Northern Energy Group response to Ministry of Transport

Hīkina te Kohupara – Kia mauri ora ai te iwi

Transport Emissions: Pathways to Net Zero by 2050

Northpower

the lines company keeping you connected

COUNTIESPOWER

TOP ENERGY Te Puna Hihiko

vector

Exec Summary

We welcome the opportunity to provide feedback on the Ministry of Transport's (the Ministry's) consultation paper "Transport Pathways to Net Zero by 2050". We support this strategy.

We encourage the Government to be bold in driving optimised, national charging infrastructure which accelerates affordable electrification;delivers optimal health and safety outcomes; and which increases our electricity system security and reliability.

Electric Vehicles (EVs) will have a profound impact on our electricty networks. EVs have the potential to double network capacity requirements by 2050, if demand from them is not managed. This impact will be concentrated at the low voltage network – which is close to homes and businesses. In the future this part of the network will become increasingly complex, with bi-directional flows of power from EVs enabled by vehicle to home (V2H) and vehicle to grid (V2G) technology and solar PV and battery systems, transforming the electricity system from a centralised, to a multi lateral system. Coordinating this system is key to continued system security and reliability as electricity plays a greater role in customers' lives – as well as for affordable electrification.

Smart charging – a form of digital demand response – can reduce the impact of EV driven demand on network capacity substantially. This has a direct and significant cost impact to customers. Whilst the full cost impact of the convergence of our electricity and transport sectors is still unknown, we know that increasing utilisation of the network by managing demand will reduce cost to customers significantly. Smart EV charging requires EV chargers which are installed to have communications capability (an IP address) and for them to be connected to a digital platform for dynamic management – in turn offering customers benefits from demand management schemes. Networks do not need to own EV chargers for smart charging – and we do not seek to.

Networks across New Zealand are moving proactively to understand the impact of EVs to enable their effective management. Members of the Northern Energy Group are working proactively to integrate and understand the impact of EVs, including Vector's trial of EV smart charging. we are working together to develop insights and solutions that will accelerate affordable electrification and meet the needs for our different communities.

As highlighted by the Climate Change Commission (CCC) "The technology and tools the country needs to get there exist today" and this is true for smart charging. The Distributed Energy Resource Management System (DERMs) – which was co-developed by Vector is available to New Zealand networks now. Digital platforms for smart charging can also create wider customer choice and benefit – and managing demand peaks can deliver value across the whole system including for transmission and generation.

Just as the proactive implementation of Ultra-Fast Broadband throughout New Zealand acted as an enabling platform for New Zealand's economy (including for regional economic development and connectivity and resilience in the context of Covid-19) there is an opportunity to drive the implementation of smart platforms which can accelerate affordable electrification. We encourage the Government to be bold in driving optimised, national charging infrastructure – underpinned by action to ensure that EV chargers installed are smart – and that digital platforms are in place across New Zealand to enable customers to receive optimisation services, saving them – and all electricity customers-money. Customers will not be able to choose incentives and savings offered for smart charging services if they don't have a smart charging device. To illustrate the value that EV smart chargers deliver to customers, Frontier Economics has found that a residential EV smart charger adds ~$300NZD per annum in net value to the system. This is money that customers do not need to spend because of the smart charger – even when accounting for its capital cost of a smart charger.

In pursuing optimised charging to accelerate affordable electrification, the interests and needs of customers need to be at the centre – including a coordinated approach between local networks, cross-industry partners, and central and local government. This can be supported by aligned planning rules and regulations which accommodate the integration of new technologies – including through the RMA reform. This will be important for our future charging infrastructure.

About Us

The Northern Energy Group formed around a shared interest in delivering future ready electricity systems to customers and a common belief that customer voices need to be stronger in industry and government decision-making. As networks which are entirely or majority owned by customer trusts, we believe that customers' interests belong at the heart of our energy sector. We see the sector as being on the brink of significant change and opportunity, and we want to lead a new energy future with the voices and interests of our communities at the centre. Together nearly 40% of New Zealand's power connections (ICPs) are across our networks.

Introduction

We agree with Ministry of Transport that "there is a very close relationship between transport and energy. The shift to cleaner fuels in the transport system will have significant implications for the energy sector. In particular the shift towards EVs will significantly increase the demand for electricity (which needs to come from renewab le sources) as well as capacity for electricity storage". This convergence is a challenge and an opportunity – and front-footing our infrastructure readiness for a decarbonised transport system is an opportunity to accelerate electrification, delivering decarbonisation affordably.

How we respond to Hīkina te Kohupara

In our submission we respond mainly to the proposals and discussion related to the uptake of EVs – captured under "Theme 2: Improving our passenger vehicles". This is because of the profound impact that the integration of EVs will have on our electricity networks – and in turn our communities. We have addressed key consultation questions which are relevant to this focus throughout the discussion.

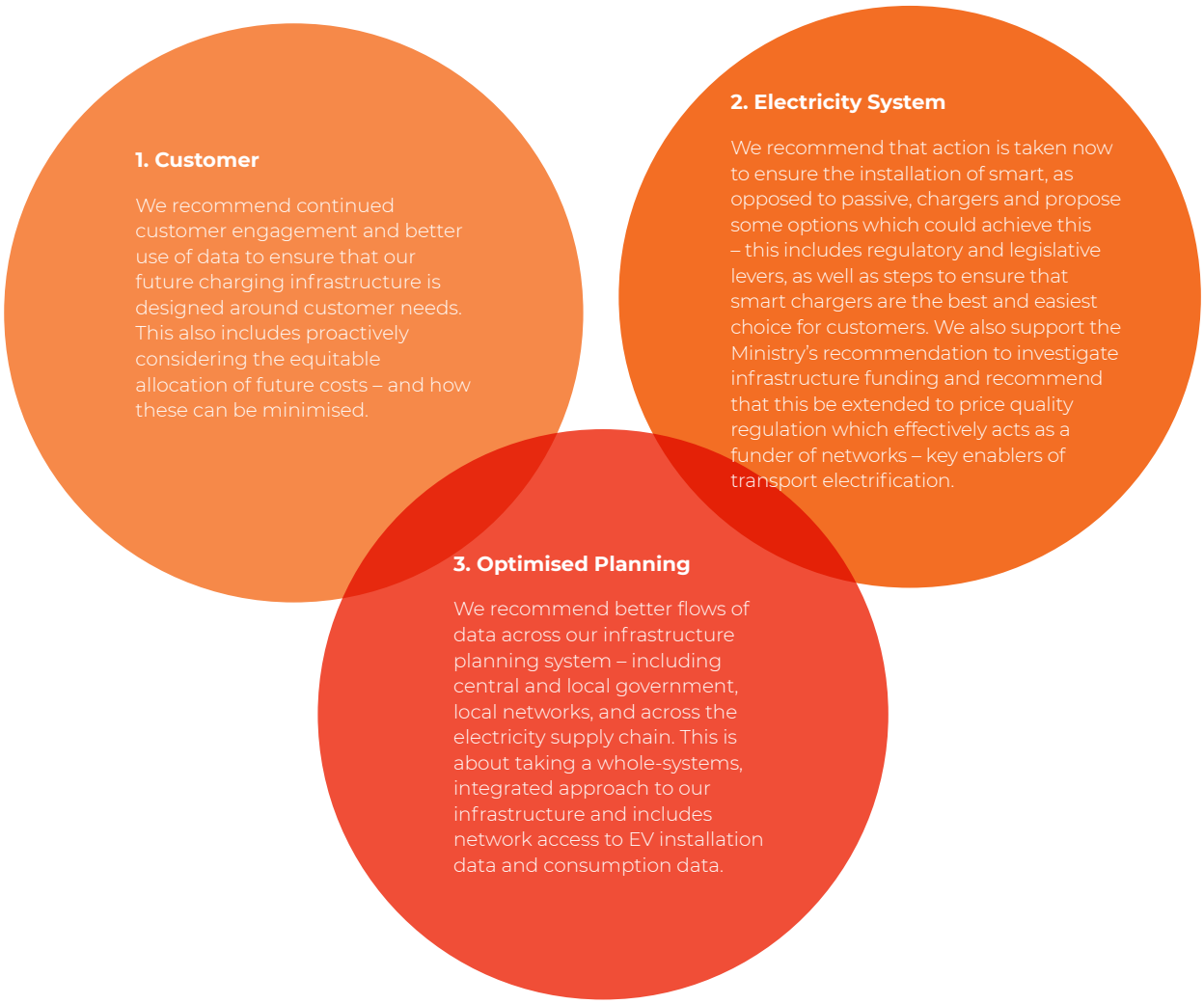
We respond to the key principles proposed by Hīkina te Kohupara, as well as key actions proposed under "Theme 2: Improving our passenger vehicles" in "Recommendations". Finally, we propose principles and set out some options to support smart charging – which is an exciting and necessary platform for affordable electrification.

We support the key actions and approach proposed by the Ministry in Hīkina te Kohupara – but encourage the Government to go further and be bold in driving the electrification of transport as a key step to achieving our pathway to net zero. In particular, there is an opportunity to act now to proactively ensure that our future charging system accelerates affordable electrification; delivers platforms for wider customer choice and benefit; and increases system security and reliability.

> 'we need to increase the supply of clean vehicles, increase demand for them, and provide supporting infrastructure'
> – Ministry of Transport

Our focus in this submission aligns with the "Improve" objective of the Ministry's "Avoid, Shift, Improve framework", and in particular the national charging infrastructure plan. We agree that **"we need to give further consideration and investment to infrastructure that supports low emissions vehicles – including charging networks for electric vehicles".**

In this submission we discuss our future charging infrastructure across three key dimensions:



We acknowledge that this green paper is not Government policy – but rather a system wide view of opportunities to reduce transport emissions – and a menu of policy options to advance these opportunities – for both our Emissions Reduction Plan (ERP), as well as the 10-15 year time horizon strategy that sets out the Government policies beyond this.

In its ERP, we recommend that the Government be bold in driving our future charging infrastructure to accelerate the electrification of transport – and to lead the world in delivering the most affordable, secure, and customer centric charging infrastructure. The smart platforms which can enable this infrastructure can in turn deliver wider customer and electrification benefits.

We welcome the announcement to increase the Low Emission Transport Fund administered by EECA by nearly 400% by 2023 to continue growing the nationwide EV charging network and to support other low emission refuelling networks – as well as the rebate to make the purchase of low emissions vehicles more affordable for more New Zealanders.

Dimension One:
Customer

Customers need to be at the heart of our decarbonised transport system

As highlighted by both the CCC – and the Ministry of Transport – levers to decarbonise our transport system are also an opportunity to leverage greater 'co-benefits' for customers – or customer benefits from interventions to decarbonise which go beyond climate change mitigation. The Ministry has identified co-benefits from decarbonising our transport system of: health and safety, more inclusive access, and resilience and reliability as recognised by the Transport Outcomes Framework.

The Transport Outcomes Framework has provided a foundation for our transport system to date – including acting as a 'north star' for the delivery of a complex transport system across central and local government agencies.

Affordable electrification – and with it the convergence of our transport and electricity systems – requires us to re-focus the customer outcomes that centre our decisions to ensure that they are fit for the future.

Underpinning these shifts is digitalisation – which, by increasing customer choice and enabling greater demand-side participation, is an opportunity to re design our electricity and transport systems – around customers and their needs.

Our view on how the Ministry of Transport's Transport Outcomes Framework should be updated for our journey to transport electrification is below. We have outlined the Ministry's Outcome, alongside our view on what this Outcome means now given the transformative drivers of digitalisation and decarbonisation.

Outcome of Transport Outcomes Framework	What it has meant to date	What it also means now	Explanation
Inclusive Access	Enabling all people to participate in society through access to social and economic opportunities, such as work, education and healthcare	**Digital Inclusion.** Having the network platforms in place across New Zealand to enable every customer to gain the most benefit from low carbon technologies, driving affordable electrification.	Ultra-fast broadband enabled a transformation in the way that New Zealanders connect and do business – serving as a critical platform for our Covid-19 economy, and for regional economic development. Similarly, smart network platforms for low carbon technologies should be understood as foundational to our electrified future economy.
Economic Prosperity	Supporting economic activity via local, regional, and international connections, with efficient movements of people and products.	**Equity.** As the uptake of EVs increases there is a need to ensure that EV uptake is affordable and attractive – and that costs are not spread unfairly.	Demand management platforms can increase utilisation from EV demand – reducing prices for all customers. However, failure to manage new demand would result in more expensive infrastructure upgrade costs for all electricity customers – whether or not they own an EV.
Healthy and Safe people	Protecting people from transport-related injuries and harmful pollution and making active travel and attractive option.	**Safe EV charging** – and the management of voltage levels at a household level.	The charging process itself – which starts from the purchase and installation of the charging device – requires the right health and safety standards and practices to ensure it is safe. This relates to the device and its installation. This is particularly important as uptake of EVs moves beyond 'enthusiasts' who are aware of electrical risks to wider usership. There is an additional need to manage voltage levels and frequency with the integration of EV chargers – as well as new high demand customer devices. This starts at a household level.
Environmental sustainability	Transitioning to net zero carbon emissions and maintaining or improving biodiversity, water quality and air quality.	**Create a new system geared for decarbonisation.** Rather than seeking to minimise or offset adverse environmental impacts of a transport system geared for fossil-fuels – we need to design future systems around the goal of decarbonisation.	Global fossil fuel supply chains have been based on the extraction, consumption, distribution and consumption of fossil fuels as a commodity product. Electrifying transport affordably requires us to value efficiency over consumption – and services over commodity.

Outcome of Transport Outcomes Framework	What it has meant to date	What it also means now	Explanation
Resilience and security	Minimising and managing risks from natural and human-made hazards, anticipating and adapting to emerging threats and recovering effectively from disruptive events.	**Balancing a more complex system for continued reliability.** Ensuring system security in a future of EVs (including bi-directional flows of power from V2H and V2G technology) and other smart customer devices – requires more tools to balance the system – starting at a household level. As well as preventing outages, strengthening future resilience is also about leveraging distributed assets – including EVs – to reduce the customer impact of outages when they do occur.	The integration of EVs – as with other distributed energy resources (DERs) – will transform our electricity system from a centralised to a multi-lateral system, with involvement from a greater range of assets and actors. Failure to manage this new complexity will result in lower power quality (blackouts and brown outs) as well as curtailment (pending network capacity upgrades to integrate more EVs or DERs into the network). These outcomes are the opposite to affordable and accelerated electrification.
Affordable electrification	NEW OUTCOME!	As we transition from fossil fuels to electricity in how we get around, affordable electrification is now a critical transport outcome.	We need to take a whole-systems view of both the transport and electricity sectors – and consider potential electricity cost implications of this convergence as well as ensuring we utilise tools to minimise this cost.
Customer empowerment	NEW OUTCOME!	Our future system should create choice, favour community ownership, and reward the actions of customers which drive better whole-of-system outcomes.	There is an opportunity now to ensure that our decarbonised transport system rewards customer actions – including demand response. This is also about leveraging community ownership models to ensure that local interests remain at the heart of digital transformation.

Designing a system for customers

When it comes to designing our national charging infrastructure plan – we need to start with customers. This is about leveraging customer insights and data, as well as connections with local communities, to build a decarbonised transport system for them.

What we know about customer's charging infrastructure behaviours, so far:

- **Most charging will happen at home** Whilst publicly available charging stations will form a small, but important part of our overall future charging, about 95% of charging happens at home.
- **Smart charging works for customers** Vector's smart charger trial found that 90% of customers were satisfied with the service, with customers actually preferring the dynamic charging service – which was found to be the most effective at flattening the peak – as compared with scheduled charging. Specifically, more than 90% of customers rated the speed of charging, ease of usage, and overall satisfaction with their current charging situation (dynamic charging in the context of Vector's smart charger trial) as positive, providing a score between 8-10 for each of these aspects of smart charging.
- **Static, scheduled charging – including through the use of in-vehicle charging timers – was found to create secondary peaks.** That is, manually scheduling charging away from peak demand simply shifts the peak to a different time. Dynamic algorithmic charging is needed to break up the peak by staggering the times that EVs draw power from the network.

Bringing customers on the journey

Customer actions which drive affordability and decarbonisation need to be clear, easy and beneficial for them. The key role that customers have to play in our decarbonisation pathway generally is expressed in the CCC's policy direction in their final advice – which understands policy interventions for decarbonisation in terms of two 'broad categories':

1. Create an enabling environment for socially acceptable climate policy
2. Drive the creation and choice of low emissions options

Driving each of these objectives requires a range of levers at both a macro and micro level – including market interventions to ensure that smart charging infrastructure and platforms are in place; as well as direct customer engagement to strengthen energy literacy as customers rely more on electricity as a transport fuel. We support programmes such as Energymate – funded by cross-industry partners including Top Energy and Vector to enable customers to gain more value from their home energy bill. However, there is a need to deepen this engagement in the context of the impact of EVs on infrastructure. As electricity plays a greater role in customers' lives, the potential gains to be made from smart and efficient energy use increases – for all customers, not just early adopters of low carbon technologies.

Key conclusion: With 90% of charging in the home or at businesses overnight, customer charging behaviour is going to have a pro found impact on networks. It is important customers are engaged early in the discussion around affordable, efficient and safe EV charging. This is particularly because ensuring safe EV charging starts with the EV charger selection and installation.

Dimension Two:
Electricity System

Network integration of EVs to deliver lower costs for all customers

Networks have a critical role to play to enable the decarbonisation of our transport system and affordable electrification. EVs can unlock new customer benefits and accelerate decarbonisation. However, if un-managed new demand from EVs could also increase customer cost.

Vector's analysis has found that EVs have the potential to double network capacity requirements by 2050 if not managed. Ensuring adequate capacity to meet peak demand is a significant driver of cost for networks – for some EDBs making up half of their total costs currently. This cost is ultimately borne by customers in their electricity bill.

The impact of new EV demand will be concentrated at the edges of our network – where homes and businesses connect to low voltage (LV) distribution transformers. The impact of new EV demand on the medium and high voltage parts of the network – which go beyond the LV distribution transformers and are closer to our national grid – was found to be less than expected in Vector's smart EV charger trial.

System security

As our system moves from a centralised, linear system, with a few actors and assets, to a multi-lateral system with bi-directional flows of power – we need more tools available for balancing our system to ensure continued system security and reliability. This coordination needs to start at a household level (through the management of voltage from EV chargers, as well as new high demand customer devices), and manage demand on the LV network to avoid network constraints

Constraints would occur if, as mentioned above, demand exceeds network capacity with un-managed EVs and other devices drawing power from the network at the same time. Similarly, bi-directional flows of power (from solar PV and future V2G technology) could cause export levels to increase voltage levels on the LV network resulting in quality issues (brown outs) or power flowing back up stream, which would risk exceeding thermal limits of distributed energy resource (DER) assets, if these new power flows aren't coordinated . If they are coordinated this technology can strengthen the balancing of the system – as indicated by the Whole-Energy System Cost (WESC) analysis.

System security is about avoiding lower power quality and lower reliability, and it requires coordination through digital platforms. Proactively managing constraints is also about avoiding curtailment. Curtailment is when, absent tools to integrate and manage new assets, the electricity infrastructure providers defer their integration in order to avoid exceeding existing capacity, interrupting services for all electricity customers. In some parts of Australia, LV network capacity constraints are becoming an increasing barrier to DER integration. Curtailment of low carbon technologies – including EVs – is the opposite of what is needed for accelerated electrification. Further detail about the need for proactive network management of new demand is highlighted in *The Role of Customer-Owned Electricity Distribution Businesses in Accelerating Distributed Renewables Uptake – Implications for Policy and Regulation* by Dr Richard Meade, attached as Annex One.

As our reliance on electricity increases, displacing fossil fuels, we need to expand the tools at hand to ensure continuity of supply. There is a need to integrate a greater range of solutions, data, insights and platforms to leverage the demand-side to balance our system and meet demand peaks.

Key conclusion: There is a need to proactively manage new demand and complexity from EVs at the right level to avoid constraints and curtailment, delivering system security and accelerated uptake. This requires the right settings and platforms to be in place proactively in order to manage new demand and complexity.

Doing so is an opportunity to:

- Accelerate affordable electrification, at a lower cost than the counterfactual
- Deliver platforms for wider customer choice and benefit
- Increase electricity system security and reliability

EV uptake – and with it demand – could accelerate quickly

As highlighted by Transpower on new technology integration – once the uptake of EVs increases, it could accelerate quickly. Transpower's report Whakamana I te Mauri Hiko "makes the case that we must prepare for this future now" – we agree with this.

The CCC's demonstration pathway in their final advice includes 36% of New Zealand's light vehicle fleet and 46% of light vehicle travel being electric by 2035.

We support the Government in taking bold action to pursue New Zealand's pathway to net zero – including the roll out of New Zealand's national charging infrastructure plan.

Dynamic charging can reduce network costs and unlock new value for customers - from across our whole electricity system

Smart charging	Passive charging
• The EVSC* (charging appliance) is connected to the internet and its own IP address. It can 'communicate' with a smart digital platform which can coordinate the times that different assets draw power from the network and at what amperage (determining the current). • Separate in-vehicle battery capacity management capability – enabled by some car manufacturers – provides visibility of the vehicle's battery capacity and may add another layer of optimisation to customers. Without an aggregator, this capability enables connectivity to the manufacturer – not networks – and it cannot achieve the network optimisation benefit of increasing utilisation by itself. Because this capability is also at the discretion of manufacturers, this should be seen as a potential input to – rather than displacement of – system wide demand management of EVs.	• The charger has no communications capability with the network. • The car draws power from the network when a customer plugs it in, and stops when a customer ends the charging or when the charge is full. • Results in higher peaks as customers all draw power at the same time – either by plugging in at the same time, or through scheduled charging. For example, some vehicles offer manual scheduled charging. Because it is static, relying on customer scheduling for optimisation risks creating new peaks.

What is EVSE? And why do EVs need it?

Simply put, EVSE (Electric Vehicle Supply Equipment) is a protocol to protect customers and their cars while charging. Using two-way communication between the charger and car, the correct charging current is set based on the maximum current the charger can provide as well as the maximum current the car can receive.

As part of the protocol, a safety lock-out exists, preventing current from flowing when the charger is not connected to the car. It ensures that if a cable is not correctly inserted, power will not flow through it. EVSE can also detect hardware faults, disconnecting the power and preventing battery damage, electrical shorts or fire.

Despite the value of such devices, an EV smart charger trial undertaken by Australian Power Company, Origin, found that 60% of participants were using a standard socket to charge their cars prior to the trial.

By staggering the times that EVs draw power from the network, dynamic smart charging can significantly reduce the likelihood of network capacity breaches driven by demand peaks, instead optimising the existing capacity in the network and avoiding the need for infrastructure upgrades. Smart charging requires chargers to have smart capability, as well as their connectivity with a digital platform. Networks do not need to own the chargers to enable smart charging – rather, this is about having the digital platforms in place to enable customers to participate in a demand management scheme (much like existing hot water load control). The value of demand response in meeting our climate objectives is demonstrated clearly by the “Avoid” and “Shift” pillars of the “Avoid, Shift, Improve” framework.

Reducing mileage in ICEs – either through working from home, or through mode-shifting – to reduce emissions from transport is a demand-side lever. Similarly, managing demand in our electricity system also has significant potential to accelerate our emissions reduction goals. In the same way that pricing levers or traffic control measures may be deployed to stagger the times that cars travel across a bridge or motorway, reducing the need to build another lane (which would be all but empty outside of peak times) smart EV charging staggers the time that power is moving through our network, increasing utilisation and efficiency – whilst ensuring that customers can drive when they need to.

Smart charging algorithm can efficiently integrate EVs into the network and deliver high customer satisfaction

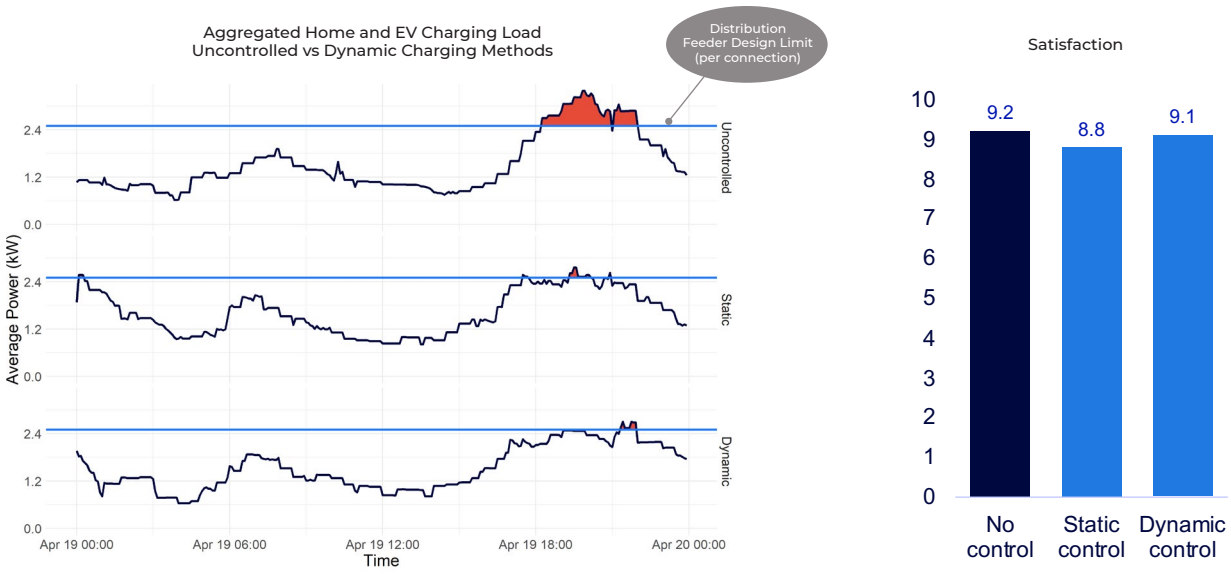


Figure One: Impact of dynamic management on peaks and customer satisfaction

When a Northern Energy Group member modelled its network peak demand in 2050, the addition of smart charging resulted in a **60% reduction in network peak growth** when compared to unmanaged EV charging.

In addition to this network optimisation benefits, dynamic peak management can drive value across our whole electricity system.

For example, illustrative analysis undertaken by Frontier Economics has found that accounting for the capital cost of a smart charger, they add an additional ~$174NZD per MWh in avoided cost to the system.

That is – accounting for displaced generation costs, system balancing value, as well as avoided network capacity upgrades – a smart charger adds a net value to the system of $174NZD for every MWh discharged. This whole-electricity system cost (WESC) calculation is demonstrated in the graph below, which was produced by Frontier Economics having applied the metric – developed for the UK Government – to New Zealand's electricity system (Annex Two refers)[2].

[2] https://www.frontier-economics.com/uk/en/news-and-articles/news/news-article-i834 -decarbonising-the-energy-sector-in-new-zealand/;

Whole-Energy System Cost of different energy assets in New Zealand

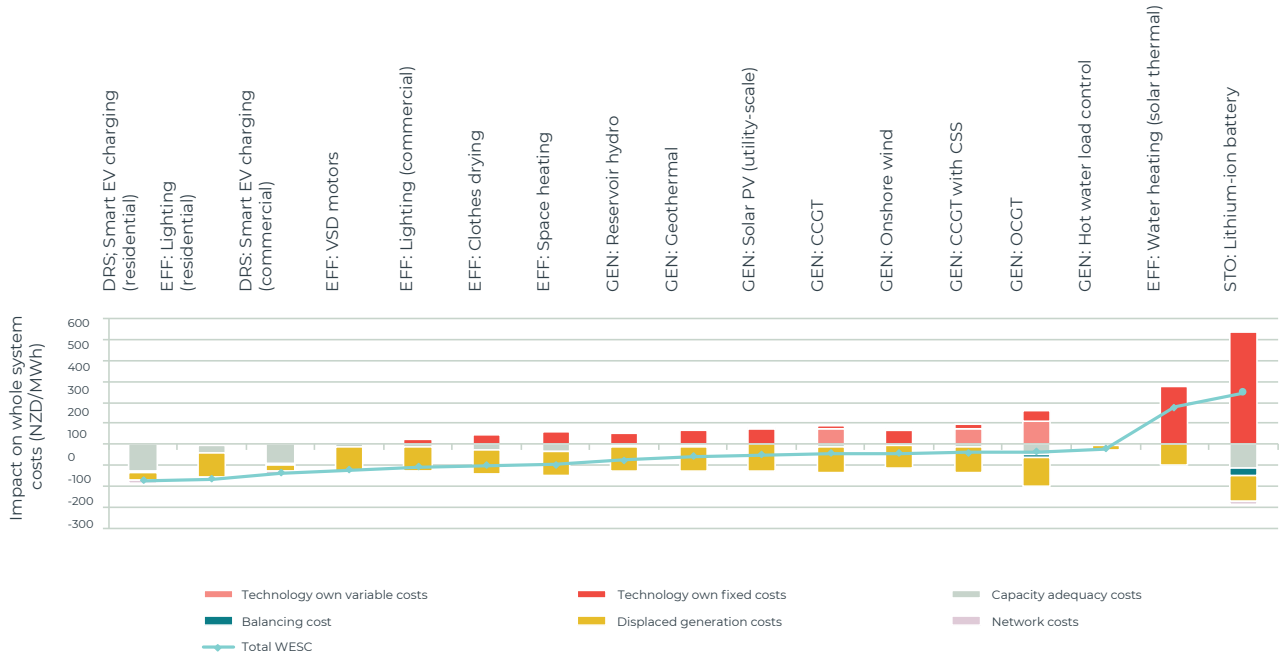


Figure Two: Net whole-system value of different energy assets per MWh

Each column relates to a different technology (whether generation or demand side). The coloured bars show the additional costs (or, if negative, reduced costs) that the technology imposes on different parts of the power system:

- Technology own fixed and variable costs reflect the cost of building and running the technology itself;
- capacity adequacy costs relate to the way in which the addition of capacity can mean other capacity can be retired (saving its fixed and variable costs) while maintaining the same security of supply;
- balancing costs refer to the additional costs imposed by technologies which have volatile output (requiring actions to keep electricity demand in line with supply), or the benefits of technologies that can undertake those actions;
- displaced generation costs refer to the reduced costs of running other generators during the periods that the technology is producing power; and
- network costs are the distribution network reinforcement costs that the technology may avert (we have not modelled the transmission network).

All these elements are expressed, like a levelized cost, on a $/MWh basis. The light blue line, which is the sum of these components, is the overall system impact. It represents the change in the total costs of the electricity system when a technology is added that has a lifetime output of 1 MWh (and the rest of the system adjusts accordingly). When the blue line is below $0/MWh, adding a technology such that it produces 1 MWh over its lifetime reduces total system costs. When the blue line is above $0/MWh, it indicates that adding the technology with a lifetime output of 1 MWh increases total system costs. Technologies with lower figures will add greater benefits to the system for each MWh of energy they produce.

Using the components of the WESC to express this on a per annum basis (as distinct from the chart above – which displays this on a per MWh basis), a smart charger ads ~$300NZD per residential EV to the system – or ~$600NZD per smart charger p.a. for a commercial vehicle. This is avoided cost through the whole system which is not passed on to customers – delivered by a single smart charger.

We support the generational planning and investment approach of the Ministry which takes a structured approach to compare the benefits various investment options and interventions might achieve. We encourage the Ministry to consider the benefit across an assets' whole life, and to the whole system, when assessing investments and decisions for our national charging infrastructure. Whilst a higher up-front cost, smart EV chargers deliver demonstrable and significant net value to customers.

As mentioned above, the WESC includes 'displaced generation costs' in its value stack – demonstrating the value that smart charging can add to gentailers by reducing the need to use fossil fuel peakers to meet peak demand. In this way, smart charging has the potential to deliver both network optimisation benefits as well as support services such as 100% renewable charging – whereby EVs only charge when remote generation is not using fossil fuel peaking. Smart EV charging can also drive greater efficiencies for transmission infrastructure.

EV uptake can increase utilisation, reducing system cost

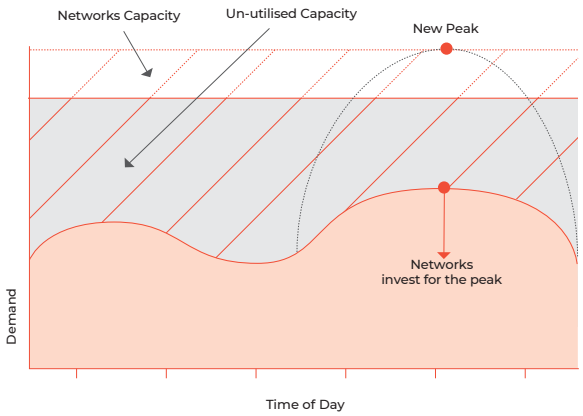


Figure three: Illustration of network utilisation

If overall demand for electricity increases at a rate which is faster than increases in infrastructure costs (because that demand is being spread effectively across existing infrastructure) this would increase utilisation, reducing electricity prices for all electricity customers, whether or not they own an EV. The full system impact – and cost implications of this – from the convergence of our transport and electricity systems is still unknown. However, we know that integrating smart charging capability can save customers significantly given the profound impact that EVs will have on our electricity system. This point is articulated clearly by Wellington Electricity and the Business Energy Council in their submissions.

"Smart charging can shift EV charging demand away from peak demand periods enabling higher network utilisation and deferring network upgrades, resulting in lower electricity prices to customers".

Consultation Question 12: A just transition will be important as we transition to net zero. Are there other impacts that we have not identified?

Ensuring that the allocation of cost of our charging infrastructure is equitable should be a key priority of our future charging infrastructure planning. As mentioned, the cost impact of the convergence of our transport and electricity systems is still uncertain. However, there needs to be an early awareness of the potential equity implications of charging infrastructure investment, accounting for different factors across urban and rural communities. For instance networks throughout New Zealand use different tariffs. Whilst urban networks are likely to experience the fastest uptake of EVs, they also have a denser population across which tariffs can be spread. We also note that average rural commutes can be longer than those experienced in some urban centres.

We agree with the Ministry that there are already inequities in the transport system and support the focus on ensuring that these do not deepen through our transition.

Northern Energy Group members Top Energy and The Lines Company have parts of the network where a large portion of the addresses are holiday homes. Whilst these homes may be empty for a long period of time, during peak times there may be a high demand for fast charging. The cost of increasing capacity for these peaks would be spread across the whole community – whether or not they have a holiday home. As explained above, our objective with EV uptake should be to increase utilisation to drive whole system benefits – and likewise we should seek to avoid reducing it, as would occur if we invest for a narrow but pointy peak.

The New York Department of Public Service (NYDPS) white paper Vehicle supply equipment and infrastructure deployment, recommends a number of actions (including 'leveraging utilities' expertise and unique position') to promote EV uptake. This includes a focus on the 'thoughtful siting' of EV chargers to ensure that all communities have equal access to charging infrastructure.

We support the equitable placement of EV chargers – and it is critical that all parts of our communities have an equal voice in determining investments that impact all customers.

Dimension Three:
Planning Optimisation

Public chargers

Whilst we know that customers like to charge at home, this won't always be possible – in particular in urban environments with less off-street parking – and when customers are travelling distances that exceed EV range. In these cases, public EV chargers will need to be provided. As mentioned above this is likely to form a small but important part of overall charging and needs to be responsive to the different needs of communities across rural and urban New Zealand.

A coordinated approach including central Government (including the joint work of EECA and MOT to develop New Zealand's national charging infrastructure plan), local government, and, local networks will be critical for the efficient and customer centric installation of public EV chargers.

We agree with the Ministry that "stronger collaboration between central and local government will be important to ensure there is a joined-up systems approach to mitigating transport emissions". However, this collaboration needs to extend to infrastructure providers – including to strengthen flows of data across our planning and infrastructure systems. As our electricity and transport systems converge there is a need for stronger coordination to deliver future ready, integrated systems.

Network visibility and access to data

Providing EDBs with EV registration data and smart meter data would enable more efficient network planning and operations. Data on EV charging installation locations can ensure networks deploy the most efficient response where EV charging results in load changes; can inform better forecasting of EV uptake supporting investment prioritisation; and, in conjunction with consumption data can help 'right size' future investments by enhancing networks' understanding of EV network impact. This should be considered a bare minimum for networks to forecast, plan for and manage the network growth associated with accelerated EV adoption in NZ. Networks currently are only provided with data on solar PV installations – given the potential immediate impact that these assets can have on system security for all electricity customers. System impacts from EVs would happen on the low voltage network (particularly around clusters of EVs in residential areas) – and an extension of this visibility to EV installations is a bare minimum requirement for future network management. The UK has acted to ensure that networks have visibility of all 'low carbon technologies' by requiring customers to notify their local network when installing solar PV, heat pumps, EV charging points, or battery storage to ensure safe and effective operation of the electricity networks[3]. We recommend similar steps are taken in New Zealand for EV charging installations given the impact that they could have on the network.

[3] https://www.gov.uk/government/publications/register-energy-devices-in-homes-or-small-businesses-guidance-for-device-owners-and-installation-contractors/register-energy-devices-in-homes-or-small-businesses-guidance-for-device-owners-and-installation-contractors;

Recommendations

Below we respond to the principles proposed in Hīkina te Kohupara as well as the key actions proposed for Theme 2: Improving our Passenger Vehicles. We further respond to

Response to principles in Hīkina te Kohupara

Consultation question 1: Do you support the principles in Hīkina te Kohupara? Are there any other considerations that should be reflected in the principles?

We agree with the principles in Hīkina te Kohupara – and have respond to those below which are most relevant to us.

Principles / approach of Hikina	Our Response	Recommendation
Principle 2: We need to focus on moving to a zero carbon transport system, rather than offsetting emissions	We agree – rather than tweaks – or looking at ways to offset impacts of a system that was designed around a different set of objectives, we need to fundamentally re design our energy system to meet the goals of affordable electrification.	We recommend a strong focus on the value of the demand-side of our electricity supply chain, starting with customers. To ensure continued system security we should be looking at opportunities to balance the system starting with demand.
Principle 7: Innovation and technologies will play an important role in reducing emissions but people are key to the future	We agree that people are key to the future – however we think that the people vs technology framing is a false dichotomy. Digitalisation for instance is a tool to ensure the electrification of transport will be affordable to customers.	We recommend that this principle is changed so that it reads "Innovation and technologies will play an important role in reducing emissions AND enabling customer benefits and actions from decarbonisation".
Principle 4: Coordinated Action is required across the transport system to reduce and avoid emissions	We agree that coordinated action is needed – both within the sector and with other sectors that have a strong influence on transport emissions.	We recommend that the Ministry incorporate a strong systems-level approach to the way that it reduces emissions from transport – including a coordinated view of both the transport and electricity sectors. We agree with the Business Energy Council's submission that "Siloed thinking risks unintended consequences and poorly allocated resources. Interconnectivity between the energy and transport markets is already emerging…". Taking a whole-systems view of the electricity supply chain is also an opportunity to unlock value across market segments – including through the integration of smart EV charging.

Response to proposed key actions in Hīkina te Kohupara

We support the key actions proposed for Theme 2: Improving our passenger vehicles.

Response to proposals for Theme Two: Improving our passenger vehicles

Decarbonising the light vehicle fleet: possible key actions	Our Response	Recommendation
Further investigate infrastructure funding	We support this key action – as recommended by the CCC, there is a need to ensure that networks are incentivised to invest in solutions that enable affordable electrification. However, as also recognised – the Commerce Commission effectively acts as a funder of monopoly networks and there is a need to evaluate whether the current regulatory environment is fit for future needs.	We recommend that this investigation into infrastructure funding is advanced as a matter of urgency – and that it includes the Commerce Commission's price quality regulation – which effectively acts as a funder for regulated networks, in many cases determining their scope for investment in platforms and solutions which will be critical for affordable electrification. In the last Default Price Pathway – which sets out the allowable revenue for regulated networks through to 2025 – no new funding for cyber security was provided; there was an innovation allowance of 0.1 percent; and for some networks, the DPP resulted in a significant reduction in forecast capex for the period. This is out of step with the need for infrastructure funding for accelerated electrification.
Pursue the standardisation of charging infrastructure	We strongly support this key action	As discussed below there are a number of levers which could ensure the uptake of smart EV charging – which is the single most important component of an efficient charging future. If this is not achieved there is significant likelihood that peak demand will not be managed resulting in higher network investment and costs to EV owners – and all electricity customers. This is exactly the opposite of what is needed to electrify transport and to accelerate affordable electrification. Every EV charger which is installed without smart charging capability is a missed opportunity for system wide cost reduction.
Consider how parking and priority use on roads for low emission vehicles can encourage uptake, or reduce the use of ICEs	We support this key action	We recommend that regulation is introduced to ensure that publicly provided EV charging car parks are only used by EVs – similarly to the regulation around mobility car parks
Further investigate potential tax incentives (including Fringe Benefit Tax)	We support this action	We recommend the implementation of fringe benefit tax measures to encourage commercial fleets to transition to EVs increasing the supply of EVs in New Zealand.
Encourage the acceleration of Govt procurement of low emissions light vehicles, including encouraging the procurement of safe low/zero emitting vehicles	We support this key action	We recommend that consideration of Government procurement be extended to encourage the uptake of smart EV charging, through the national charging infrastructure plan.

Networks – many of which are majority owned by their customers – have a strong incentive to support the adoption of new technologies, platforms and business models as this avoids unnecessary cost for their customer owners.

Just as the CCC has identified a need to align funding mechanisms for the public sector around the goal of decarbonisation, through the recommended Vote Climate Change multiagency appropriation, there is a need to align funding and investment mechanisms for infrastructure providers who have a critical role enabling the electrification of transport – including regulated utilities.

We support the CCC's position that "Accelerating EV uptake remains key to achieving our emissions budgets"– and we encourage the Government to be bold in pursuing this advice. In addition to the key actions proposed above, we recommend that the Government drive world leading, national charging infrastructure which accelerates affordable electrification and which delivers new benefits for customers.

Northern Energy Group principles for our national charging infrastructure

We recommend the following principles to underpin and guide the development of our national charging infrastructure:

Preserve optionality

Avoid tech lock-in and lock-out

Preserving optionality is about avoiding tech lock-in, including through open and modular standards which avoid committing customers and systems to one technology provider. Optionality also requires us to avoid 'locking out' technologies which accelerate affordable electrification. Given the cost of retrofitting, every passive EV charging installation effectively 'locks-out' potential for dynamic management.

In its final advice, the CCC describes as a market problem for which policy intervention is needed, 'infrastructure lock-in'. This is where options to reduce emissions are constrained by available infrastructure. Conversely, digital platforms can enable the emergence of new markets and services, and the integration of new solutions. By enabling a dynamic response to new demand, such platforms also support investment optionality, mitigating the risk of 'infrastructure lock-in'

Use thresholds and open standards

We also recommend that to preserve optionality, thresholds are used in standards and planning rules and regulations. For example, standards to manage voltage levels should prescribe thresholds.

Enable adaptation to technological change in planning rules and regulations

To illustrate this point – in 2018 one Northern Energy Group member sought to install berm batteries into the network to manage demand peaks. However, this project stalled as a result of Unitary Plan requirements not aligning with the required technology. The battery systems at 2.2m (designed around the necessary height of the inverters) exceed the height limit for assets located

in the berm (1.8m), as well as the noise thresholds, prescribed in the Unitary Plan. The 1.8m threshold was based on the size of traditional assets, with transformers being 1.5m high. However, networks increasingly need to integrate non-traditional network technologies. We recommend that planning rules and regulations accommodate the integration of new technologies – including through the RMA reform. This will be important for our future charging infrastructure.

Leverage platforms

There is an opportunity to leverage platforms across New Zealand to enable localised optimisation of demand, efficiently. We agree with the CCC that the tools and technology we need for decarbonisation exist today – and there is no need to re-invent the wheel. Our challenge is to ensure that regulatory and funding mechanisms are aligned with the integration and uptake of technology and solutions.

We support the Ministry's recommendation to investigate funding – including whether the Commerce Commission's price quality regulation is aligned with decarbonisation, given its role as a funder of enabling infrastructure. This is to enable the proactive implementation of platforms for the smart management of EVs as well as new flexibility assets, the emergence of new markets and services, as well as balance new complexity on the system for continued system security.

Take a whole-systems approach

Taking a whole systems approach is about ensuring that we assess the cost and value of assets and solutions across the whole electricity system – and across both the electricity and transport systems. Accounting for the avoided cost that a smart EV charger delivers across the whole system — they deliver a significant net benefit for customers, even whilst their capital cost may be higher. As mentioned earlier, , taking a whole-systems view finds a residential EV charger adds ~$300NZD in additional value to the system per annum.

A siloed approach, which seeks to maximise the utility of each segment of the market in isolation (and assesses investments in this way) results in a loss of value to customers. A whole systems view should be fundamental to our national charging infrastructure plan. A whole systems view is also about understanding the convergence of transport and electricity – including recognising and proactively minimising the cost implications of this.

Northern Energy Group options to accelerate affordable EV uptake through safe and efficient charging infrastructure

> **"The technology and tools the country needs to get there exist today – Aotearoa does not need to rely on future technologies"**
> **– Climate Change Commission, Final Advice**

We support the CCC's recommendation that the Government commit to: "Enhancing the roll out of EV charging infrastructure to ensure greater coverage, including at marae, multiple points of access, mandatory smart charging, and fast charging" recognising that "as the uptake of EVs increases it will be important that EV charging does not overload local network capacity or exacerbate daily morning and evening peaks."

Smart charging requires EVs to be capable of participating in a management scheme provided through a smart digital platform. These platforms can enable the coordination of other smart demand response products and services (such as smart heat pumps, or hot water load control) – delivering new customer value and ensuring continued system security in the context of new demand and complexity. That is, distributors could offer customers benefits and incentivise participation in such a demand management scheme. However, the EV charging devices installed need to be smart in the first place in order for this to happen.

This is recognised by the Publicly available specifications (PAS) 6010:2021 and 6011: 2021 Electric vehicle (EV) chargers for commercial applications and residential use, respectively, which provide clear and simple guidance on how to safely and cost-effectively charge an EV and things to consider when installing an EV charger. PAS 6011 – developed between Standards NZ, EECA, the Commerce Commission, Electricity Authority, and industry participants – includes a communications protocol for smart charging as well as health and safety standards. However, these standards are a voluntary guide. There is a risk that the market favours the product with the lowest up-front cost – but which would incur the higher whole-of life cost, and lowest health and safety, to all customers. Having little technical knowledge customers may not enforce the PAS 6011 through their purchase decisions.

As with the uptake of all low carbon technologies – the market should ensure that the option which delivers the greatest efficiency, health and safety, decarbonisation, and security and reliability – is the easiest and lowest cost. However, this does not always happen without Government action.

A trial undertaken by Australian power company, Origin Energy, has supported the value of smart charging and the need for action to drive its uptake, **finding that 60% of trial participants had been plugging their car batteries into standard. sockets in their garages, usually during the evenings before the trial[4].**

Given the pace at which the uptake of EVs must be driven, we see a role for Government to ensure that the settings and platforms are in place to proactively ensure that charging is safe and smart – including for example, to ensure that the standards they have developed are implemented.

[4] https://www.smh.com.au/business/companies/batteries-on-wheels-the-smart-charging-tech-in-garages-needed-to-drive-ev-boom-20210621-p582tg.html;

There are a number of potential levers to ensure that safe, smart charging is the easiest choice for customers. These options are not mutually exclusive – for example, import and manufacture standards could work alongside procurement policies, customer incentives, as well as Electricity Codes of Practice (ECPs).

Options to ensure safe and smart charging:

1. **Procurement policies.** We support the national charging infrastructure plan and see an opportunity for the Government to lead this enabling infrastructure with partners across industry. As part of the implementation of this plan the Government could use procurement to ensure that that the chargers that are used are smart and safe.

2. **Customer incentives.** Purchasing power could similarly be leveraged at a customer level through an incentive to offset the additional capital cost of smart EV chargers.

3. **Import and domestic manufacturing standards.** In the same way that the CCC recommended a ban on the import and manufacture of ICE vehicles to ensure NZ's vehicle supply favours EVs, import and manufacturing standards could be used to ensure adequate supply of smart chargers to make this the easiest choice.

4. **A supporting Electricity Code of Practice could be introduced which incorporates a communications protocol for smart charging as well as health and safety provisions.** Electricity Codes of Practice are implemented by Worksafe and ensure standards that need to be met by industry participants – including regulating for installations. This could enforce PAS 6011.

5. **Regulations to ensure that all chargers installed are safe and smart.** Such regulations were proposed and consulted on in the UK. Whilst the NZ Electricity Industry Participation Code (the Code) does give effect to Distributed Generation Connection and Operation Standards, it does not currently talk to standards for EV charging installations. Establishing a connection standard for EV charging in the Code would require a change to the Electricity Industry Act 2010, which currently prevents the Code from imposing obligations on consumers. This change would create a new type of industry participant.

We note that Amendments to the Electricity Industry Act 2010 are already progressing this year in New Zealand to implement changes recommended by the Electricity Price Review (EPR) intended to ensure rules regarding network access are fit for a 'rapidly evolving electricity system'. This could act as a vehicle for any necessary legislative change or new provisions that are required to implement PAS 6011.