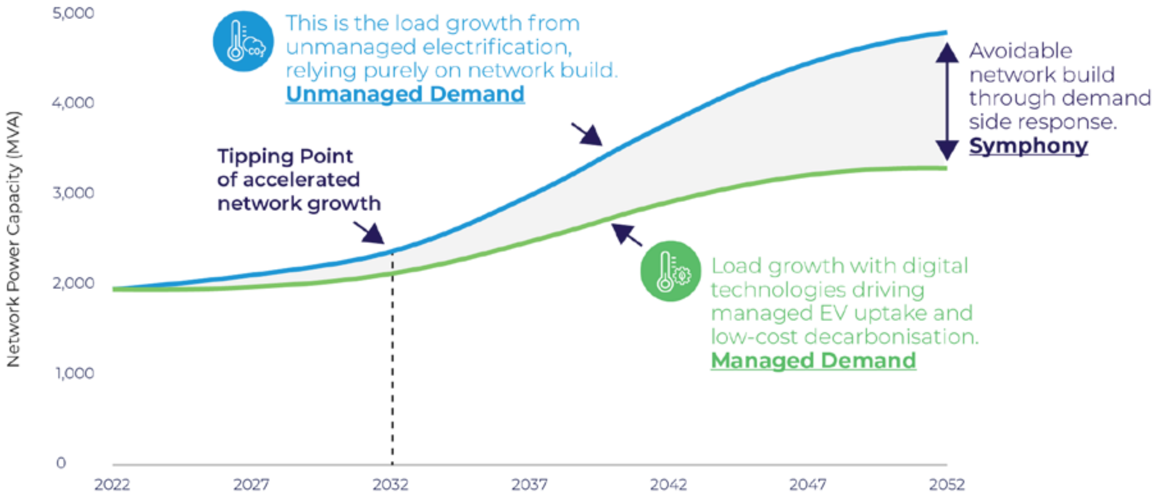
Widespread smart EV charging is make or break for affordable electrification – the critical hurdle in achieving New Zealand's emissions reduction targets. Twenty percent of emissions come from transport – making it the second biggest driver of emissions after agriculture[1].

Whilst electrifying transport is at the forefront of our fight against emissions, below the surface is our electricity infrastructure that makes this possible. Increasingly complex and interconnected, this enabling system must be digitalised to affordably rise to the EV challenge.

To avoid infrastructure regression we must choose progression – for consumers of today and for future generations. This is about embracing and driving innovation that can deliver the step change needed in Aotearoa's infrastructure. This will not happen by accident.

New Zealand's EV charging infrastructure includes both the provision of EV chargers themselves – as well as our electricity infrastructure. Ensuring the right settings are in place to enable connectivity between these two layers will be critical for affordable and secure EV uptake. This is about ensuring that chargers have the functionality to be connected to a system for management. The cost of the counterfactual is significant.

Smart EV charging reduces consumer cost



The above graph shows the difference in network capacity required to meet demand when demand management (such as smart EV charging) is utilised, vs when it is not. This shows that the peak experienced by the network more than doubles by 2050, in the absence of smart EV charging. This is shown in the y axis by the increase from 2000 MVA today to well over 4500 MVA by 2052. With this higher peak demand comes a need to invest in more network capacity – and much more. Inefficient capital investment increases electricity bills for every electricity consumer.

This increase in peak demand however is reduced significantly by demand management (such as smart EV charging) – the impact of which is represented by the difference between the blue and green lines. This brings the peak demand on the network down from ~4500 to 3000 MVA by 2050 – a significant reduction in the increase in peak demand growth forecast under the counterfactual. This graph and further analysis related to the challenges and opportunities associated with our transition to net zero is also reported in Vector's Taskforce on Climate-related Financial Disclosures (TCFD).[2]

[1] *Accelerated Electrification. April 2019. https://www.iccc.mfe.govt.nz/assets/PDF_Library/daed426432/FINAL-ICCC-Electricity-report.pdf;*
[2] *https://blob-static.vector.co.nz/blob/vector/media/vector-2022/6-vector-2022-tcfd-report.pdf;*

The above modelling is also supported by wider sector analysis led by the Business Energy Council (BEC). The TIMES-NZ 2.0 modelling shows electrification – driven by the demand for EVs – could double required network capacity by 2050, if demand is not managed. Additional infrastructure and significant improvements to New Zealand's electricity network would be needed. Analysis undertaken by Concept Consulting estimates the growth in transmission and distribution network costs (which are largely driven by peak demand) will be in the range of $160-220/kW/year (an additional $6.1bn cost using passive charging compared to smart charging by 2050)[3] . Higher prices will be felt by all consumers – regardless of whether they own a BEV. Smart chargers would flatten peak demand, improve network utilisation, and reduce the need to build new electricity capacity.

We agree with EECA and the EA that:

Harnessing controllable DER will mean lower electricity bills at the household level, and at a system level, the impact can be even more significant.

Both the system impact and household bill are inextricably linked as demonstrated by the Whole Energy System Metric of Cost (WESC).

The WESC expresses the impact of an asset on the electricity system as it would be felt on a consumer's electricity bill. It does this by accounting for the cost or saving that the asset has on the whole energy systems including:

- The impact that an asset has on system balancing (whether the asset incurs additional cost through volatile output requiring other actions to keep electricity demand in line with supply, or, if it adds value by stabilising this);
- displaced generation (reduced costs of running other generators during the periods that the technology is producing power);
- network impact (the distribution reinforcement costs that the technology may avoid or incur);
- capacity adequacy impact (whether or not the technology allows existing capacity to be retired, or new capacity to be forgone, while maintaining the same level of security of supply); and,
- the cost incurred by building and running the technology itself.

Taking into account these factors the WESC produces the cost of electricity on a per MWh basis, attributable to a technology. That is, it shows the cost or saving that is incurred by an asset that has a lifetime output of 1 MWh (and the rest of the system adjusts accordingly).

This illustrative metric estimates that a smart EV charger delivers a net benefit to the electricity system of $174 per MWh (or a 'negative cost' of $174 per MWh) - which is much more cost effective than building new generation (or indeed, installing passive chargers – even accounting for their lower capital cost).[4] Applying the same inputs of the WESC to produce a per annum estimation finds that a residential smart EV charger adds $274 p.a.

This is $274 per annum that consumers do not need to pay in their electricity bill in a year as the result of a single residential smart EV charger. This accounts for the higher upfront cost of a smart vs a passive EV charger (Frontier Economics estimated this difference in up front capital cost to be $300NZD). Much like insulation which comes with a higher capital cost, the overall savings for consumers from the investment outweighs the up-front cost. However, in the case of investing in a smart EV charger this up-front capital cost hurdle is much less than

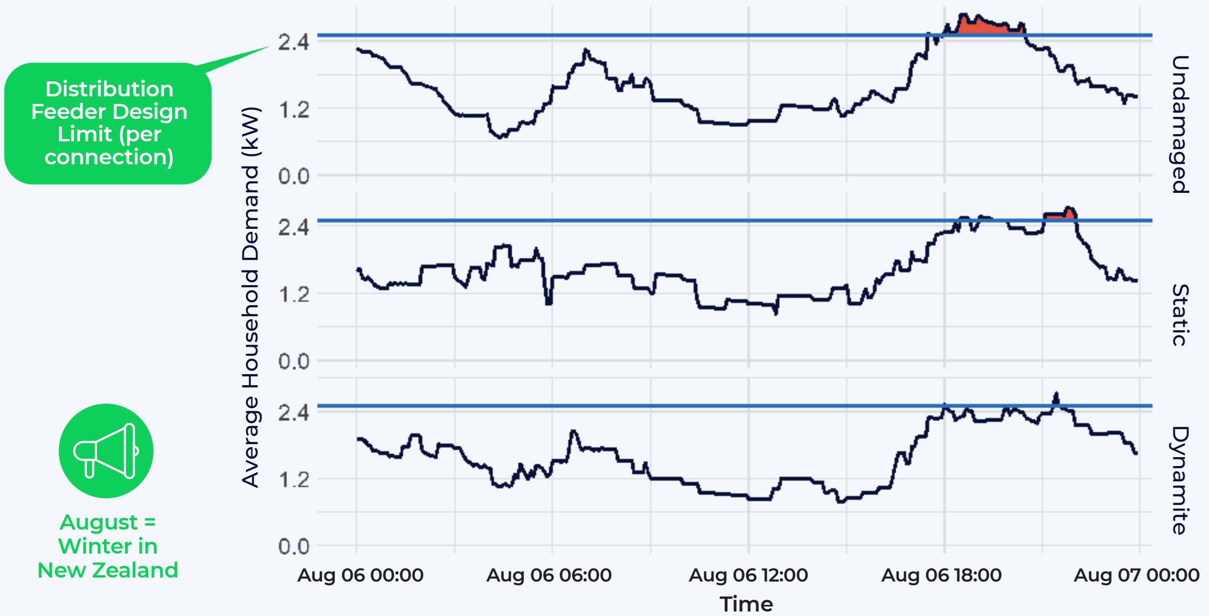
[3] *https://www.concept.co.nz/uploads/1/2/8/3/128396759/ev_study_v1.0.pdf;*
[4] *https://blob-static.vector.co.nz/blob/vector/media/vector2021/annex-1-frontier-whole-system-costs-in-nz.pdf;*

is the case for insulation. As we explain further this up-front cost could be further reduced through an incentive for smart EV chargers.

Whilst the WESC is illustrative, the impact of smart EV charging on the network alone is significant (as represented by the graphs above).

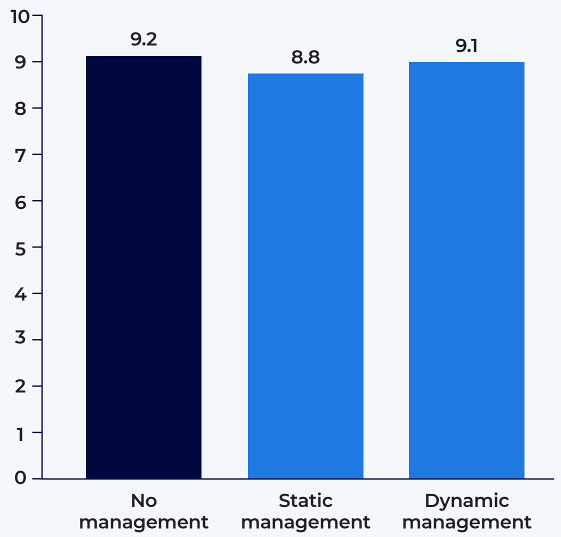
Vector undertook a trial of smart EV chargers to answer the question of whether smart EV charging could both manage network peaks as well as meet consumer needs. The trial of around ~200 participants found that it could.

Smart charging algorithms in action



This shows that the dynamic management of EV charging was successful in bringing peak demand within existing network capacity limits.

Smart EV charging delivers consumer confidence



"The trial has been essentially invisible, as we have not noticed any changes in service while monitoring was happening, or alterations to charger parameters made." (Nissan Leaf owner)

90% of customers rated the speed of charging, ease of usage, and overall satisfaction with dynamic charging as positive, providing a score between 8-10 for these aspects.

"Don't think I could get any better or more convenient option. Seems to work perfectly." (BMW i3 owner)

The above shows consumer satisfaction with the dynamic management of EVs.

Our smart EV charger trial has found that dynamic management of EV charging (smart EV charging) can deliver network benefits driving down cost, as well as ensure customer satisfaction.

Smart EV charging can defeat the peak enabling a secure transition to greater renewables

We agree with EECA that:

Smart and energy-efficient electric vehicle (EV) charging holds the greatest potential to reduce peak electricity demand in New Zealand. This is because we expect to see significant growth in electricity demand from EV charging, and most of the generation required to meet this growth in demand has not yet been installed. We stand the best chance of realising this potential if we start planning for an expected increase in EVs and EV chargers now, when we can influence the types of devices installed.

We agree with the findings from MBIE's investigation into the August 9th grid emergency:

"The increasing use of EVs will either be part of the solution or contribute to the problem. We can avoid unnecessary future increases in peak demand if EV charging is managed to shift load. The network has the capacity to deal with mass off-peak EV charging, and load shifting can help avoid events like those of 9 August… While pricing signals that reach consumers are necessary, they are unlikely to be sufficient to avoid EVs increasing peak demand. Regulation is likely to be needed, but it needs to provide for flexibility given the uncertainty."[5]

As we transition to greater renewables, both increasing the levers to manage a more volatile system (driven by greater reliance on more intermittent generation) for system security - as well as using smart ways to manage peaks (and not just overbuilding largely underutilised and expensive infrastructure) for affordability – will be critical for maintaining a secure, reliable and affordable electricity system that both keeps the lights on for all consumers and keeps EV owners moving.

Implementing settings for smart EV charging – as with wider demand response capability – can unlock new competitive markets and consumer services

We support EECA's acknowledgement that:

Flexibility services, such as demand response, have a key role to play in the energy transition. It can help to manage intermittent renewable supply and manage peak demand, both of which are essential to the success of delivering energy security and affordability alongside decarbonisation.

In addition to these outcomes, the emergence of demand response and flexibility services can create new markets for more competition and consumer products. These will deliver value and enhance energy affordability both to those consumers who participate, but also to those who do not. This requires devices having the right capabilities – to enable EV optimisation and system security.

Q1. What are your thoughts on EECA's suggested engagement principles for EV chargers? What would you add or take away? Is there anything you disagree with?

We support the principles set out by EECA to guide its engagement with residential EV charging, and we note EECA's commitment to: "intervene to the minimum extent necessary" to achieve its objectives.

[5] *Page 32. https://www.mbie.govt.nz/dmsdocument/17988-investigation-into-electricity-supply-interruptions-of-9-august-2021;*

the burning platform (cont)

We support this commitment and for the avoidance of doubt:

Regulating for a standard for smart EV charging is the minimum intervention necessary to enable the affordable uptake of EVs and a reliable and secure power system.

However, ensuring that this regulation opens the door for EV optimisation services and future markets and innovation (rather than constraining these emerging markets) depends to an extent on what is included in the standard and what is excluded. We propose the below principles are key considerations in defining this scope.

standard scope – an overview

At a principles level there are two important considerations in determining the scope of a smart EV charging standard:

1. **Ensuring the right no regrets functions are regulated for today, whilst ensuring that the market for EV chargers is not unnecessarily constrained, is important for the ultimate goal of affordable EV uptake and efficiencies driven by new competitive markets and flexibility services.**

   EV chargers are likely to have lifespans of around ten years. As such this first iteration of a standard should be considered just that – the first iteration.

   Where there are potential services and functions which a smart EV charging standard could enable – but which are yet to emerge – there is scope to regulate for these in the future when there is further information. In some cases, there are multiple pathways through which new consumer services or markets could emerge. Whilst enabling optimised EV charging is certainly something that requires EV connectivity (which should be regulated for yesterday) there are a number of pathways through which these services – and other services, such as multiple trading-relationships – could be delivered. We believe that it is important to allow technology and consumer behaviours to take a leading role in shaping the optimal market pathway for New Zealand – not regulation. Given the size of New Zealand's market and our role in many cases as a technology taker rather than a technology maker, there is also a risk that pre-emptively regulating for markets and technologies could put us out of step with other markets. We recommend EECA resist the temptation to pre-emptively regulate for services and markets where technological and market pathways are not yet settled and where this is not yet necessary to maintain optionality by way of a smart EV charging standard.

2. **Smart EV charging is necessary for consumer choice and freedom.**

   It is in the absence of proactive peak management and the right settings in place to enable this, consumers will experience less choice and control.

   This could be because of more unplanned outages driven by a lack of voltage management, cost prohibitive prices for energy, or the reactive deployment of levers to manage consumer demand to avoid a system failure. What may seem like a trade-off between consumer choice and system optimisation today must be carefully assessed in the context of new pressures that will be faced by our power system – and the impact of failing to manage these pressures. That is – we must consider the counterfactual as it would occur in the near future, not the past – as that will be the parameters within which consumer experience occurs.

We believe functionalities for inclusion in a standard are:

- Capability to connect with an aggregator or service provider, for dynamic and remote management;
- default off peak charging mode and randomised delay functions for off-peak charging – particularly for the earlier stages of EV uptake;
- open communications protocols;
- power quality and control settings;

standard scope – an overview (cont)

We note that the consultation does not propose any requirements related to V2G technology specifically apart from a general requirement that EV chargers do not prevent power exports. We agree with this positioning.

We believe that this – in conjunction with the existing standard for V2G chargers (ASNZS4777.2:2020) – is adequate in enabling the future role of V2G technologies.

There are additional functions EECA mentions which we query as needing to be included in a regulated standard at this time:

- Requirements for EV chargers to transmit data on their location and use;
- requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner; and,
- energy efficiency for on-board EV chargers.

what should be regulated for?

Q2. What are your thoughts on the proposed specifications for 'smart' chargers in New Zealand? What do you see as most and least important? What functions would you add or exclude, if any, and why? What information could you supply to EECA to help inform our thinking about this issue?

We agree that EV chargers that have a common set of functions and means of communication, and can be used by any potential operators of a device, are best placed to deliver maximum value to NZ. Specifically, we support the following specifications be included in a regulated standard for smart EV chargers (listed in order of importance) to enable peak management:

- Functionality for dynamic and remote management

  Specifications for smart EV chargers must include functions which enable near real-time *dynamic* load shifting by an aggregator. This is so demand (or export) management can respond to dynamic factors relevant to the system's performance such as: the charging of other proximate vehicles (or demand of other energy-using devices) and available network capacity. These functions can also enable load shifting which responds to temporal factors through the system – such as the availability of cheaper, renewable generation. With the right settings – such as to ensure dynamic and remote management – an aggregator could have a view of these factors and optimise charging in response to them.

  This is recognised by one of EECA's three key performance factors for smart EV chargers - *Connectivity of EV chargers: including functions to enable signals to be sent to, and received from, an external party. We support this strongly.*

- Default off-peak charging mode

  This would mean that EV chargers would be capable of charging off-peak by default and would be pre-set to do this. Whilst the emergence of flexibility aggregators / markets for optimised charging services are still in the early stages, ensuring that chargers are set to off peak by default is a positive step to manage demand from EVs. This is particularly true whilst most consumers still do not have an EV. The UK includes a pre-setting to off-peak charge mode by default as part of their regulations.

- Randomised delay function

  A randomised delay function could help to smooth any secondary peaks when used in conjunction with default off-peak charging mode. The risk of a static intervention (such as default off-peak charging) rather than a dynamic one – is that a secondary peak is created. That is, by simply shifting rather than staggering charging, a peak still occurs on the network (especially the LV network) – just at a different time. This was demonstrated by our smart EV charger trial which found that consumers' use of manual scheduled charging tended to result in most consumers scheduling to the same time. If enough consumers were to do this, a secondary peak would be created. However, by starting the charging of vehicles at different times, randomised delay function can help smooth the ramp up to secondary peaks somewhat. This needs to be staggered appropriately (randomised delay of up to half an hour). As noted above however, unlocking the potential of EV optimisation is ultimately about the provision of dynamic and remote management. Default off-peak charging mode, in partnership with randomised delay functionality, are valuable requirements for EV charging management – particularly as markets for dynamic management services are emerging and EV uptake is still relatively low. However these functions are no replacement for dynamic management capability.

We note that for the proposed specifications of default off peak charging and reduced charging at peak mode, EECA holds that:

"The owner would retain the ability to manually override the default mode". As noted above our smart EV charger trial found that consumers rate smart EV charging services highly, and that managed EV charging (that is – which does not include a consumer override) can both meet network requirements and consumer preferences and needs.

There are some important considerations around consumer override.

Consumer override and system security

EECA recognises "maximising energy and electricity system security, reliability and stability", as an objective, and, as noted by the Independent Investigation into Electricity Supply Interruptions of 9 August "load shifting can help avoid events like those of 9 August". We agree. Just as some networks were able to utilise hot water load control to shed load in response to system operator requests during the 9 August grid emergency (without resorting to consumer outages), connected EVs offer an opportunity for distribution system operators or networks in the future to also shed load during an emergency event, or, to stabilise the system, preventing such an event from occurring. This appears to be contemplated by EECA: "They [smart EV chargers] may even be able to respond to real-time signals from external parties such as a network operator or a load aggregator".

To enable the demand response contemplated above, EV chargers must be responsive to such an aggregator protecting system security or responding to an emergency - in spite of the ability for consumers to override an off-peak charging setting in a business-as-usual scenario. This is particularly important as there may be circumstances which trigger widespread simultaneous consumer override – such as an external weather event prompting consumers to want to 'fill up' the EV all at the same time (particularly with vehicle-to-home technology, whereby a full EV battery is an attractive way to continue using electrical appliances even during a storm-induced outage). Whilst understandable, it is important that levers are in place to ensure that such behaviours – occurring "en masse" – don't have the perverse effect of compromising network security and deepening the impact of an extreme weather event. This could happen, if, for instance every consumer leverages their override to fill their EV in response to a forecast storm event, creating more demand than supply, destabilising the system and causing a widespread outage. Such events of widespread simultaneous consumer override would be very low probability but could be very high impact – and it is important that the provisions are in place to mitigate this risk. This includes the ability for a distribution system operator or network to manage EV load to maintain system security in spite of the ability of the consumer to override BAU peak management settings. Such a lever – an override of the override – should be seen as the 'ambulance at the bottom of the cliff'. Whilst the ambulance is important, prevention is optimal. In this case, prevention is widespread participation in dynamic demand management. The greater the proactive peak management that can be achieved through such services the less the ambulance would need to be deployed.

Consumer override and planning certainty

Another important consideration around the inclusion of consumer override is uncertainty for those planning and operating the network. This is particularly true for networks with more efficiently designed After Diversity Maximum Demand (ADMD) – that is, less network capacity, or 'headroom', to accommodate unanticipated peaks. For such networks, without certainty that consumers' EV charging can be managed, the engineering solution will favour an immediate increase to designed ADMD – an expensive capacity upgrade. The network cost efficiencies driven by smart EV charging (which accounts for a significant portion of the cost efficiencies driven by smart EV charging for the system overall) are derived by the avoidance of such upgrades. Part of the value of smart EV charging would therefore be lost if upgrades were made anyway, given the absence of certainty of charging outcomes and lower existing network capacity. Furthermore, when V2G becomes more prevalent – likely reducing the peak – planners that invested to accommodate consumer opt-out may be considered to have 'gold plated' the network.

We appreciate that consumer override may be important for consumers to accept EV smart charging regulations as a matter of principle – however our message is that the higher the certainty that can be provided to network planners and engineers, the lower the cost for every electricity consumer.

This is also true of consumer 'opt out' – that is, if, in the future a large number of consumers 'opt out' of EV management services this would reduce the ability to manage and plan for new demand and size the network optimally. This would in turn reduce much of the value proposition of smart EV charging. As we discuss further, smart EV charging rests on the chargers being smart – but also connected to a platform for management. We propose below on page 10 a potential pathway to support the enrolment of a smart EV charger with a demand management provider.

Connectivity failure

The value of smart EV charging also depends of course on the reliability of the connectivity between EV chargers and an aggregator or DER manager. That is – systems and processes which connect an EV charger to a management system, enabling the smart charging, need to be robust enough to deliver a high degree of certainty that the demand will be managed. There are a number of ways that this connectivity could be provided (via a cellular network, fixed-line broadband, radio mesh or another IoT solution) – and of primary concern is ensuring that the systems are robust and interdependency with other infrastructure – such as the WiFi network – is considered. An important secondary consideration to ensuring connectivity is maintained through robust infrastructure and technologies, is what happens when connectivity is not maintained.

Q3. Do you support EV charging being open access, and why/why not? What information could you supply to EECA to help inform our thinking about this issue? Do you think that 'smart' chargers should address issues of cyber security? How would you suggest this is done?

We support open communication protocols. Interoperability is important for consumer experience, future proofing technology, and competition in future flexibility markets. We also believe that a 'smart' EV charging standard should address cyber security.

Open access protocols are distinct from open communications protocols and have significant implications for cyber security. As the proliferation of smart EV charging services increases this also increases the ways that malicious actors could disrupt consumer services or reliability.

We recommend two actions to ensure cyber security is maintained as smart EV charging is enabled. One is concerned with the cyber security credentials of an aggregator managing smart EV chargers in the future and the other is concerned with the standard for the EV chargers themselves.

what should be regulated for? (cont)

Establish a process through which flexibility providers / aggregators are authorised to offer EV management services. This should include a minimum cyber security standard that an aggregator has to be complaint with. This is to ensure that the platform that they use for smart EV charging doesn't put consumer assets or the whole electricity system at risk.

Include a cyber security standard alongside the open communications protocols for smart EV chargers. There are different open communications protocols that could be used – OCPP or OpenADR. There are pros and cons to both and we recommend that overseas jurisdictions are reviewed and the sector consulted to make a determination on this. We note that the PAS currently includes OCPP. However, whatever open communications protocol is used there also need to be a cyber security standard included.

Whilst we acknowledge that EECA is seeking to address cyber security separately, we recommend that a framework is considered now and include the above actions as bare minimum steps to maintain continued system security and reliability as our electricity system becomes more digitalised – and the 'points of access' to it increase. This is ultimately consistent with the goal of interoperability.

Q4. What are your thoughts on EV chargers having to transmit information on their location and use, and the suggested scope of information to be provided? Who should be able to access this information? In what form should it be transmitted? What processes should be in place to safeguard the data? Is there any other way this data might be captured?

EV locational data requirements

Understanding where EVs charge and when is critical for efficient network planning. This is heightened by the fact that this technology is new, largely unknown and the uptake pathways are still unclear. The important thing in providing this visibility is that the EVs are registered to an ICP at the time of installation.

If the location of EVs chargers were provided as GPS data, this would need to be separately mapped against ICPs, which adds additional complexity to gain the benefit of understanding where the device is connected to the network. There are alternative pathways to achieve visibility of EVs which would not require EV chargers to transmit their location to a third party. These pathways should be used to provide networks with the ICP associated with an EV as well as its maximum potential demand. These are as follows:

The Certificate of Compliance pathway

When a solar system or V2G is installed a requirement exists under Part 6 of the Code to register this installation with a network business:

Section 9A

3) The distributed generator must also give the distributor the following information as soon as it is available, but no later than 10 business days after the approval of the application:

   (a) a copy of the Certificate of Compliance issued under the Electricity (Safety) Regulations 2010 that relates to the distributed generation:

   (b) the ICP identifier of the ICP at which the distributed generation is connected or is proposed to be connected, if one exists.

This is executed through a Certificate of Compliance being completed by an electrician and provided to a network. Whilst Part 6 applies to distributed generation (including V2G technology – which is captured by Part 6 as it injects power into the network, making it 'distributed generation') this pathway could be expanded to include the registration of all EV charging installations. Indeed, including EV charging installations on the existing registry administered by the Electricity Authority is something we have been seeking for some time. This option to ensure network visibility of EV chargers by ICP is virtually zero cost. This option does not propose that the application process in its entirety as set out in Part 6 be applied to all EV charging installations – but that the requirement in Section 9A 3) does.

There are also some important changes that would need to be made to ensure that this process is viable to provide locational data of EV chargers to networks:

1. The requirement to register the installation should be placed on the installer rather than the customer. The Code currently imposes an obligation on a consumer (understood as a distributed generator for the purposes of Part 6 and thus an industry participant for the purposes of the Act) to provide the location of the installation. However, as above, this is generally performed in practice by an electrician or installer and when this data is not provided (as is true for around 14% of installations), following up with the installer rather than the consumer is more fruitful. We recommend that the Code is aligned so that the

obligation to register the installation with the network rests with the installer. Having this clarity could increase consistency across installer practices and introducing this responsibility for installers now would be timely alongside the introduction of an EV charger standard for chargers sold and installed in New Zealand.

2. Introducing penalties for non-compliance. Currently the only recourse available to a network in the instances of non-compliance with this registration requirement is cutting the asset off from the network. This is not consumer centric, to the point where we virtually never do this. This also penalises a consumer when, as above, we believe that the responsibility should rest with the installer. In addition to 1 there is a need for a viable non-compliance penalty on installers to enforce registration requirements. The burden of registering an installation for Code compliance is much less than the burden on a network business following up 14% of installations to gain the registration data. This burden on networks would only increase if the registration requirement were widened without the right enforcement levers.
3. The EA's registry needs to be amended so that registered assets can be 'tagged' as an EV. This currently does not exist, even for V2G – for which the registration requirement already exists. As a result these assets are 'seen' as the same as distributed generation – even though their power injection behaviour is likely to have some differences which are relevant to network management purposes. For this process to be viable in providing networks with data on the location of EVs these additional categories would need to be added (that is for 'V2G' and 'EV charger') so that the type of asset is identified with its registration.

We appreciate that Part 6 is designed to apply to distributed generation – and indeed that the Code can only apply to those who are an industry participant as defined in the Electricity Industry Act 2010. Changing the Code is also the role of the Electricity Authority, rather than EECA, but we understand that the various Crown entities will be working together to determine the best means by which to achieve these outcomes.

Qualified installer programme pathway

The UK's Office of Zero Emissions Vehicles (OZEV) administers a scheme through which people can become a registered installer for EV chargepoints (CPs). This is alongside regulations to ensure that the CPs sold and installed have smart functionality, and a subsidy for compliant EV CPs which is claimed back by installers for customers.

To become accredited, installers must: be registered with a Competent Persons Scheme (which is also a requirement to become a registered electrician); have completed an EV charging course (these typically have pass rates of 100% and cost around £350); and, have completed the course of a manufacturer and registered with them to install their EV CPs.

Depending on the manufacturer and home requirements a home installation takes around two hours. The EV CP typically costs between £300 - £1000. Depending on the manufacturer, installers connect a smart CP with a platform for management as part of the installation process. There are separate qualification channels outside of the OZEV registered installer scheme through which someone can install an EV charger although these pathways are not eligible for the subsidy.

For the full value of smart EV charging to be realised, chargers need to both have the right functionality and be connected to a platform or third-party aggregator for management. Whilst this consultation is concerned with ensuring the former (that the devices carry the right 'smartness') – there is a need to subsequently consider pathways beyond a regulated standard to drive connectivity. A qualified installer programme (or process – which leverages existing electrician qualifications in NZ) or a widened CoC process could provide this. As is the case in the UK, the installation process could ensure that the EV charger is connected to a demand management platform at the time of installation. Unlike the provision of EV registration data by ICP, this outcome does not need to be delivered now, but it will need to be soon.

As we discuss further in our response to Question 12 on incentives on page 15, there is a need to ensure that regulations are accompanied by the right incentives, processes and market solutions, to avoid a situation where every EV charger is smart but continues to behave in a non-smart way.

What this means for the standard

The ability of an EV charger to capture and transmit data on its location may be a valuable way of future proofing pathways for EV chargers to add the most system value in the future (i.e., this data may be valuable for planners or local government). However, for networks the key thing is that the EV is registered to an ICP.

Rather than require EVs to collect and transmit location data, we recommend that the existing CoC process is improved and widened as above to ensure that EV registration data which is imperative for network planning immediately is provided with some certainty. We also recommend the exploration of a qualified installer programme as an option – noting that such a pathway may also be valuable in enrolling EVs into valuable demand management services in the future. These two steps could be considered together in developing a pathway for EV registration and connection. This supports our recommendation that registration requirements rest with an installer rather than a consumer.

Consumption data requirements:

When it comes to the provision of data it is important that the pathways and processes exist for this data to be shared in interests of the most consumer value. Towards this end, the multi-year process which ensued for networks to gain access to consumption data from retailers is a blue-print of what not to do.

A valuable consideration when it comes to the provision of consumption data for consumers is ensuring that the data is captured in a similar format (i.e., through a data standard) so that it can be easily used by a range of services and providers to offer consumers this visibility in valuable and innovative ways.

However, we consider such processes for data access (the terms on which data is provided and how) to be distinct from provisions for data capture (which is what a device standard is concerned with).

We do not see a need for EV chargers to be regulated so as to capture meter settlement quality consumption data (but – as we say in response to Question 5 on the provision of data to consumers, our view is that consumers own their own data. As such any data that is captured by an EV charger should be made available to them).

We note EECA's recognition that the right consumption data capture could be important for future multiple trader relationships:

"The development of Multiple Trader Relationships (MTRs) or Peer to Peer trading (P2P) would likely require each EV charger to contain its own electricity consumption and generation measurement, and on-demand remote reading capability. Placing these recommendations in a Standard (that is either widely trusted and/or regulated) would future-proof users' investment for potential electricity market development".

Indeed, opening the door for different and multiple providers to serve consumers is an exciting opportunity to increase competition and innovation in our electricity market, and many smart EV chargers already carry sophisticated data capture capabilities.

However requiring this capability at a market settlement standard by way of a regulated EV charging standard would impose a significant additional requirement – and cost – on EV chargers in New Zealand, at a time when the market and technological pathways for MTR are still uncertain.

MTR turns on the ability for the market to reconcile bills across devices and there are a number of ways that this could be performed – for instance through the right smart metering provisions. We are of the view that requiring multiple meters or ICPs per household for MTR could increase complexity and cost for consumers which may not be necessary (and indeed we have recommended that the Government address existing requirements which limit one retailer per ICP to broaden market access to independent renewable generation). There are platforms available now capable of deriving consumption data by device from metering profiles – even without sophisticated consumption data capture capabilities of devices. Such metering platforms are importantly distinct from DER management platforms.

However, the multi-meter pathway would be tacitly favoured by a regulated requirement for EV chargers to carry market settlement metering quality data capture capabilities, effectively turning them into meters. This is not required for EV driven peak management and any standardisation necessary for MTR does not need to be determined through this EV charger standard workstream – the goal of which is affordable EV uptake. We support the Ara Ake trial of MTR – and any EV charger requirements needed to support the emergence of MTR in New Zealand could be integrated into a 'second generation' iteration of an EV charger standard.

Q5. What are your thoughts on a requirement for EV chargers to monitor and record electricity consumed and/or exported during EV charging, and for this information to be made available to the EV owner? What other information may be valuable to the EV owner? What format should be used for this information if this requirement is adopted?

We support the goal of encouraging greater EV owner engagement and agree that transparency is important for consumers to become informed about their consumption.

However, we are also aware that such services (i.e., which offer consumption data to consumers in a meaningful way) are at an early stage and our view is that requirements should not become a barrier to new EV charger provider entering the market or to innovation – but instead should 'future proof' the provision of such services. As above, we do not believe that sophisticated data capture capabilities need to be included in an EV charger standard at this time – but we also recognise that some consumption data capture may well be valuable for consumers.

If the charger does have data capture then this should be provided to consumers as is consistent with the principle that consumers should own their own data.

mandated settings for power quality and control

Q6. What are your thoughts on requiring mandated power quality and control settings for EV chargers?

We support this strongly and we support EECA's proposal for a setting where the EV charger automatically turns off or down if frequency of voltage drops below a pre-set threshold and restores when the frequency or voltage recovers.

These requirements for DG inverters (including V2G) are currently covered in the Australian and NZ joint Standard AS/NZS 4777.2.2020. They should also be included in a standard for EVs. As below volt watt control is currently missing from the Publicly Available Specification (PAS) which EECA refers to. This is an area where the PAS would need to be amended to form the basis of a smart EV charging standard.

energy efficiency

Q7. What are your thoughts on regulating the energy efficiency of onboard EV chargers? What information could you supply to EECA to inform this issue? What challenges, if any, do you see in regulating in this area?

As we have noted in previous submissions we are unsure how restrictions on vehicle manufacturers would be implemented in practice and we caution against regulations that would restrict EV imports.

charging cables

Q9. What are your thoughts on whether charging cables which contain a 'smart' charging enabling device should be in scope for intervention?

We support a range of technologies that enable optimised charging but note that charging cables have natural limitations in their functionality. The UK regulates specifications for smart cables but excludes them for non-smart cables. We support this approach.

Q10. What are your thoughts on the 'do nothing' option for EV chargers in New Zealand? Do you think the market can adequately address this issue without the need for government intervention? What information could you provide to EECA to inform this issue?

The relative risks between 'do nothing' and making an intervention (i.e., regulating smart EV chargers) are drastically asymmetric. The downside of regulating – potentially a modest increase in price of EV charging units – is vastly outweighed by the risk of missed opportunity of much more efficient and effective use of the electricity system, which in turn will help to limit increases in the price of electricity.

This was summarised by the UK's regulatory impact assessment which said:

"The technology and business models for electric vehicle smart charging are still in their infancy – both in the UK and internationally - and there are a variety of different technical approaches to delivering it. The diversity in business models and practices of this early market, whilst important for innovation, also risks a proliferation of smart chargepoint (CP) systems developing with varying standards and functionality. Without clear requirements and standards set for the industry, it's unlikely that the market will deliver smart CPs that provide sufficient grid and consumer protection, at least in the short term".[6]

Q11. What are your thoughts on the likely effectiveness of information, education and labelling to improve the uptake of 'smart' EV chargers? What information could you provide to support your position?

We support the provision of education to consumers on demand response technologies – however, much like EECA's existing approach to for energy efficiency this is an 'and' for regulations rather than an 'or'. We commend the Genless campaign of EECA and recommend a demand response focused educational campaign on demand response technologies as the next frontier. Labelling can be a useful signal to consumers – however, we caution against over relying on this. Having the right product regulations in place (by way of a regulated smart EV charging standard) can ensure the bare minimum functionalities for EV charging technologies are in the market without requiring a high degree of consumer engagement or research at the time of product purchase decisions.

Consumers have a crucial role in an energy system that unlocks the benefits of the demand side – but we are also of the view that it is up to industry and the regulator to 'internalise complexity' – delivering the most cost effective and consumer centric energy services without imposing a high consumer burden. EV charging regulations are a key and bare minimum step in ensuring this happens.

As we have mentioned it is also important to strike the balance between ensuring the right bare minimum functionalities are in place without tilting the market in favour of one provider or technology over another – particularly while new functionalities and products are emerging. We see regulating for a smart EV charging standard with the specifications we have set out as being the 'first cab off the rank' alongside consumer education on demand response technology.

[6] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015290/electric-vehicles-smart-charge-points-regulations-2021-impact-assessment.pdf*

Q12. What are your thoughts on the use of incentives to encourage the uptake of 'smart' EV chargers? What incentives do you think would be effective and who should provide these? What other incentives might be valuable beyond financial incentives?

Much like education, we see the provision of incentives as an 'and' rather than an 'or' for smart EV charging and demand response services. The biggest prize from a smart EV charging future is a lower electricity bill than would be delivered to consumers in the absence of smart EV charging. By gaining efficiencies at a systems level smart EV charging will deliver cost reductions for all electricity consumers as compared to a future of passive charging – whether or not a consumer themselves uses an EV. This is also why smart EV charging regulations are important for an equitable energy transition. These cost reductions could be increased and conveyed to consumers by way of incentives – such as lower energy as a service contracts for smart EV charging, smart EV charging tariffs, or TOU tariffs. Whilst such innovative pricing schemes have a key role to play in a consumer centric, efficient, and competitive market they are no substitute for regulating a smart EV charging standard. This is because incentives for smart EV charging pricing schemes require smart charging functionality. Whilst some incentive options are currently being offered by retailers (which we support) these are relatively few and it is unlikely that they are adequate in tilting consumer purchasing decisions in favour of smart charging currently in the absence of regulations. Once a passive charger is installed a consumer is unable to subscribe to a smart EV charging pricing product or incentive (unless they retrofit the charger) potentially restricting the market for such incentive products. Smart EV charging regulations and incentives are not mutually exclusive – they hinge on one another.

Incentives to install a smart EV charger could be an effective way to overcome the higher capital cost of a smart as opposed to a passive charger. We consider this a lever to support the implementation of smart EV charging regulations and to ensure that this does not increase the cost burden on consumers – an important concern in the context of energy affordability; a just transition; and the cost of living generally. Overall, it is important that wider levers are considered alongside regulating the specifications for smart EV chargers to ensure that using a charger at all (which further to regulation would carry smart functionality) is favoured by consumers (as opposed to using no charging device – i.e., using a three pin plug).

However, this is a step for consideration alongside regulations, rather than instead of regulations. We note that the UK provides an EV CP grant for 75% of the cost of a EV CP (or £350) for landlords, businesses, or apartment block owners (because of the UK's parallel regulation every CP sold or installed in the UK must already be smart). This is a good example of an incentive working alongside regulation to help tilt consumer behaviour in favour of efficient charging and of reducing the cost burden on consumers. We also note however that the Electric Vehicle Homecharge Scheme – which preceded the CP Grant and which also offered a 75% or £350 subsidy for any compliant smart charger – was in place well before regulations for smart chargers were implemented. This signals that the incentive was not by itself adequate in driving smart EV charging. The narrowed eligibility of the CP Grant also reflects a rapid reduction in cost for the price of a residential smart EV charger. Both of these learnings are salient and supportive of smart charging regulations in New Zealand.

Q13. What are your thoughts on regulating the 'smartness' of EV chargers in New Zealand? What do you think of New Zealand adopting the approach being undertaken in the UK? What information could you provide to support your position?

We support regulating for smart EV chargers strongly. As we noted at the beginning of the submission smart EV charging can:

- Reduce consumer cost;
- defeat the peak enabling a secure transition to greater renewables;
- unlock new competitive markets and innovative consumer services; and,
- deliver a high degree of consumer satisfaction as demonstrated by our own EV smart charger trial.

As above the benefits of smart EV charging will be significant. Ensuring that the charging devices have smart capability will not by itself unlock these benefits – but it is still a crucial and necessary step. We look forward to continuing to engage with the EECA, the EA, and the Ministry of Transport to enable the efficient and reliable uptake of EVs. We look forward to the release of the National EV Charging Strategy led by the Ministry of Transport as another important step in driving the provision of future ready EV charging infrastructure. We commend EECA for advancing this work to determine the case for, and scope of, a regulated standard for EV chargers.

As above, we think that the approach of the UK has many benefits and we support the implementation of that approach here. In particular we support:

- Regulating for the inclusion of 'smart' functionality in EV chargers as well as default off-peak charge mode. This is in addition to the wider specifications we support above.
- The accompanying incentive / subsidy to help tilt consumers in favour of smart charging (and helping to avoid the perverse outcome of consumers defaulting to the use of no charging device i.e., a wall plug). By overcoming the up-front cost barrier to EV smart chargers this can also support an affordable transition.
- The qualified installer programme. This should be adapted for the New Zealand context to avoid burdening our already pressured labour market with further qualification requirements which may not be necessary. However, such a programme could also offer an important pathway to ensure that EV chargers are both registered to an ICP with a network, and are connected to a demand management platform. This could be further supported by widening the existing DER registration pathway as well as shifting the onus from consumers to installers in meeting these requirements.

In addition to the UK, we note that South Australia has recently implemented smart EV charging regulation meaning that electric vehicle supply equipment (EVSEs) in the state must include demand response functionality and an open communications protocol by July 2024.

In addition to looking to overseas jurisdictions we support EECA in undertaking this thorough consultation to define the scope of a regulated EV charging standard that is appropriate for the New Zealand context, should this regulatory step be taken. We believe strongly that it should be and defer to our comments above in helping to determine the scope of NZ's first iteration of an EV charging standard. As we noted at the outset of this submission there are many aspects of future markets and services which are yet to be determined and the lifespan of an EV charger is about ten years. We recommend that this standard (which is a key step to enable the emergence of new competitive markets and services) be considered the first generation – allowing more information to emerge before decisions which will impact future markets and innovation are made. As above we believe that consumer preferences and technologies should lead the emergence of these markets – not regulators.

Q14. What are your thoughts on using the PAS for residential EV chargers to underpin regulation/incentives? What parts would you exclude or change? Does the PAS cover all the important issues? What other resources may be useful for New Zealand

We broadly support the specifications in the PAS to underpin a future regulated standard for smart EV charging. As above, we also support inclusion of provisions for voltage management within a smart EV charging standard and in particular volt watt control. This is currently missing from the PAS referred so we recommend that a provision for volt watt control (which already exists in the V2G standard ASNZS4777.2:2020) be included.