



THE UNIVERSITY OF
MELBOURNE

Electric Vehicle Charging

Preferences of Australian Consumers

Dr Patricia S. Lavieri

February 2022



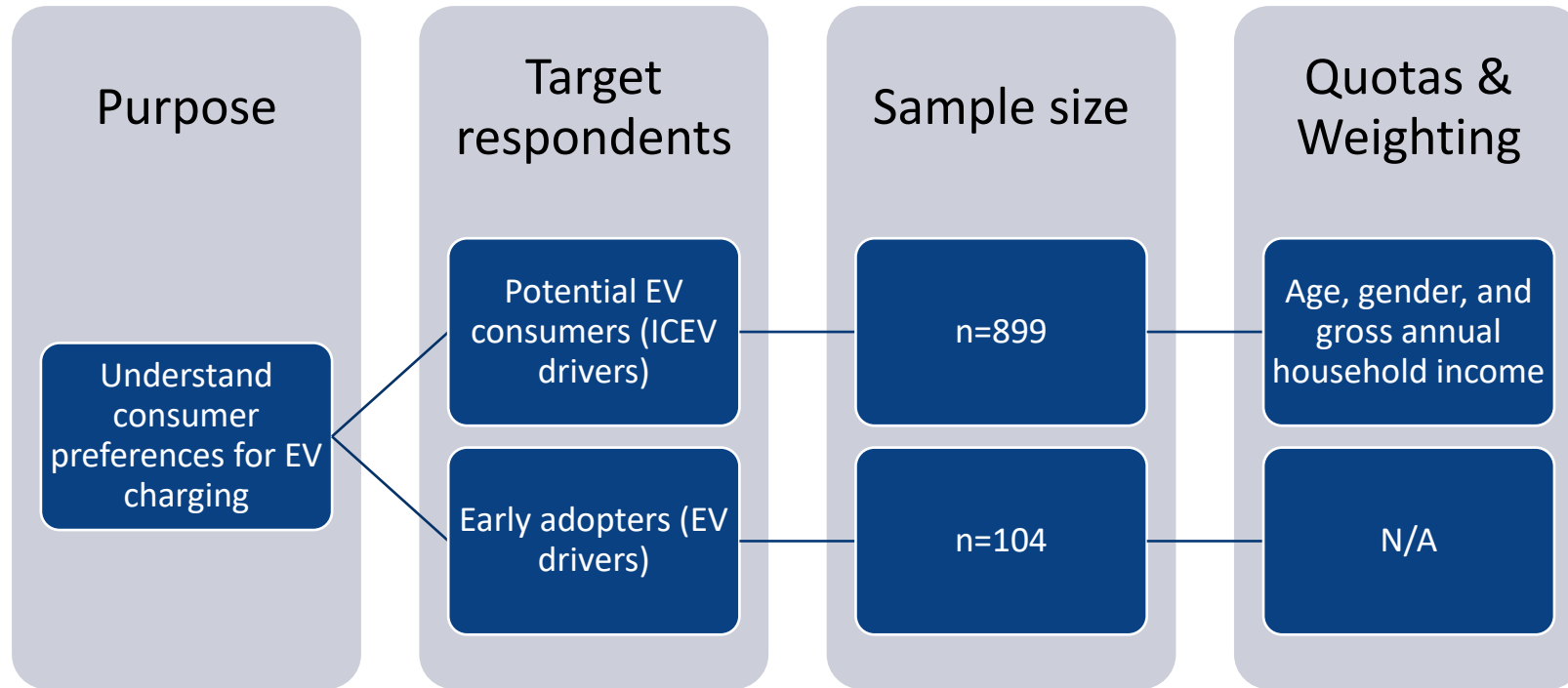
Survey Aim and Objectives

Aim: to generate insights into EV charging preferences of Australian consumers

Objectives

1. To characterise EV ownership and purchase intention.
2. To identify preferred locations and times for EV charging among current EV owners and potential consumers.
3. To understand consumer willingness to adopt time-of-use tariffs and supplier-managed smart charging systems.

Survey Details



Data collection

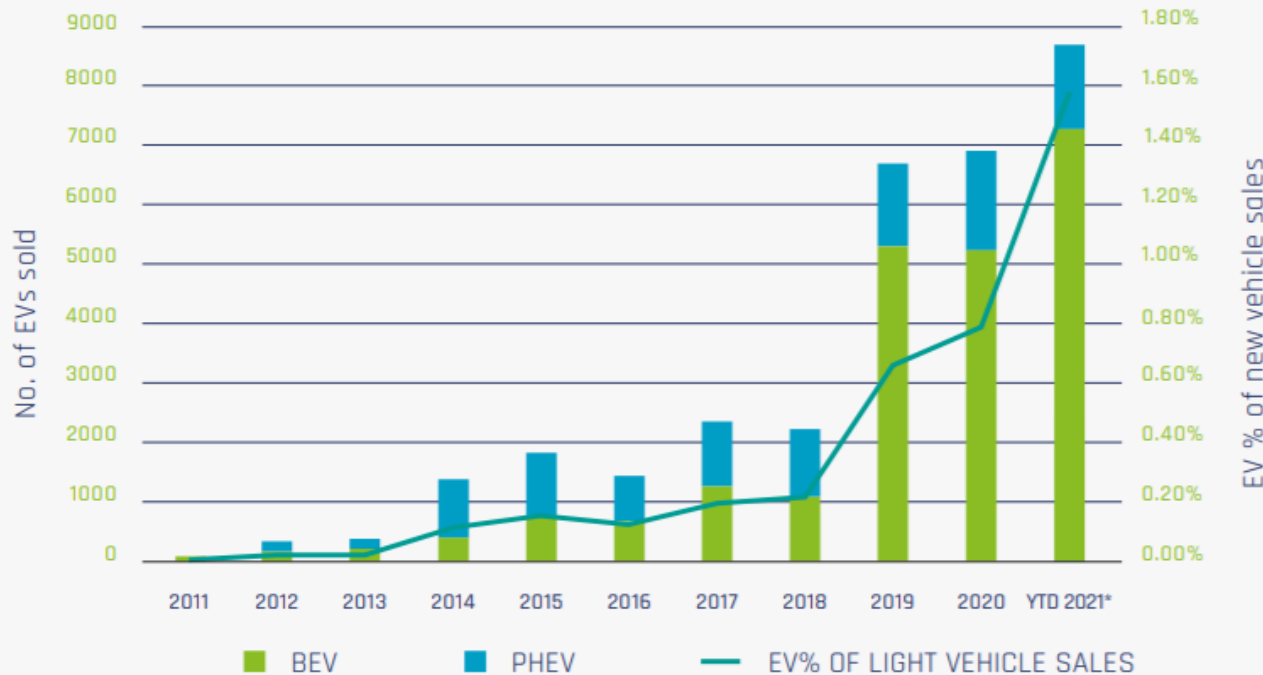
- Between July and August 2021
- 15-minute online survey
- Recruitment and compensation by Qualtrics



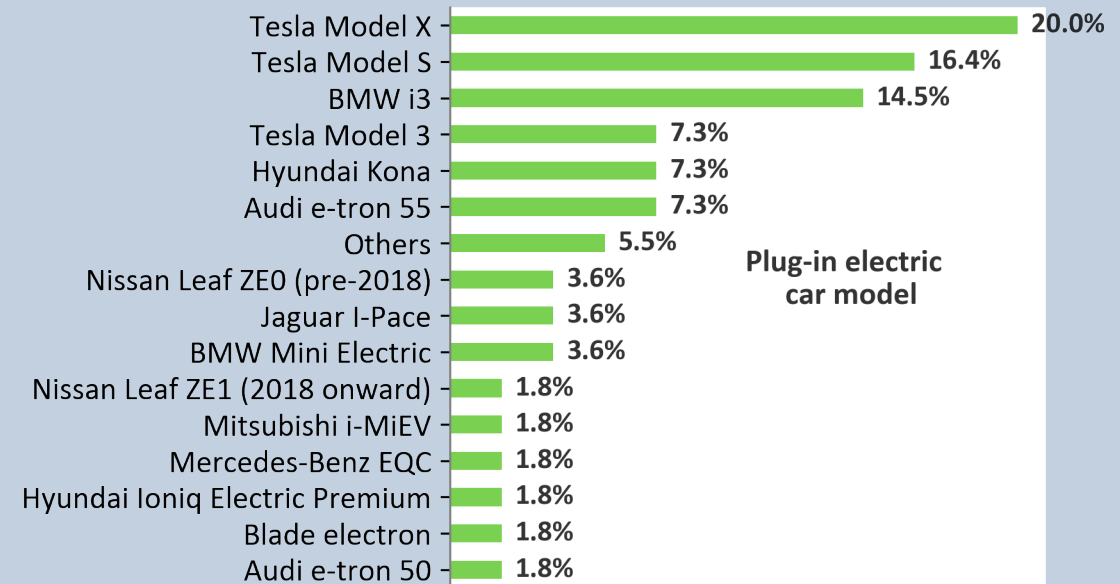
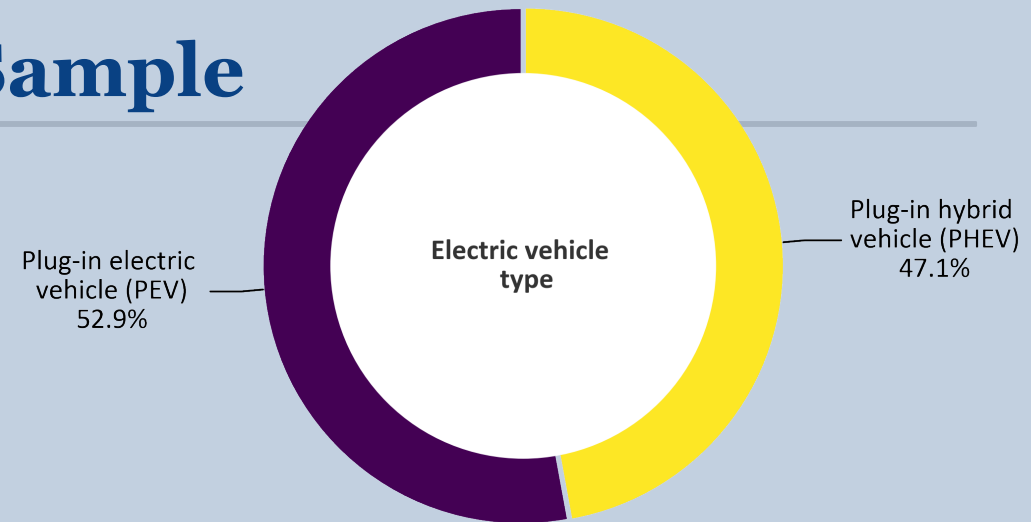
EV ownership and purchase intention

Electric Vehicle Type: Sales vs. Sample

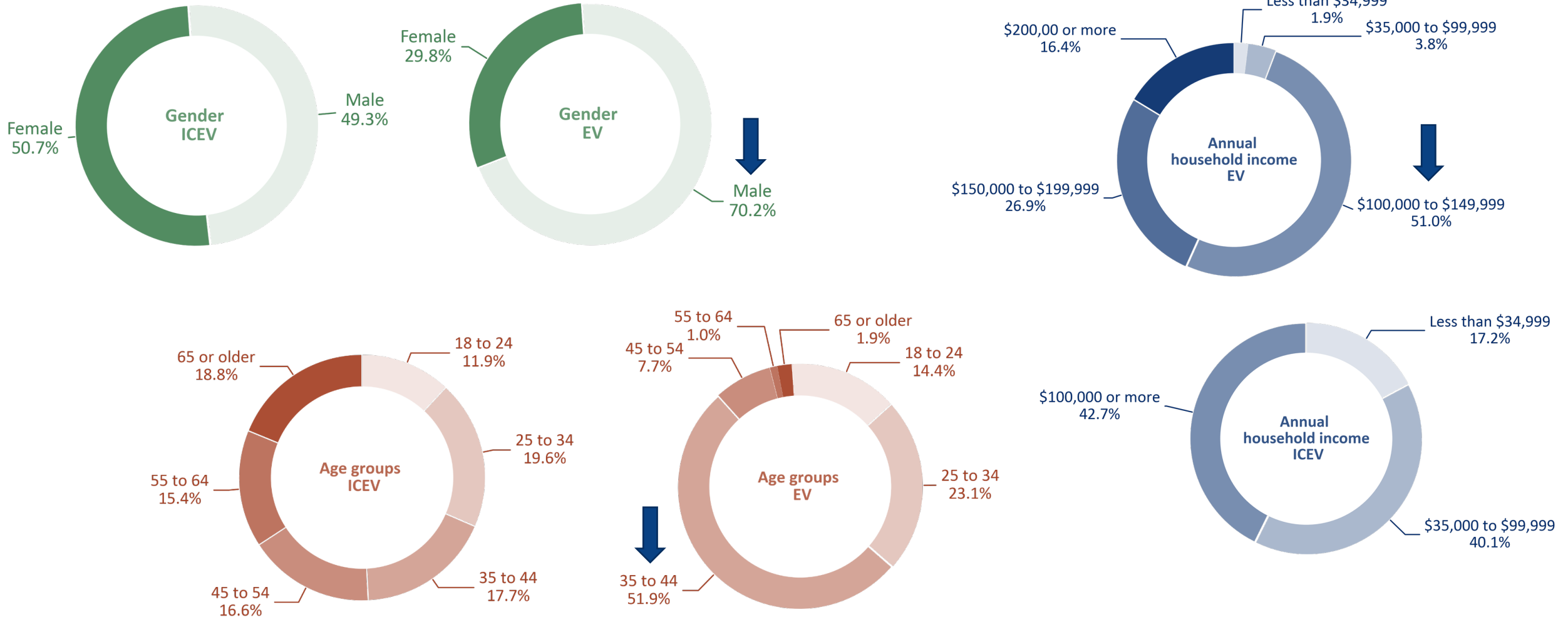
Australian electric vehicle sales



Source: EVC, 2021 (<https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021.pdf>)

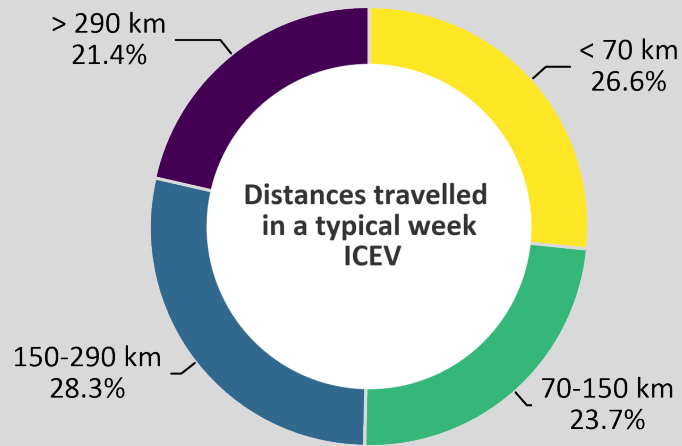


Samples' Description: Key Insights

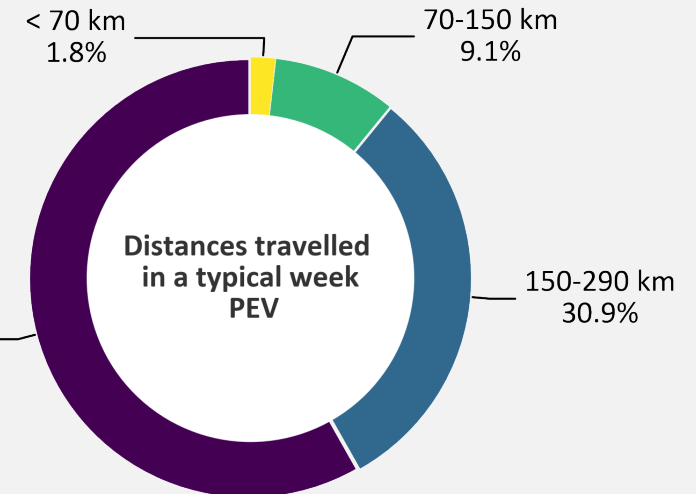
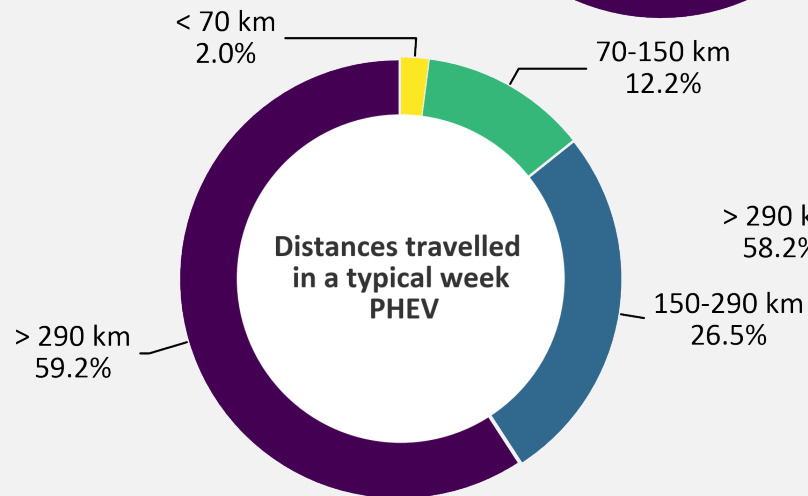
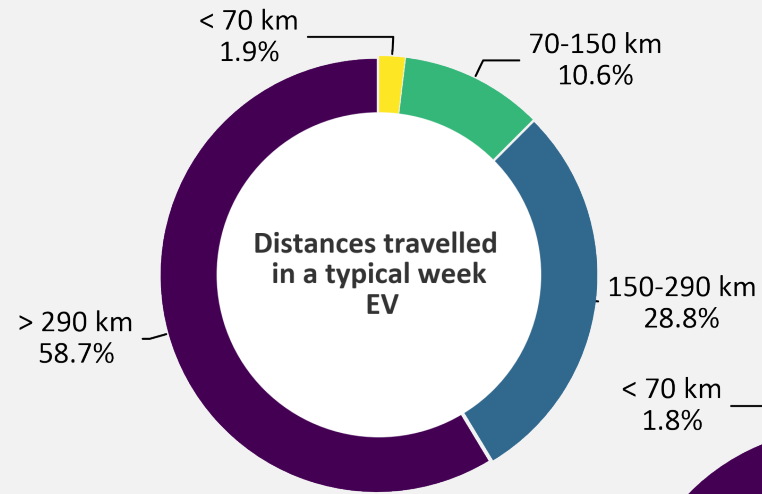


*Note that we cannot guarantee that the sample of EV drivers is representative of the EV driver population of Australia as characteristics of this population are unknown and we are not using a random sampling technique. However, the results observed here provide a general idea of the socio-demographic profile of this group.

Weekly Distances Travelled

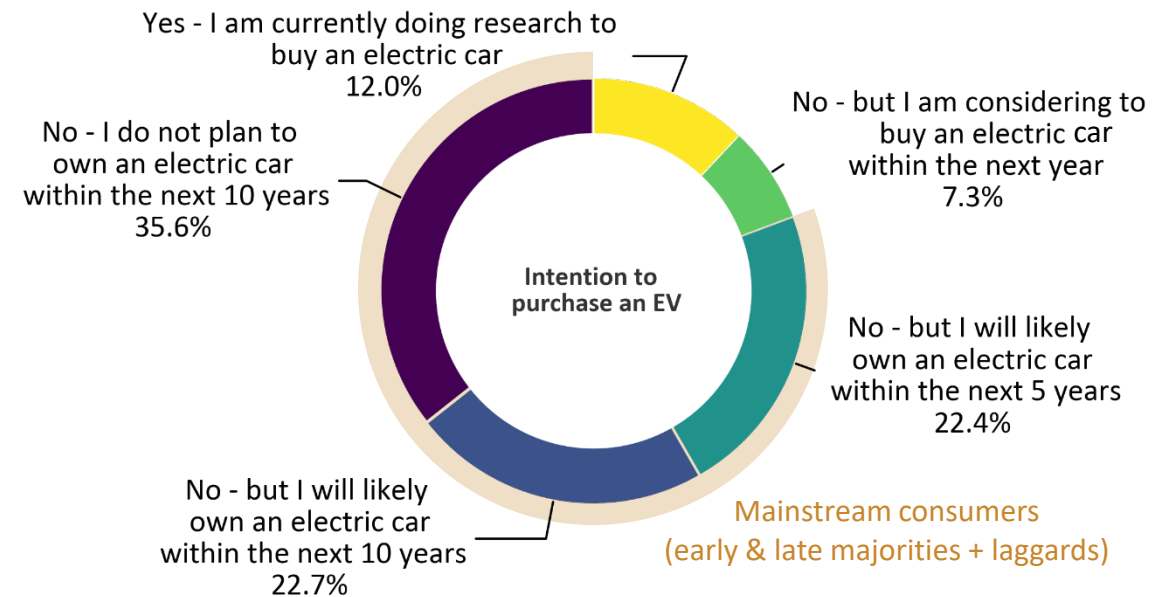
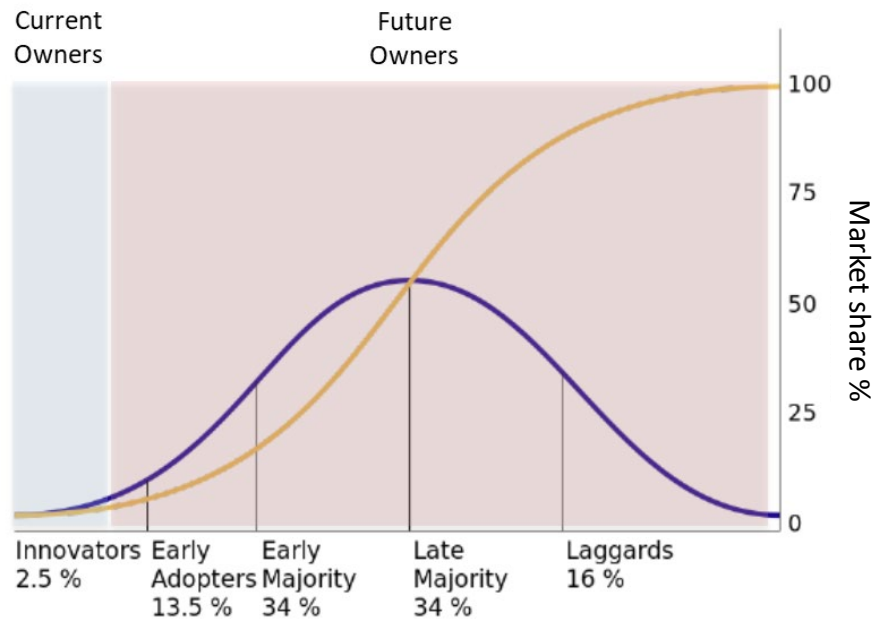


Australians drove on average 213 km per week in 2020¹



¹Australian Bureau of Statistics, 2021. [Motor Vehicle Census 2021](#). (Accessed 16/08/2021)

Intention to Purchase an EV





Charging perceptions and preferences

Hypothetical Scenario



ICEV drivers gave responses about EV charging based on the following hypothetical scenario:

For the remainder of the survey, please consider that you are the owner or regular user of a **plug-in electric car**. A car that **NEEDS** to be plugged into an electrical outlet to recharge and does not use traditional fuel such as petrol or diesel.

Also, consider that your **parking arrangements allow you to charge your car at home**.

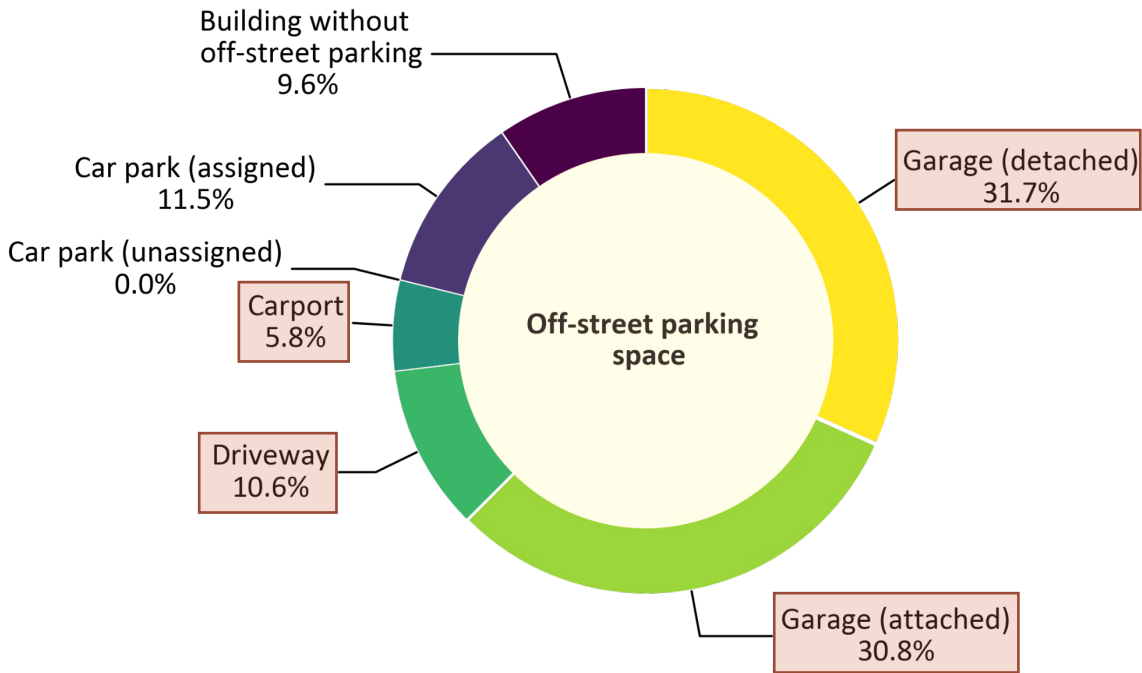
Charging an electric car may take from less than 1 hour to more than 12 hours, depending on the battery size, level of charge, and type of charger. Cars can be charged overnight at home, but residential chargers usually require longer charging periods than public chargers.

Usual charging rates available at different locations:

- 1- Dedicated fast-charging facility: 225 km per hour of charge
- 2- Regular public chargers at car parks of shopping, dining, recreational, and sporting facilities: 45 km per hour of charge
- 3- Regular public chargers at workplace car parks: 45 km per hour of charge
- 4- Residential chargers: 20 km per hour of charge

Ability to Charge the EV at Home

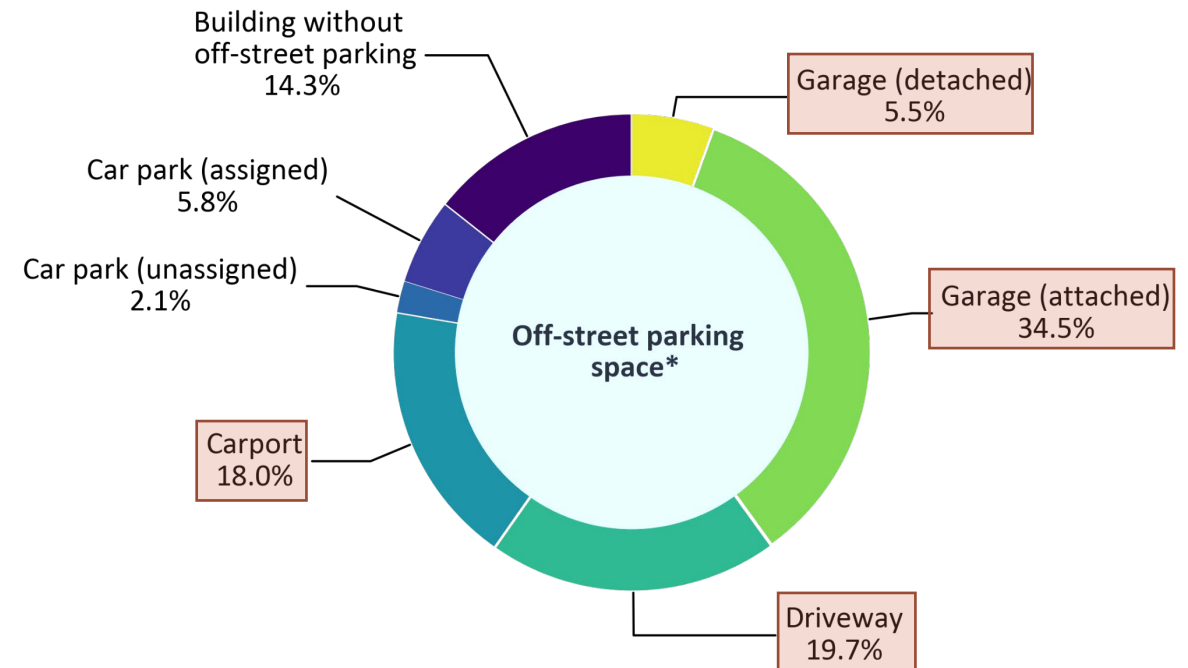
EV drivers



Considering your current living and parking arrangements, are you able to charge an electric car at home?

Yes	92.30%
Maybe	-
No	7.70%

ICEV drivers

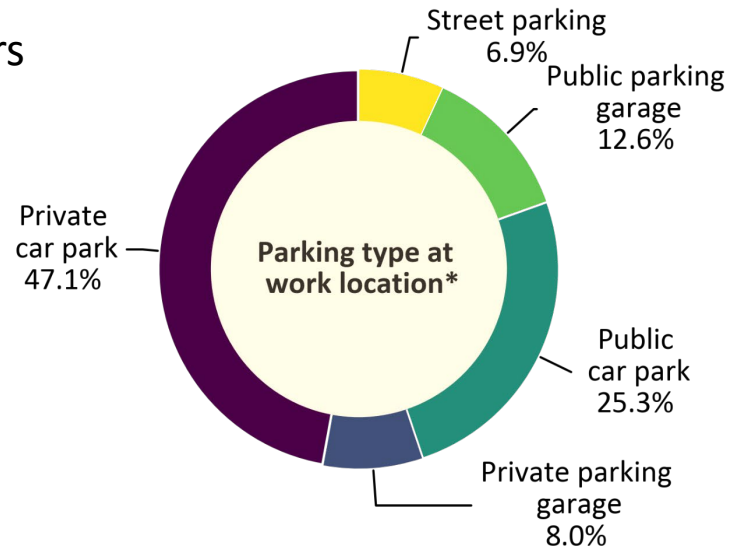


Considering your current living and parking arrangements, do you think you would be able to charge an electric car at home?

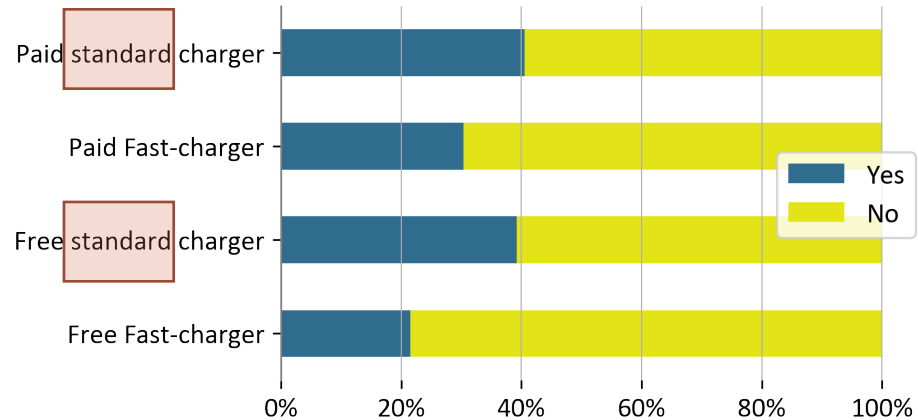
Yes	52.20%
Maybe	31.50%
No	16.30%

Ability to Charge the EV at Work

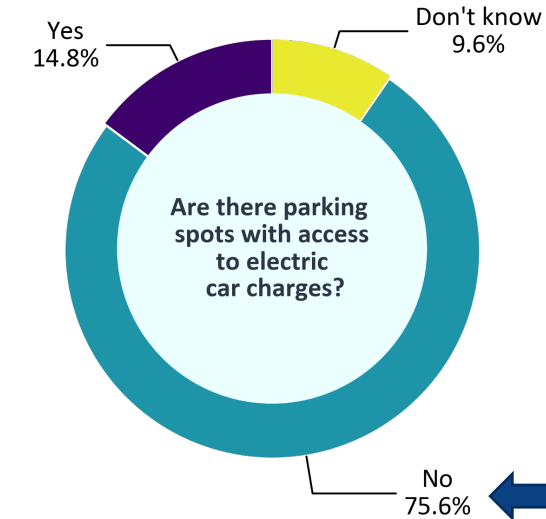
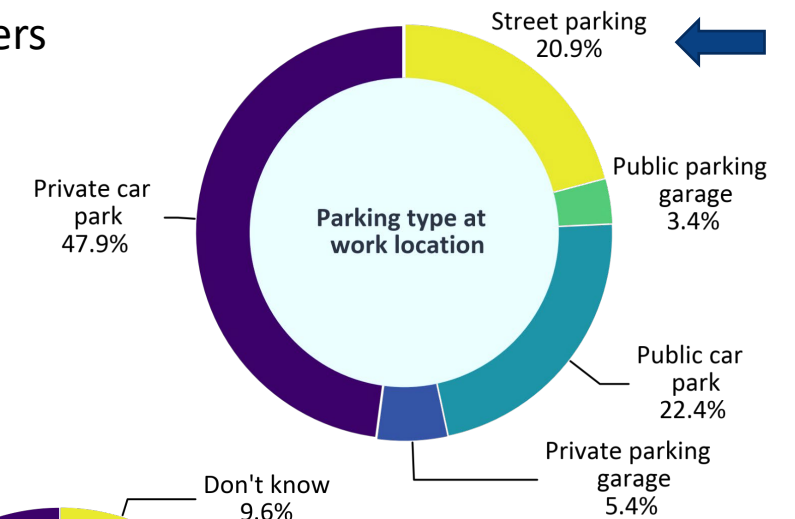
EV drivers



Charger type at workplace parking space***



ICEV drivers



*N=87, respondents who drive to their primary workplace; **N=42, respondents without access to free charging at their primary workplace parking location; ***N=79, respondents with access to one or more chargers at their primary workplace parking location.

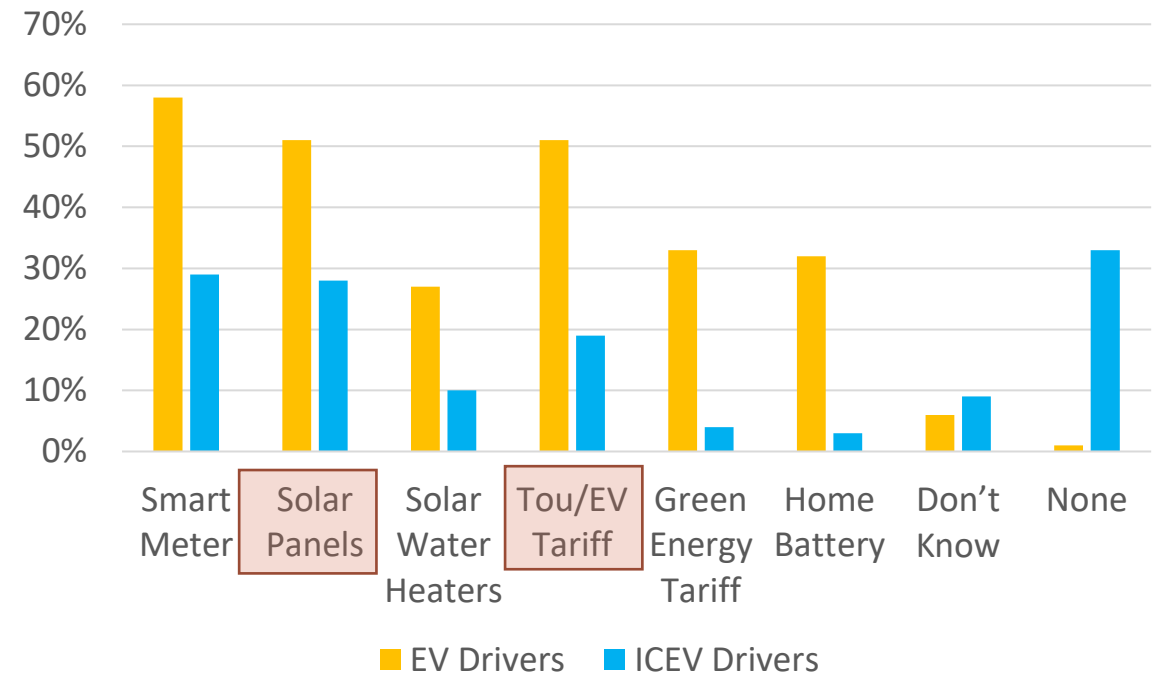
Charger Level, Electricity Plan and Solar Power



EV Drivers' Residential Chargers

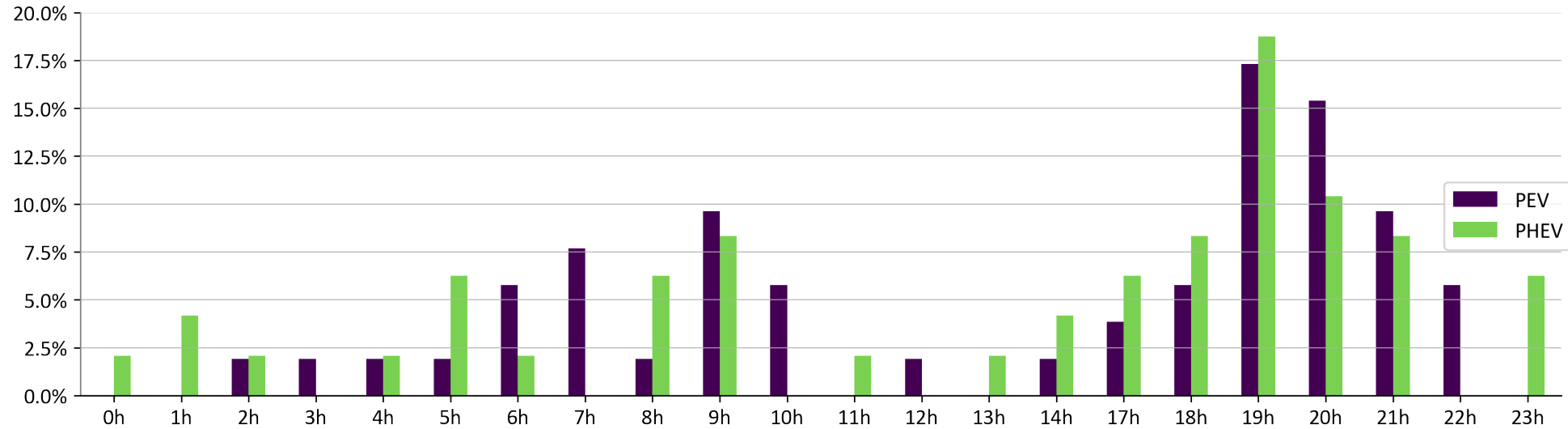
- Level 1: 28.8%
- Level 2: 61.5% ←
- Don't know : 5.7%
- Never charge at home: 3.8%

Residential Charger Level	Charging Range Rate
Level 1	7.5 to 15 km/hour
Level 2	18 to 40 km/hour

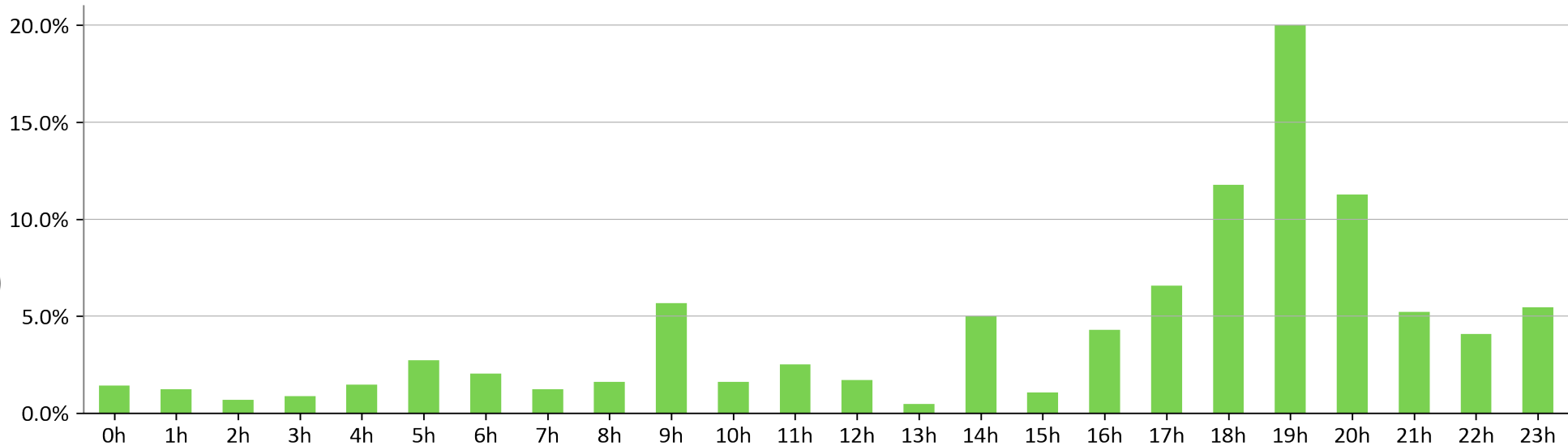


Home Charging: Usual Start Time

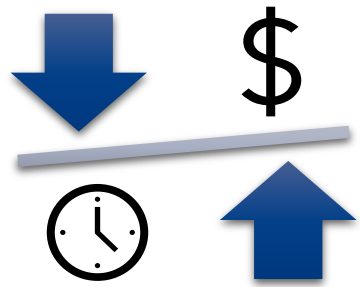
EV
drivers
(revealed)



ICEV
drivers
(preferred)



Home Charging: Willingness to Change Start Time



EV drivers

Discount Level	Change to 11pm*	Change to between 10am and 2pm**
No discount	13.6%	16.5%
10% discount	19.8%	24.2%
20% discount	27.2%	40.7%
50% discount	66.7%	53.8%

ICEV drivers

Discount Level	Change to 11pm*	Change to between 10am and 2pm**
No discount	7.9%	4.6%
10% discount	15.9%	10.5%
20% discount	32.0%	22.7%
50% discount	74.8%	50.6%

At 50% discount level:

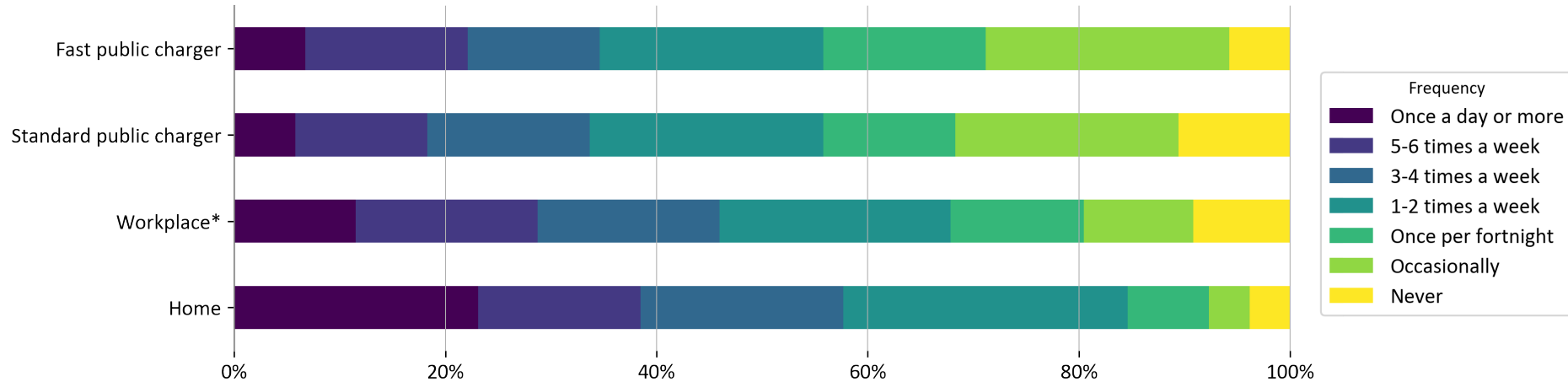
- 42% of consumers would move to both 10am-2pm charging or after 11pm charging
- 33% would only move to 11pm charging
- 8% would only move to 10am-2pm charging

*N=81, N=756 respondents who charge at home and whose charging start time in between 7am and 10pm

**N=91, N=797 respondents who charge at home and whose charging start time is not between 10am and 2pm

Charging Location: Frequency & Preference

EV
drivers
(revealed)

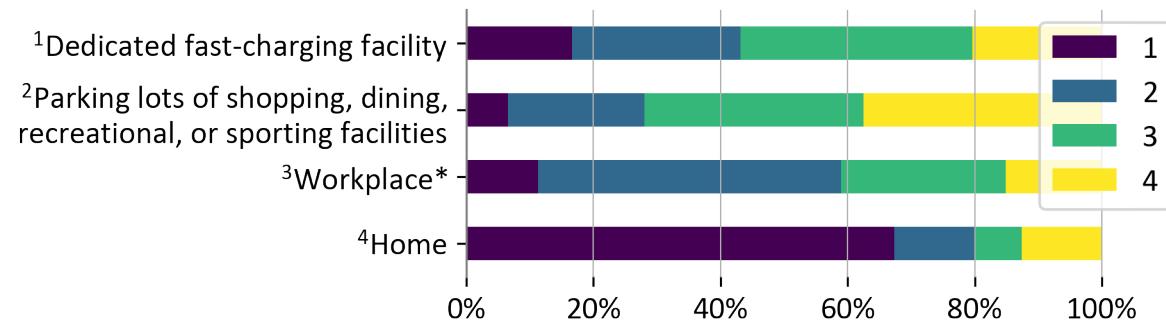


ICEV
drivers
(preferred)

Charging rates provided :

- 1- 225 km per hour of charge
- 2- 45 km per hour of charge
- 3- 45 km per hour of charge
- 4- 20 km per hour of charge

Please rank the charging locations from most to least convenient. With 1 being the most convenient ICEV



Acceptance of Supplier-Managed Charging: Definitions

Survey respondents were presented with definitions of smart charging and charging management options:

Types of chargers



Conventional chargers: don't include a data connection.



Smart chargers: include a data connection.

Options for controlling the charging, and managing your costs and electricity demand



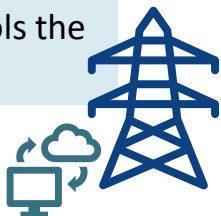
Unmanaged conventional charging: Charging is monitored and controlled only by the user.

Residential charger controls the load



User-managed smart charging: Charging is optimised by an automatic system that reacts to dynamic price signals. The rate of charge may be lower than your charging point specification to minimise costs. If you need to use your car before your set departure time, it may not have the desired level of charge.

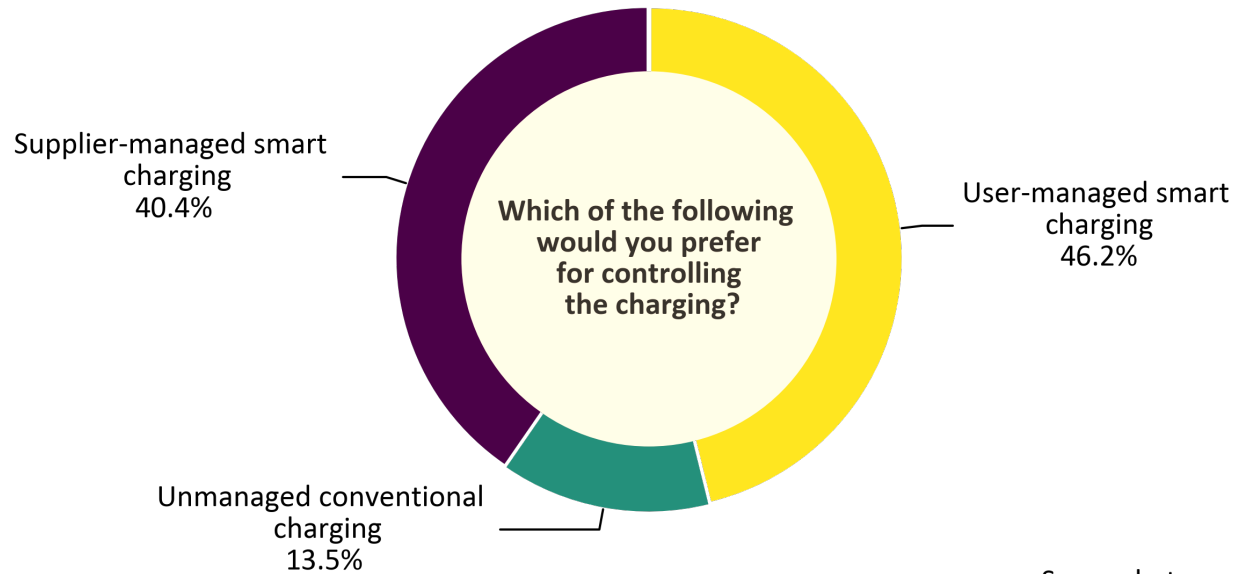
Supplier controls the load



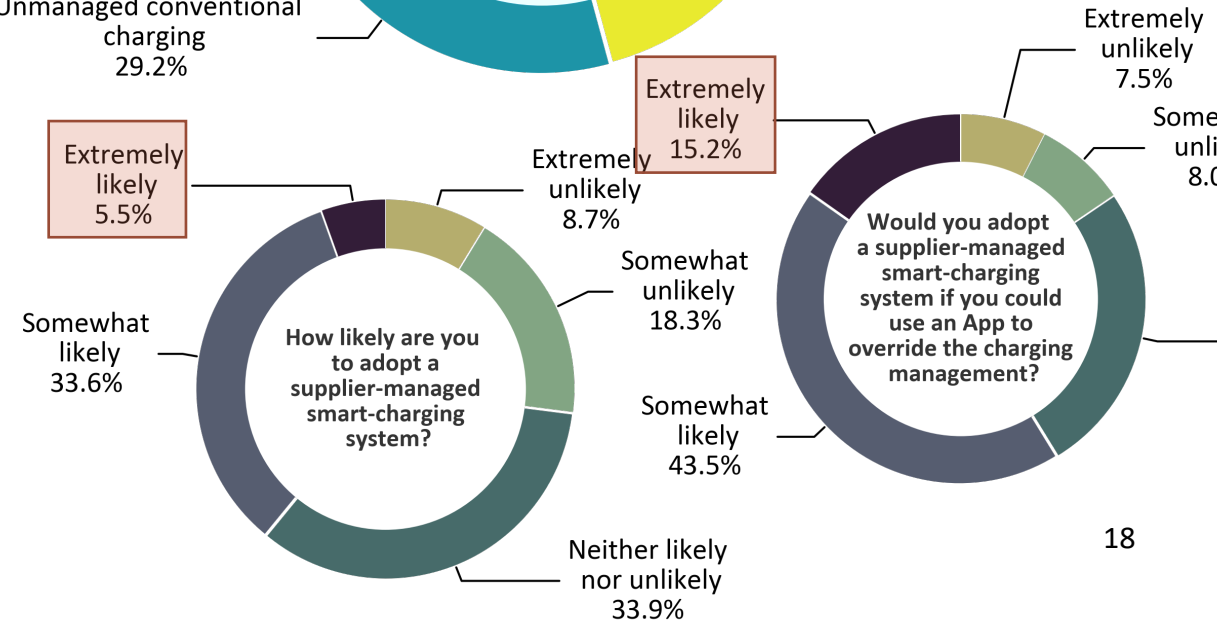
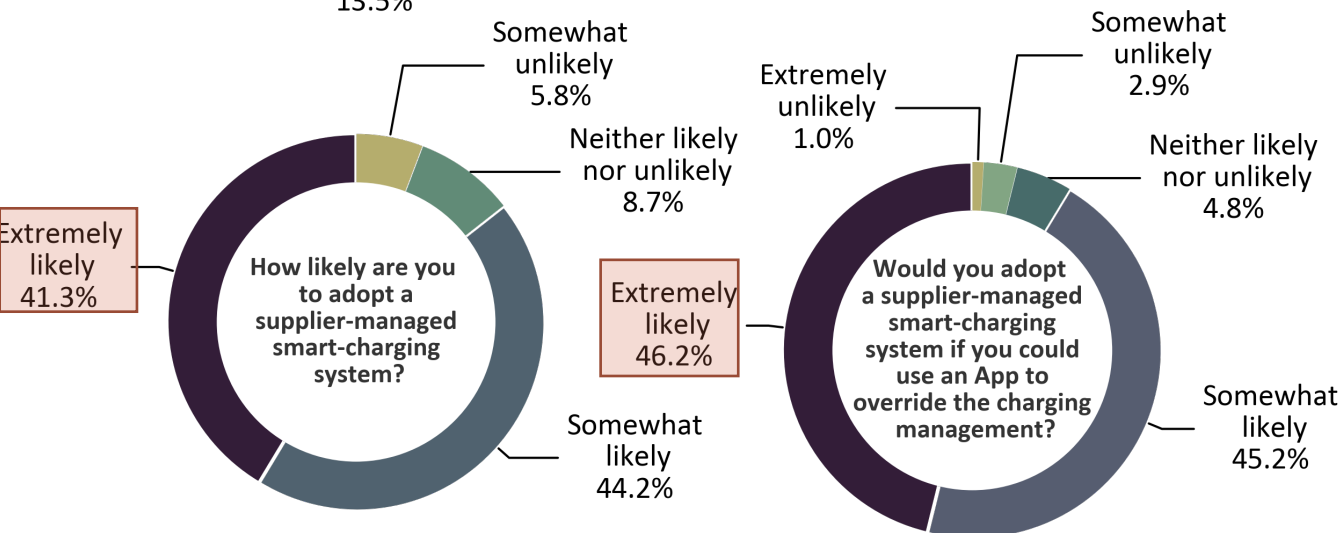
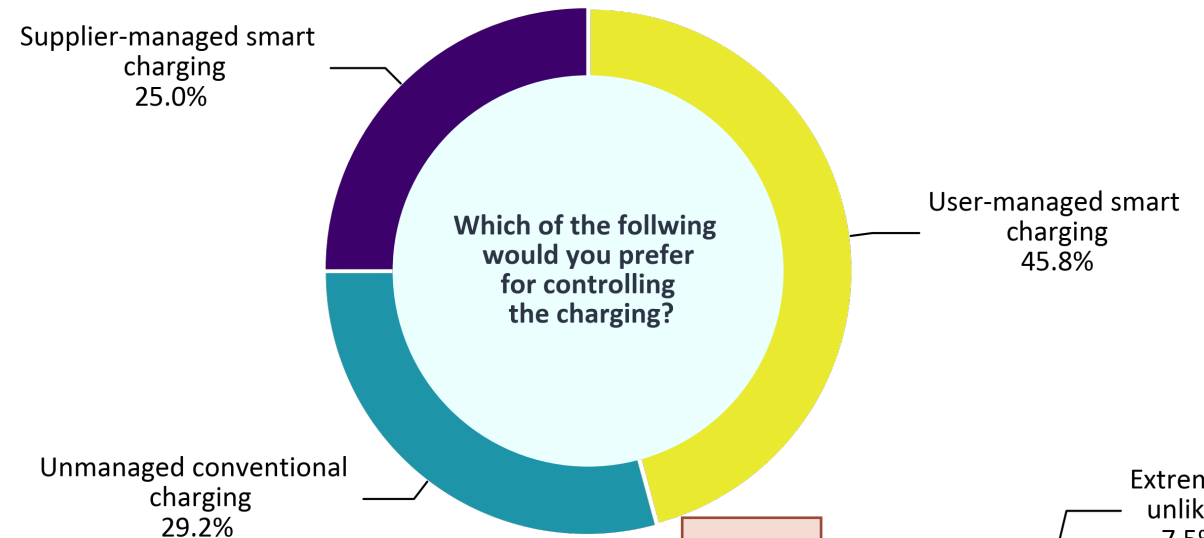
Supplier-managed smart charging: Charging is optimised by a centralised system that communicates and coordinates with the electricity supplier to determine the best schedule for your charge considering real-time electricity demand in your area. The rate of charge may be lower than your charging point specification to minimise costs and balance the demand and increase the share of renewable energy used. If you need to use your car before your set departure time, it may not have the desired level of charge.

Preferred Type of Charging Management

EV drivers



ICEV drivers





Conclusions and recommendations

Conclusions and Recommendations (1)

Current EV owner profile: Like in Europe and the USA, we observed that most EV owners are men, approaching middle age, with high income and education.

- PHEVs are more likely to be the only household vehicle than PEVs.
- EV owners drive almost two times the national average distance travelled per car per year and there are no significant differences between PEV and PHEV drivers.

Prospective buyers: Those intending to buy an EV within the next year also drive longer distances than the national average. This indicates that the higher purchase cost of EVs may only be appealing to those who will benefit the most from lower running costs.

- From a utility provision standpoint, it is interesting to note that weekly charging needs per individual are likely to decrease as the adoption curve reaches the majorities.

Adoption timeline: Among those considered mainstream consumers, 44% do not consider purchasing an EV within the next 10 years. Skepticism is higher in regional areas.

- Marketing campaigns and changes in the current policy scenario seem necessary to accelerate EV dissemination in Australia.

Home is the preferred charging location for current owners and potential consumers. However, workplace charging is also frequently used by current owners.

- All consumers who commute show significant interest in using workplace charging if it leads to monetary savings. This can be an opportunity to balance EV charging demand both temporally and spatially.

Potential consumers seem to underestimate their ability to charge at home and at work.

- Initiatives that increase consumer knowledge about EV charging may be necessary to increase technology acceptance.

Fast-charging service stations are preferred over standard chargers located at destinations of interest, such as shopping facilities.

- Current users of free public-charging would continue using it if a fee was introduced. However, mainstream consumers will likely be more sensitive to cost changes.

Conclusions and Recommendations (2)

Residential charging is likely to take place during evening peak if unmanaged.

- Even though most EV drivers can set a timer to start charging their vehicles, 51% begins charging between 5-10pm. 55% of the potential consumers would also charge during this time.
- Half of the EV owners adopt EV specific, and/or ToU tariffs, and/or residential solar panels. PEV owners are two times more likely than PHEV owners to adopt those.
- Less than one-fifth of potential consumers currently consider that special tariffs and solar panels would be necessary if they purchased an EV.
- These results emphasize that charging management to nudge consumers into different charging times will be necessary together with measures to increase awareness about ToU benefits.

Mainstream consumers are more responsive to ToU discounts than current EV owners.

- A 50% residential tariff discount after 11pm could attract up to three-quarters of the consumers who prefer different times.
- A 20% mid-day (10am-2pm) discount could shift the charging times of around one-fifth of those who prefer different times.

- The demand shift is constrained by cars not being parked at home during this time.

Preference for and acceptance of supplier-managed smart charging is higher among EV early adopters (both EV owners and those planning to buy an EV in the near future).

- Less than one-fourth of mainstream consumers would prefer supplier-managed smart charging over user-managed or unmanaged charging.

To increase supplier-managed smart charging acceptance:

- Monetary savings need to be evident and clear to consumers, even if tariff structure is dynamic and complex.
- Third-party management and control need an interface via App that increases user sense of control over charging and decreases the feeling of uncertainty.
- Clarity in data sharing and user privacy policies is required.
- Consumer awareness about environmental and community benefits need to be addressed in campaigns.
- Public charging needs to be perceived as an easy and accessible backup plan.



Contact

Dr Patricia Lavieri

The University of Melbourne

Faculty of Engineering and Information Technology

Level 2, 700 Swanston St

Carlton, VIC 3053

+61 3 9035 3274

patricia.lavieri@unimelb.edu.au

