

ELECTRIC VEHICLE CHARGING RESEARCH

Insights into EV owners' charging habits, and use of public EV charging,
March 2023



Background

This research was conducted for EECA to update their understanding of current charging habits of BEV and PHEV owners

Insights from this research help demonstrate the dynamic between residential and public charging, including motivators and barriers to public charging.

The research will help to inform future investment in the public charging network across New Zealand

Insight Objectives

- Evaluate how residential charging is currently undertaken (type of in-home charger, how often) and how this may differ by vehicle type and region.
- Explore current use of home smart charging and off-peak charging
- Explore demand for various public charger speeds and locations
- Compare results to the research from November 2021

This study is conducted by [TRA](#). TRA is an insight agency that combines understanding of human behaviour with intelligent data capability to help clients navigate uncertainty and answer complex problems.



What we did



QUANTITATIVE ONLINE SURVEY

10-minute online survey of n=712 of BEV and PHEV owners in New Zealand

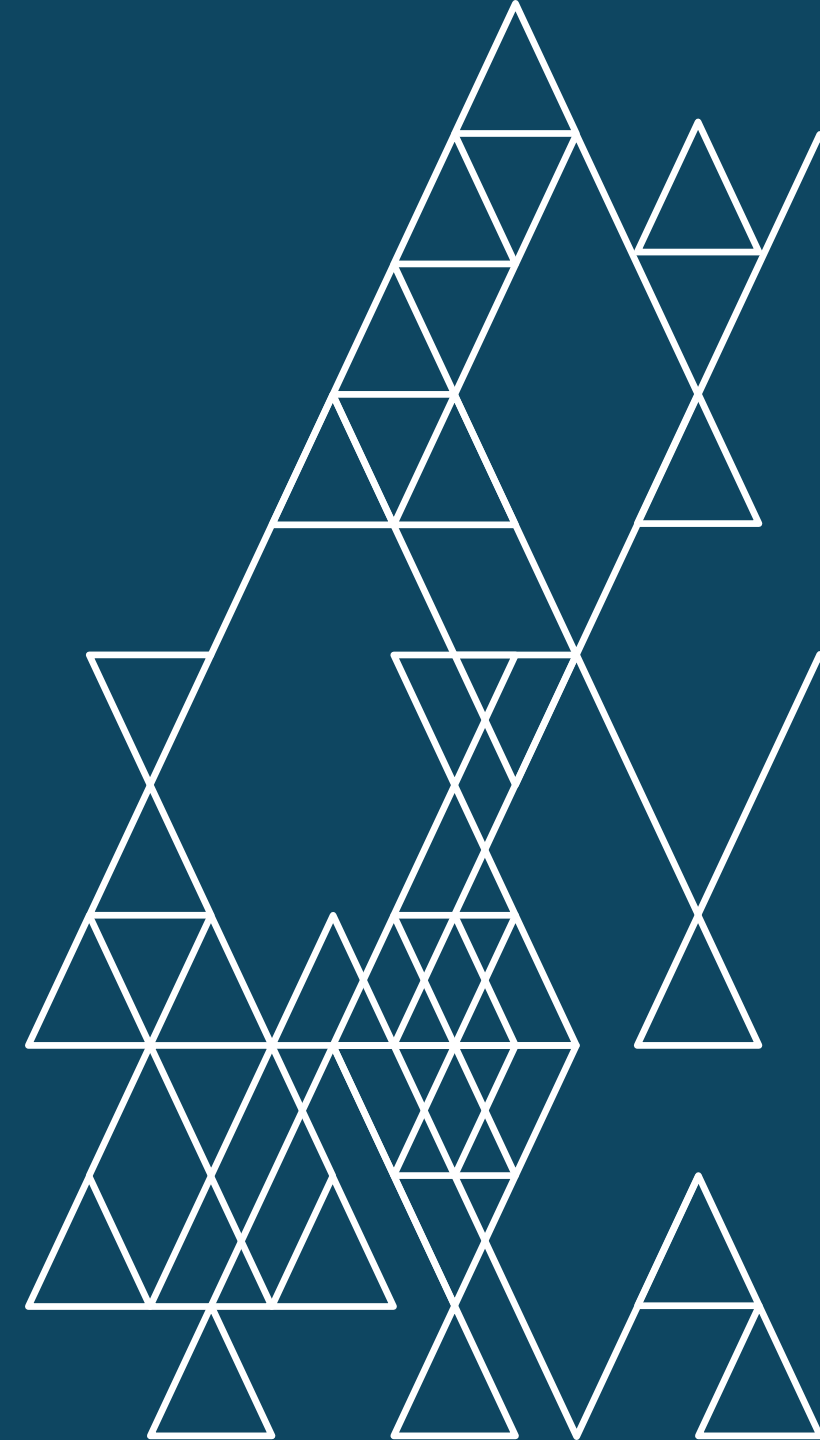
General Research Sample n= 107

Facebook Groups Sample n= 605

- Aged 18+
- Owner of 1 or more PHEV or BEV vehicle

Fieldwork dates: 2nd – 19th of February 2023

A blended sampling approach was used – consumer panel alongside a survey invite sent out by EECA through special interest groups and networks provided



Agenda

1

Context

2

Home Charging

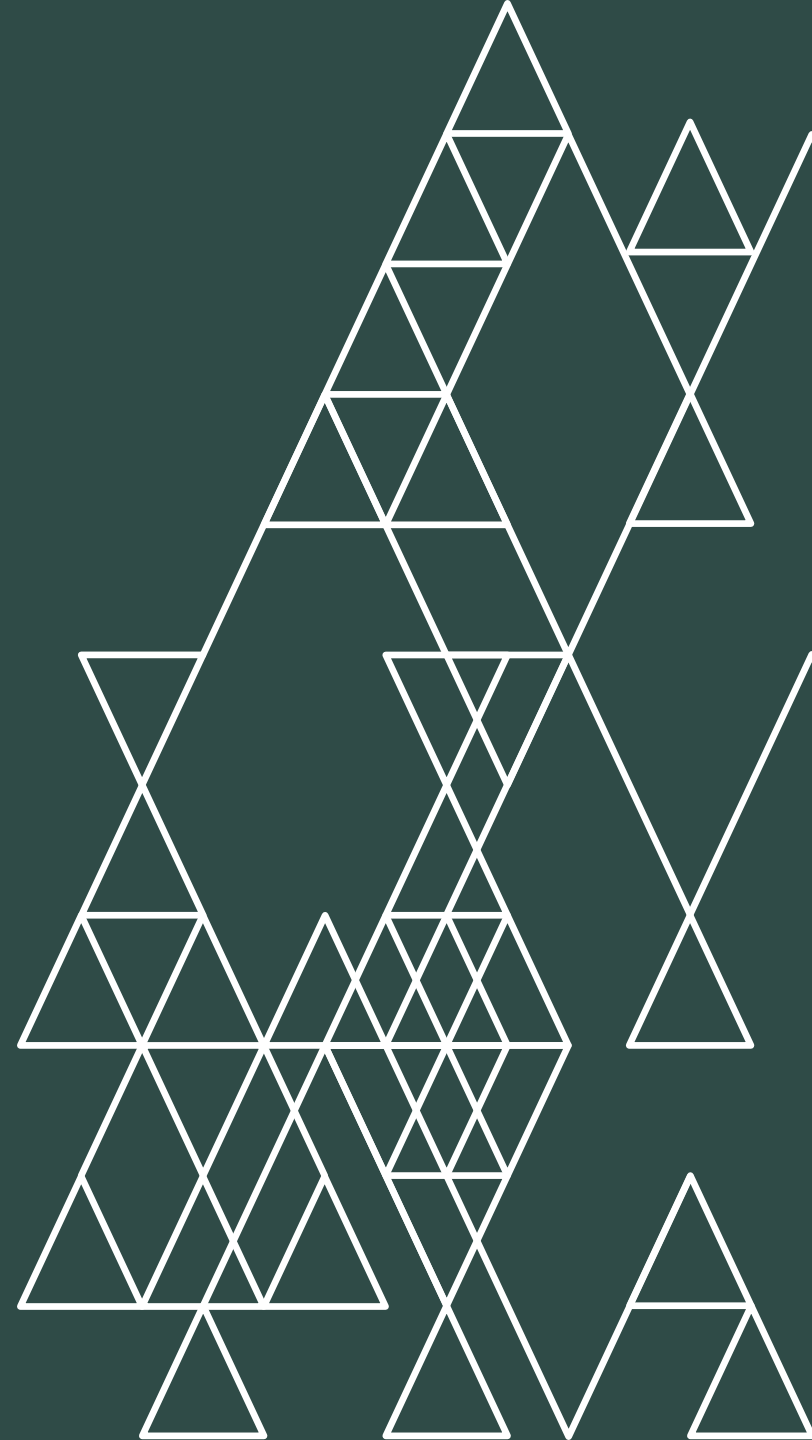
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Public Charging



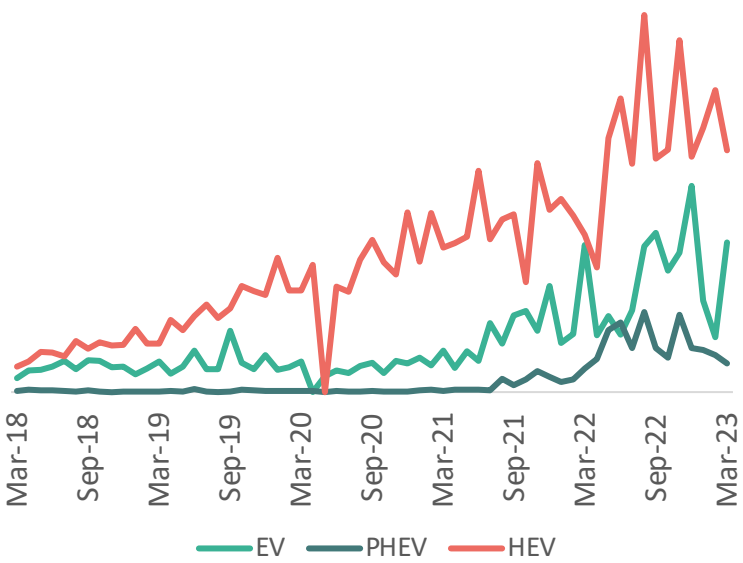
EECA

Context

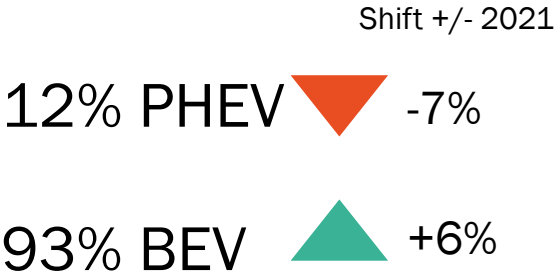


The demand for electric vehicles in New Zealand has steadily increased in the past 5 years – both for personal and business use

Import Levels of Reduced Emission Vehicles NZ



EV Ownership of Respondents



EV Primary Usage of Respondents

| | |
|-----------------------|-----|
| Only for personal use | 73% |
| Only for business use | 1% |
| Both | 26% |

Manufacture Age of EV Vehicle

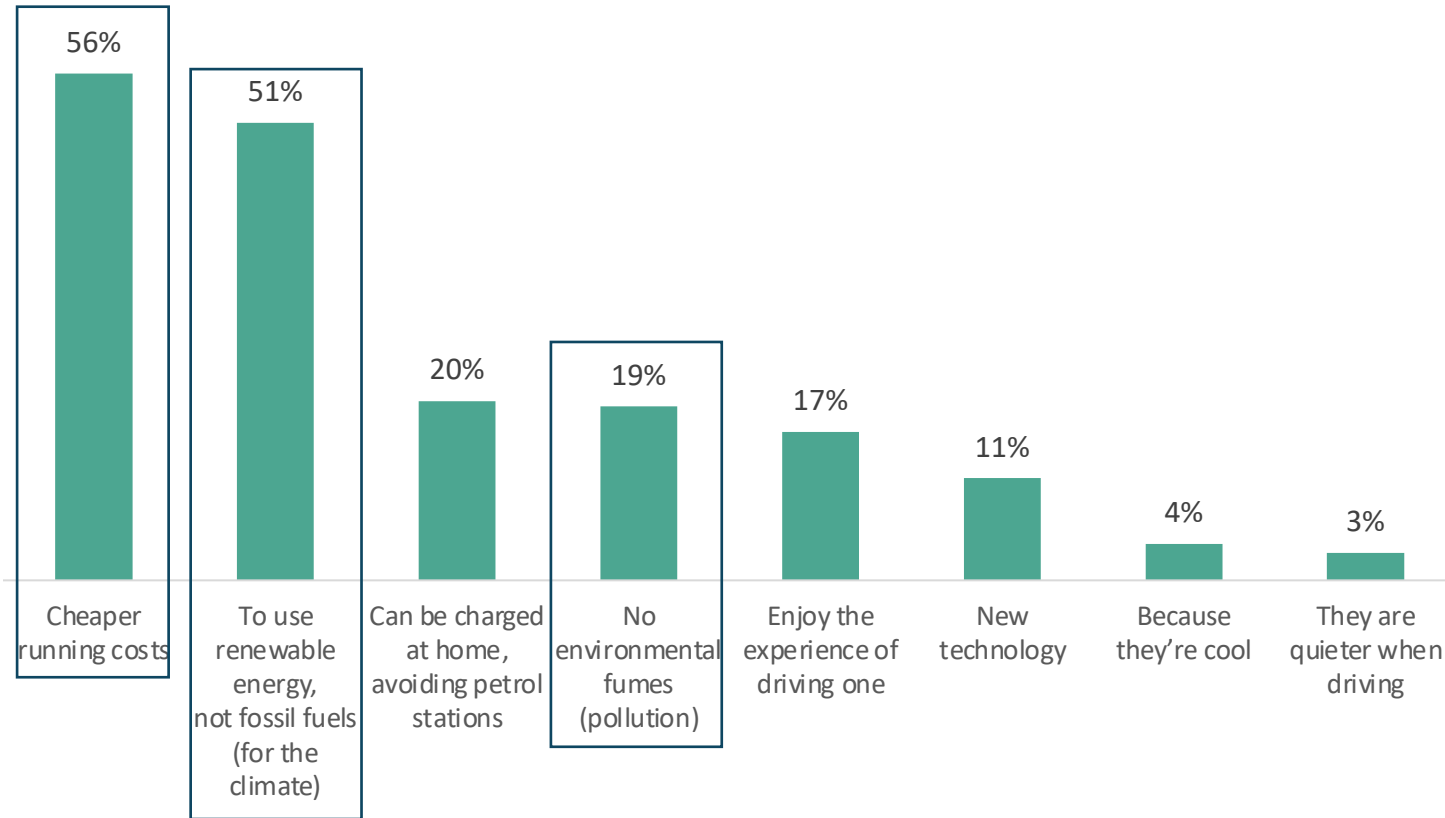
| | BEV | PHEV |
|------|-----|------|
| 2016 | 5% | 1% |
| 2017 | 6% | 4% |
| 2018 | 6% | 8% |
| 2019 | 7% | 7% |
| 2020 | 4% | 9% |
| 2021 | 14% | 11% |
| 2022 | 42% | 36% |

Source: Stats NZ Vehicle imports- February 2022
 S2. What type of cars or other passenger vehicles (excluding motor bikes) do you currently own within your household?
 SC_VEHICLE: X- How many of the following vehicles do you or your household own, 'PRIM_VEHICLE: Is your battery electric vehicle ... ?, EV_YEAR_BEV: In what year was your Battery electric vehicle made?, 'EV_YEAR_PHEV: In what year was your Plug in Hybrid vehicle made?
 Base; November 21 n= 220, February 23 n= 712



EV owners love the idea of their lower cost and environmentally friendly vehicle

2023 Purchase Drivers



2021 Importance Drivers

| Importance | % |
|----------------------|-----|
| Environmental impact | 89% |
| Lower emissions | 91% |

Note: Statements with n/a were added in November 2022



The clean car discount has been highly influential in driving this increase

Clean Car Discount

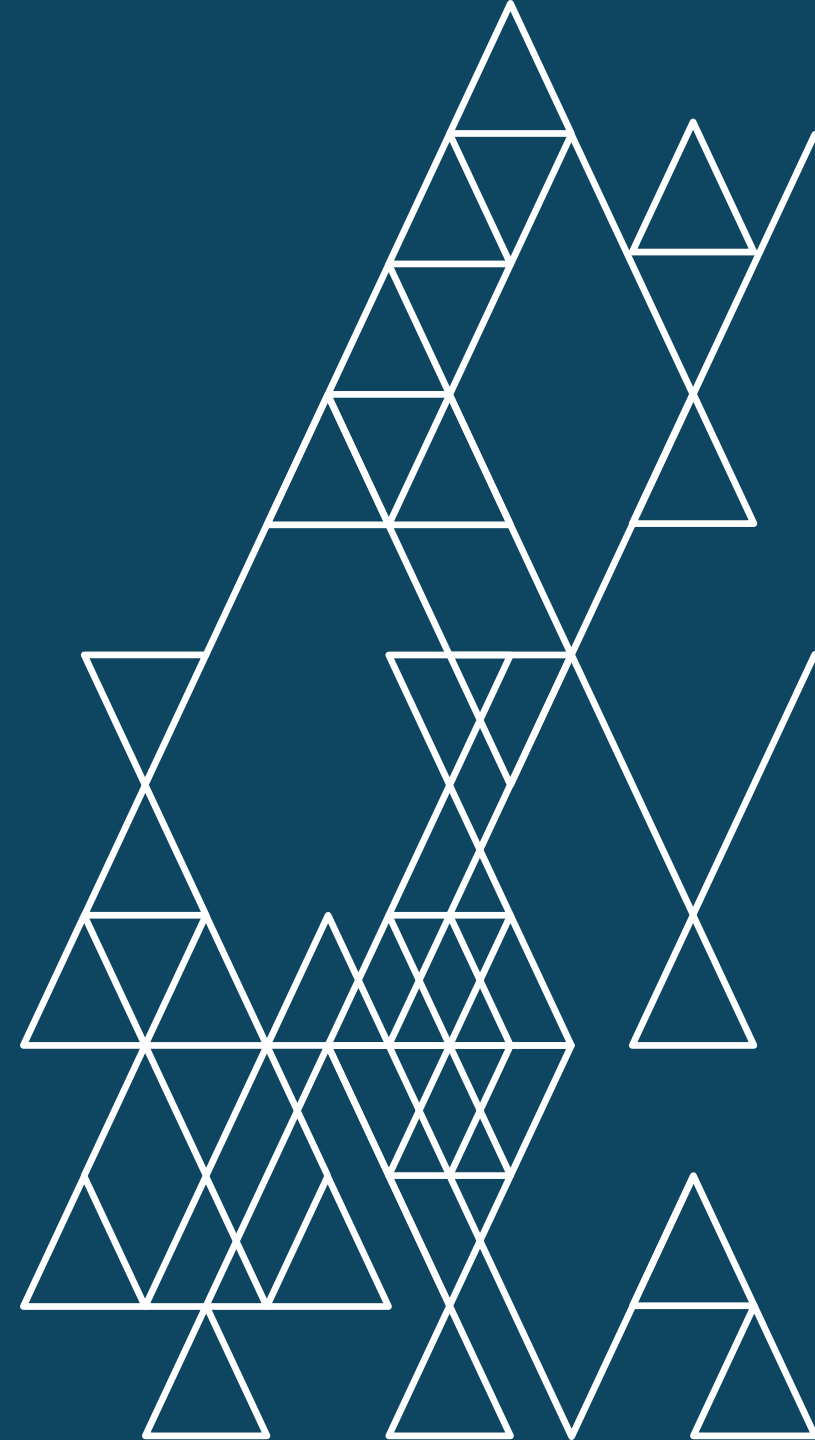
| Discount Effect on Decision | % |
|--|-----|
| Yes, I purchased an EV/PHEV sooner than I otherwise would have | 62% |
| No, I would have purchased it when I did anyway | 16% |
| No, I purchased my EV/PHEV before the Clean Car Discount was available | 22% |



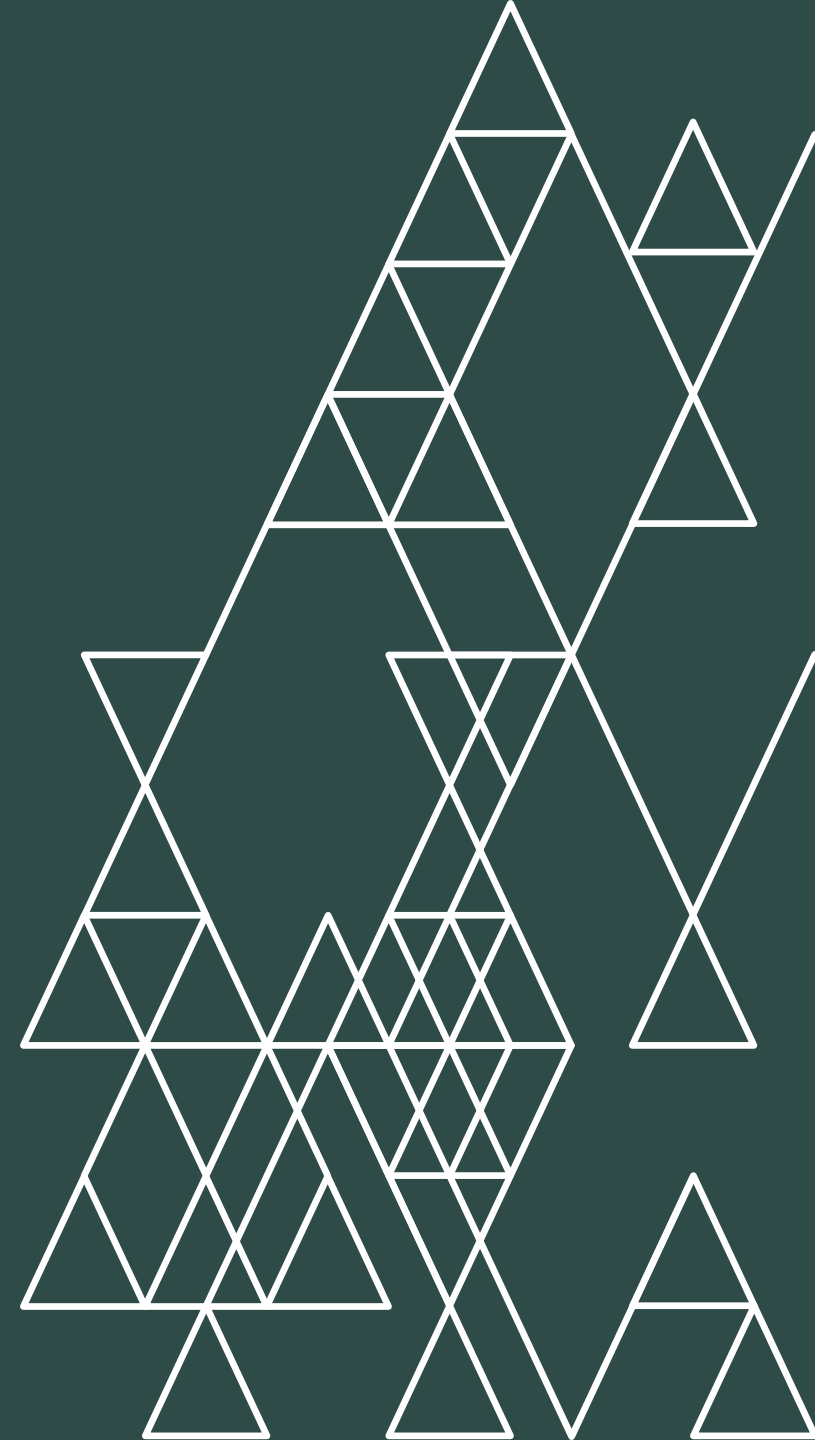
EV popularity continues to grow in New Zealand

The popularity and desire for EV vehicles in New Zealand has continued to grow in the past five years, particularly BEVs.

This growth is being driven by EV considerers perceptions of positive effects on the environment by switching to an EV, while the clean car discount has acted alongside these views as a catalyst for EV purchases.



Home Charging



EV owners charge most frequently at home, and the majority are charging off-peak

Home Charging Proportion

| | 0-9% | 10-19% | 20-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-79% | 80-89% | 90-100% | > 50% |
|---------|------|--------|--------|--------|--------|--------|--------|--------|--------|---------|------------|
| At home | 4% | 4% | 3% | 3% | 2% | 4% | 3% | 4% | 9% | 59% | 80% |

Home Charging Timings

| | 5pm | 6pm | 7pm | 8pm | 9pm | 10pm | 11pm |
|---|-----|-----|-----|-----|-----|------|------|
| What time of the day do you typically start charging | 4% | 7% | 5% | 7% | 34% | 8% | 12% |

| | 4am | 5am | 6am | 7am | 8am | 9am | 10am |
|--|-----|-----|-----|-----|-----|-----|------|
| What time of the day do you typically stop charging | 4% | 6% | 9% | 38% | 6% | 1% | 1% |

97%
of EV owners are charging at home at least some of the time



Off peak electricity pricing has been persuasive in encouraging people to charge at off peak times

And EV owners who have access to off peak pricing often take advantage of this

Off Peak Pricing Schemes

Have access to off peak pricing plans

69%

Use off peak charging times most/some of the time

96%

Charging Start Time x Use of Off-Peak Pricing

| | Yes, all or most of the time | Yes, some of the time | No, I just charge when I need to |
|-------------|------------------------------|-----------------------|----------------------------------|
| 5pm | 1% | 2% | 0% |
| 6pm | 1% | 6% | 28% |
| 7pm | 1% | 12% | 0% |
| 8pm | 3% | 11% | 22% |
| 9pm | 52% | 21% | 6% |
| 10pm | 9% | 7% | 6% |
| 11pm | 19% | 4% | 0% |
| 12 midnight | 6% | 5% | 0% |
| 1am | 2% | 0% | 0% |

¹ELECTRICITY_PLAN: Do you have a retail electricity pricing plan that provides lower prices for electricity used in off-peak periods?

²OFF_PEAK: When charging at home, do you usually charge at times that take advantage of off-peak electricity rates?

³CHARGE_X

Base: February 23 total n=712, off peak n = 479



Within this context, there has been a lack of movement to usage of smart chargers

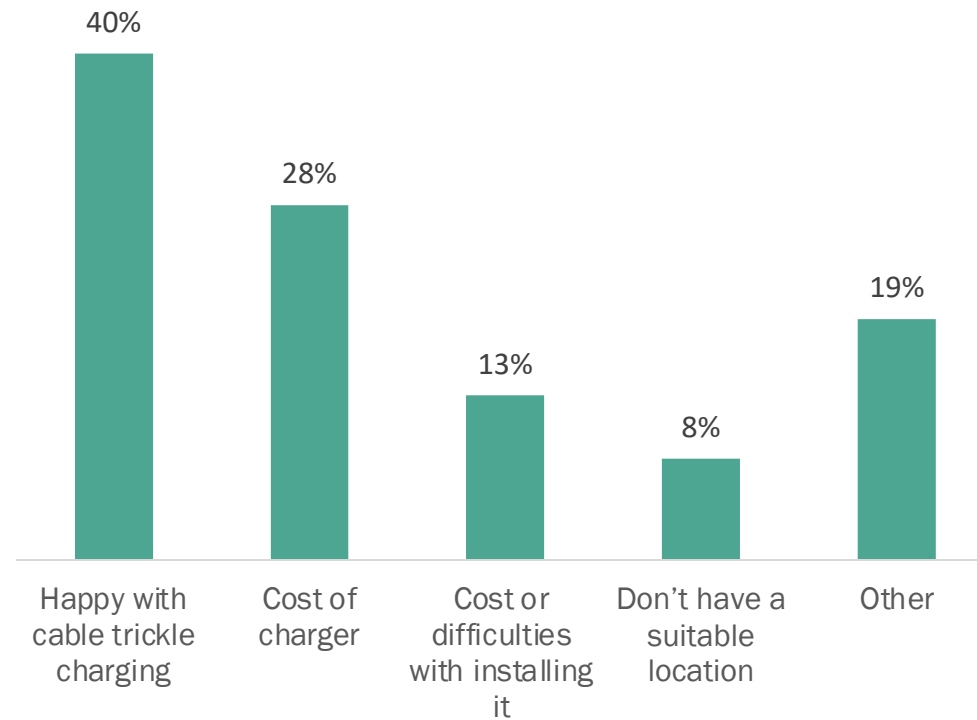
EV owners are content with their current set up for at home charging

Charger Type

| Charger | % |
|---|-----|
| Charging cable - Mode 2 AC (3- pin plug) | 61% |
| Wall mounted charger – Mode 3 AC with connectivity | 32% |
| Wall mounted charger - Mode 3 AC without connectivity | 13% |
| Caravan adapter | 14% |
| Other | 2% |

Shift +/- 2021
▲ +21%

Barriers to Smart Charger



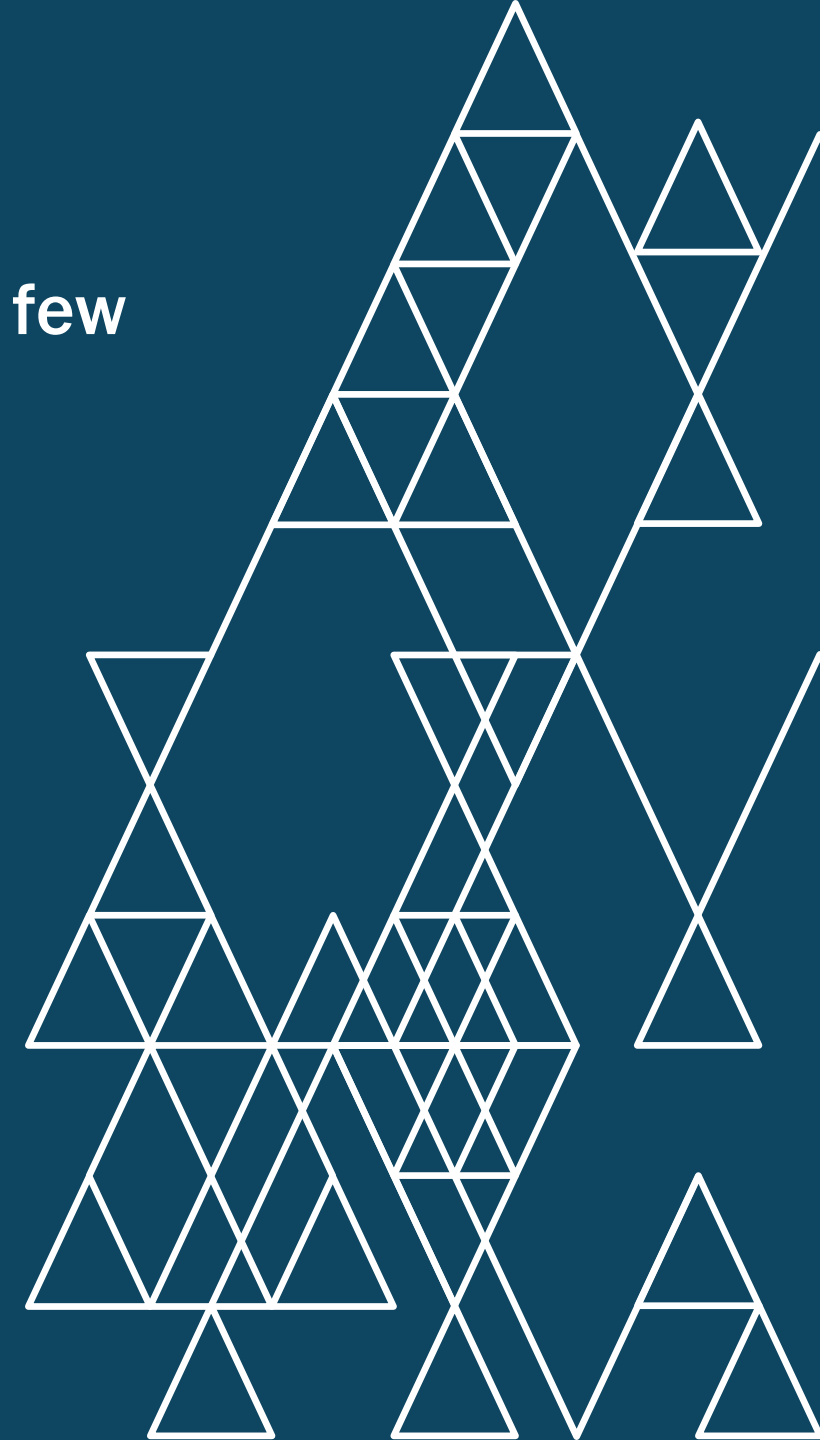
'IN_HOME_CHARGE_NEW. What type of charger(s) do you have at home?
 'IN_HOME_CHARGE_NOT_SMART. Is there a reason why you haven't purchased a smart wall mounted charger?
 'C3. How are you currently charging your EV?
 Base: February 23 n=712, November 2021 n = 220

Statistically significant difference to 2021: ▲



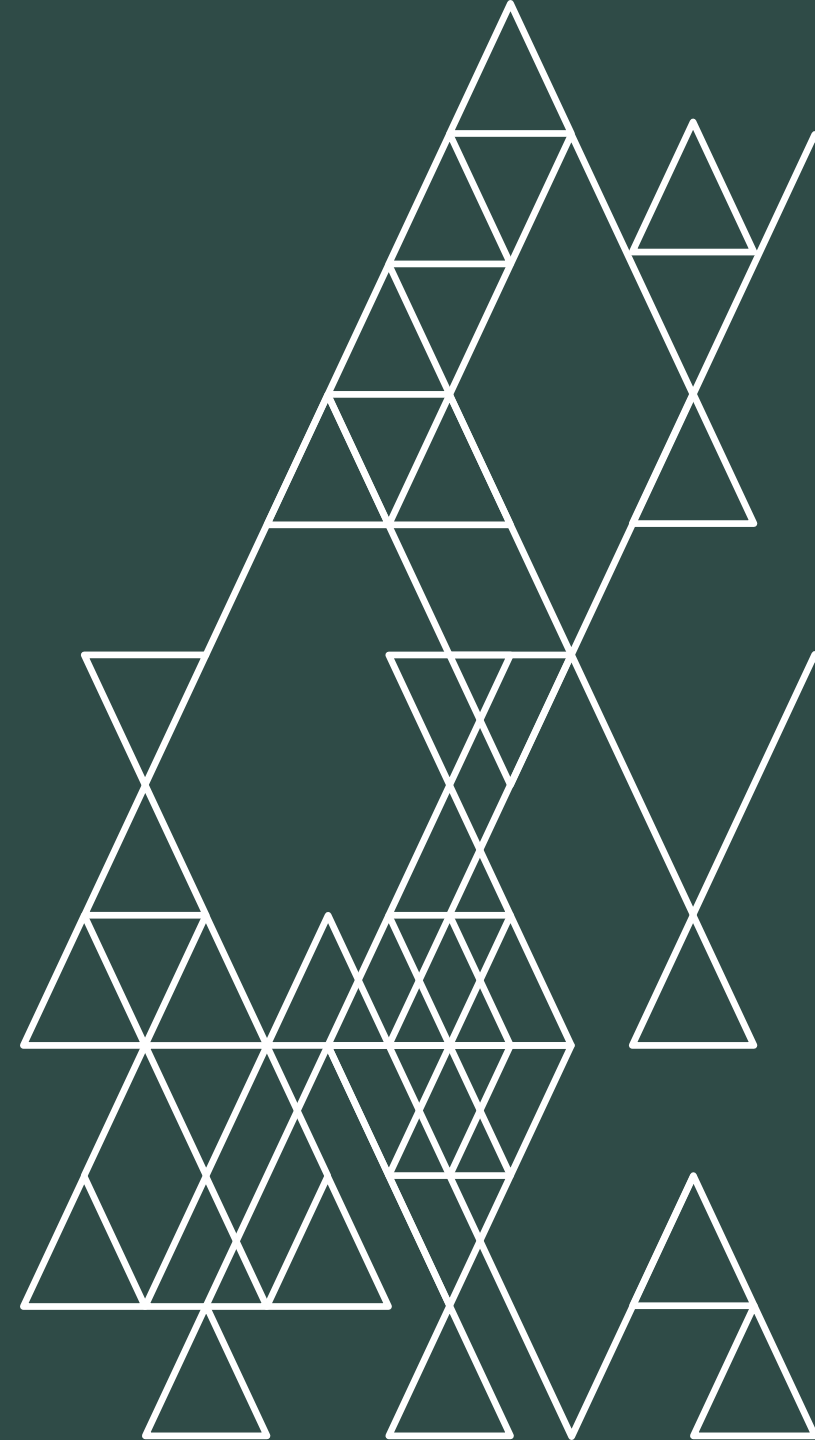
EV owners are incentivised by off-peak pricing, but few are utilising the benefits of smart charging

| | % of Total Survey | Extrapolated to total EV in NZ | if EV ownership doubles |
|-------------------------------------|-------------------|--------------------------------|-------------------------|
| Access to off-peak pricing | 69% | 26,000 | 52,000 |
| Using off peak (Starting after 9pm) | 61% | 23,000 | 46,000 |
| Wall mounted with connectivity | 32% | 12,000 | 24,000 |



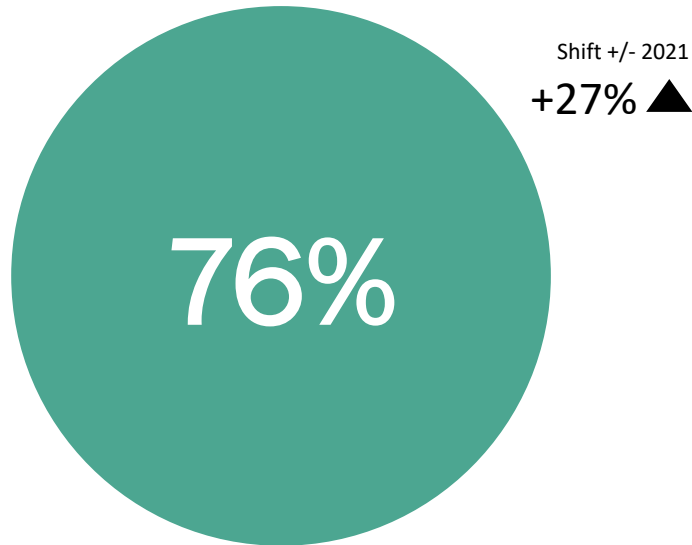
'ELECTRICITY_PLAN: Do you have a retail electricity pricing plan that provides lower prices for electricity used in off-peak periods?
 'CHARGE_X: 'What time of the day do you typically start charging?
 'IN_HOME_CHARGE_NEW: What type of charger(s) do you have at home?
 Base: February 23 n=712

Public Charging

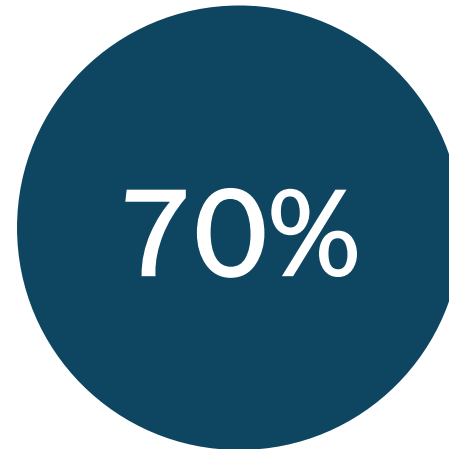


Public chargers are being used primarily for long distance travel

Public Charger Usage



Driving over range x BEV owners



Of BEV owners are taking trips that exceed the battery range every few months or less

Trip Type

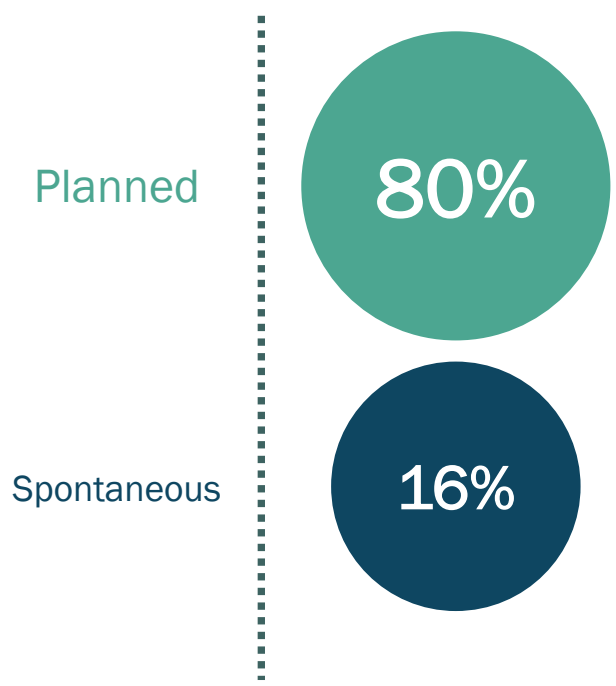
| Use of Public Charger | % |
|----------------------------------|-----|
| Long weekends / holiday trips | 75% |
| Day trips during leisure time | 33% |
| Commuting / regular daily travel | 15% |
| Short trips around town | 14% |
| Other | 8% |
| None of these | 1% |

CHARGE_PROPORTION: Approximately what proportion of charging do you do at the following types of locations (these should add to 100%)
 CHARGE_ER: How often do you drive your electric vehicle on a trip that exceeds the range of the vehicles battery (meaning you charge en route/use fuel if you have a plug-in hybrid)?
 TRIP_TYPE: On what types of trips do you typically use public chargers?
 C3: How are you currently charging your EV?
 Base: November 21' EV owners n =220, February 23' total n=712, public charger users n = 624



These stops are usually planned, often lasting around 30 minutes

Public Charging Habit



Time Spent Charging

| Time | % |
|------------------------|-----|
| Less than 10 minutes | 1% |
| 10 - 19 minutes | 17% |
| 20 - 39 minutes | 57% |
| 40 - 59 minutes | 16% |
| 1 hour or longer | 6% |
| Don't know / can't say | 3% |



EV owners feel there is a lack of public chargers throughout New Zealand

Negative Perceptions of EV ownership

| Time | % |
|--|-----|
| Not enough public chargers on routes I travel | 42% |
| Range anxiety | 23% |
| Time needed to charge at public chargers | 22% |
| Time needed to charge (both public and private chargers) | 17% |
| Worried about battery replacement costs | 10% |
| Not being able to tow without depleting battery too much | 7% |
| Other | 11% |

“Reliability and cost of public chargers”

“Not enough charging spots along the travel route”

“Afraid of running out of battery”

“I worry about the range of the car if the distance is too far”

“Don't have time to charge or insufficient chargers in the area”



'EV_CHOICE: Are there certain types of trips that you would choose to use an alternative mode of travel for, instead of your electric vehicle?
 'EV_CHOICE_WHY_YES: Why do you sometimes choose alternative forms of travel to your EV/PHEV?
 'EV_WORST: What have you liked the least about owning an EV/PHEV?
 Base: February 23 n=712

As we look to those with higher charging needs, the sense of availability of public charging decreases

And range anxiety remains prevalent across the needs of EV owners

Negative Perceptions of EV ownership x Weekly Distances

| | 0-80km | 81-200km | 201-350km | 350km+ |
|---|--------|----------|-----------|--------|
| Not enough public chargers on routes I travel | 39% | 39% | 43% | 48% |
| Range anxiety | 22% | 24% | 25% | 17% |



Linked to availability, queuing or waiting is a key barrier to public charger usage

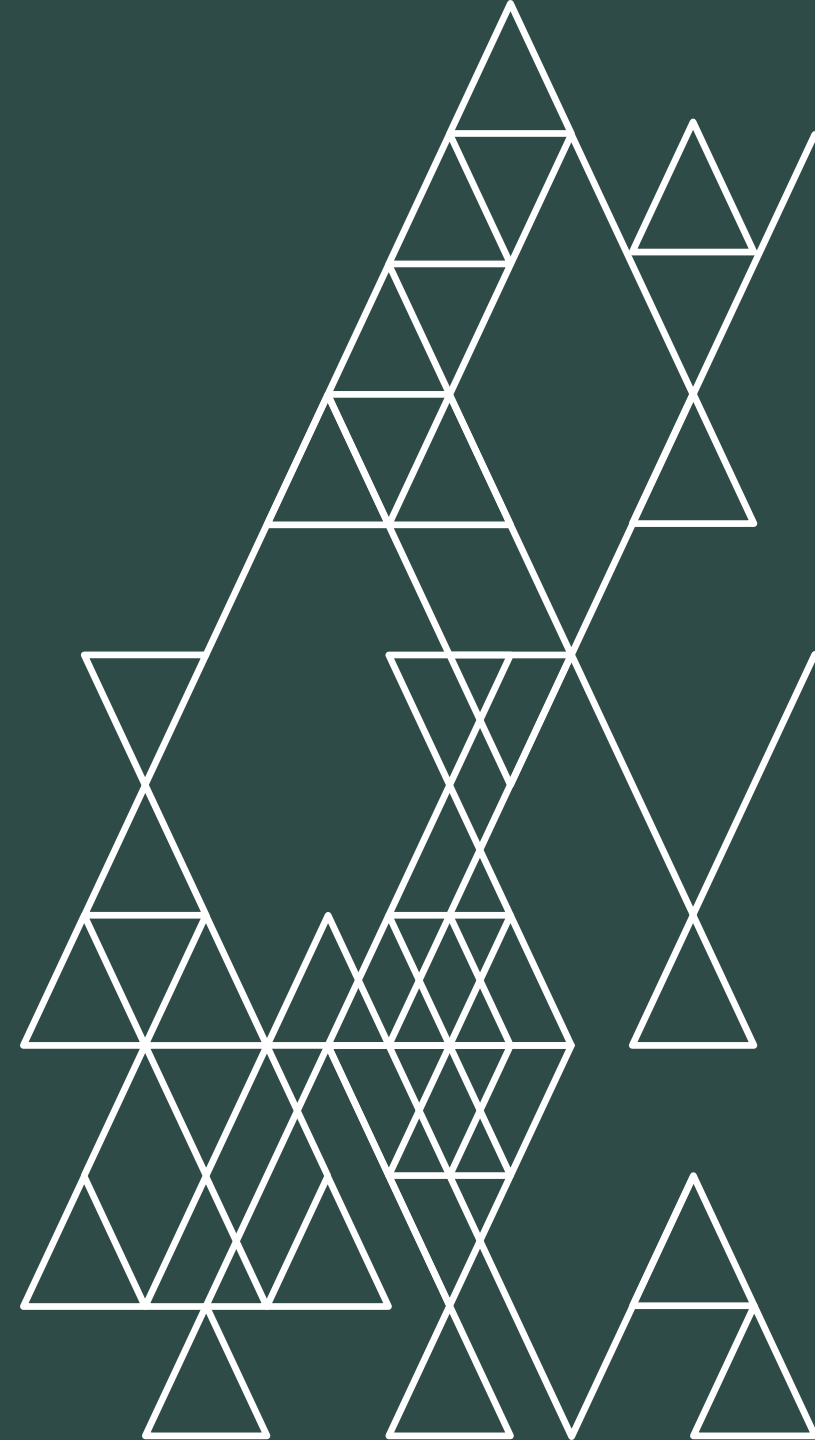
Public Charging Barriers

| Barrier | % |
|--|-----|
| Having to queue/ wait for a charger | 55% |
| Cost to charge | 36% |
| They aren't located in convenient places where I'm passing / going | 29% |
| It takes too long to charge | 17% |
| There aren't any near enough to me | 16% |
| Concerned about degrading battery through a fast charging network | 13% |
| No room at public chargers when towing | 10% |
| They're not all compatible with my ev | 9% |
| I don't always know where to find them | 9% |
| Concern about safety | 4% |

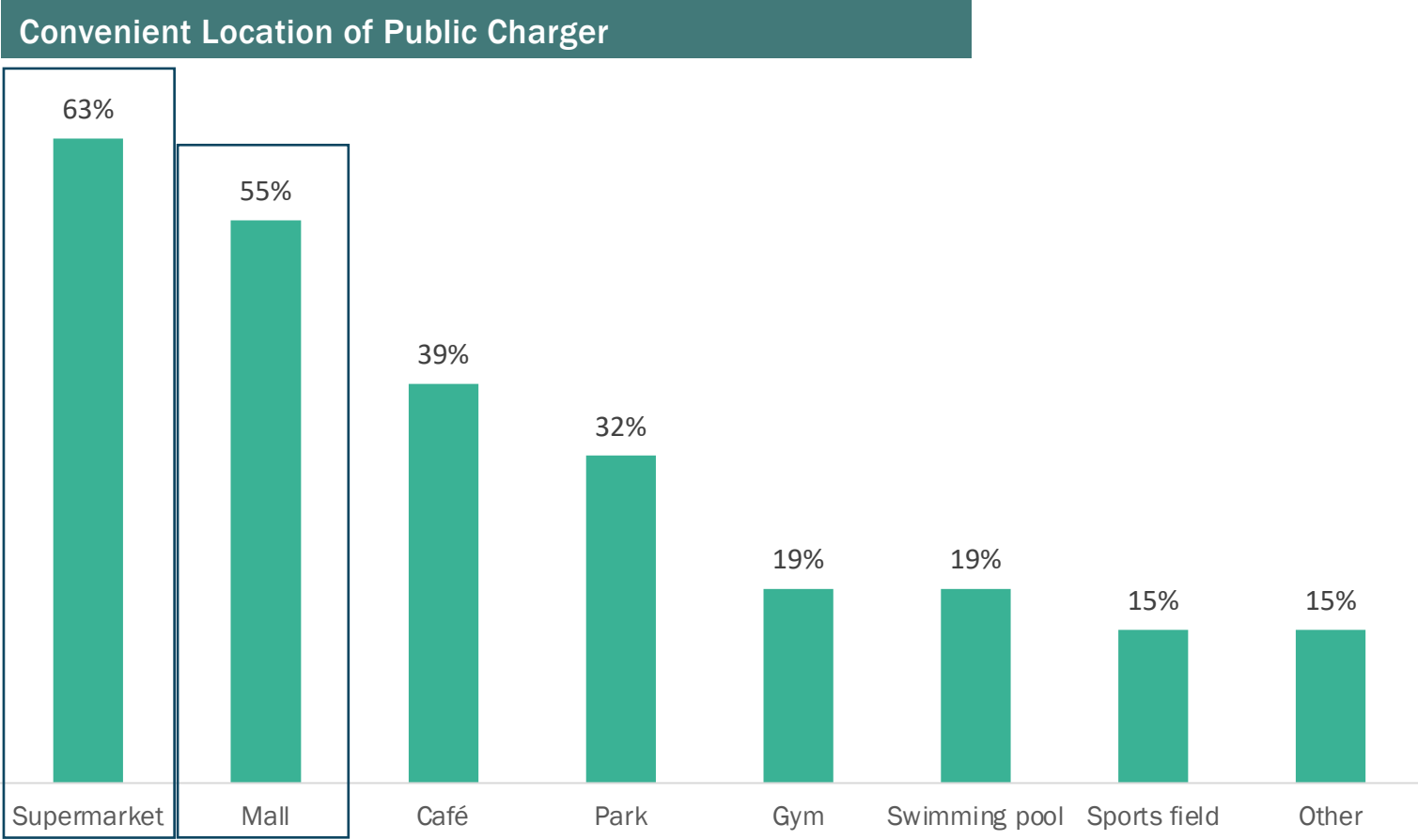


A large majority of EV owners feel the public charging network in New Zealand does not sufficiently service their charging needs

So, what do EV owners want when it comes to their public charging network...



Supermarkets and malls are seen as the most convenient option for public charging



Ultrafast chargers on popular routes are the most appealing option to EV owners

Rank of Appeal

1

Ultrafast chargers on popular routes, e.g. at petrol stations (faster than 50kW DC)

2

Destination/top up chargers at local places like supermarkets and malls (25-50kW DC)

3

Destination/top up chargers at local places like supermarkets and malls (up to 22kW AC)

4

Slow chargers in residential areas with limited off-street parking (up to 22kW AC)



EV owners desire the ultimate rest stop when charging in public

All regions have expressed toilet and food amenities are key factors, while shelter is particularly important for the Upper North Island

Improvements to Public Charging

| Improvement | % |
|--|--------------------|
| Toilets/facilities | 60% |
| Shelter | 44% ▲ +9% Upper NI |
| Accessibility for different plug locations | 35% |
| Security/safety | 33% |
| Accessibility for towing | 17% |
| Other | 27% |

Activities during Public Charging

| Activity | % |
|---|-----|
| Eat / Drink | 79% |
| Use toilet facilities | 71% |
| Go shopping | 50% |
| Visit a park | 35% |
| Use free Wifi | 31% |
| Use a public facility such as a pool or library | 26% |
| Clean/vacuum car | 20% |
| Use gym/ leisure facilities | 16% |

Statistically significant difference than total: ▲



EV owners in the South Island have higher needs for public chargers on long routes

While wait times and availability are a larger issue in the Auckland and Wellington regions

Use of Public Chargers by Region

| | Auckland | Wellington | Upper NI | Lower NI | Canterbury | Other South Island |
|----------------------------------|----------|------------|----------|----------|------------|--------------------|
| Short trips around town | 19% | 14% | 12% | 9% | 18% | 8% |
| Commuting / regular daily travel | 22% ▲ | 10% ▼ | 18% | 6% | 15% | 11% |
| Day trips during leisure time | 32% | 34% | 32% | 26% | 36% | 38% |
| Long weekends / holiday trips | 71% | 80% | 67% ▼ | 74% | 79% | 87% ▲ |

Barrier to Public Charging by Region

Having to queue/ wait for a charger

Auckland +8% ▲

It takes too long to charge

Wellington +6% ▲

I don't always know where to find them

Auckland +4% ▲

Statistically significant difference than total: ▲▼

*REGN_NZ: Which part of the country do you live in?

*TRIP_TYPE: On what types of trips do you typically use public chargers?

*CHARGE_BAR: Which of the following, if any, stops you from using PUBLIC chargers more often?

Base: February 23 n=712, Auckland n=207, Wellington n=143, Upper NI n=126, Lower NI n=52, Canterbury n=110, Other South Island n=74

EV owners' preference for public charger locations differ across community areas, dependent on their unique needs

Convenient Location of Public Charger by Region

| | Urban area | Suburban area | Semi-rural area | Rural area |
|---------------|------------|---------------|-----------------|------------|
| Supermarket | 53% ▼ | 64% | 70% | 70% |
| Mall | 62% ▲ | 56% | 44% ▼ | 52% |
| Café | 36% | 38% | 47% ▲ | 43% |
| Park | 33% | 34% | 27% | 27% |
| Gym | 32% ▲ | 17% | 11% ▼ | 9% ▼ |
| Swimming pool | 24% ▲ | 18% | 19% | 9% ▼ |
| Sports field | 13% | 16% | 20% | 14% |

'REGN_NZ: Which part of the country do you live in?

'IMPROVE: And what would improve the public charging experience for you?

'LOCATIONS: Are there any locations that you regularly spend 30 mins - 2 hours that would be convenient locations for you to regularly charge?

Base: February 23 n=712, Urban n=143, Suburban n=432, Semi-rural n=91, Rural n=44

Statistically significant difference than total: ▲▼

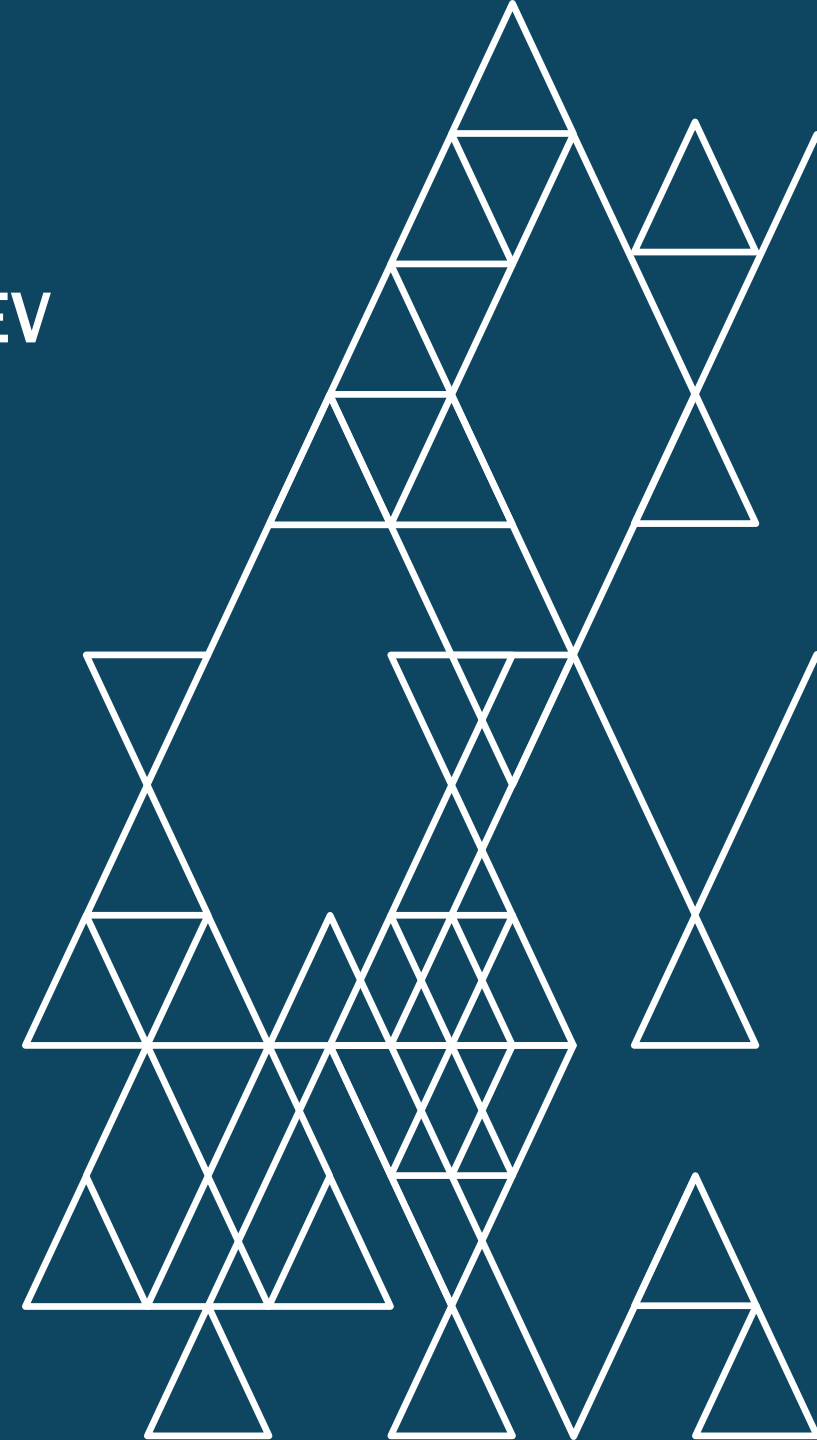


There is appetite for more public charging among EV owners – locations differ by EV owner need

EV owners currently feel the public charging network across New Zealand does not meet their needs, leading to range anxiety, particularly on long trips and holidays.

For urbanised and city areas, where more daily commuting activity occurs, accessibility to more chargers in convenient locations such as supermarkets, malls and gyms is key to motivating public charging.

To cater to those travelling longer distances and in lower density regions, public charging along popular routes and state highways is key, with the desire of rest stop facilities such as food, toilets and shelter.



Let's Talk

