Insights into electric vehicle ownership:

A survey of Tesla Owners Club Australia members in partnership with the Electric Vehicle Council.

ELECTRIC VEHICLE COUNCIL

TESLA OWNERS AUSTRALIA

While there is increasing attention on electric vehicles (EVs) in Australia, and the critical role this technology will play in the transition to net zero, there is still a lack of information regarding what types of consumers purchase EVs, how they drive and charge their vehicles, as well as what costs they are encountering while owning an EV.

To help provide further insights on these issues, the Tesla Owner's Club of Australia and the Electric Vehicle Council have partnered to survey owners of electric vehicles across Australia.

In total, 741 Tesla owners were surveyed across the country, making up 51% of the total TOCA membership. This is a significant response to a self-reporting survey, and one of the largest surveys of EV owners in Australia.

Respondents to this survey provided information on vehicle owner demographics, charging behaviour, and total cost of ownership, helping to gain a better understanding of EV ownership in Australia, and also address some common misconceptions.

The intention of this report is to assist policy-makers in planning for future EV uptake, learning from the insights of existing EV owners.

It should be noted that this survey was restricted only to Tesla owners, and although this does currently represent the majority of Australia's EV market, it may not be fully representative of all EV owners in Australia.

We welcome further efforts in collecting data and insights on EV owner preferences and behaviour in Australia to inform future government policy. This will help to ensure there is a strong evidence-base for shaping regulatory decisions, particularly with respect to EV charging, and help to address common misconceptions about EV ownership.

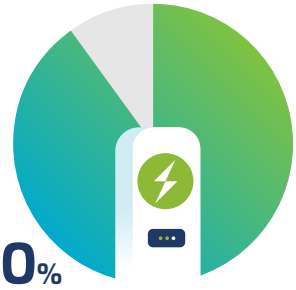
ELECTRIC VEHICLE COUNCIL

The Electric Vehicle Council is the peak national body representing the EV industry in Australia. It is a membership-based organisation with the objective to accelerate the decarbonisation of transport in Australia.

TESLA OWNERS AUSTRALIA

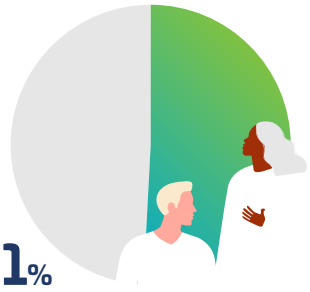
The Tesla Owner's Club of Australia was established in March 2016 by a group of enthusiastic Tesla owners. The Club is an Official Partner of the Tesla Owners Club Program, giving access to information, activities and discounts that are passed on to members.

Summary of findings:



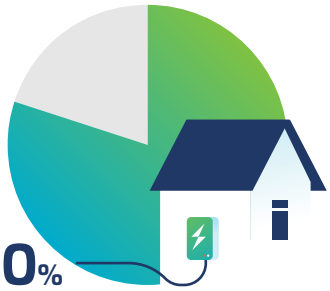
90%

Approximately 90% of owners reported using public chargers less than once per week.



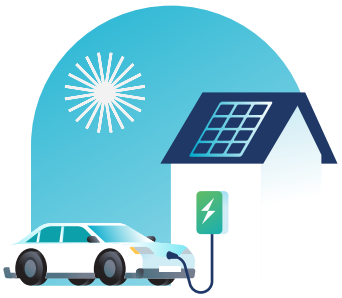
51%

The majority (51%) of survey respondents were between 50 and 69 years old.



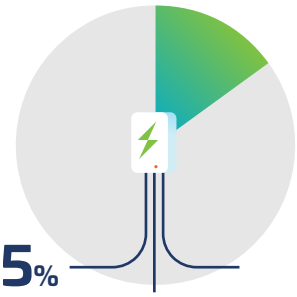
80%

Over 80% of owners reported charging at home at least twice per week.



EV owners with home solar systems reported primarily charging during the day, and also for shorter charging sessions around midnight.

EV owners without home solar systems reported primarily charging overnight, peaking around 1:00 – 2:00 am.



15%

Only 15% of owners reported routinely charging during the evening peak.

EV owners expressed a wide range of views regarding the external management of charging, with the data analysed in this report suggesting the present need for these types of schemes likely being minimal.

Almost half of EV owners reported saving more than $2,000 per year on fuel

01.
Demographics

To understand the representativeness of the survey sample respondents were asked a series of demographic questions.

Which state do you live in?

A broad sample of Tesla owners were surveyed across Australia. As shown in Figure 1, the majority of respondents were from the most populous Australian states of New South Wales (NSW) and Victoria (VIC).

Respondents from the Australian Capital Territory (ACT) were overrepresented, as compared with the distribution of Australia's population, however, this is unsurprising given the ACT Government's supportive EV policies.

Reported state or territory

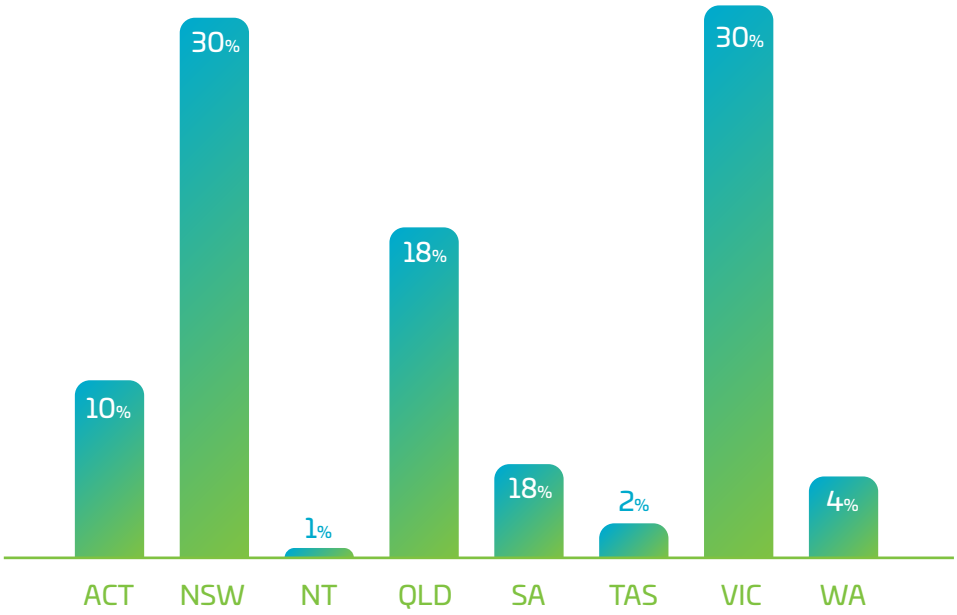


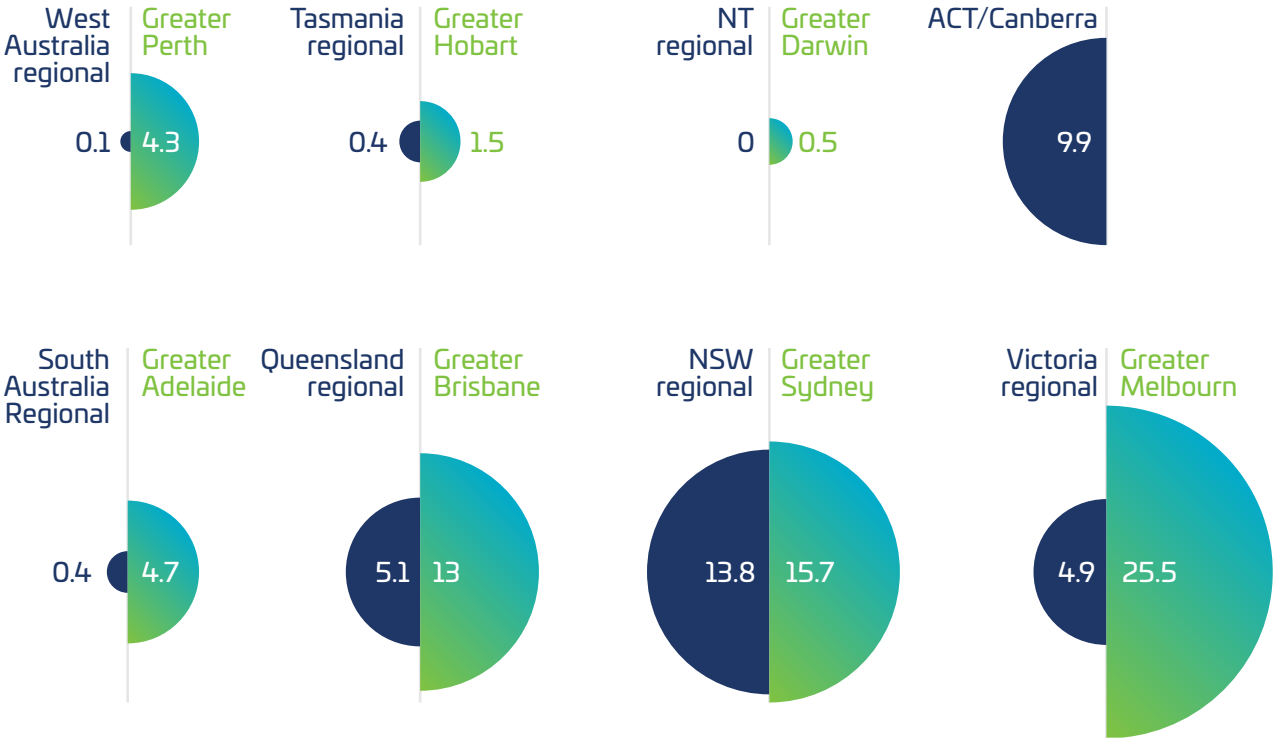
Figure 1
Distribution of survey respondents across Australian States

The distribution of surveyed owners across regional versus metro areas in Australia is shown in Figure 2. As expected, in most cases the larger number of owners were based in metro areas, however, in some states e.g. NSW, there was still strong representation from regional areas.

The strong adoption of Tesla EVs in regional areas is a good indicator that current vehicle driving range is fulfilling the needs of many owners who may need to drive longer distances based on where they live.

Spread of registrations (%)

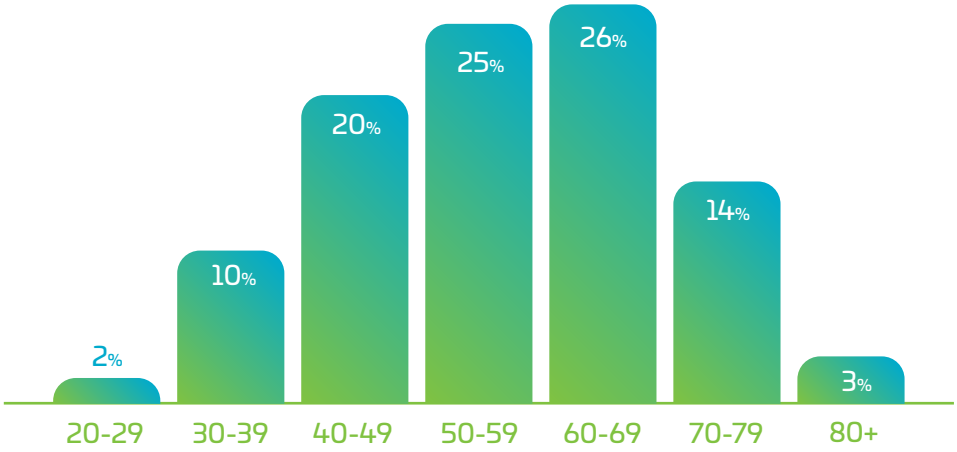
Figure 2
Spread of registrations



How old are you?

The respondents to the survey were spread over a wide range of age brackets, with the majority (51%) between 50 and 69 years old. While this is not truly representative of the Australian population in terms of age distribution, it demonstrates that a broad range of owners were surveyed. It is not unsurprising that few respondents were under the age of 30, given current model availability, but it does highlight the need to better understand the preferences and needs of this age bracket, who may have greater aspirations to own an EV in the future.

Figure 3
Age of respondents



How many kilometres do you drive per year?

According to the ABS, the average passenger vehicle travelled 11,100 km in the year ending June 2020[1], with EVs estimated to travel 11,100 km[2]. As part of this survey, respondents reported that:

89% drive more than 10,000 km per year in their Tesla.

38% drive more than 20,000 km per year in their Tesla.

On average, the majority of respondents to our survey reported travelling between 10,000 – 19,999 km per year, which aligns with the ABS findings above.

Further data collection of vehicle usage through telematics may help to shed further insight into the average distance travelled compared to internal combustion engine vehicles.

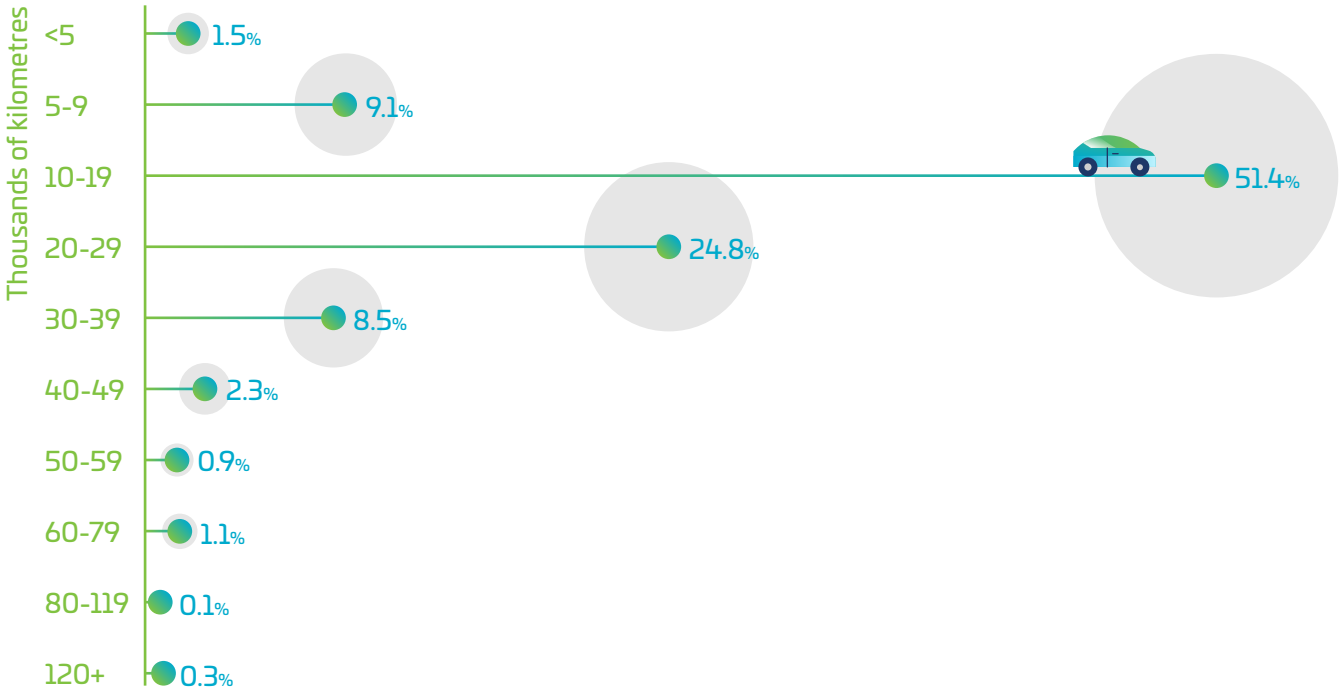
In line with the ABS data, these results suggest that at the very least, EVs are likely being driven as far as petrol/diesel vehicles.
This finding highlights that driving range limitations are not being experienced by many existing EV owners. This is important to note given it is often reported that non-EV owners perceive driving range as a significant barrier to adoption and suggests that EV ownership experience may help to address this misconception.

1 www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia/12-months-ended-30-june-2020

2 www.abs.gov.au/articles/electric-passenger-vehicle-use-experimental-estimates

Annual kilometres driven

Figure 4
Annual kilometres driven



02.
Purchasing a Tesla

To better understand the factors behind owners choosing to purchase an EV, survey respondents were asked a series of questions related to past and current vehicle ownership, and usage.

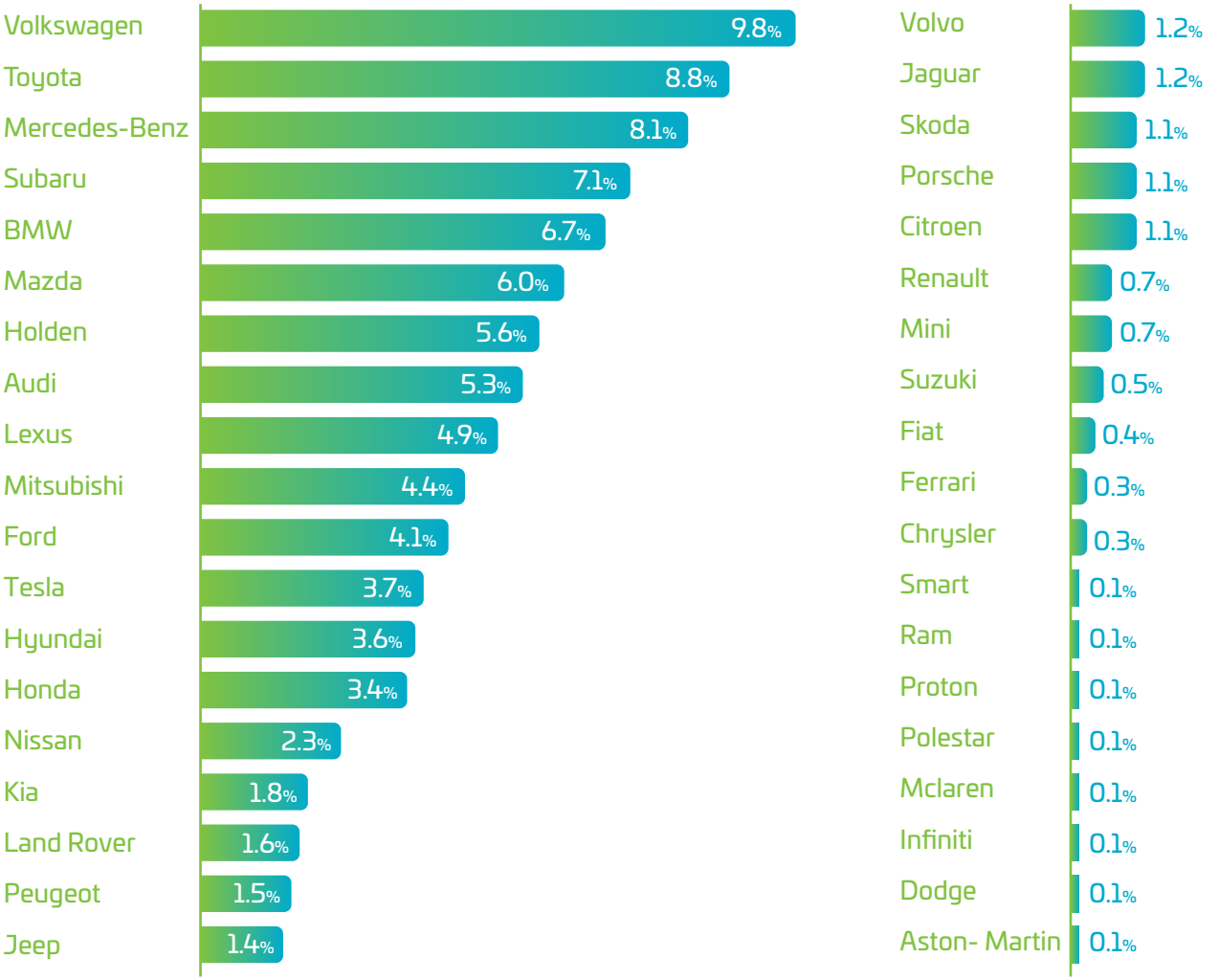
Which vehicle did you previously own?

Respondents were asked what make of vehicle they owned prior to purchasing a Tesla. 731 respondents answered the question.

There was a diverse mix of vehicle brands reported by respondents, and Volkswagen was the most commonly owned brand comprising 9.8%. This was followed closely by Toyota (8.8%) and Mercedes-Benz (8.1%). This finding highlights that while Tesla vehicles are often perceived as luxury vehicles, they are being purchased by owners as a replacement vehicle for a range of mass market brands.

What was your previous car?

Figure 5
Previously owned vehicles

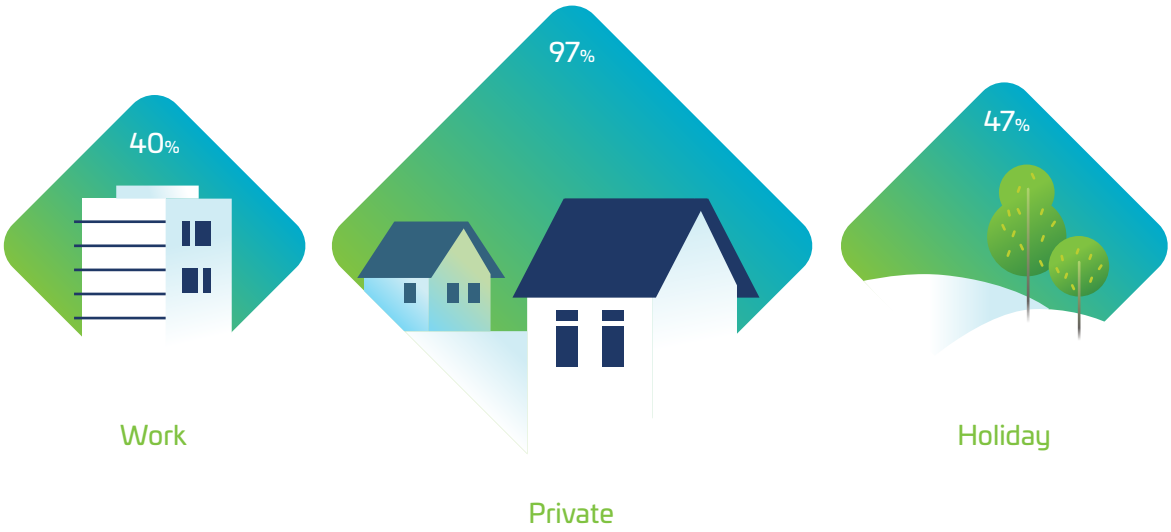


What types of trips do you use your EV for?

Respondents were asked what type of trips they used their Tesla for and were able to select any and all options. 40% of respondents reported using their Tesla at least some of the time for work and 47% for holidays. Nearly all respondents reported that they use their Tesla for private use – as expected.

Reported usage of EVs

Figure 6
Reported usage of EVs



Why did you choose to buy an EV?

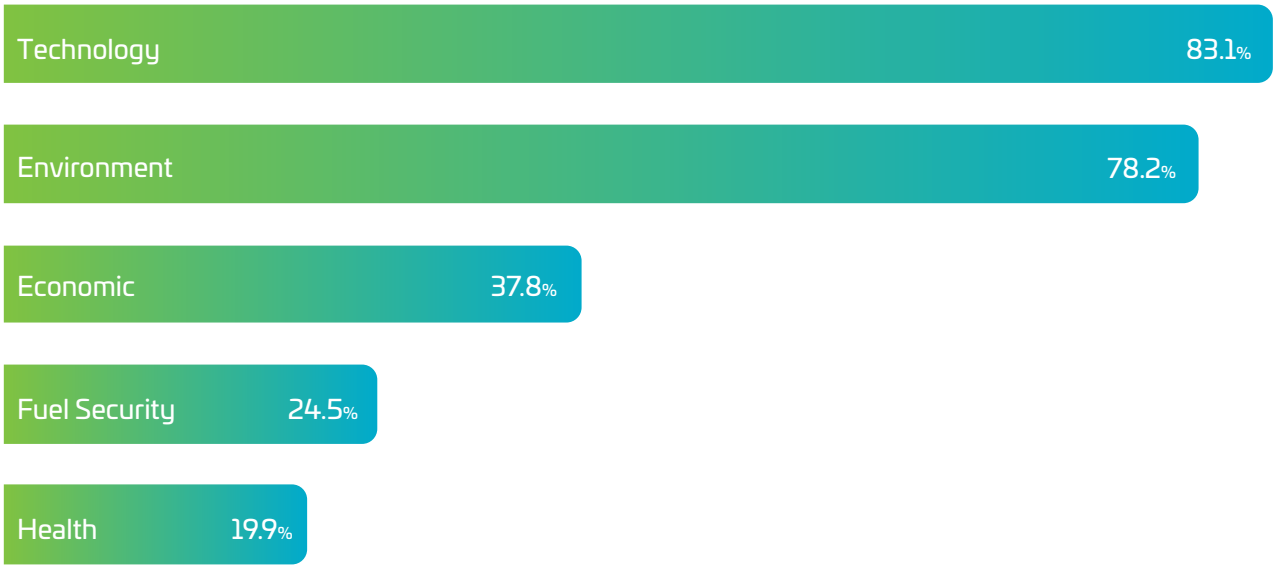
Respondents were asked for what reason they chose to buy an electric vehicle. There was no limit to the number of factors that could be selected.

Technology was the number one reason to purchase their EV, with 83% of respondents selecting it. This was closely followed by the environment (78%). Interestingly, fuel security and health were not reported as commonly as key reasons for purchasing an electric vehicle.

Further research is required to understand how these responses compare to non-Tesla EV owners, and also non-EV owners. This would provide greater insight into whether potentially different EV consumer personas exist e.g. early adopters, and what factors may be the main drivers for different types of consumers.

Why did you choose to buy an electric car?

Figure 7
Reason for purchasing a Tesla



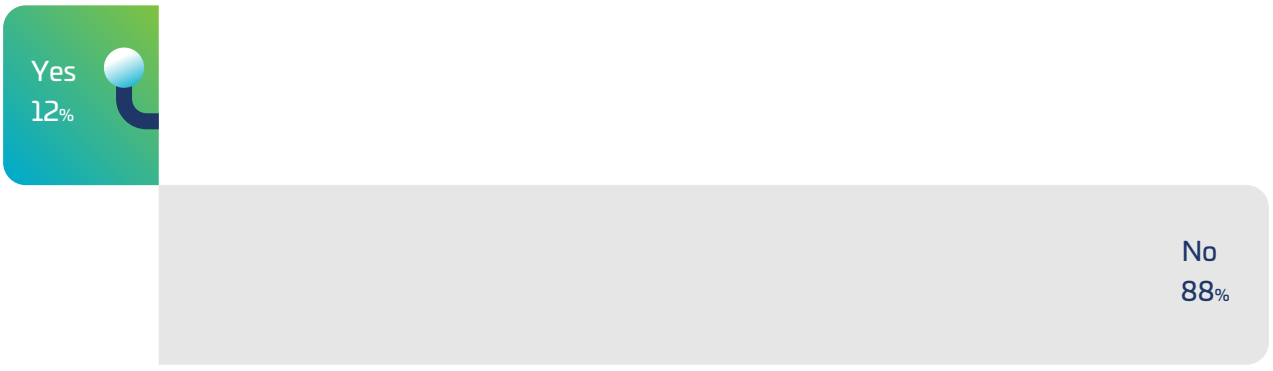
Do you use your car to tow?

Towing is a capability often cited as desired by Australian vehicle owners, and which has been previously weaponised to claim the lack of this capability is a limitation of, and barrier to EV ownership.

1 out of 10 respondents to this survey indicated that they use their Tesla for towing. Not all Tesla models come with a factory option for towing, so it suggests that some owners are fitting an aftermarket towbar to provide this capability. While it is a minority of the sample using their EV for this purpose, it is nonetheless still significant in highlighting than many EV owners can, and do use their vehicles to tow.

Do you use your EV to tow?

Figure 8
Using EV to tow



03.
Charging behaviour

There is a significant lack of information regarding the charging behaviour of EV owners. In part, this has led to misinformation around the impact that EVs may have on the grid, with little evidence provided to justify many of these claims.

In the following section of this report analysis of self-reported charging behaviour has been included to provide further insights into this issue. Given this behaviour is self-reported - as opposed to measured data of actual charging sessions - there is potentially some error associated with reported behaviours. This is the case for all self-reported surveys.

Nonetheless, the results of this survey provide initial insights into how a sample of Australian EV owners have reported charging their own vehicles. The results here could be verified through future data collection of actual charging sessions – at home, and at public charging infrastructure.

How often do you use public chargers?

Survey respondents were asked how often they use different types of public chargers, including: Tesla Superchargers, Tesla destination chargers and other DC chargers.

For all public charging types, approximately 90% of respondents reported using them less than once per week. This suggests that the majority of charging is being done at home and follows the trend of high-uptake international markets[3].

Tesla owners also reported similar usage of the Tesla supercharger network (91%) as compared to other fast public charging networks (89%).

3 www.transportenvironment.org/discover/only-5-percent-ev-charging-happens-public-charging-points/

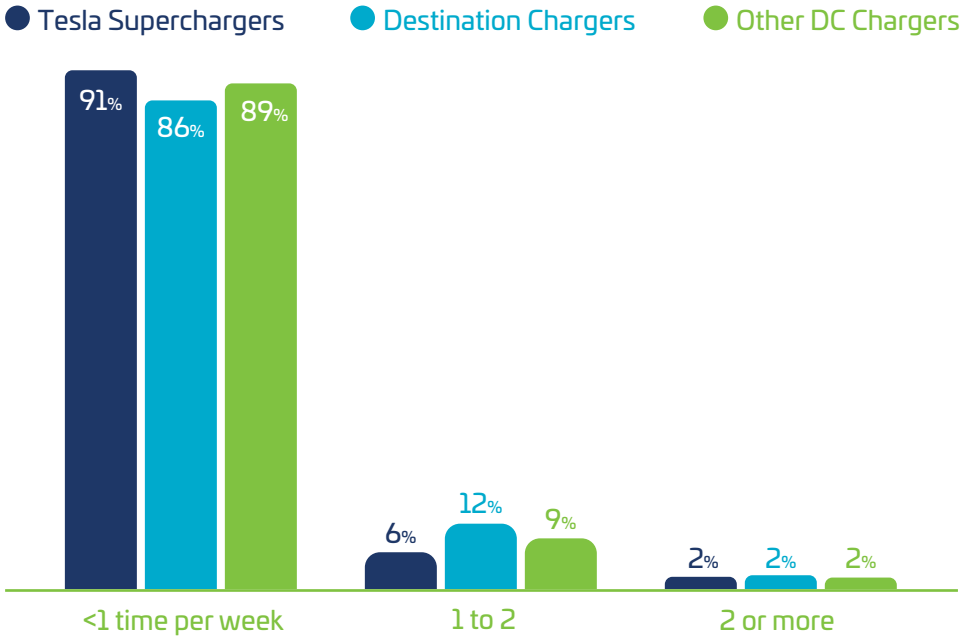


Figure 9
Respondents usage of public chargers

When respondents were asked about the frequency they use workplace charging, 11% of respondents reported using workplace charging more than once a week.

Measures to further increase the frequency of workplace charging, such as providing support for employers to install charging infrastructure, and the introduction of an fringe benefits tax exemption for workplace charging, could help to align EV charging with daytime excess solar energy generation.

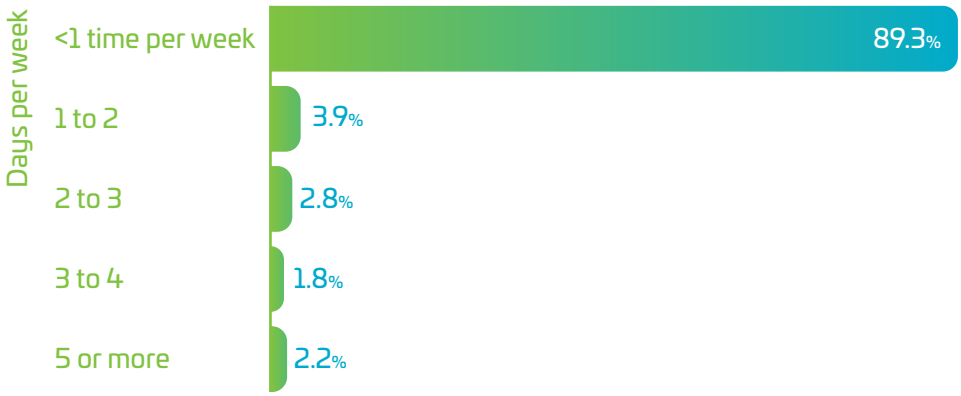


Figure 10
Frequency respondents use workplace charging

How many days per week do you usually charge at home?

Regarding home charging, over 25% of respondents reported they charge daily. This aligns with commonly reported behaviour of EV owners plugging in each day, and performing smaller battery top-ups, as opposed to larger charging sessions[4].

4 Ausgrid 2020, NSW Electric Vehicle Owners Survey and Ergon 2020, EV SmartCharge (Queensland) Insights.

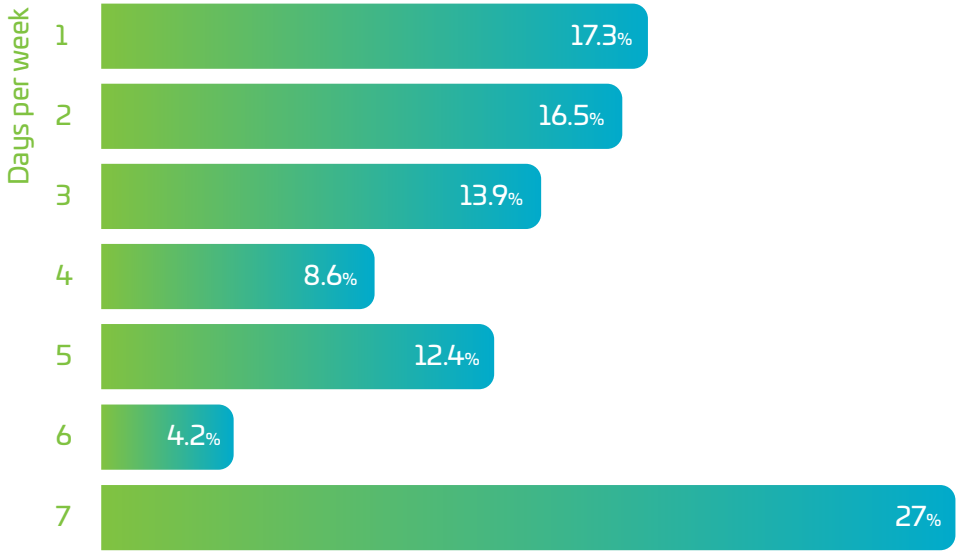


Figure 11
Frequency of home charging use

Additionally, around half of the respondents reported using home solar to charge their EV, and a further 25% reported using green energy/ offsets. It is not clear from this data what proportion of charging was delivered directly from solar, versus other sources, however, this is a topic for further investigation in future studies.

At which hours do you most commonly charge at home?

While it is expected that the total increase in energy demand from EVs will be manageable over the coming decades, it is important to ensure EV charging primarily occurs outside of peak electricity demand periods to minimise additional stress on the grid. In order to encourage this behaviour, however, it is first important to understand how significant this issue is at present.

To gain insight into this issue, respondents to this survey were asked to select up to 12 hours they most commonly charge their EV at home.

The responses indicate that there are two peak periods Tesla owners reportedly charge their vehicles: at 1.00 am and 1.00 pm. Furthermore, when separating EV owners that use home solar for charging, and those that do not, it is clear this factor influences charging behaviour. Recall that approximately half of survey respondents reported using home solar for charging, versus half that did not.

EV owners using home solar reported mainly charging during the day. These owners also reported charging overnight, but primarily around 1.00 am, for shorter durations – possibly only for short top-up charging sessions. Further research is required to understand the impact of the following day's travel plans on charging behaviour, particularly overnight charging for EV owners with home solar systems.

In contrast, EV owners that reported not using home solar for charging appear to charge less during the day – with the exception of a small peak around 1.00 pm. The majority of charging for this group was reported to occur between 9.00 pm and 5.00 am, peaking between 1.00 and 2.00 am.

Only 15% of owners reported routinely charging during the evening peak demand period. This group was comprised of a slightly higher number of EV owners without home solar, compared to EV owners with home solar.

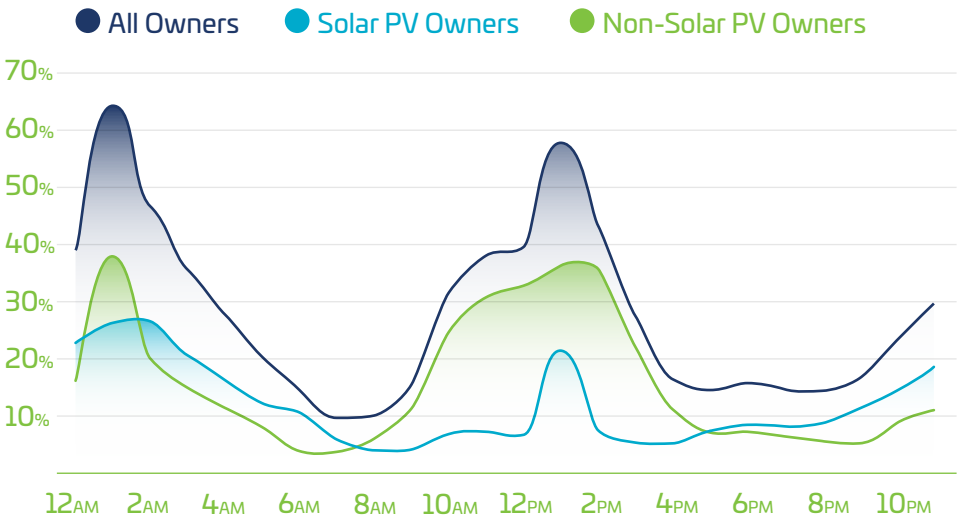


Figure 12
Preferred home charging times of respondents

While these results are based on self-reported owner data, the findings suggest that peak period charging may only be undertaken by a small minority of EV owners.

While we welcome the collection of further data on actual charging events to validate these findings, the data presented here suggests that current market offers e.g. time-of-use tariffs, may already be sufficient for shifting the majority of charging outside of peak-hour periods – whether EV owners have home solar or not.

How likely would you consent to having your charger externally managed?

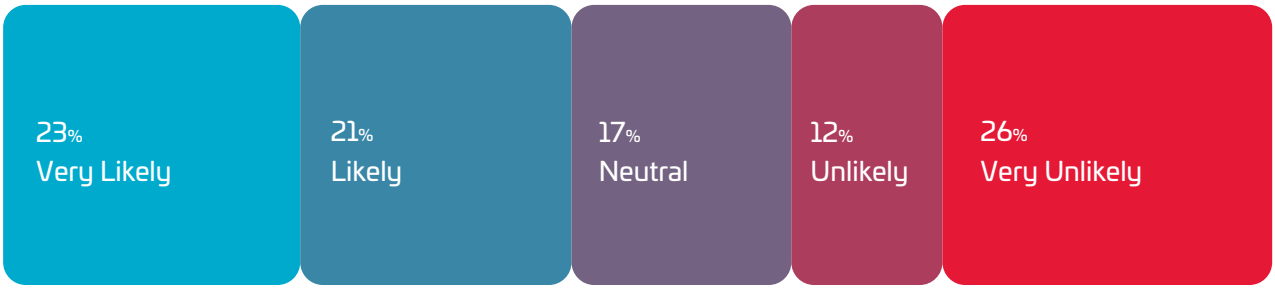
When asked how likely owners would be to consent to having the charging of their EV managed externally, there was a significant group at each end of the spectrum. 23% reported being very likely, followed by 21% who were likely. In contrast, just over a quarter of respondents were very unlikely to allow external management of charging, and 12% were unlikely. A further 17% were neutral.

While more EV owners were open to external management of charging, compared to those that were opposed, these results are more mixed than other surveys have suggested. For example, a study of 104 EV owners in Australia found that more than 85% of their sample were either extremely likely, or somewhat likely to accept external management of charging[5]. This difference in findings suggests there

5 c4net.com.au/wp-content/uploads/2021/10/EV-Charging-Consumer-Survey-Report_revised.pdf

Would you allow external management of your charging?

Figure 13
Percentage of respondents who would allow external management of home electric vehicle charging infrastructure



are likely a diversity of views across existing EV owners, and such schemes should be carefully designed to avoid being viewed as a significant barrier to EV ownership.

Further evidence on real-world EV charging behaviour is still required to understand the extent to which external management of charging is necessary. From the findings of this survey it would be appear that the need for external management of charging may be lower than some expect, assuming other appropriate market offers are in place to encourage beneficial, off-peak charging behaviour e.g. time-of-use tariffs.

It may be the case that behaviours change over time, particularly as different consumers transition to EVs, and thus this further highlights the importance of ongoing data collection of EV driving and charging behaviour to continue to study this issue.

04.
Total cost of ownership

There is generally a lack of understanding about the total cost of ownership for EVs. Respondents were asked a series of questions about costs associated with EV ownership to help shed further light on this issue.

How much do you save in fuel costs?

As the price of petrol and diesel has significantly increased during 2022, there has been increasing attention on the potential fuel savings that can be delivered through switching to an EV.

As part of this survey, owners were asked about their fuel costs, and associated savings. Firstly, 48% of respondents reported that they calculate their fuel savings from owning an electric car. It is expected that these savings would have been calculated on a fuel ($/L) vs. electricity ($/kWh) comparison.

Do you calcuate your fuel savings?

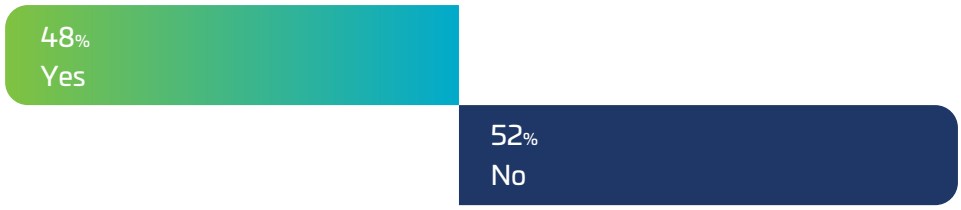


Figure 14
Percentage of respondents that calculate their fuel savings

Of those that calculate their fuel savings, nearly 50% of respondents identified that they save over $2,000 per year.

Annual fuel savings estimated by respondents

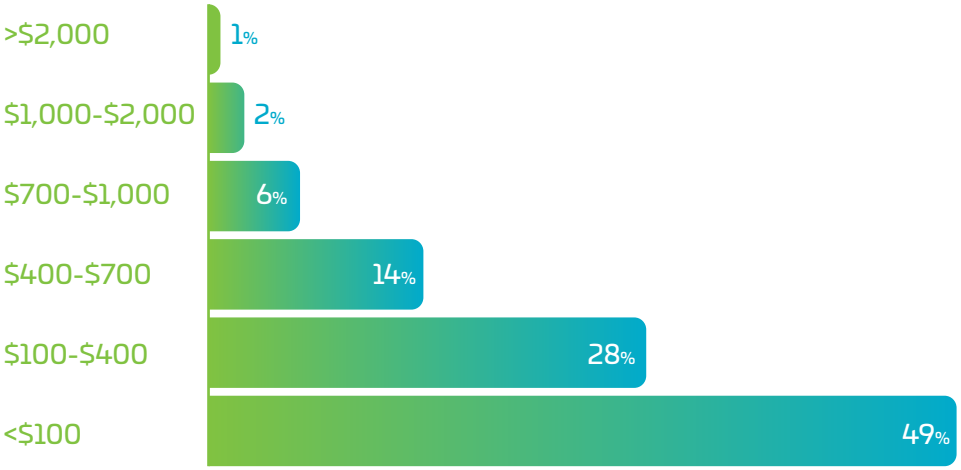


Figure 15
Respondents reported annual fuel savings

Three quarters of respondents reported saving more than $1,000 per year in fuel costs.

This aligns with expectations, with the average petrol car that consumes around 10 litres per 100 km costing around $2,400 to fuel each year, compared to the average EV costing closer to $400 in electricity per annum[6].

6 Subject to the precise electricity tariff used for EV charging at the owner's premises.

How much do you save in maintenance and fuel costs?

In addition to fuel savings, EVs also have lower servicing requirements, leading to maintenance savings. It is difficult to estimate maintenance cost savings. Respondents were asked about the servicing requirements of their electric vehicles to provide greater insight into these costs and potential savings.

Respondents were first asked how often they service their vehicles, with 65% identifying they do not follow a maintenance schedule. This is expected given Tesla vehicles do not require formal logbook servicing.

Frequency of reported vehicle servicing

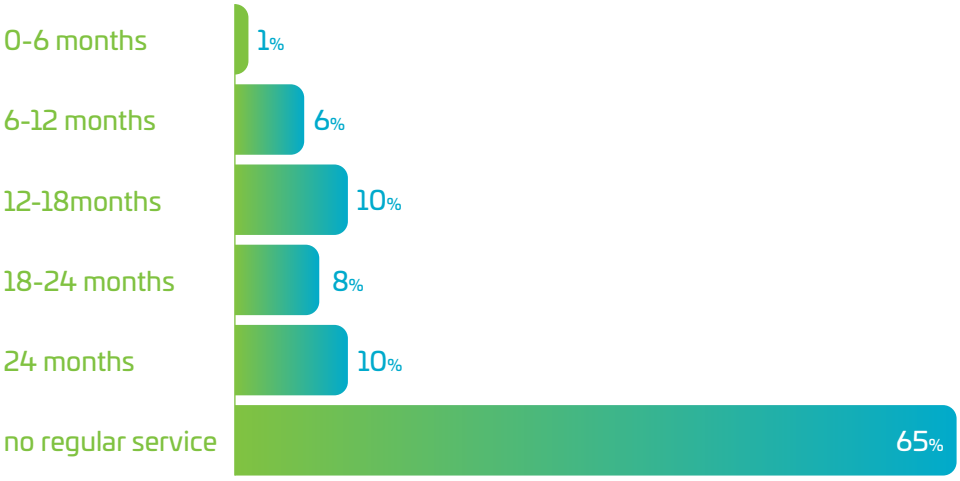


Figure 16
Frequency of reported vehicle servicing

48% of respondents reported measuring and/or calculating their ongoing service and maintenance savings.

Do you calculate your servicing and maintenance costs?

Figure 17
Percentage of respondents that calculate their servicing and maintenance savings

Of those that calculate their maintenance savings, 41% report saving more than $1,000 per year. These reported savings were higher than anticipated based on the published servicing costs of internal combustion engine vehicles. Unfortunately it was not possible from the results of this survey to determine a breakdown of these savings.

Further research is required to better understand the components of maintenance savings for electric vehicle owners, and over what time period these savings are being calculated.

Annual maintenance savings estimated by respondents

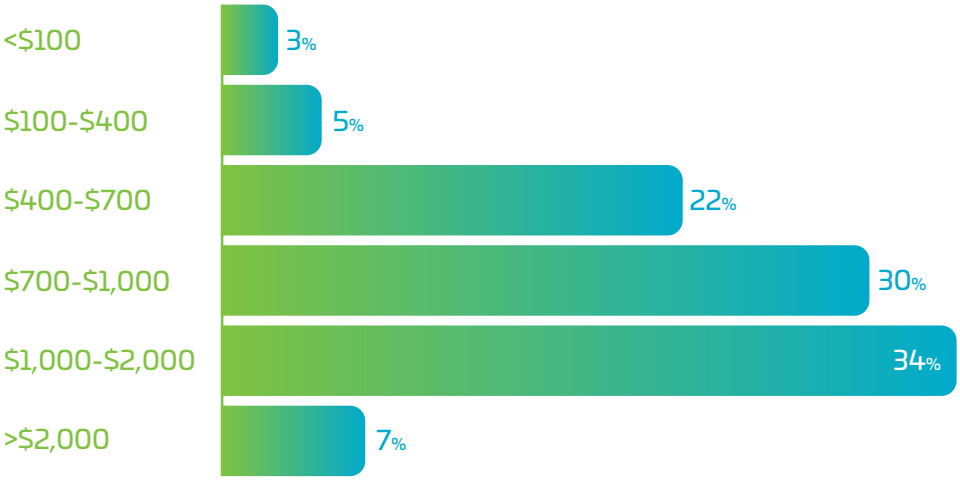


Figure 18
Respondents estimated annual maintenance savings

Looking Forward:
The need for further research on EV owner preferences and behaviour

The survey results analysed in this report build on other research into Australian EV owner preferences and behaviour to provide additional insight into EV owner views, including how they charge and drive their vehicles.

As with all self-reported surveys, some level of error is expected in terms of the accuracy of data when relying on respondents to recall what they do, and make assumptions about their average behaviour over time. This is expected with all surveys of this nature, but does not take away from the useful insights provided in this report, which analyses the results from one of the largest surveys of EV owners in Australia.

While the findings outlined in this report are useful for policy-makers in gaining initial insights into critical issues - such as the time of day EV owners report charging their vehicles - there is still a need for collection of real-world data pertaining to both actual EV driving and charging behaviour e.g. telematics data.

Industry has started to investigate these issues, such as Energy Queensland's EV SmartCharge program[7]. Australian researchers are also collecting independent data to help inform policy related to EV preferences and behaviour[8].

Additionally, further research is recommended to continue to understand the different types of EV consumers that emerge over time, as well as their perception of EV costs and savings.

We welcome further research and data collection to build an even stronger evidence base to inform future EV policy and regulatory decisions. Without this strong evidence base, pre-emptive moves to limit or control how EV owners use their vehicles is likely to slow adoption, and as a result, runs the risk of jeopardising Australia's chances to achieve its commitment to net zero carbon emissions by 2050.

7. www.energex.com.au/home/control-your-energy/smarter-energy/electric-vehicles/ev-insights

8 arxiv.org/abs/2206.03277

Through the greater insights gained through further data collection, EV policy and regulations can be designed to support and accelerate EV adoption, while preparing both the energy and transport sectors for this critical transition; ensuring perceived risks are converted into opportunities.

Increased collection of data on EV usage could also enable a range of other opportunities, including: smart charging, vehicle-to-grod, traffic management, etc[9].

9 www.sciencedirect.com/science/article/pii/S2772424721000135?via%3Dihub

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