EECA INSIGHTS

Efficient and low emissions transport

Electric Vehicle Charging Survey

Insights into EV owners' charging habits, and use of public EV charging

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Contents

Foreword

Electric vehicles (EVs) make up a small portion of our total fleet now, but that is going to change. With governments worldwide setting stricter fuel efficiency standards, vehicle manufacturers offering more electric and hybrid models, and some moving away from fossil-fuelled vehicles for good, the tide is turning.

The Government's goal for EV uptake is for it to rapidly increase in the next decade and beyond to meet our emissions reduction targets. In New Zealand, the Climate Change Commission has recommended phasing out imports of fossil-fuelled cars by no later than 2035, and the Clean Car Discount has incentivised accelerated adoption of EVs.

The provision of electric vehicle charging is one element to support the decarbonisation of our vehicle fleet. Ensuring that New Zealand has a public charging station network to support the growth in EVs is an important part of the Government's ongoing work.

EECA has co-funded more than 300 fast DC chargers nationwide. As part of the Government's commitment to decarbonising the transport sector, which makes up around half of all energy-related emissions, EECA will continue to co-fund public charging infrastructure through the Low Emissions Transport Fund (LETF) which is increasing in funding to $25m by 2023/24.

EECA commissioned independent research agency TRA to undertake an online survey to better understand the charging habits of private light passenger EV owners, and to gain insights into the use of public EV charging. EECA believes the public and end consumer perspectives and insights are key to understand how to mobilise New Zealanders to be clean and clever energy users. The results of the survey are intended to provide evidence based research and insights for both industry and government into EV charging infrastructure.

This research has formed an important part of EECA's public consultation document "**State of charge:** Consultation paper on developing a short-term roadmap for the public electric vehicle charging network", and we were pleased to work with independent research agency TRA to complete the survey.

Kate Kolich
Manager Evidence Insights and Innovation

EECA TE TARI TIAKI PŪNGAO
ENERGY EFFICIENCY & CONSERVATION AUTHORITY

1 Summary of results and key insights

1.1 Survey results

EECA commissioned independent research company TRA to undertake an online survey during the period of 8 July to 2 August 2021.

- There were 932 respondents to the survey.
- Amongst the respondents, 63% have a Nissan Leaf, 12% have a Tesla Model 3, 4% have a MG ZS, 3% have a Hyundai Kona, 3% have a Hyundai Ioniq and the remaining 15% of vehicles are 'Other' makes and models.
- 31% of respondents were from the Auckland region, 22% from the Wellington region and 11% from the Canterbury region.

1.2 Key Insights

The survey asked questions across three key areas.

1) Daily Driving Habits

- 78% of owners of older EVs ("EV's 2018 or older") are unlikely to drive them on certain trips such as those that require longer distance to travel (e.g. range), compared to 42% of newer EV owners.

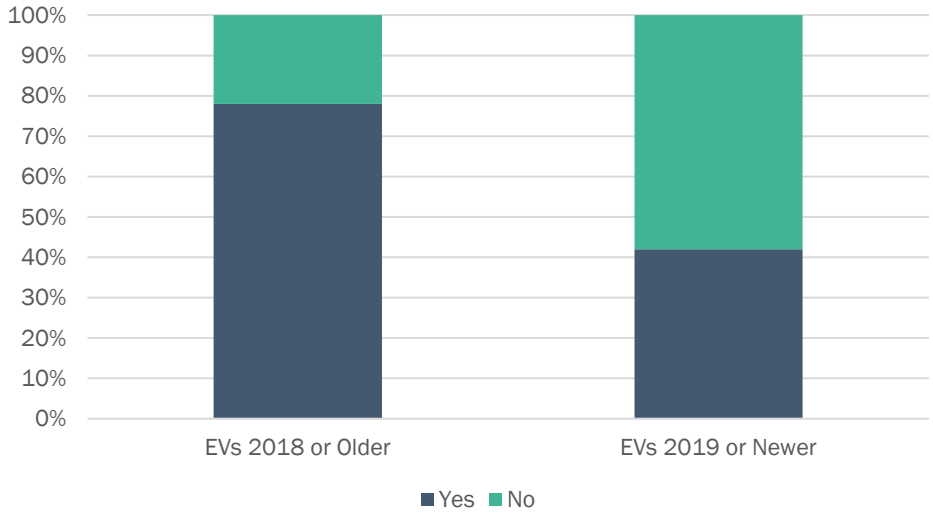

Figure 1: Survey Results. Question: Are there certain types of trips that you would not use your EV for?

2) Charging Preferences

- 82% of people most commonly charge at home.
- The use of a 3-pin charging cable is the most common type of charger for EV owners at home, with 77% of respondents having one. Only 30% of respondents have a wall mounted charger.

3) Public Charging Preferences

- 86% of respondents plan and know in advance which public charge stations they will use.
- The most common reason stated for not using a public charge was having to queue or wait for a charger. This response was given by 41% of respondents.

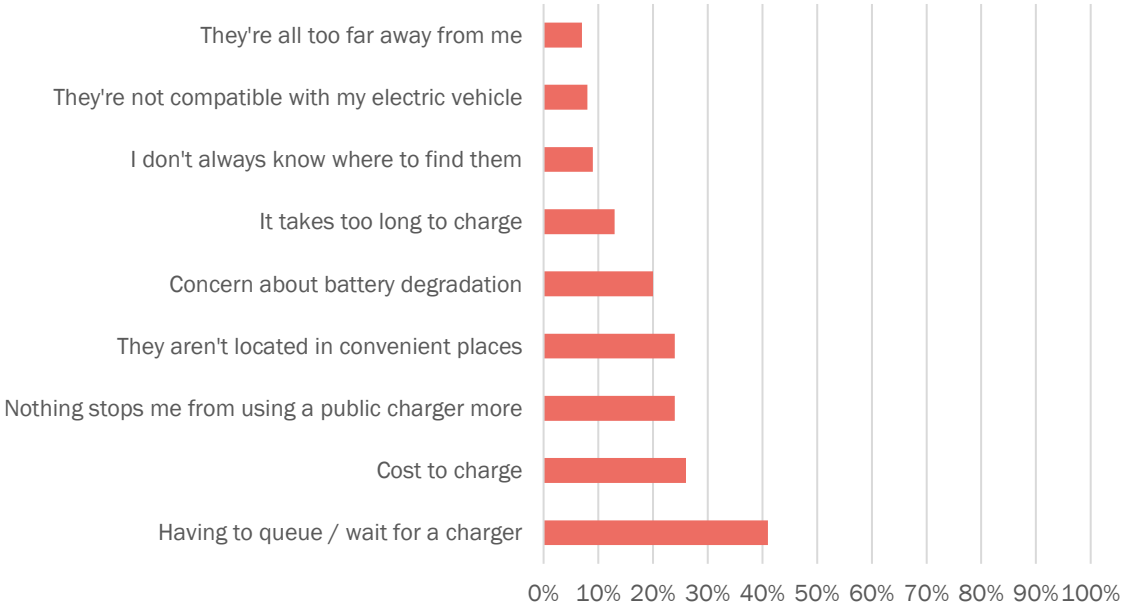

Figure 2: Survey Results. Question: Which of the following, if any, stops you from using public chargers more often?

- When using a public charger, 83% of charging sessions are likely to be completed in less than 40 minutes.

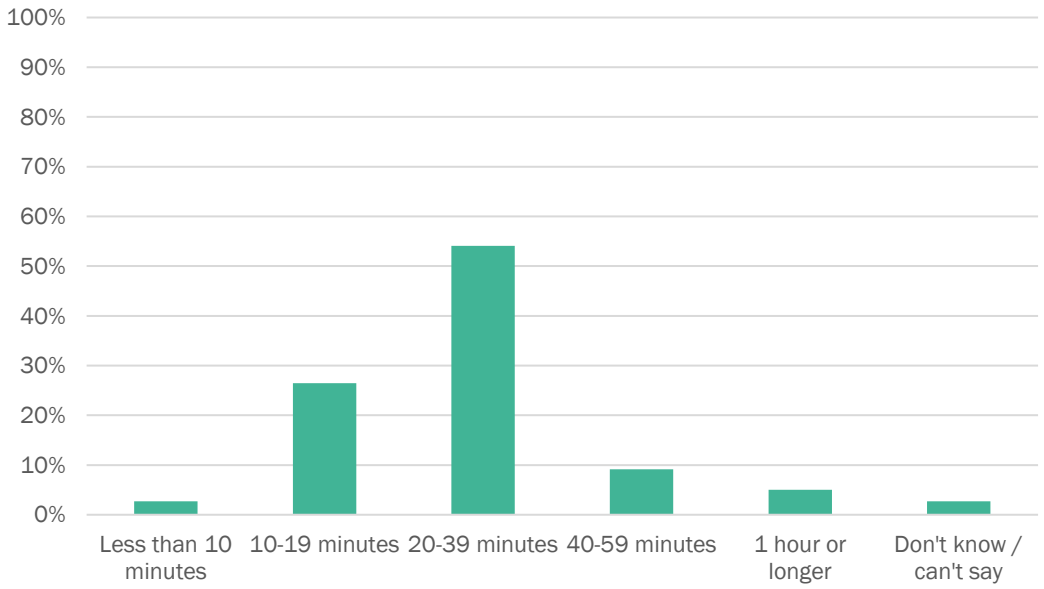

Figure 3: Survey Results. Question: When using a public charger, how long would you typically charge for?

- The top three preferred activities EV owners would like to do while using public charging are: eating or drinking, shopping, and going for walks.

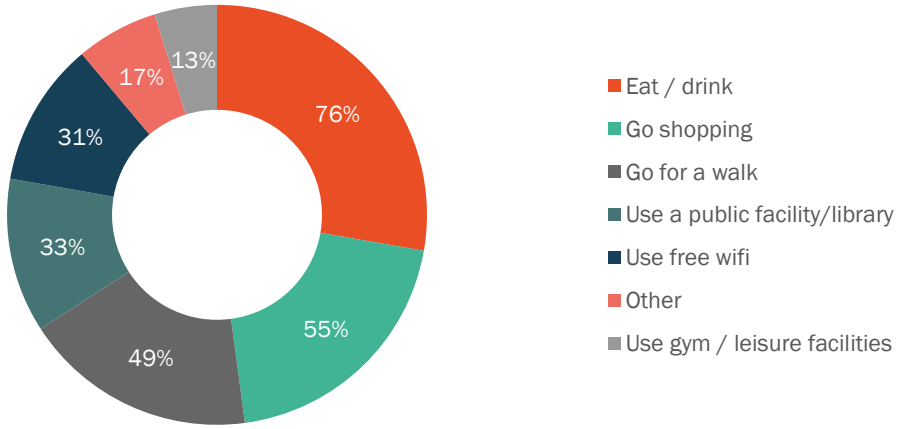

Figure 4: Survey Results. Question: What do you ideally want to do whilst waiting for your electric vehicle to charge in public?

1.3 Survey response groups

The survey responses are also grouped into two subsets, differentiating between the year of manufacture. These are pre-2019 ("EVs 2018 or Older") and post-2019 ("2019 or newer").

1. **Those with EVs from 2018 or older**
    - 70% of those surveyed had cars which were 2018 or older.
    - These were most likely to use public chargers for day trips.
    - More likely not to drive their EV on certain trips.
    - More likely to do 10-20 minute charging sessions on public charger stations.
2. **Those with EVs from 2019 or newer**
    - 30% of people surveyed had cars which were 2019 or newer.
    - Are more confident driving their EVs on any trip.
    - Use public chargers more for long weekend or holiday trips.

2 Survey response detail

2.1 Demographics

The following is an overview of the demographics of the survey respondents.

Age Range	
Under 35	14%
35-49 years	39%
50-64 years	30%
65+	17%

Ethnicity	
NZ European or Pākehā	79%
European	7%
Māori	5%
Chinese	4%
Other Asian	3%
Indian	2%
Samoan	1%
Some other ethnic group	5%
Rather not say	3%

Region	
Northland	3%
Auckland	31%
Waikato	7%
Bay of Plenty	6%
Gisborne	0%
Hawke's Bay	2%
Taranaki	2%
Manawatu - Whanganui	3%
Wellington	22%
Tasman	2%
Nelson	2%
Marlborough	1%
West Coast	0%
Canterbury	11%
Otago	7%
Southland	1%

Gender	
Male	64%
Female	35%
Gender Diverse	1%

Household Income	
Less than $50,000	10%
$50,000 - $74,999	12%
$75,000 - $99,999	13%
$100,000 - $149,999	19%
$150,000 - $199,999	17%
$200,000 and above	20%
Rather not say	10%

Residential area	
Suburban area	59%
Urban area, e.g. city centre	18%
Semi - rural area, e.g. lifestyle block	16%
Rural area	7%

Make and Model	
Other	2%
Audi e-tron quattro	1%
BMW i3	1%
Ford E-Transit	<1%
Hyundai IONIQ	3%
Jaguar i-Pace	3%
Kia Niro	1%
Kia Soul EV	<1%
LDV EV80	<1%
Mercedes Benz EQC	<1%
Mitsubishi iMiev/ Peugeot iOn	1%
MG ZS	4%
Nissan eNV200	1%

Renault Kangoo	<1%
Renault Zoe	2%
Tesla Cybertruck	<1%
Tesla Model 3	12%
Tesla Motors Model S	1%
Tesla Motors Model X	2%
VW e-Golf	1%
Nissan Leaf	63%

3 Daily driving habits

About 39% of all respondents drive 26-50km on a typical day

Respondents have similar daily driving distances, irrespective of car age/type.

How many kilometres would you drive your electric vehicle on a typical day?	All	EVs 2018 or Older	EVs 2019 or Newer
0-10 km	8%	8%	9%
11-25 km	30%	30%	30%
26-50 km	39%	39%	41%
51 km +	22%	23%	20%

78% of owners of older EVs wouldn't drive their EV on certain trips, compared to 42% of newer EV owners.

Are there certain types of trips that you would not use your EV for?	All	EVs 2018 or Older	EVs 2019 or Newer
Yes	68%	78%	42%
No	32%	22%	58%

When asked why EV drivers sometimes choose alternative forms of travel rather than their electric vehicle, range was the most common answer. In addition, respondents cited *towing, the need to seat more people or need more storage e.g. bikes, the terrain, inconvenience of charging, not enough chargers, battery overheating, risk of busy chargers or travelling distances with equipment such as for skiing.*

4 Charging preferences

4.1 Home charging

30% of people have wall-mounted home chargers, while 77% have a 3-pin plug charging cable Some respondents have access to both.

More respondents with newer EVs have wall mounted chargers at home.

What type of charger(s) do you have at home? Please select all that apply	All	EVs 2018 or Older	EVs 2019 or Newer
I don't have a charger at home	1%	1%	2%
Charging cable (Mode 2 AC, 3 pin plug)	77%	84%	60%
Wall mounted charger (Mode 3 AC)	30%	22%	51%

How often do you drive your EV on a trip that exceeds the range (meaning you charge on route/use fuel if PHEV)?	All	EVs 2018 or Older	EVs 2019 or Newer
A few times or more a month	33%	33%	34%
Every few months	37%	34%	45%
Less often	30%	33%	21%

Most respondents charge their EV when the battery is lower than 50%, with 4% of people preferring to keep their EV near fully charged.

What level do you typically let the battery capacity get down to before you charge it?	All	EVs 2018 or Older	EVs 2019 or Newer
75% or higher	4%	3%	5%
50-74%	13%	11%	17%
25%-49%	42%	42%	41%
10-24%	34%	36%	29%
Less than 10%	6%	6%	7%
Don’t know	2%	2%	0%

4.2 Charging locations

Overall, 82% of EV owners most commonly charge at home.

What is the most common place you charge?	All	EVs 2018 or Older	EVs 2019 or Newer
Home	82%	84%	72%
Work	4%	4%	6%
In a public parking lot	4%	3%	6%
At a supermarket	3%	3%	4%
At a retail outlet / mall	2%	2%	4%
At a petrol station	1%	1%	2%
On-street/ roadside	1%	1%	2%
In a private parking lot	1%	1%	1%
At a holiday park or hotel	0%	0%	1%
At a cafe / restaurant / bar	0%	0%	1%
At a public library	0%	0%	0%
Other	1%	0%	2%

Examples of 'Other' locations include *sports centres, tourist destinations and friends' houses.*

5 Public charging preferences

Most respondents, regardless of vehicle age, plan their use of public chargers in advance.

If using a PUBLIC charger, which would you be more likely to do?	All	EVs 2018 or Older	EVs 2019 or Newer
Plan and know in advance which public charge stations I will use	86%	87%	86%
Charge spontaneously and locate public charging stations en route	14%	13%	14%

EV owners are most likely to charge in public for 20-39 minutes. People with newer EVs will charge for longer on average.

When using a public charger, how long would you typically charge for?	All	EVs 2018 or Older	EVs 2019 or Newer
Less than 10 minutes	3%	3%	1%
10-19 min	26%	32%	12%
20-39 min	54%	50%	64%
40-59 min	9%	6%	17%
1 hour or longer	5%	5%	4%
Don't know / can't say	3%	3%	2%

Respondents use public chargers most commonly for long weekends and holidays. People with newer EVs are less likely to use a public charger for day trips or regular daily travel.

On what types of trips do you typically use public chargers? Please select all that apply	All	EVs 2018 or Older	EVs 2019 or Newer
Long weekends/holiday trips	64%	59%	77%
Day trips during leisure time	43%	47%	31%
Short trips around town	15%	17%	14%
Commuting / regular daily weekday travel	14%	15%	11%
Other	12%	13%	9%
None of these	3%	3%	2%

Examples of 'Other' include *business trips, when I've forgotten to charge at home, travelled more than I expected to, no parking at home so only use public chargers* and *when home solar power is low*.

5.1 Barriers to public charging

For most respondents, queuing, cost and the location of chargers stopped them from using public chargers more often. Owners of older EVs were a lot more concerned about degrading the battery through fast-charging.

Which of the following, if any, stops you from using public chargers more often? Please select all that apply	All	EVs 2018 or Older	EVs 2019 or Newer
Having to queue / wait for a charger	41%	41%	41%
Cost to charge	26%	27%	26%
Nothing stops me from using a public charger more	24%	23%	28%
They aren't located in convenient places	24%	22%	27%
Concern about degrading battery through a fast-charging network	20%	23%	14%
It takes too long to charge	13%	12%	16%
I don't always know where to find them	9%	8%	11%
They're not compatible with my electric vehicle	8%	9%	7%
They're all too far away from me	7%	7%	6%

There were 24 responses about safety concerns while charging, particularly charging in poorly lit areas at night in parking lots with no people around or businesses open, near trees, bus stops or railway stations. There were responses about damage to cars and intimidation near betting outlets.

5.2 Activities people do while using public EV chargers

Respondents indicated a preference for facilities that enabled them to do another activity while using public charging, such as eating or drinking, shopping or going for walks.

What do you ideally want to do whilst waiting for your electric vehicle to charge in public? Please select all that apply	All	EVs 2018 or Older	EVs 2019 or Newer
Eat / drink	76%	73%	84%
Go shopping	55%	57%	51%
Go for a walk	49%	51%	46%
Use a public facility/library	33%	37%	23%
Use free wifi	31%	33%	24%
Use gym / leisure facilities	13%	14%	11%
Other (please specify)	17%	19%	15%

'Other' activities commonly mentioned include *having a toilet stop nearby, playground for children, happy to wait in the car, somewhere to sit outside nearby, walk the dog, work, vacuum the car and do a tyre check while waiting*. Respondents would like to stay close to their car while charging so they can move it as soon as it's finished for the next person.

6 Additional questions

The survey included two short answer questions:

1. **With EECA looking to invest more in public chargers, what do you think the main priority should be?**
2. **And what would improve the public charging experience for you?**

With EECA looking to invest more in public chargers, what do you think the main priority should be?

There were five main categories in response to this question with location and quantity of chargers being the most common answers.

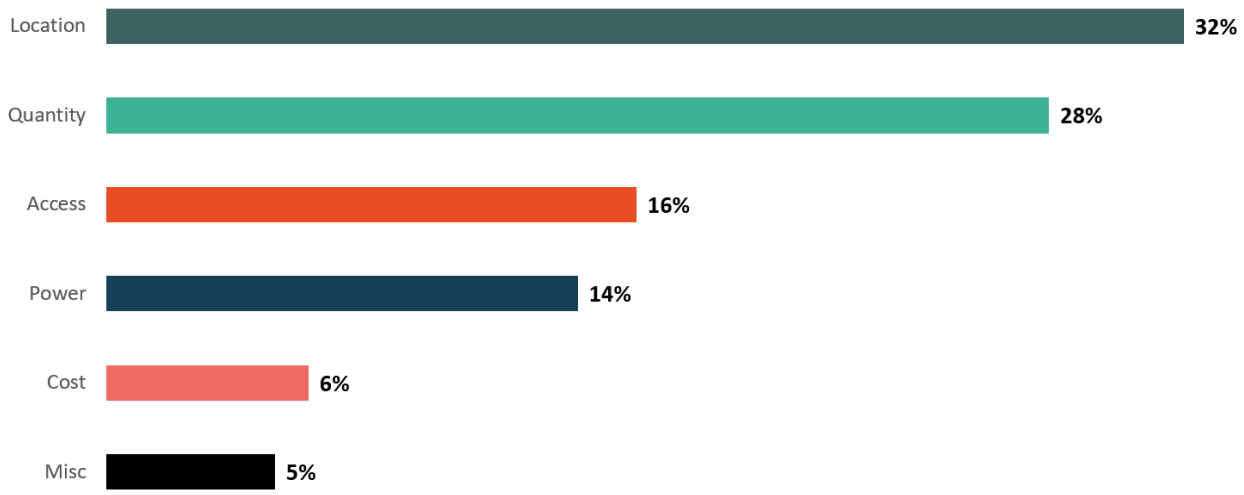

Figure 5: Survey Results. Question: With EECA looking to invest more in public chargers, what do you think the main priority should be?

Location of chargers

Answers mentioned an increase in the number of charging locations, requests for specific locations; either journey or destination charging locations, gaps, distance apart etc. **316 primary responses and 37 secondary responses were given as location (32%).** This is the largest count in the survey question.

For example: *More EV chargers in malls or at supermarkets - places you regularly go, more on the open road*

Quantity of chargers at a location

Many answers mentioned the number of chargers on the network, or number of chargers at a charging location. Most of the answers showed queues or charger speed was the reason for wanting more chargers. **260 primary responses and 37 secondary responses related to this (27%)**.

For example: *More chargers at heavily used points. Multiple chargers at a single location.*

Access

Answers in this category mentioned the accessibility of the charger. This includes a wide range of answers including types of chargers, compatibility of the car, finding the charger, being safe and secure or car turnover/queueing. **146 primary responses and 21 secondary responses were given as access (16%).**

The answers below show a snippet of the wide range of answers that are in this category.

- *Clear and standardised signage of EV charging spaces, to keep us from getting ICEd (having an internal combustion engine vehicle park in the EV charging space).*
- *Charging car turnover, I don't want to waste my time waiting in line i.e. a car fully charged but occupying the space due to a driver being outside of the car for a drink or snack.*

Power

These answers mention the kW level of power or speed of the charger. Most respondents have shown concern around time or access to chargers; however they don't mention that they should only be rapid. **126 primary responses and 22 secondary responses were given as power (14%).**

For example:

- *More rapid chargers*
- *22+ kw AC and 50+ kw DC chargers. Not superchargers as they only help a small number of cars*

Cost

Half of respondents would like chargers to be more expensive/not free, to combat 'freeloaders' and queues. The other half have labelled free of cost and accessibility in their answer. **35 primary responses and 25 secondary responses were given as cost (6%).**

For example:

- *Lower costs. I'm against free charging but some are over the top when it comes to cost.*
- *Filling in gaps, but more chargers should be paid chargers, to avoid "the tragedy of the commons".*

Although cost wasn't as commonly identified as a top priority, the main motivation for this answer was to avoid queueing and increase accessibility.

What would improve the public charging experience for you?

Responses followed similar themes to the prior question, except there was a new common category '**Queueing'**, which saw answers based around queues and lines at public chargers.

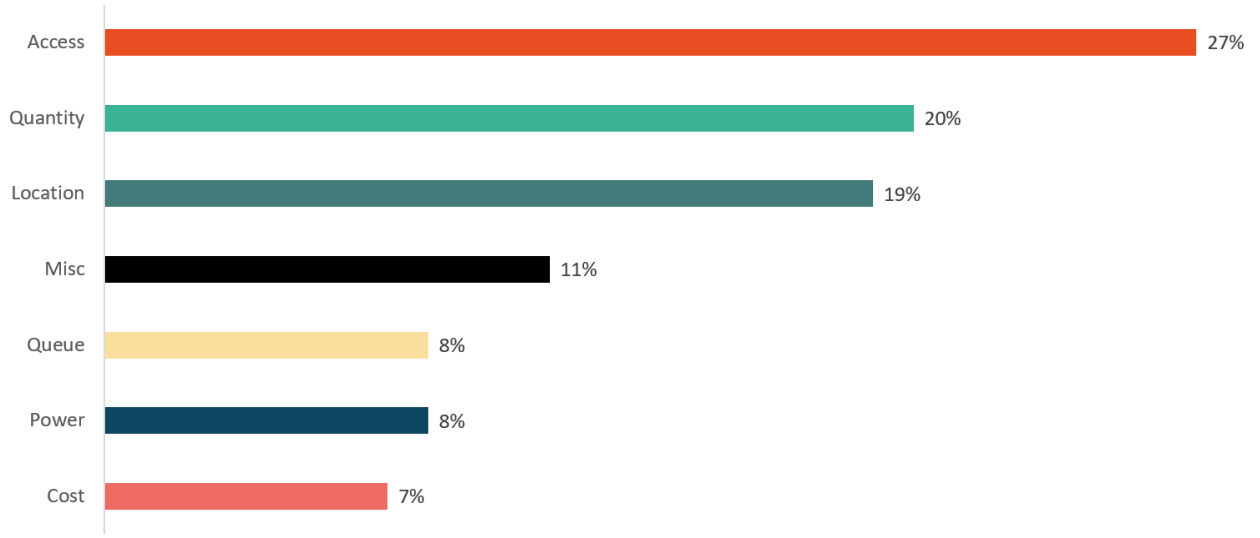

Figure 6: Survey Results. Question: What would improve the public charging experience for you?

The word '**queue'** was used **59** times in the answers to this question, as opposed to **21** times for the previous question.

For example:

- *Less queueing and stricter time limits - people who hog the charger need to be unable to do so. Not everyone is respectful of others.*

7 Next steps

This research forms part of a package of information that underpins "***State of charge:*** *Consultation paper on developing a short-term roadmap for the public electric vehicle charging network*". The consultation paper draws on this research, as well as the current public EV charging network, for which EECA has built a data visualisation map. Together, these will enable more informed decision making on proposed approaches for identifying future locations for public fast EV charging infrastructure. This will then inform EECA's approach to investment in the public EV charging network over the next 12-24 months and test the approach for developing further EV charging requirements in the future.

View the data visualisation map: www.eeca.govt.nz/nz-public-ev-charger-map

View the consultation document: www.eeca.govt.nz/nz-public-ev-charging

Ngā mihi