

# Charging Our Future: Discussion document

The Government's long-term strategic vision for Aotearoa New Zealand's national electric vehicle charging infrastructure system

March 2023



**Te Kāwanatanga o Aotearoa**  
New Zealand Government

**Ko te pae tawhiti whaia kia  
tata. Ko te pae tata, whakamaua  
kia tina [ The potential for  
tomorrow is determined by  
what we do today**

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# Ministerial Foreword



**In May 2022, the Government released Aotearoa New Zealand's first emissions reduction plan. The plan sets out how we will meet the first emissions budget for 2022–25 and put us on track to meet future emissions budgets.**

Transport is one of our largest sources of greenhouse gas emissions and is responsible for 17 per cent of Aotearoa New Zealand's gross emissions and 39 per cent of total domestic CO<sub>2</sub> emissions.

More sustainable transport options can also reduce the cost of transport and reliance on global fossil fuel markets.

Therefore, the Emissions Reduction Plan includes the action to rapidly adopt low-emissions vehicles including by improving EV-charging infrastructure across Aotearoa to ensure that all New Zealanders can charge when they need to.

While electric vehicles are not a panacea, they have a big role to play as part of our future decarbonised transport system, complementing increased opportunities for adults and children to safely walk, cycle and use high-quality public transport.

The Government has already co-funded over 1,300 EV chargers and will continue to improve EV charging infrastructure across Aotearoa to ensure that all New Zealanders can charge when they need to. Charging infrastructure will be accessible, affordable, convenient, secure and reliable for everyone.

However, we cannot rest on our achievements. We need an EV Charging Strategy to provide certainty to all parties about the role government will play in supporting EV charging infrastructure.

This is particularly true given:

- EV ownership is already ahead of projected levels
- the technological environment for EVs is dynamic.

For these reasons, we are releasing the draft Charging Our Future strategy, along with this discussion document, for public consultation.

The Government is also conscious of the need to allow all New Zealanders access to EV charging and the benefits of EVs, no matter where they live or which demographics they belong to.

These aspirations are incorporated in the vision of the draft strategy: **that Aotearoa's EV charging infrastructure supports the transition to and use of low-emissions transport by being accessible, affordable, convenient, secure and reliable.**

We look forward to seeing your submissions on this draft strategy and discussion document so we can finalise an EV Charging Strategy that harnesses and is well-informed by the collective knowledge of all New Zealanders.



**Hon Dr Megan Woods**  
Minister of Energy and Resources



**Hon Michael Wood**  
Minister of Transport

# Introduction



**Transport emissions are the second largest source of domestic GHG emissions, responsible for 17 percent of gross domestic GHG emissions<sup>1</sup>, and will need to fall significantly, and swiftly, if Aotearoa New Zealand is to achieve its 2050 net zero emissions target. Approximately 89 percent of transport GHG emissions come from road transport: 65 percent from travel by light vehicles and 24 percent from the heavy vehicle fleet.**

Aotearoa New Zealand has a target to increase zero-emissions vehicles to 30% of the light vehicle fleet and reduce emissions from freight transport by 35%. Meeting this target will require a significant increase in light EV uptake and electrification in the heavy vehicle, shipping and aviation sectors.

We're making good progress with more New Zealanders choosing EVs. In the year ending March 2022, EV imports increased 309 percent to \$543 million. PHEV imports increased 141 percent (\$46 million). EVs made up 30 percent of all light passenger vehicle sales in August 2022.

Given recent enthusiasm for EVs, it is unsurprising that congestion and queuing is present at some of our public charging sites. A perceived lack of access to charging remains an impediment a barrier to greater uptake of EVs and

the benefits that come with this. To continue our momentum, and reach our emissions targets, New Zealand will need significantly more EV charging infrastructure.

New Zealand has unique characteristics which will impact the nature of government support for charging infrastructure. We have amongst the highest levels of vehicle ownership in the world and most households have access to off-street residential parking, which is helpful for charging. Our population is generally highly urbanised, and most car, van and truck journeys are short, but we have a widely dispersed rural population and industry base and increasing numbers of people in cities living in multi-unit dwellings and high density areas with less straightforward access to charging options.

### **The draft strategy relates to all EVs that require charging**

The draft strategy is of primary relevance to light EVs which comprise most of the electric fleet in New Zealand. This includes battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

The draft strategy is also relevant – and will become more so over time – to heavy road transport, such as buses, trucks, and heavy-duty EVs intended for offroad use (e.g. in the primary sector).

Looking to the future, the government also expects electric boats, ships and aeroplanes to feature more prominently in New Zealand's transport sector. The draft strategy does not delve deeply into these areas as their future role and charging requirements are relatively unclear.

1. These figures are an estimate of 2019 transport emissions based on New Zealand's Greenhouse Gas Inventory 1990–2020.

## INTRODUCTION

### The draft strategy relates to all types of charging

The draft strategy relates to public and private charging at all speeds required to serve the EV fleet.

### Implementation sits across government portfolios and the private sector

The very nature of EV charging will mean that actions will span across the electricity and transport sectors, with success predicated on joined up action across the sectors.

The draft strategy has been led to date by Te Manatū Waka with input and advice from other government entities and stakeholders. Going forward, the draft strategy will be developed and finalised jointly by Te Manatū Waka and the Ministry of Business, Innovation and Employment to better enable effective coordination across the wider transport and energy systems.

Once the draft strategy is finalised, the Government commits to work in partnership with industry to implement it, drawing on expertise and capital across the public and private sectors. In the short term, implementation will require dedicated resourcing within agencies in the Transport and Energy and Resources portfolios.

As the charging system matures and acquires scale, current arrangements to co-lead EV charging work from within existing agencies are unlikely to be sufficient to deliver and implement the range of interlinked actions the draft EV Charging Strategy identifies. One option could be to establish a 'Zero Emissions Vehicles Unit' (or similar) within one of the agencies currently working on EV Charging, with a view to this unit becoming a standalone unit over time. Annex 2 of this discussion document sets out several options for institutional models to lead implementation of the final EV Charging Strategy in the longer-term, and officials are interested in feedback on these options.



Do you have any comments about the institutional arrangements for implementation set out in Annex 2, or on the way central government should work with the private sector when implementing the final version?

### Next steps

Officials will consider feedback from submissions and finalise the *Charging Our Future* strategy in 2023.

We welcome comments on both the high-level strategic framework and possible actions that could contribute to achieving it. We would particularly welcome comments that could inform the prioritisation and timing of completing the actions. We will prepare an implementation plan in consultation with stakeholders based on the final actions. This implementation plan may need to be informed by additional research and analysis.



### Have your say

We are currently seeking public feedback on a draft national EV charging strategy for Aotearoa New Zealand. Read the draft strategy and discussion document at [consult.transport.govt.nz](https://consult.transport.govt.nz) and share your feedback by 11 May 2023.



# Why have a strategy for EV charging?

## EVs support our climate change targets

Government has a target for net zero greenhouse gas emissions by 2050 (other than for biogenic methane). The Emissions Reduction Plan (ERP) is the government's key means of delivering this target.

This ERP includes the initiative to “complete a national EV-charging infrastructure strategy to set out the Government’s vision and policy objectives (for both the public and private sectors) around EV charging over future emissions budget periods”.

The ERP commits to significant action to reduce transport emissions by 41 percent from 2019 levels by 2035. EVs support this. A BEV is responsible for 80 percent less CO<sub>2</sub> than an equivalent petrol vehicle when being driven in Aotearoa New Zealand and 60 percent fewer emissions over its full life cycle.<sup>2</sup>

The ERP also aims to increase zero-emissions vehicles to 30% of the light vehicle fleet by 2035. Achieving this requires around 1.5 million more BEVs by 2035, including around 200,000 electric vans and utes.

Electrification will also play a key role in the heavy vehicle, shipping and aviation sectors. For heavy vehicles, the ERP commits us to reduce emissions from freight transport by 35% by 2035. This will need to be achieved through a combination of approaches, including electrification.

## Other drivers

The other main drivers for producing the draft strategy are:

- EV technology is cutting edge, innovative and subject to significant research and development. This means EVs have changed significantly in the past decade, e.g. in average range, charging speed, and variety. These technological changes have implications, including for driver behaviour. All areas subject to considerable innovation have some inherent uncertainty. One important role for the strategy is clarifying and setting expectations about the role of central government in this uncertain environment.
- New Zealand's EV uptake is exceeding forecasts. In the year ending March 2022, EV imports increased 309% and PHEV imports increased 141%. EVs made up almost 30 percent of all brand new light passenger vehicle sales in recent months (August, September and November 2022). Public transit vehicles are also changing to electric, with electric bus imports overtaking diesel buses for the first time in the last 12 months. A variety of electric truck and van models, and an electric ute model are now available. The Government wants to continue the momentum in public enthusiasm for EVs. This necessitates a strategy to offer certainty over the future state of charging infrastructure.

2. <https://genless.govt.nz/for-everyone/on-the-move/consider-electric-vehicles/why-buy-an-ev>

## WHY HAVE A STRATEGY FOR EV CHARGING?

- Given recent enthusiasm for EVs, it is unsurprising that congestion and queuing is present at some of our public charging sites. This is particularly prevalent at seasonal demand peaks for public charging in holiday locations. EECA research from July 2021 highlighted that queuing or charging wait times were the main factor preventing EV owners from using public chargers (41 percent of respondents). High demand for public chargers should not be a barrier to greater uptake of EVs and the benefits that come with this.
- To continue to promote EV adoption, EV chargers should be convenient, accessible and safe.
- EVs also reduce air pollution and noise pollution, particularly in urban areas.



If there are drivers missing, what are they and what impact do you think they would have on the content of the final strategy?

### **Strategic direction is needed as our EV charging network expands**

The final EV Charging Strategy will play a critical role in:

- ensuring coordination and consistency in the planning and implementation of our national EV charging infrastructure over the short – and long-term
- providing government (central and local), industry leaders, business leaders and the public with greater certainty around Aotearoa New Zealand's long-term EV charging outcomes, which could help shape co-investment in EV charging
- identifying and appropriately addressing any gaps in EV charging infrastructure capacity and coverage to enhance our ability to prepare for, and meet, future demand for EV charging
- clarifying and setting expectations for actions and responsibilities across a range of key stakeholders across a national, regional and local level.

# Baseline: the current state of charging infrastructure

Before outlining the government's vision for the future of EV charging, we outline the status quo.

One of the key ideas that needs to be made clear to drivers is how the charging of an EV differs from fuelling an ICE vehicle. For an ICE vehicle, the driver needs to refuel at a petrol station, where they will spend a short time refuelling and then drive off. A well-functioning EV charging system would have EV's charging where people were already planning to be, with a charging speed that matches how long they will be there.

In this system, a driver would only need to visit a dedicated petrol station-like charging hub relatively occasionally, for example when they need a quick charge during a long journey.

The next section classifies EV charger types based on where the charging is taking place (public or private). Another way to think of the different parts of the EV charging system that need to work together is by describing how long someone has available to charge:

- Places where someone will be longer than 4 hours (such as at home, work or holiday accommodation). This only requires slow charging (i.e. charging speeds up to about 22kW)
- Places where people will be for 30 minutes to 2 hours (such as supermarkets, gyms, libraries etc). These locations would benefit from faster charging speeds (i.e. about 25-50kW) to give people are more substantial charge in a relatively short amount of time.
- When someone is in a hurry and only has about 10-45 minutes and needs a substantial charge (such as stopping part way through a long journey, with enough time to visit the bathroom and get something to eat). In this situation charging needs to support the maximum charging speeds of vehicles (the fastest chargers available for light vehicles are currently about 300kW) to allow people to get back on the road as quickly as possible.

## Chargers are divided into public chargers and private chargers

The following tables illustrate the different types of charging found in Aotearoa.

**BASELINE: THE CURRENT STATE OF CHARGING INFRASTRUCTURE**

**Public charging options**

<b>Journey charging (including Hub Charging)</b>	<b>Residential on-street charging</b>	<b>Destination charging</b>
<p>Journey (or en-route) charging is used to top up midway through people’s journeys. These chargers range from fast to ultra-fast chargers. Charging normally takes 15 – 45 minutes. Typical journey charging destinations include service stations, cafes, and public rest areas.</p> <p>Hub charging is a communal parking area with multiple chargepoints, with the capacity to service multiple vehicles at once.</p> <p>Aotearoa’s public EV charging network now offers fast/rapid direct current (DC) charging stations at least every 75 kms for over 97 percent of our state highway network. In 2022, EECA provided co-funding for chargers in five of the main remaining network gaps. These chargers should be operational in 2023.</p>	<p>Charging stations installed to serve vehicles parked on-street.</p> <p>Residential on-street charging is particularly important for EV owners without off-street parking.</p> <p>Several have been installed in Wellington suburbs.</p>	<p>Charging is provided at destinations where the user may park for a number of hours. For example, at gyms, cinemas, tourist attractions, shopping centres, and supermarkets. Charging normally takes 1 – 2 hours.</p>

The government has co-funded over 700 public chargers.

To date, central government’s involvement in public charging has primarily focussed on supporting the roll-out of journey charging infrastructure. While journey charging only accounts for a small proportion of EV charging, it is an essential part of the charging landscape

as good availability and visibility of charging points for light EV users along main routes and at major centres is important to reducing range anxiety and encouraging EV uptake. Journey charging also faces higher cost barriers, which make it difficult for the provision of this infrastructure to be commercially viable while EV numbers are relatively low.

**BASELINE: THE CURRENT STATE OF CHARGING INFRASTRUCTURE****Private charging options**

<b>Residential off-street home charging</b>	<b>Depot Charging</b>	<b>Workplace Charging</b>
<p>Private off-street charging on driveways and in garages. This is considered the cheapest and most convenient form of EV charging. Users typically slow charge overnight (and pricing generally encourages this). In Aotearoa, 92 percent of light vehicles are parked at a residential property overnight, with 80 percent using off street parking. Unsurprisingly, EECA's research suggests that 82 percent of charging sessions occur at home.</p>	<p>Charging at private business locations for EVs used commercially, such as buses, trucks and public sector fleets.</p>	<p>Intended primarily for employees that commute to work. This can be slow or fast charging and is typically provided at private car parks. This is also a convenient way for company employees and fleets to charge their vehicles. EECA's research suggests that about 4 percent of charging sessions are done at workplaces.</p>

The government has co-funded over 550 private EV chargers.



Do you agree with this description of the status quo? Is anything missing from this description of the status quo?

**Our vision  
for Aotearoa  
New Zealand's  
EV charging  
infrastructure**



## OUR VISION FOR AOTEAROA NEW ZEALAND'S EV CHARGING INFRASTRUCTURE

➤ Our vision: Aotearoa's EV charging infrastructure supports the transition to and use of low-emissions transport by being accessible, affordable, convenient, secure and reliable.

The system-wide vision crystallises the government's long-term strategic direction for our national EV charging infrastructure system to guide its expansion out to 2035.

This vision ensures the government's long-term strategic direction:

- **considers both public and private charging infrastructure and charging behaviour**, such as residential off-street, residential on-street, journey and destination charging
- **includes an initial focus on charging for light EVs**, while accommodating for and recognising areas where other vehicle modes and zero-emission energy sources may fall within scope, such as commercial heavy trucks and green hydrogen
- **includes a commitment to all New Zealanders** (existing and future EV users across demographic and geographic groups) to support an equitable transition.



Do you think this draft vision serves as a useful guide for the EV Charging Strategy? If not, what is missing from the vision?



**FIVE LONG-TERM OUTCOMES SUPPORT THE VISION**

# Five long-term outcomes support the vision

The vision for Aotearoa New Zealand’s EV charging infrastructure is supported by five key long-term outcomes.



These outcomes reflect the urgent need to decarbonise Aotearoa’s transport system, while acknowledging the need for an equitable transition which benefits all New Zealanders.

- **Outcome 1:** Aotearoa’s EV charging system is underpinned by affordable, reliable, secure and safe power supply and infrastructure.
- **Outcome 2:** All EV users can safely access and use EV charging when and where needed.
- **Outcome 3:** Aotearoa’s EV charging system is underpinned by integrated and streamlined cross-sectoral planning and standards.
- **Outcome 4:** Aotearoa’s EV charging market functions effectively, can adapt and evolve over time, and is attractive to users, operators and investors.
- **Outcome 5:** Our national EV charging system supports the transition to, and use of, low-emissions transport modes across the wider transport system.



## Each long-term outcome is supported by key focus areas

Each of these five long-term outcomes is supported by key focus areas, which will help to thematically group areas of work underway and set out the further actions needed for their realisation.

The relationship between the vision, long-term outcomes and key focus areas is summarised by the figure in Annex 1.



Do you agree with the proposed outcomes? If not, please explain why.



Should the final strategy focus on more or different outcomes? If so, please identify what these outcomes should be.



Do you consider any of these outcomes more important than the others? If so, which one(s) and why?



**OUTCOME 1**

# Outcome 1: Our national EV charging system is underpinned by affordable, reliable, secure and safe power supply and infrastructure

## What is the challenge?

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EECA estimates that, when averaging to account for EV models and battery sizes, the average household electricity consumption could increase by 25 percent with the uptake of an EV.

EVs require electricity at a time when other sectors are electrifying to support their decarbonisation objectives. This increases pressure on electricity infrastructure, which could require significant investment in renewable generation and upgrades to transmission and distribution networks. Unmanaged, EV charging could exacerbate congestion at demand peaks when the grid is under the most pressure, risking the security, quality, affordability and safety of our electricity supply, and vehicle charging equipment. This is particularly true for urban networks which already experience some congestion and are likely to have higher uptake of EVs initially.

The electricity industry can manage capacity issues through investment. However, those investments will likely be very expensive, avoidable, and will ultimately be recovered from electricity consumers.

## What is the opportunity?

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EVs also present an opportunity to manage demand using smart technology to alleviate pressure on the grid.

Encouraging EVs to be charged in non-peak periods reduces congestion and subsequently, the need for costly over-investment. Transpower estimates every gigawatt of avoided peak demand would ultimately save consumers approximately NZ\$1.5 billion annually by 2050.

Smart EV charging technology can facilitate flexible charging of EVs, by responding to signals such as energy prices, system capacity or network congestion, and information on consumer needs and battery status. It enables consumer demand for EV charging to be lowered during peak periods and times where there is congestion on the local network, while meeting consumers' needs.

Given the relationship between EV adoption and charging infrastructure is inextricably linked to the affordability, reliability, security and safety of our underlying electricity infrastructure, electricity sector regulators, industry bodies and stakeholders have a critical role in our ability to achieve our long-term vision for our national EV charging network.

Given the problem and opportunity created by EV uptake in regard to electricity infrastructure, our first focus area is minimising stress on the electricity network.

## Focus area 1a. Minimising stress on the electricity network

Several government agencies have commenced related work to minimise stress on electricity networks from EV charging.

MBIE is responsible for:

- Electrical standards, including standards specific to EV chargers
- The regulatory regime overseeing energy efficient products, including energy performance standards

Cabinet will consider MBIE's proposals to enhance the regulatory regime for energy efficient products and services in early 2023. This includes clarifying that EECA's energy performance standards and labelling can include requirements related to demand response capability ('smartness'). If adopted into legislation it would enable EECA to regulate EV chargers for demand response capability.

EECA is responsible for encouraging the use of sustainable energy in New Zealand. It supports consumers and the sector with co-funding, information campaigns and regulation. EECA has recently published a discussion document to consider options to improve the energy performance of private EV chargers. Options being explored include the current use of voluntary guidelines, financial incentives to install 'smart' chargers and regulation using EECA's Minimum Energy Performance Standards regime.

The Electricity Authority oversees regulatory settings for distribution networks, including exploring settings necessary to facilitate a network of distributed energy resources, including smart EV chargers. The EA also has been promoting to Electricity Distribution Businesses the idea of offering a separate load control tariff for EV chargers, to help encourage consumers away from charging during peak demand.

The Commerce Commission regulates EDBs, including setting price and quality controls for EDBs that aren't consumer-owned, and requirements for performance publishing and information disclosure. The Commerce Commission is reviewing the rules and processes that underpin key aspects of information disclosure and price-quality regulation. As part of this work, the Commission is considering related matters.

### Further actions which could help meet Focus area 1a. Minimising stress on the electricity network

- Use vehicle and electricity supply data to identify and plan for electricity network requirements (i.e. avoid inefficient network upgrades).
- Publish detailed electricity network capacity data so public and private infrastructure planners can see where constraints are to encourage efficient investment.
- Investigate emerging technologies that can prevent the need for additional power generation, with the aim of encouraging innovative technologies that will make a positive difference.
- Promote the benefits and support the uptake of smart chargers for EVs.
- Work with lines companies to identify opportunities, mitigate risks, and clarify responsibilities in developing EV charging infrastructure.

Q

Do you agree with the focus area under outcome 1? If not, please explain why.

Q

Which further actions under Focus area 1a would you prioritise? Please explain your answer.

Q

Please provide any comments on the timing of completing these actions.

## OUTCOME 2

## Outcome 2: All EV users can safely access and use EV charging when and where needed

### What is the challenge?

To accelerate the transition to EVs, we must ensure that our national charging network enables New Zealanders to have confidence they can complete their necessary travel using an EV. This includes their ability to make necessary shorter trips, like daily commutes to and from work and/or school, as well as longer cross-country travel, such as holiday or work-related trips, and unplanned trips.

Consequently, we have two focus areas under this outcome:

- Improving the equity of, and access to, safe residential/home charging at a time when New Zealanders are inhabiting a wider range of types of housing
- Accommodating for geographic variation in charging needs and energy supply, given New Zealanders living in different areas and circumstances have different challenges in using EVs.

### Focus area 2a. Improving the equity of, and access to, safe residential/home charging

Residential/home charging is the cheapest and most convenient form of EV charging with 92 percent of light vehicles are parked at a residential property overnight and over 80 percent use private off-street parking. Charging at home during off-peak times has the equivalent cost of buying petrol at around 40c/litre on average.<sup>3</sup> Home charging typically runs through either a wall-mounted charging unit or a portable cable.<sup>4</sup> As noted, EECA's research suggests that 82 percent of charging sessions occur at home.

There is likely to be a growing need to address access to reliable home charging, given the growing trend towards medium – to high-density urban development.<sup>5</sup> Often complex ownership and management structures present challenges for EV chargepoint installation and operation. Specific charging considerations are therefore needed for those residing in:

- **Multi-unit dwellings and social housing.**  
A growing trend towards higher density urban development that are unlikely to have dedicated parking spots, instead relying on on-street or shared parking facilities. Retrofitting multi-unit dwellings with EV charging infrastructure can be logistically challenging and quite costly depending on the location of the parking spaces and the proximity to a chargepoint.

3. <https://genless.govt.nz/for-everyone/on-the-move/consider-electric-vehicles/charging-an-ev/#:~:text=They%20typically%20cost%20about%20%2410%20per%20100km>

4. As noted in the Publicly Available Specification for EV Chargers for Residential Use, the on-board (Mode 2) charging cables provided with many New Zealand EV's are safe to use but only with a suitably sized wiring circuit designed to handle the current drawn by an EV. The safest and best way to charge an EV at home is using a wall-mounted (Mode 3) charging unit that is connected into the electrical wiring of the home.

5. We note that higher-density housing can create less need for transport and help reduce vehicle kilometers travelled, for example, if more people live closer to amenities or public transport hubs.

- **Rental accommodation.** The 2018 census indicated that 1.8 million New Zealanders live in rented accommodation. Renters may face challenges in securing permission to install home chargers, or access a chargepoint, at their rental premises. If landlords are unwilling to install charging for their renters, overseas analysis indicates that these households generally need to rely on more workplace and public charging, which is often more expensive.<sup>6</sup>
- **Locations with challenging topography.**<sup>7</sup> Those living in residential areas with challenging topography may have limited charging options if they have poor access to off-street parking or if local topography makes installing kerbside residential chargers difficult.

While generally not permanent residences, marae also have unique charging considerations and opportunities. Marae face surges in usage and accommodate a range of community needs. Charging solutions at marae may also be transferrable to other shared-use community infrastructure.

Support for more inclusive and equitable<sup>8</sup> residential charging is needed if we are to realise our vision for a safe, affordable, accessible, and practical EV charging system for all EV users. Further work is needed to overcome residential EV charging barriers, such as those described above.

### Further actions which could help meet Focus area 2a. Improving the equity of, and access to, safe residential/home charging

- Improve our understanding of the issues for access to chargers at home, using data and evidence. Specifically looking at:
  - rental accommodation
  - locations with challenging topography
  - living in multi-unit dwelling
  - social housing without access to off-street parking.
- Explore solutions to increase the provision of public charging infrastructure (i.e. slow AC charging) in locations with limited access to off-street parking.
- Partner with iwi and hapū to identify needs for, and deploy solutions for EV charging on marae.
- Review current regulations relating to residential EV charging to ensure they remain fit for purpose.
- Ensure policies and interventions target an equitable transition to meet the specific needs of different communities. This may mean targeted government investment or intervention where gaps are identified in market provision.
- Investigate the case for a 'right to charge' policy for renters.

6. ICCT White Paper (2021). Charging up America: Assessing U.S. Charging Infrastructure through 2030.

7. This group forms about five percent of EV owners in Aotearoa.

8. We note that equity in this context can refer to the way EV owners are served by chargers, but also the way costs and benefits could fall to non-EV owners who are electricity consumers and pay, to some degree, for network upgrades.

## OUTCOME 2

### Focus area 2b. Accommodating for geographic variation in charging needs and energy supply

EV charging needs vary heavily with local factors, including population density, renting patterns, public transit access and supply, and parking patterns.

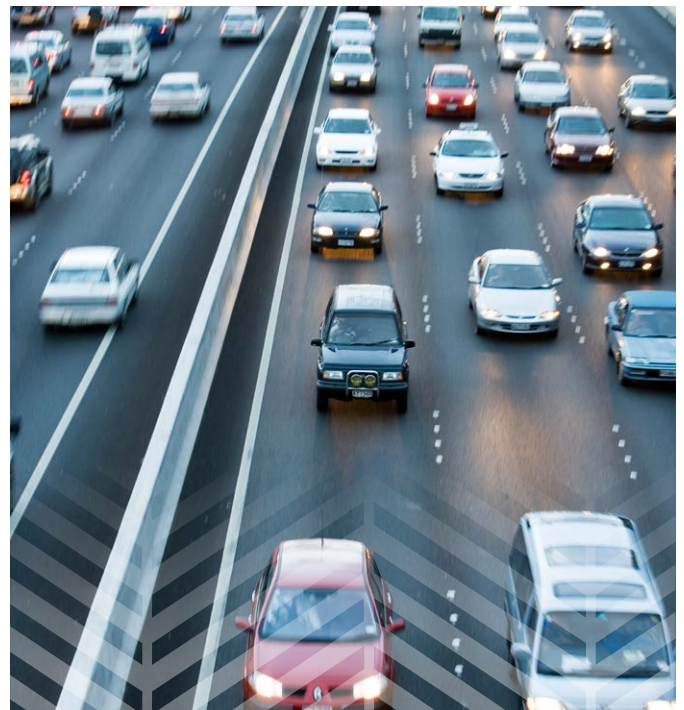
Smaller and rural communities are likely to face greater challenges in shifting towards lower-emissions transport options, e.g. public transport, cycling and walking. EVs and supporting charging infrastructure will therefore likely play an important role in supporting rural and lower-density communities to transition towards lower-emissions transport. Access to convenient charging points is essential to ensure that rural communities benefit from the transition to EVs, both for local and visiting EV drivers.

There are specific challenges around EV charging provision in low population density areas:

- On average, rural areas tend to have less robust electrical infrastructure, which can affect the speed and volume of chargers available. Electricity supply upgrades are expensive, and there are often a lack of other sources of electricity demand in the area to support the investment.
- Electricity supply upgrades at these 'grid edge' locations often have high costs as there is often a lack of other significant new electricity loads in the area to support this investment.
- Rural charging stations may have a lower utilisation rate, compared to urban chargers. Consequently, it may be more difficult to attract commercial investment for rural charging.

Vehicle-to-load technology – the ability of some electric vehicles to sell demand response services to the electricity grid including by offering electricity generation – could offer resilience to households and electricity networks, including in rural areas. Distributed generation, e.g. small scale solar, wind, or micro-hydro generation, could support the improvement of electricity supply to charge EVs in rural areas.

EECA's Roadmap and support through the Low Emission Transport Fund is helping to identify and address critical regional public charging coverage gaps, but further Government intervention may be needed to improve charging provision and service quality at the local level in rural areas.



### Outcome 2 links to targets for EV charger provision

Aotearoa's public EV charging network now offers fast/rapid charging stations at least every 75 kms for over 97 percent of our state highway network. We want to set new targets for EV charging infrastructure in the final strategy, considering the different types of chargers, their location and coverage across the country.

### A quantifiable target for journey chargers makes sense in New Zealand

We propose a target of **having a journey charging hub every 150 – 200 kms on main highways by 2028**. This would result in a network of approximately 25 – 34 hubs with each hub containing up to 20 chargers. Each hub would be akin to a petrol station for EVs, offering services to customers while they wait to charge their vehicles.

### Targets for urban and suburban areas could vary across New Zealand

In urban and suburban areas, the need for charging capacity relates to the convenience of access to charging infrastructure. This will depend on the availability of public charging and home charging options. Therefore, for urban and suburban environments we propose that charging is aligned with user convenience and needs to support EV uptake.

In urban areas with limited off-street parking (generally in central Auckland and central Wellington) we could **aim to have one public charger for every 20 – 40 EVs**.

### We propose a population target for non-urban areas

To ensure that rural and provincial New Zealand locations are accessible for visitors and residents with EVs, we propose a target **that all settlements with a population of 2000 or more should have public charging at municipal or community facilities by 2025**.

This commitment would ensure comprehensive coverage of most populated parts of New Zealand and avoid towns being left out, but would involve installing less than 100 new chargers across the country as many of the larger population centres are already served.

This target may result in some infrastructure that is relatively lightly utilised, especially in the first few years, but it will help build confidence with New Zealanders that EVs are suitable for journeys in all parts of the country, provide greater resilience, and reduce the need for people to detour to other charging destinations.

### A collaborative approach is needed to inform regional investment

The EV charging ecosystem will vary between regions. This is due to council requirements and strategies, variations in electricity distribution network infrastructure, and different appetites for private investment. Hence, we expect regional needs for charging infrastructure to differ. We therefore propose to do further research on regional requirements, including consultation with regional actors, to inform targets and approaches to deployment across the country.

## OUTCOME 2

### Further actions which could help meet Focus area 2b. Accommodating for geographic variation in charging needs and energy supply

- Monitor the expansion of the public EV charging network in line with EV uptake forecast levels across regions to inform investment.
- Implement a consistent, practical planning and approval process across councils.
- Introduce high-level targets corresponding to EV uptake projections and regional factors based on research and data.
- Provide additional government support (financial or otherwise) to assist the planning and installation of public charging infrastructure that specifically meets the needs of rural communities.
- Explore the role of existing vehicle service suppliers in improving regional/rural EV charging provision. For example, the UK has investigated implementing a requirement for large fuel retailers and motorway service areas to provide chargepoints at their forecourts.
- Support vehicle-to-load technologies that increase resilience to the grid.
- Investigate the role of stationary battery storage and other charging innovations for rural locations. These measures can help to address seasonal EV charging demand peaks in more remote tourist areas and/or provide a lower-cost option for those areas facing costly electricity network upgrades due to regional energy supply barriers. The Low Emission Transport Fund is already actively encouraging applications of this technology.



Do you agree with the focus areas under outcome 2? If not, please explain why.



Which further actions under Focus areas 2a and 2b would you prioritise? Please explain your answer.



Please provide any comments on the timing of completing these actions.



Are there any actions needed to reflect the particular EV charging needs of disabled communities, Māori, or other groups? Please explain your answer.



Please provide any comments relating to targets for EV charging infrastructure.



## Outcome 3: Aotearoa's EV charging system is underpinned by integrated and streamlined cross-sectoral planning and standards

### What is the challenge?

Identifying sites for, installing and operating chargepoints and charging stations across Aotearoa requires navigating complex environments, including the resource consenting process and standards. There is an opportunity to integrate and streamline planning and standards relating for EV charging.

Consequently, we have three focus areas under this outcome:

- Improving standardisation and interoperability
- Optimising data use and capture
- Consideration of housing and urban development planning, where appropriate.

### Focus area 3a. Improving standardisation and interoperability

Aotearoa's public EV charging infrastructure is dominated by a few charging suppliers, meaning EV drivers can use the current charging system relatively easily. As the market expands, we expect new entrants and greater competition in charging infrastructure, which, if not properly managed, could deteriorate consumer experience by fragmenting payment systems, for example. At the same time, local government may need support to ensure consistency in its approach to charging while accommodating for diversity in local charging needs and behaviours.

### Standardisation and interoperability in payment systems

While the market is still small, there is an opportunity for New Zealand to avoid charging fragmentation issues. A lack of standardisation and interoperability can negatively impact the EV user experience, as evidenced overseas. For example, it is inconvenient for EV drivers to register for a variety of memberships, accounts, and smartphone apps to access publicly available charging infrastructure. In some cases, drivers may face barriers to access, like needing a credit card.

Government co-funding of most public EV chargers has provided the ability to require chargers to reflect specific requirements, such as open payment systems. However, as the market matures and an increasing number of chargers are installed without government co-funding, there may be a need for additional measures to ensure standardisation and interoperability.

Introducing standards (including data standards) and regulations for charging network operators in New Zealand could help ensure EV drivers can safely and conveniently access and use charging stations when and where they need to, while promoting competition among charging providers.

**OUTCOME 3****Standardisation and interoperability in other areas**


For private EV charging, EECA has published a discussion document that considers options to improve the energy performance (energy efficiency, interoperability, and connectivity) of private EV chargers. Options being explored include the current use of voluntary guidelines, financial incentives to install 'smart' chargers and regulation using EECA's Minimum Energy Performance Standards regime.

Standards New Zealand published voluntary guidelines for residential and commercial EV charging in 2021, known as PAS (Publicly Available Specifications). PAS are facilitated by Standards NZ and EECA in a joint development committee made up of government and industry participants. The PAS will be updated in 2022/23 to reflect the latest technological developments and advice.

**Considerations for local government**

Local authorities have the best understanding of local transport needs and behaviours and have responsibility for local planning policies. Local authorities play a key role in future proofing roads and carparks, including planning to accommodate on-street and destination charging.

National-level guidance may be necessary to ensure consistency in charging networks while still accommodating for diversity in local charging needs and behaviours. Local authorities may need support in achieving the right solutions for their local area. We will produce guidance for local authorities to inform them about EV infrastructure and encourage best practice to incentivise infrastructure.


**Further actions which could help meet Focus area 3a. Improving standardisation and interoperability**

- Promote national consistency and reliability of service and a customer-centric approach to EV charging.
- Explore policy options to ensure chargers are efficient and safe.
- Support and enable data sharing where appropriate (e.g. EV charger and/or network providers) to support standardisation and interoperability.
- Support local authorities to implement the required public charging infrastructure.
- Develop systems and support networks to share best-practice between local authorities, industry and central government to ensure guidance and regulations are feasible and proportionate.

**Focus area 3b. Optimising data capture and use**

There are opportunities to use data capture and sharing to improve charging services. Data sharing can (i) help regulators and utility firms to forecast peaks in demand and design appropriate tariffs; (ii) consumers find available charging facilities; (iii) suppliers identify high demand locations for further development; (iv) help to educate the market and the public on habits, charging trends, charging capacity, and vehicle behaviour. More broadly, improved data capture and use could help maximise return on charging investment for both public and private sector organisations (including EDBs).

For any data collection and sharing initiatives, precautions to protect data and ensure privacy will be critical.

Currently EVRoam (a live database of Aotearoa's EV charging infrastructure) collects real-time information from all safe and monitored public charge points around New Zealand, and freely distributes it through various apps and websites. This lets EV drivers know the charger location and availability. For those chargers with automated data, it also shows if the charger is available to use or in use. This means drivers can confidently plan their journey.

EECA is working on 'demand flexibility' across a number of initiatives, with EV chargers being one component of a flexible demand system. A functional system will require device registration (to enable visibility and control over the electricity network), data capture, and robust cybersecurity.

#### Further actions which could help meet Focus area 3b. Optimising data capture and use

- Explore the value of mandating real-time broadcasting of the location, type and availability of public chargers (e.g. through EVRoam).
- Investigate other user information the market would want EVRoam to capture, e.g. nearby services, price, etc.

### Focus area 3c. Consideration of housing and urban development planning, where appropriate

A wide range of government policy can affect the development of EV charging infrastructure. For example, there may be an opportunity to explore regulatory change in the housing and urban development sector to encourage charge-ready infrastructure or installed charge points in new builds. While there will likely be upfront

costs, installing during construction can be easier, cheaper and less disruptive than retrofitting charging infrastructure.

As required by the government, Auckland Council removed minimum parking requirements from the Auckland Unitary Plan on 11 February 2022. The Council is investigating mandating electricity connections to enable smart EV chargers to be installed where developers choose to provide on-site parking.

#### Further actions which could help meet Focus area 3c. Consideration of housing and urban development planning, where appropriate

- Explore the costs and benefits of introducing charging infrastructure requirements for new developments (residential, commercial, and industrial).
- Investigate potential changes to planning strategies (for local and regional councils, e.g. minimum numbers of EV parking bays in certain locations).
- Provide guidance material for local councils, landowners and developers (e.g. in regard to "licences to occupy" granted to charging providers to place charging on council land).

Q

Do you agree with the focus areas under outcome 3? If not, please explain why.

Q

Which further actions under Focus areas 3a, 3b, and 3c would you prioritise? Please explain your answer.

Q

Please provide any comments on the timing of completing these actions.

## OUTCOME 4

# Outcome 4: Aotearoa's EV charging market functions effectively, can adapt and evolve over time, and is attractive to users, operators and investors

## What is the challenge?

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Charging infrastructure delivery will be achieved by a wide range of actors working together to share knowledge and best practice to drive investment in optimal charging locations and options. We need an EV charging market which is effective and is attractive to operators and investors. Doing so will help to ensure New Zealanders have access to affordable charging options and services.

Consequently, we have two focus areas under this outcome:

- Accelerating commercial investment to maximise the opportunity for market-led deployment.
- Enabling innovation in new technology and business models.

## Focus area 4a. Accelerating commercial investment

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We seek to maximise the opportunity for a market-led rollout to support our vision for our national charging network.

The EV fleet is still not yet high enough to make providing EV charging services commercially viable across the whole country. Faster chargers (150-350kW+) have higher costs: upfront for the charger and electricity network upgrades, and ongoing electricity lines charges. Currently few vehicles (mostly premium ones) can use these higher-powered chargers, but this expected to change over time.

The number of commercial players with interest in investing in charging infrastructure is increasing. As the market grows, there is a role for government to remove barriers and encourage new entrants and competition for charging infrastructure. Over time, the consumer base for EVs will shift from early adopters to a much broader, diverse base, which will reflect diverse consumer needs and expectations.

EECA continues to co-invest in the public EV charging network to support commercial partners, with a focus on high-speed journey charging. In August 2022, EECA sought registrations of interest from industry for the development of two prototype EV charging hubs, with multiple high powered charging heads, end user services and security similar to a petrol station. Co-funding, support and coordination by EECA will work alongside charging providers, local councils, electricity distributors, iwi and local communities to identify and find solutions for barriers to implementation.

The Electricity Authority is assessing and addressing any significant first mover disadvantage issues facing customers connecting to distribution networks. The Authority also recently issued guidance to distributors on how to appropriately pass-through charges under the new transmission pricing methodology, including to new and expanding connections.

The Commerce Commission's rules and processes for information disclosure and price-quality regulation applied to EDBs. The review of price-quality regulation for EDBs will consider any barriers to EDBs creating new connections in a timely and cost-effective manner.

The targeted review of information disclosure could support increased transparency to allow the Commission and other stakeholders to assess and monitor the performance of EDBs in providing new connections. The review could require EDBs to provide:

- information on connection processes and decisions
- better information about network capacity and congestion
- better information on pricing
- metrics on the timeliness of processing connection requests
- descriptions of the potential for large new connections.

The Publicly Available Specification, *Electric vehicle (EV) chargers for commercial applications*,<sup>9</sup> is a collation of best-practice advice to guide New Zealand publicly facing businesses, suppliers of EV supply equipment, associated equipment and services to adopt a best practice approach for public and commercial EV charging. The PAS is designed to become a single touch point document, containing all relevant general EV charging information, and incorporates: WorkSafe New Zealand safety requirements and Waka Kotahi NZ Transport Agency guidance; advice concerning the energy efficiency transmission of electricity from the grid to an EV in a commercial installation setting; and the types of chargers available to optimise this efficiency.

#### Further actions which could help meet Focus area 4a. Accelerating commercial investment

- Work with investors, charge point network operators and providers, and other key parties to support investment in public chargepoints.
- Enable data access and sharing where appropriate and needed to accelerate commercial investment.
- Ensure public funds are targeted at areas where commercial investment is unable to fully deliver.
- Ensure the network connection process and pricing for firms wishing to connect public EV chargers to distribution networks is efficient and enabling. Investigate changes to the current system that could reduce 'first mover disadvantage'. This barrier is explored in further detail under Outcome 5.

9. <https://www.standards.govt.nz/shop/snz-pas-60102021/>

## OUTCOME 4

### Focus area 4b. Enabling innovation in new technology and business models

Electrification of the light vehicle fleet represents a significant change for the transportation and electricity system. The government and the market should enable innovative solutions to manage potential impacts from an increase in demand and permit new types of charging behaviour and technology, like battery swap schemes, smart charging, and induction charging. Government will need to carefully balance the risk of stranded assets while looking to encourage further innovation where appropriate, particularly for public charging.

Research and technology focusing on charging solutions for the heavy vehicle sector, including ferries and ships, could help to overcome charging barriers for the freight sector.

EECA's Low Emission Transport Fund demonstrates innovative solutions to stimulate wider replication of successful projects in the transport sector. The LETF has been able to demonstrate several innovative technologies, including:

- battery swap for trucks
- high-powered chargers with battery storage to overcome electrical capacity constraints at Springs Junction
- a portable rapid charging station for locations which experience temporary or periodic increases in EV charging demand.

#### Further actions which could help meet Focus area 4b. Enabling innovation in new technology and business models

- Continue to co-fund the demonstration of innovative charging technologies and work with industry to address barriers to uptake where benefits exist.

Q

Do you agree with the focus areas under outcome 4? If not, please explain why.

Q

Which further actions under Focus areas 4a and 4b would you prioritise? Please explain your answer.

Q

Please provide any comments on the timing of completing these actions.

## Outcome 5: Our national EV charging system supports the transition to, and use of, low- and low-emissions transport modes across the wider transport system

### What is the challenge?

The key focus to date has been on providing charging infrastructure for the light vehicle fleet; however, there is a need to now give more attention to other types of vehicles that are electrifying such as buses, trucks, ships, and planes. Consequently, there are two focus areas under this outcome:

- Progressing work on heavy vehicle charging (buses and trucks)
- Decarbonising other modes across the system and ensuring a coordinated investment approach.

### Context for outcome 5

The Government has set in place a mandate requiring that only zero-emission public transport buses be purchased by 2025. In 2019, there were around 450 buses entering our fleet, about 100 of which were for public transport.<sup>10</sup> In April 2022, there were 131 electric buses in our fleet, and this figure is projected to grow to 392 electric buses by 2025.<sup>11</sup>

Zero emissions trucks are starting to be widely commercialised, with technology advances occurring at a pace and scale considerably faster than expected. At COP26 the Government signed a Memorandum of Understanding (MOU) committing to increasing the sales of zero emissions heavy vehicles to 30 percent by 2030, and 100 percent by 2040. While zero emissions trucks only make up 1% of our heavy vehicle fleet currently, if we put in place policies to support the uptake of these vehicles to meet our MOU targets, there could be around 9,200 Zero-emission heavy vehicles in New Zealand by 2030.

While there is still some uncertainty over how many of these vehicles will be electric versus hydrogen, recent literature, and current technological advances point to a likelihood that smaller trucks used for urban and intra-regional travel will be mostly electric. For longer journeys, we expect there will be a mix of battery electric (including those with battery swap technologies) and hydrogen vehicles.

Decarbonisation of other transport modes (and off-road vehicles) is also starting to happen. Some smaller marine vessels are using BEV technology (for example, the Ika Rere ferry in Wellington and Sparky the electric tugboat in Auckland). Further, Sounds Air and Air New Zealand are exploring options for electric planes for short haul flights. However, while small marine vessels and short haul flights may be electric in the future, long haul flights and large ships are unlikely to be powered by electricity for the foreseeable future and will use other fuels and technologies (although ships in port may use onshore power from the grid).

While each transport mode will possess unique considerations and potentially a different mix of alternative fuels, there is an opportunity for synergy, particularly when thinking about regulatory action. It will also be important to view infrastructure investment across the system, to ensure we are optimising investment in charging infrastructure across modes and preparing for future electrification. This will also need to consider how/where different modes connect across the freight system.

10. MoT, 2022. 2020 Annual Fleet Statistics.

11. MoT, 2022. Vehicle Fleet Emissions Model (VFEM) PT0E-base-base scenario (scenario considering the government's commitment to have 100% new public transport buses electric by 2025, the Climate Change Commission's Demonstration Pathway carbon prices).

## OUTCOME 5

### Focus area 5a. Progressing work on heavy vehicle charging (buses and trucks)

Heavy vehicles (trucks and buses) have significantly different charging requirements than light vehicles. They are much heavier and travel longer ranges. Therefore, they require much larger batteries than cars. Because of these large batteries and high vehicle optimising, heavy vehicles also rely on DC fast charging – transport operators need the vehicles charged quickly to maximise the productivity of the vehicles. These factors considered together pose challenges for charging infrastructure, and for electricity networks (ensuring they can deliver enough electricity where and when it is needed).

The previous section discussed that we don't know the relative proportions of vehicles that will be electric versus the proportion that will be hydrogen; however, we anticipate that there will be a role for both technologies to support the transport system. Also, hydrogen electrolysers and DC fast charging will pose similar challenges for electricity networks (both requiring high-capacity electricity connections). While the relative importance of each technology is not yet clear, it is important that government invests to support both technologies – a recent report commissioned by Te Manatū Waka stated that, in the long-term, over-investment in both technologies early on was cheaper for New Zealand than delaying investment until more information is known.<sup>12</sup>

New technologies on the horizon could be game changing but will also pose challenges for electricity networks – for example, the Megawatt Charging Standard (MCS) that can fully-charge a BEV truck from empty in 10-15 minutes. There are also BEV trucks available in New Zealand now that have a swappable battery pack (this takes around 5-10 minutes). Widespread uptake of technologies that reduce the amount of time that a vehicle needs to “charge” will improve the productivity of these vehicles.

#### New Zealand Freight and Supply Chain Strategy

Te Manatū Waka is developing New Zealand's first Freight and Supply Chain Strategy. That strategy will set the direction for the national freight and supply chain system for the next 30 years, to achieve a set of outcomes including optimisation of the freight sector. One of its roles will be to optimise the freight network to enable freight to shift to lower emission transport modes, improving the efficiency of freight movements which will contribute to reducing VKT, and developing better data and modelling approaches to support strategic decision-making, including in low emissions infrastructure. Work on the Freight and Supply Chain Strategy will inform and align with this work on EV charging infrastructure.

12. Concept Consulting and Retyna Consulting, 2022. Policies to incentivise the uptake of zero-emission trucks. [https://www.concept.co.nz/uploads/1/2/8/3/128396759/policies\\_to\\_incentivise\\_the\\_uptake\\_of\\_zero-emission\\_trucks.pdf](https://www.concept.co.nz/uploads/1/2/8/3/128396759/policies_to_incentivise_the_uptake_of_zero-emission_trucks.pdf)



### Charging at base or depot

Buses and heavy vehicles will be very dependent on charging at base/depot (approximately 70 percent). A proportion of bus and truck operators do not operate at night, and this usage pattern would suit BEVs, as they can be charged overnight when they are not being used and while electricity demand and prices are low. However, some operators run their vehicles 24/7, these operators will rely on having fast charging locations to ensure these vehicles can remain operational.

In order to have the infrastructure at depot to enable multiple vehicles charging overnight, or fast charging during the day, many truck depots may need to have higher capacity electricity connections installed to support the higher electricity demand from EV charging. In many cases, there may need to be upgrades to electricity distribution or transmission networks to support the additional demand too.

This may trigger 'first mover disadvantage' (as mentioned in focus area 4a), whereby companies whose investment in EV charging at their depots requires electricity distribution businesses (EDBs) to invest in network upgrades (for example, higher-capacity transformers) would currently be required to pay for these investments regardless of whether they need all of the additional capacity. Another issue, particularly for small or medium businesses who may be leasing their premises, is that commercial property owners will be concerned about the payback period for these network upgrades and so may not be willing to contribute to the upgrade costs or could increase rent as a result.

While some of the smaller trucks may be able to fast charge on current DC fast charging power levels used by cars, heavier trucks will need higher power megawatt charging to ensure charging wait times are reasonable. Most international original equipment manufacturers planning to offer heavy electric trucks are looking to deploy the forthcoming megawatt charging system (MCS) in their vehicles, allowing charging at rates between 600 kW and 4 MW. MCS is a sister-standard to the combined charging system (CCS2) connectors already included in Waka Kotahi's guidelines. It is expected that heavy electric trucks will have both a CCS2 port for depot charging and an MCS port for highway charging. The CCS2 port can also be used to charge the trucks at public DC charging stations for light vehicles if there is sufficient parking and maneuvering space provided.

### Public charging to support on-route heavy vehicle charging inter-regionally

Although depot charging is expected to play a significant role for heavy EVs, public charging infrastructure for heavy EVs will also be important for:

- Building confidence for both vehicle distributors and buyers
- Providing back-up charging while they are away from the depot
- Enable BEV trucks to make longer trips, expanding the scenarios where BEV trucks can replace diesel trucks. In the absence of this, vehicle manufacturers may be less confident in offering their models for sale in Aotearoa New Zealand.

**OUTCOME 5**

Achieving these outcomes will generate wider benefits for the electrification of the inter-city road public transport fleet.

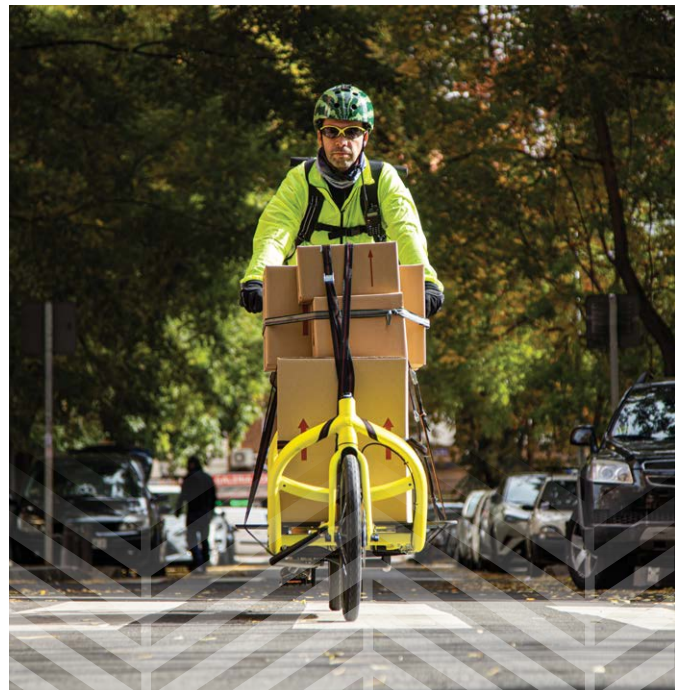
Our current EV charging infrastructure is focused on the light vehicle fleet and as noted, has now achieved good coverage across New Zealand's state highway network. However, nearly all these public journey chargers are unsuitable for heavy vehicles (for example, because there is physically not enough space for heavy trucks, or because the power output of the chargers is too low to charge such a large vehicle within a reasonable period of time).

Given that early models of BEV trucks are likely to be smaller models for mostly urban routes, ensuring the existing fast-charging stations have a dedicated 'truck bay' with additional space for a truck to park could be enough to support uptake in the initial instance. It is likely these will be used as 'top up' mechanisms for heavy vehicles rather than for full charges, which are more likely to happen at base.

EECA's Low Emissions Transport Fund round to prototype public EV charging hubs included minimum specifications including that potential projects would need to be able to accommodate light trucks or light vehicles with trailers, for example by including larger drive-through charging bays. The implementation of these prototype hubs will help to inform how best to include charging for light trucks and similar vehicles into the provision of future public charging sites.

**Public charging to support on route charging for heavy vehicles intra-regionally**

Given the current pace of battery developments, it is also expected that we will start to see battery electric long-haul trucks coming into New Zealand. This will require more dedicated and site-specific charging infrastructure for trucks at certain points on their journey. Hiringa have developed a plan for a minimum viable hydrogen refueling network across the country, aimed to get the maximum coverage. This is something that will likely need to happen for battery charging based on ranges of vehicles available now and expected improvements in battery technology.



### Public charging may also need to be considered in rural communities

Primary sector carriers moving to use zero emission heavy vehicles (ZEHVs) in their fleets will need to have charging infrastructure appropriate to their needs. For example, there are significant differences in battery efficiency for heavy vehicles travelling the golden triangle (Auckland, Hamilton, and Tauranga) and those collecting loads from properties with steep gradients and/or where the access routes may require significant gear and speed changes. These communities might also be located a long way from urban areas or major freight routes.

#### Further actions which could help meet Focus area 5a. Progressing work on heavy vehicle charging (buses and trucks)

- Where appropriate, provide for heavy vehicle charging in new light vehicle charging developments.
- Research and engage with the sector to understand how a public journey charging network for heavy vehicles might look (based on critical freight infrastructure networks).

### Focus area 5b. Decarbonising other modes across the system and ensuring a coordinated investment approach

This focus area looks at a range of vehicles that have particular charging needs, either because of their size and electricity requirements (e.g. ships and planes), or because they have specialist offroad uses and generally operate away from charging infrastructure (e.g. tractors and harvesters).

#### Charging infrastructure to support electrification in the marine space

Being significantly heavier vehicles, electrifying ferries and ships will have more draw on the grid.

We are already seeing the electrification of smaller marine vessels such as passenger ferries. Wellington is home to East by West's first fully electric ferry (Ika Rere), and another ordered from the Wellington Electric Boat Building Company. Auckland Transport have two hybrid ferries on order and are expected to be the biggest in the Southern Hemisphere. These ferries require shoreside infrastructure to recharge. The East by West electric ferry is currently charged from a 300kW charger at its overnight berth using the same specification as the high-power EV chargers used by ChargeNet in Taupō and the Bombay Hills.

**OUTCOME 5**

While bigger ships such as cruise ships and cargo ships are unlikely to fully electrify (and are more likely to use alternative fuels), these ships will require onshore power (i.e. cold ironing) to reduce their emissions at port. Onshore power is a mechanism that is being introduced globally to support ships, to be low – and zero-emissions at port. Onshore power enables emissions reduction by allowing ships to turn off their engines and connect to the electricity grid to power themselves while berthed at ports. Onshore power supply can also function as a charging station for batteries of electric or hybrid ships.

There are significant costs for ports to provide infrastructure for onshore power and for ships to install equipment capable of using onshore power. As discussed in Focus Area 5a, ports are also likely to face “first mover disadvantage” when faced with the required network upgrades needed to install onshore power. However, strengthening/upgrading the electricity network capacity at ports now is futureproofing for a range of modes and technologies, including zero-emission ships, and has been a key lesson learnt by other jurisdictions. Taking a system-wide approach to charging infrastructure will help decision makers ensure efficient investment in these assets.

### **Charging infrastructure to support electrification across domestic aviation**

Electric and hybrid planes are not widely used in Aotearoa currently but are likely to play a role in short-haul domestic travel this decade. Sounds Air has ordered three 19-seater electric planes for later this decade<sup>13</sup>, and intend to convert to a fully-electric fleet in future. Air New Zealand also expect to make use of electric aircraft on some shorter domestic routes by 2030.<sup>14</sup> Two-seater electric planes have already taken flight in Aotearoa, and are likely to play a part in reducing emissions of pilot training.<sup>15</sup>

These planes have the potential to offer a decarbonised service among routes such as Blenheim to Wellington or Wellington to Taupō. Due to the reduced operating costs of such aircrafts, it's also expected that zero-emission aircraft, such as electric planes, are likely to increase connectivity among the regions.

Small electric planes take one-two hours to charge, but as the size of planes increase with technology development, their charging could have significant impact on the electricity network and grid. It is important that airports, local and central Government are preparing proactively for the rise of electric planes in Aotearoa, including facilitating their use with charging infrastructure. Particular thought will need to be given to smaller regional airports, who are likely to reap significant connectivity benefits from the use of zero-emission aircraft, but will need support to facilitate aircraft charging.

It is not likely that long-haul planes will be electric due to weight and range issues.

13. Sounds Air, 2021. Sounds air to fly electric passenger aircraft by 2026. <https://www.soundsair.com/2021/08/Sounds-Air-to-fly-electric-passenger-aircraft-by-2026>

14. Stuff, Dec 2021. Air NZ could take delivery of its first zero emissions aircraft as early as 2025. <https://www.stuff.co.nz/business/industries/127332451/air-nz-could-take-delivery-of-its-first-zero-emissions-aircraft-as-early-as-2025>

15. Stuff, Nov 2021. First electric flight over Cook Strait lands at Wellington Airport. <https://www.stuff.co.nz/travel/news/126846054/first-electric-flight-over-cook-strait-lands-at-wellington-airport>

### **There are a range of other heavy vehicles, machinery and equipment that will also need to be considered in future charging infrastructure**

Off-road machines (for example, tractors, excavators, and mining trucks) are significant sources of GHG emissions in New Zealand Aotearoa. A report commissioned by EECA found that off-road machines use around 28 percent of New Zealand Aotearoa's annual diesel consumption and are responsible for nine percent of New Zealand Aotearoa's energy sector GHG emissions each year.<sup>16</sup> While New Zealand acts to decarbonise on-road transport, off-road fuel use will also need to be decarbonised if we are to meet our various emissions reduction targets. Technologies for decarbonising off-road machines are less well advanced compared with on-road trucks and buses; however, we expect that electrification will play a role. If we have significant uptake of BEV technologies for off-road machines, especially in rural areas, this may place extra emphasis on strengthening electricity networks in these areas to ensure that the electricity system can deliver enough power when and where it is needed.

These off-road machines operate across Aotearoa New Zealand's many industries, come in all different shapes and sizes, and all have unique charging requirements (if BEV technology uptake is significant for off-road machines). Examples of off-road machines operating in Aotearoa New Zealand's industries include:

- Forestry – tracked feller bunchers, skidders, shovel loggers, and wheeled harvesters
- Agriculture, construction, and mining – all-terrain vehicles/quad bikes, tractors, harvesters, loaders, bulldozers, and excavators
- Waste – Front loaders, side loaders, rear loaders and roll-offs
- Ports, container yards, and intermodal hubs – straddle carriers, cranes, container reach stackers, mobile port cranes, container transporters, and boat tractors
- Tourism and leisure – Ski field snow groomers, Recreational vehicles, and house buses

While some of these vehicles (such as rubbish trucks) may be able to utilise infrastructure at depots/base and other public charging infrastructure, there are a significant proportion of these vehicles that won't be able to do this. Supporting these vehicles to take up electric charging will require more holistic thinking about supply arrangements, the nature of charging connections (such as portable charging units) and the level of support needed to promote uptake.

Specialty vehicles that do not operate with a traditional truck chassis have been slower to develop zero emissions models than road vehicles and mass commercialisation is still some way in the future. However, some examples of BEV off-road machines are emerging in New Zealand, e.g. a Dunedin Quarry has invested in a fully electric 30t off-highway truck and a fully electric wheel loader.<sup>17</sup>

16. EECA, 2021. Off-road liquid fuel insights. <https://www.eeca.govt.nz/insights/eeca-insights/off-road-liquid-fuel-insights/>

17. Otago Daily Times, July 2021. Electric truck has plenty of muscle. <https://www.odt.co.nz/news/dunedin/electric-truck-has-plenty-muscle>

## OUTCOME 5

### It is important that infrastructure investments now are optimised for future needs, and consider ensuring connectivity between modes across the system

As illustrated above, as more and more type of vehicles start to electrify it will become even more important to ensure connectivity between modes. Co-locating charging infrastructure for multiple vehicle types could present an opportunity to reduce installation and maintenance costs and promote ease of access by providing a single visible hub for charging multiple vehicle types. It could also make upgrading the electricity grid more cost effective by focusing investment on a small number of locations, rather than decentralising upgrade requirements across the network. This could be advantageous in areas where there are shifts to other mode types in the freight system.

For example:

- At ports where there are multiple users/vehicles requiring charging i.e. electric straddles, electric trucks, onshore power for ships, powering reefers
- At ferry terminals where there are freight operators moving cargo and electric ferries
- At rail hubs where there are multiple operators moving freight to rail
- At freight hubs, where multiple operators are stationed with freight moving in and out.

### Further actions which could help meet Focus area 5b. Decarbonising other modes across the system and ensuring a coordinated investment approach

- Research the present and future system-wide charging needs for heavy vehicles, planes, trains, and ships, including opportunities for co-location of journey and destination charging.
- Reforms in electricity pricing consider the needs of EV charging.
- Reform the approach for the cost-recovery of local network upgrades triggered by investment in public and private chargers




### **There are particular challenges in supplying electricity to charge larger vehicles**


The larger vehicles discussed under Outcome 5 require a lot of electricity to charge. This necessitates significant investment in network upgrades from EDBs. The capital contribution policies of EDBs differ, but some EDBs would require the business investing in EV charging infrastructure to pay for these investments regardless of whether they need all of the additional capacity. Another issue, particularly for small or medium businesses that may be leasing their premises, is that commercial property owners will be concerned about the payback period for these network upgrades and so may not be willing to contribute to the upgrade costs or could increase rent as a result.


Network infrastructure investments pose a significant cost to companies if these are required. Network investments are expensive and last a long time, so the capital contributions can be very large. Furthermore, the costs are placed solely on the party requesting the upgrade, whereas other parties may benefit from the upgrade in the future for no cost. As such, this aspect is a considerable disincentive to invest in heavy EVs. There are 29 EDBs in Aotearoa, and no consolidated policy on this matter across the EDBs. The need for capacity upgrades and network investment will apply unevenly across the freight industry (i.e. it will depend on available capacity, uptake, etc).

The Electricity Authority is considering these issues. In particular, the Authority is:

- Ensuring electricity network pricing is more cost reflective.
- Reviewing the approach for the cost-recovery of local network upgrades triggered by investment in public chargers.

 Do you agree with the focus areas under outcome 5? If not, please explain why.

 Which further actions under Focus area 5a or 5b would you prioritise? Please explain your answer.

 Please provide any comments on the timing of completing these actions.

# Annexes





## ANNEX 1

# Annex 1: Vision, scope, outcomes and focus areas

## Our Vision

Aotearoa's EV charging infrastructure supports the transition to and use of low-emissions transport by being accessible, affordable, convenient, secure and reliable

## Scope

- **Both public and private charging infrastructure and charging behaviour**, such as residential off-street, residential on-street, journey and destination charging
- **An initial focus on charging for light EVs**, while accommodating for and recognising areas where other vehicle modes and zero-emission energy sources may fall within scope, such as commercial heavy trucks and green hydrogen
- **A commitment to all New Zealanders** (existing and future EV users across demographic and geographic groups) to support an equitable transition.

## Long-Term Outcomes

**1.** Aotearoa's EV charging system is underpinned by affordable, reliable, secure and safe power supply and infrastructure.

**2.** All EV users can safely access and use EV charging when and where needed.

**3.** Aotearoa's EV charging system is underpinned by integrated and streamlined cross-sectoral planning and standards.

**4.** Aotearoa's EV charging market functions effectively, can adapt and evolve over time, and is attractive to users, operators and investors.

**5.** Our national EV charging system supports the transition to, and use of, low-emissions transport modes across the wider transport system.

**Focus Area 1a**  
Minimising stress on the electricity network

**Focus Area 2a**  
Improving the equity of, and access to, safe residential/home charging

**Focus Area 2b**  
Accommodating for geographic variation in charging needs and energy supply

**Focus Area 3a**  
Improving standardisation and interoperability

**Focus Area 3b**  
Optimising data capture and use

**Focus Area 3c**  
Consideration of housing and urban development planning, where appropriate

**Focus Area 4a**  
Accelerating commercial investment

**Focus Area 4b**  
Enabling innovation in new technology and business models

**Focus Area 5a**  
Progressing work on heavy vehicle charging (buses and trucks)

**Focus Area 5b**  
Decarbonising other modes across the system and ensuring a coordinated investment approach

## ANNEX 2

## Annex 2: Outline of possible institutional models for EV charging in the longer-term

### Options for institutional arrangements within government

As the table shows, there are a range of options for institutional models to lead the implementation of the EV charging strategy in the longer-term.

Option	Description	Example	Analysis
<b>New public sector department</b>	A Crown organisation established to do some or all of (i) administer legislation; (ii) provide advice to one or more Ministers; and (iii) implement government decisions.  Close relationship with one or more ministers.	Te Manatū Waka Ministry of Transport	<ul style="list-style-type: none"> <li>• Provides for direct Ministerial oversight and control.</li> <li>• Does not provide the independence of other options.</li> </ul>
<b>New Interdepartmental Executive Board (IEB)</b>	These institutions are established to align and co-ordinate strategic policy, planning, and budgeting activities for two or more departments with responsibilities in a subject matter area. This helps support those departments to deliver on relevant cross-departmental initiatives. An IEB creates joint responsibility to manage issues that cut across two or more portfolios or ministries.	Climate Change Chief Executives Board	<ul style="list-style-type: none"> <li>• A good institutional design for encouraging collaboration across organisations and portfolios.</li> </ul>

Option	Description	Example	Analysis
<b>New statutory Crown entity</b>	<p>Crown entities are set up at 'arm's length' from ministers to deliver a range of government services and make some decisions independently. In this sense, they have some independence from Ministers. There are three main types of Crown entity:</p> <ul style="list-style-type: none"> <li>• <b>Crown agents</b> must give effect to government policy</li> <li>• <b>Autonomous Crown Entities</b> must have regard to government policy</li> <li>• <b>Independent Crown Entities</b> are generally independent of government policy.</li> </ul>	Waka Kotahi, EECA (both Crown agents)	<ul style="list-style-type: none"> <li>• Provides independence that is useful in this environment.</li> <li>• Performance would be monitored by a department that could provide advice to Ministers.</li> </ul>
<b>New Public Finance Act 1989 Schedule 4A Company</b>	<p>These companies are established when the objectives sought might be best supported by joint ownership. The Crown may not own all shares at the start or it may wish to reduce its shareholding in future.</p>	City Rail Link Limited, Crown Infrastructure Partners Limited	<ul style="list-style-type: none"> <li>• Could be a useful vehicle for government involvement if it wants to take a commercial focus and part-own assets.</li> </ul>
<b>Crown entity company</b>	<p>Crown entity companies are established and owned by the Crown to further certain policy objectives. These companies are wholly Crown-owned.</p>	Radio New Zealand Limited, Television New Zealand Limited	<ul style="list-style-type: none"> <li>• Could be a useful vehicle for government involvement if it wants to take a commercial focus and own assets.</li> </ul>
<b>State-owned enterprise</b>	<p>State-owned enterprises (SOEs) are Crown-owned companies that are expected to be as profitable and efficient as comparable businesses not owned by the Crown. SOEs are also required to be good employers and to exhibit a sense of social responsibility.</p>	Transpower New Zealand Limited	<ul style="list-style-type: none"> <li>• The growing number of charging providers suggests the government does not need to enter the market with a commercial venture.</li> <li>• Profitability may be difficult in the short term.</li> </ul>

## ANNEX 2

Option	Description	Example	Analysis
<p><b>New departmental agency</b></p>	<p>A departmental agency is an operationally autonomous agency with its own chief executive, hosted by a department of the Public Service. A departmental agency is headed by its own chief executive who is directly responsible to an appropriate minister for its clearly identified, ring-fenced activities and performance.</p> <p>The activities best suited to the departmental agency model tend to be regulatory, service delivery or other ring-fenced operations that do not need to be carried out by an entity separate from the legal Crown and that can be accountable directly to a minister (rather than come under the authority of a governance board). Such functions:</p> <ul style="list-style-type: none"> <li>• are readily identifiable and measurable, and therefore lend themselves to ring-fenced, transparent funding and reporting arrangements</li> <li>• are cohesive and/or fall within a clearly defined area</li> <li>• have relatively stable policy settings</li> <li>• have low levels of operational connection with other functions of the host department</li> <li>• have clearly identifiable staff (employees or secondees) who come within the employer responsibilities of the departmental agency chief executive.</li> </ul>	<p>National Emergency Management Agency, hosted within the Department of the Prime Minister and Cabinet.</p>	<ul style="list-style-type: none"> <li>• Reduces fragmentation and cost in the public sector.</li> <li>• Detailed analysis is needed to determine if the functions of implementing the final strategy align to those best suited to this institutional structure.</li> </ul>

## Working with the private sector

The table above describes options for institutional arrangements for future government involvement in EV charging. Government would have options for working with the private sector. For example, government can:

- continue to co-fund investments, as EECA does through its Low Emission Transport Fund
- continue to procure goods and services, as it does regularly
- codify a working arrangement with a non-government group or groups, e.g. the Future of Work Tripartite Forum is a partnership between the Government, Business New Zealand, and the New Zealand Council of Trade Unions
- consult private sector groups as appropriate
- co-design aspects of work with other parties when this approach is agreeable to all parties.

## Clean Car Sector Leadership Group's proposal

The Clean Car Leadership Group, including the Sustainable Business Council, Drive Electric and Vector, have proposed to work with Government to co-develop an implementation plan for the national EV Charging Strategy and establish a focused public-private mechanism to advance this.

Delivering accessible, affordable, convenient, secure, and reliable EV charging infrastructure will require a high level of coordination between business, industry groups and Government. Industry will also play a crucial role in the direct market-led roll-out of chargers, charging equipment and charging services.

Te Manatū Waka Ministry of Transport and Ministry for Business, Innovation and Employment will continue to work with the Clean Car Sector Leadership Group on their proposal.

## International examples

### United Kingdom

The Office for Zero Emission Vehicles (OZEV) is a team working across government to support the transition to zero emission vehicles. OZEV provide support for the take-up of zero-emission vehicles and funding to support charging infrastructure across the UK. OZEV is funded and staffed from the Department of Transport, and Department for Business, Energy and Industrial Strategy. It takes joint direction from the Transport and Business Secretaries. OZEV is responsible for:

- grants to reduce the upfront cost of new vehicles
- grants to install chargers
- supporting charging infrastructure on the wider roads network
- providing innovation support to develop zero emission vehicle technology.

### Germany

The Federal Ministry for Economic Affairs and Climate Action leads on encouraging the development and adoption of electric vehicles across Germany, whereas the Ministry for Digital and Transport focuses on road licencing and provision of infrastructure like roading.

Germany has a large automotive industry and the government's work on EV adoption extends to encouraging R&D, which is likely a feature of its machinery of government design.

### Australia

The Australian Renewable Energy Agency (ARENA) supports the commercialisation of renewable energy and other low emissions technologies. Its strategic priorities focus on transition to renewable electricity, commercialise clean hydrogen, support low emissions metals, and decarbonise land transport. Its primary mechanism is funding for projects and research.



## Ngā Uara Te Manatū Waka Te Manatū Waka Values



**WHAKAPAKARI**  
IMPROVING OUTCOMES



**AKO**  
CAPABILITY DEVELOPMENT



**MAHI TAHI**  
WORKING TOGETHER



**RANGATIRANGA**  
EMPOWERING  
AND LEADING



**KAITIAKITANGA**  
GUARDIANSHIP AND  
PROTECTION



**WHANAUNGATANGA**  
COLLABORATION  
AND UNITY



**MANAAKITANGA**  
CARING FOR AND  
VALUING OTHERS

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### Citation

Te Manatū Waka Ministry of Transport (2022). *Charging Our Future: Discussion document*. Wellington: Ministry of Transport.

Published in March 2023 by Te Manatū Waka Ministry of Transport, PO Box 3175, Wellington 6140, New Zealand.

This document is available at [consult.transport.govt.nz](http://consult.transport.govt.nz)



**TE MANATŪ WAKA**  
MINISTRY OF TRANSPORT

## Directory

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### Wellington

#### Head Office

Te Manatū Waka  
3 Queens Wharf  
Wellington 6011  
PO Box 3175  
Wellington 6140  
Telephone: +64 4 439 9000  
Email: [info@transport.govt.nz](mailto:info@transport.govt.nz)

**[transport.govt.nz](http://transport.govt.nz)**

ISBN 978-0-473-66928-7