



NSW Electric Vehicle Owners Survey

Summary Report
Survey Period
Nov 2019 – Feb 2020

Key Results



Respondent Demographics

- Couples (without children) households (33%) or Couples with children (50%) made up the majority
- Full-time workers or part-time workers (72%)
- 78% live in detached house and 88% owned their home
- Tertiary educated – Bachelor degree or higher (78%)
- Higher than average household income bracket (75%)
- Around a third of respondents were from the Northern Sydney suburbs



Vehicle Ownership

- Less than 12 months old (68%)
- 1 other car in household (53%), 2 or more other cars (32%)
- Tesla most popular brand (78%)

Vehicle Usage

- 10,000-20,000 km/year (56%)
- Many regular trips start between 7 to 10 am (55%)
- The main purposes for regular trips were work, recreation and regular shopping (69%)
- The main purposes for occasional trips were recreation, holiday or visiting family/ friends (75%)
- 58% of regular trip distances were less than 20km compared to 19% for occasional trips



Home Charging

- Vast majority charge at home (83%)
- 10pm-7am was the most popular time for home charging (65%)
- Majority already do (18%) or would consider (58%) using a solar power system to charge their EV
- Decision on when to charge is based on 'when most convenient' irrespective of state of battery charge (37%)

Public Charging

- When using public EV chargers most do so for free (72%)
- The most used public charger locations were shopping centres
- Fast chargers were nearly always used for less than 60 mins



Electricity Pricing

- Above average awareness and knowledge about pricing options
- Around half were on an off-peak tariff for charging their EV, costing them around half as much as a single rate tariff on average
- 56% indicated they used timer setting controls to charge their EV

Demand Management

- 78% would consider participating in demand management (DM) programs for their EV charging
- 51% considered up to \$10 per event to participate in a DM program would be worthwhile
- Above average awareness of energy saving actions

Total of 129 owners of NSW registered electric vehicles responded to the survey

Background



In April 2019 Ausgrid joined the Charge Together Project (Phase 2), an ARENA-funded project* led by Everergi in partnership with NSW Government, EV Council and NRMA.

The aim of the overall project was to establish best practice integration of electric vehicles and their charging equipment with the electricity grid.

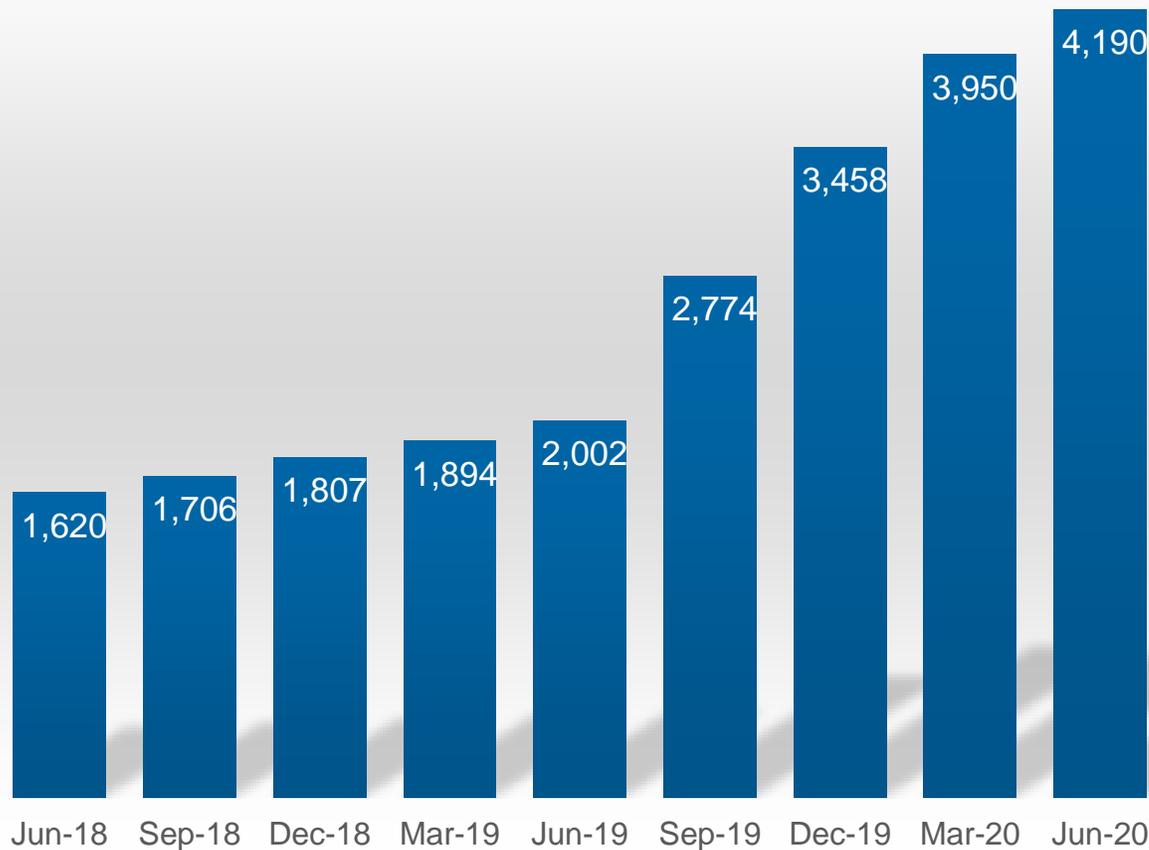
The focus for Ausgrid's involvement was to better understand customer preferences and electricity demand from electric vehicle charging to guide development of customer-side solutions and a smarter grid.

Ausgrid's support of the project was funded under the Demand Management Innovation Allowance (DMIA), a research and development fund to investigate potentially cost-effective demand management solutions as alternatives to investment in network assets.

The EV Owners Survey aimed to understand opinions and behaviours of private EV owners about their charging and driving patterns of their electric vehicles to inform demand management opportunities and forecast the emerging demand from charging electric vehicles.

Electric Vehicles - A New Electricity Load

NSW passenger electric vehicles



The number of registered electric passenger vehicles in NSW more than doubled between June 2019 and June 2020.

Electric vehicles can charge at many locations within the electricity grid and EV charging could be a significant new electricity load that has the potential to be effectively managed through demand management solutions.

The survey aimed to understand the patterns of EV drivers and the where, when and how private owners charge electric vehicles and the future demand management opportunities.

The EV Owners Survey coincided soon after the release of new models of electric vehicles in Australia (e.g., Tesla Model 3 and the New Nissan Leaf). It was completed by February 2020, just before the main impacts of the COVID pandemic started to affect Australians.



Purpose of Survey

What we wanted to know		Why?
Understand demographics of current drivers		<ul style="list-style-type: none"> • Potential patterns indicate where EV's will be charged and by whom. • Helps to target demand management programs more effectively.
Understanding EV owner opinions and motivations for purchasing an EV		<ul style="list-style-type: none"> • Provides insights into when EVs may start to appear in greater numbers on the Ausgrid network and when electricity demand may increase from EVs
How predictable is EV driving behaviour?		<ul style="list-style-type: none"> • Will it be possible to forecast the when and where of EV charging and then manage load, or will charging patterns be too irregular • Provides insights into locations to implement demand management solutions for EV charging
Potential to participate in demand response initiatives		<ul style="list-style-type: none"> • To understand what demand management techniques will be more effective with EV drivers and the demand management potential
Understanding how far people travel and how often will they charge		<ul style="list-style-type: none"> • How long will people charge each night?
Understand where they drive		<ul style="list-style-type: none"> • Where on the network will people charge?

Survey Details

Survey Timing:

- Opened in November 2019
- Closed in February 2020
- 10 to 15-minute online survey
- Eligibility for incentive – registered NSW electric vehicle

Outcome:

- Received a total of 129 responses from owners of NSW/ACT registered electric vehicles (80 in Ausgrid network)
- 114 were interested to be engaged in further research
- 4 households had 2 electric vehicles

Potential selection bias:

- Highly engaged early adopters
- High penetration of Tesla drivers
- Higher income bias due to higher cost of early models of electric vehicles

Distribution and Supporting Communication

- Partner organisations (NRMA, EV Council, EVenergi)
- Distributing through electric vehicle owner clubs (Tesla)
- Ausgrid's Facebook page and website
- Ausgrid's website
- Ausgrid's media release announcements



Respondent Locations

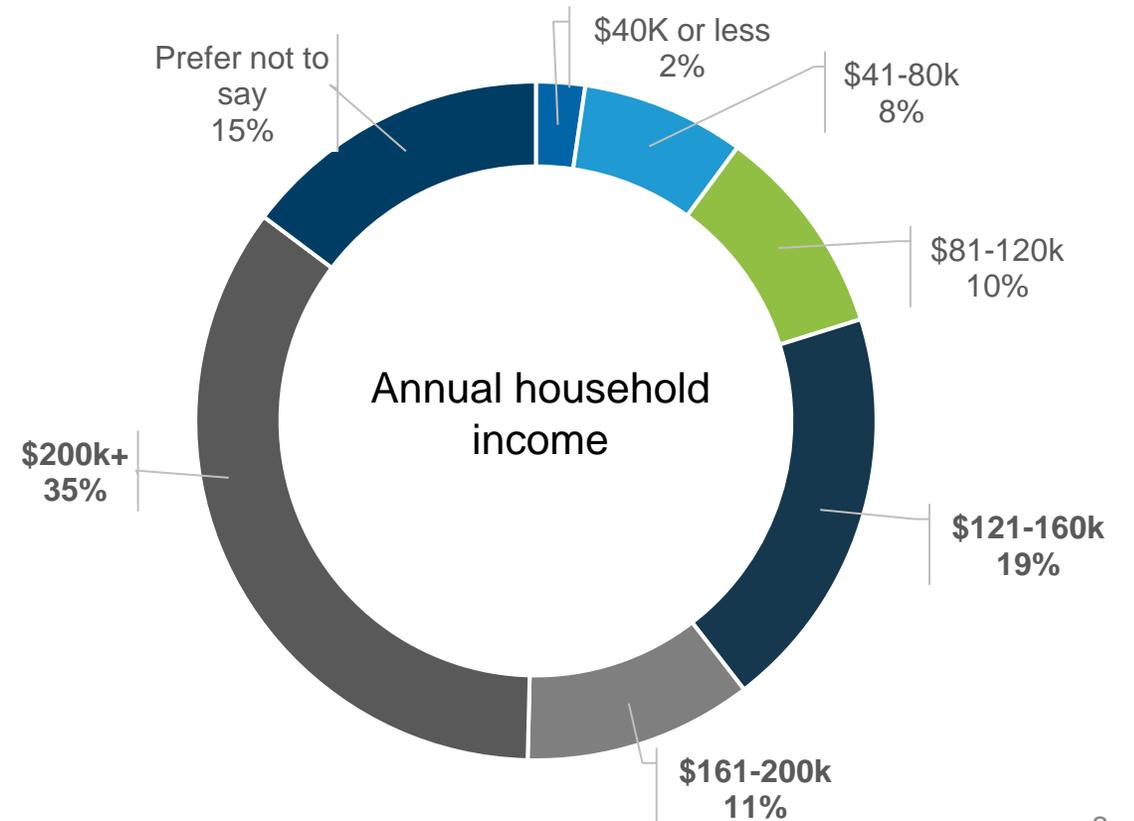
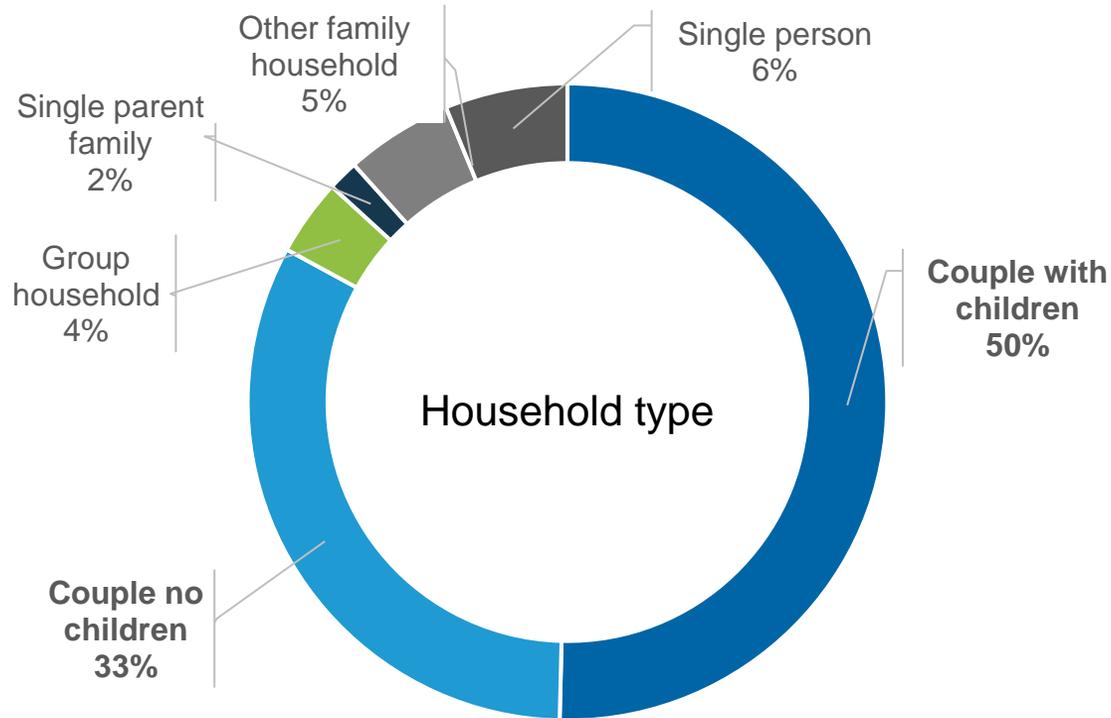
What we wanted to know and why	Results
Understanding where EV drivers live may be an indicator of future concentrations of electric vehicle charging needs and where local EV focused demand management solutions may be most viable.	<ul style="list-style-type: none"> Geographically diverse spread across Greater Sydney Higher skew towards Sydney northern suburbs with 33 respondents in the local councils of: Northern Beaches, Hornsby and Ku-ring Gai

Network	Region	Respondents
Ausgrid	North-eastern Sydney	41
Ausgrid	South-eastern Sydney	27
Ausgrid	Central Coast and Hunter	24
Endeavour Energy	Western Sydney, Illawarra and the Blue Mountains	22
Essential Energy and EvoEnergy	Regional NSW and ACT	15
Total Respondents		129



Respondent Demographic Profile

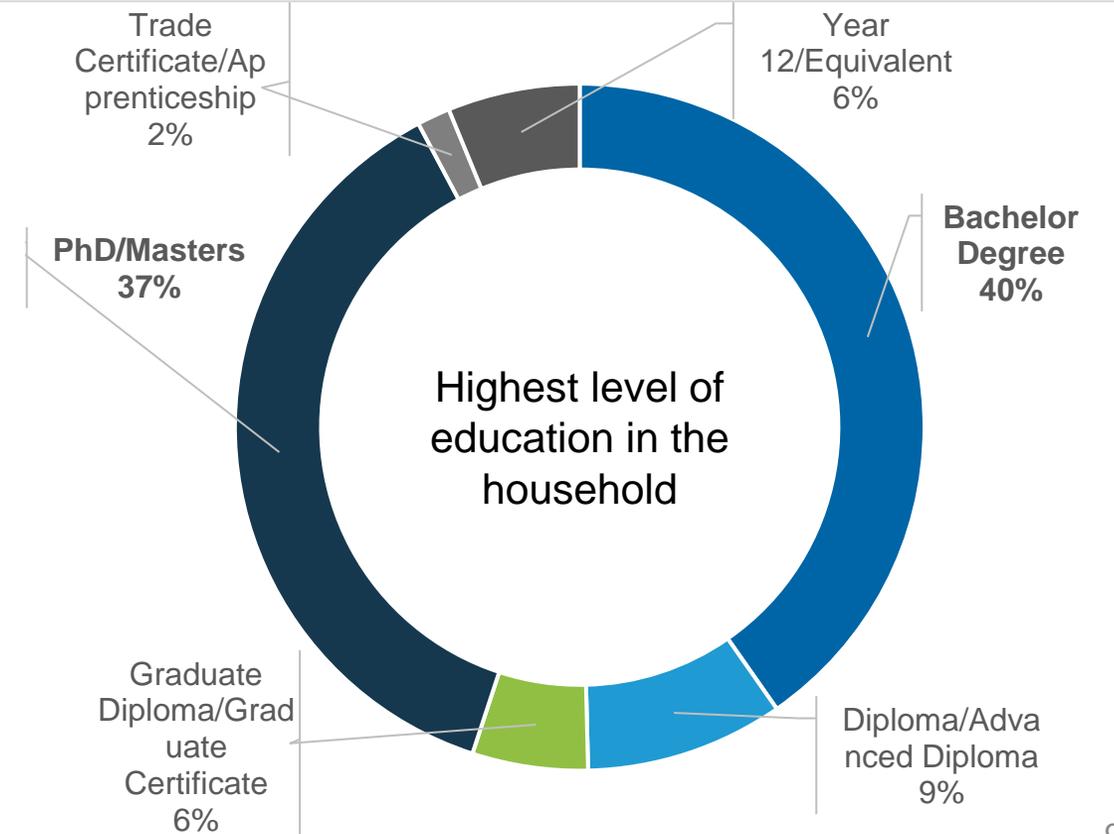
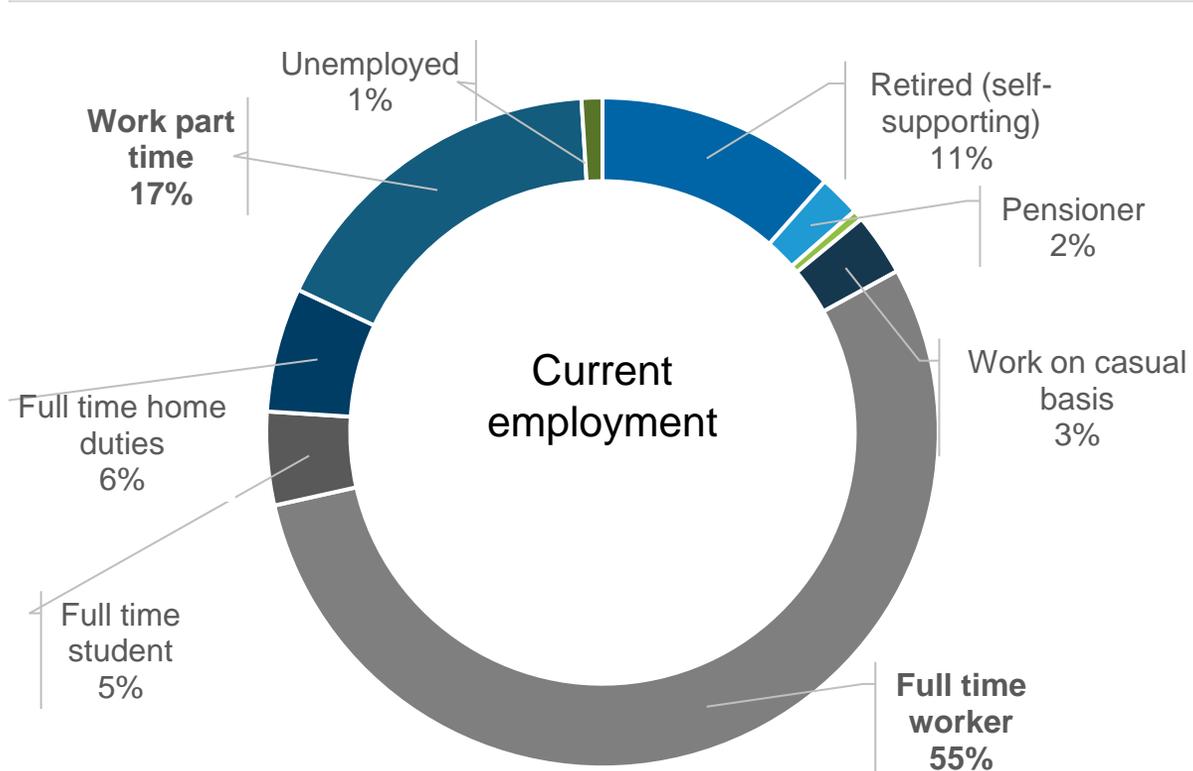
What we wanted to know and why	Results
<p>Understanding household demographics provides important background into the characteristics of customers with flexible resources which can help guide messaging and offer structures for future demand management solutions.</p>	<p>Respondents were predominantly couple households (83%) with high household incomes (65%, >\$120k per annum)</p>



(n = 129, all respondents who own a registered electric vehicle in NSW/ACT)

Respondent Demographic Profile

What we wanted to know and why	Results
<p>Understanding household demographics provides important background into the characteristics of customers with flexible resources which can help guide messaging and offer structures for future demand management solutions.</p>	<p>Respondents were predominantly full-time workers (55%) with high levels of education (77% with Bachelor degree or higher)</p>



Dwelling Type and Tenure

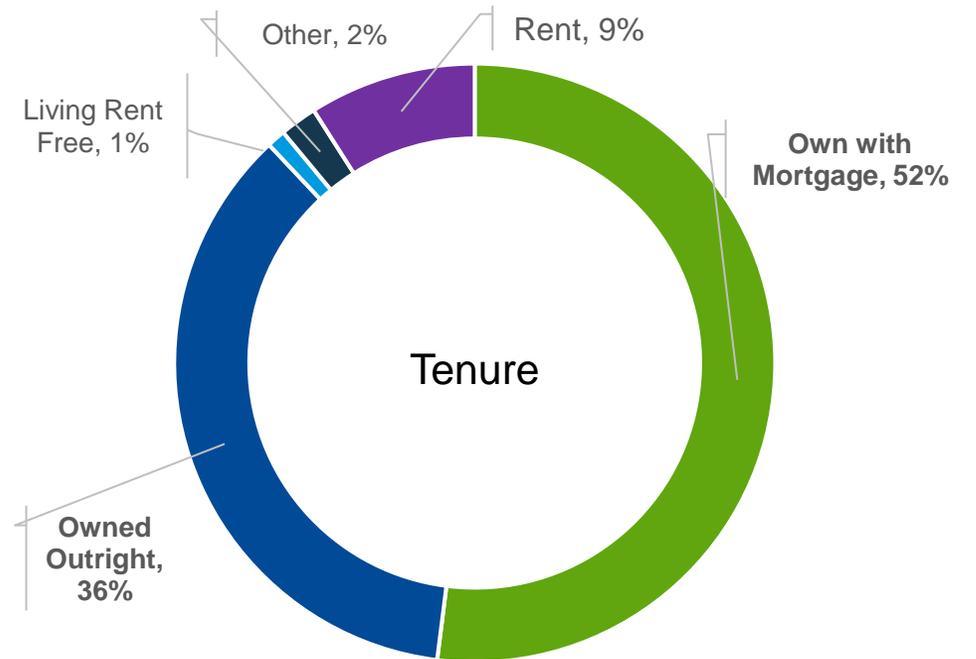
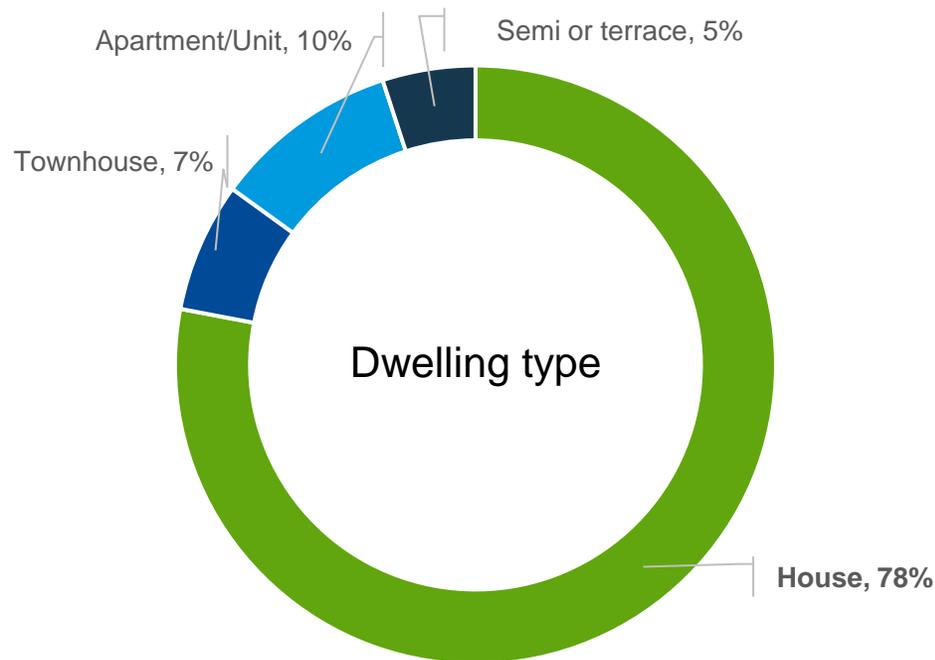
What we wanted to know and why

Understanding the type of dwelling helps to inform our understanding of the degree of home charging vs away from home charging.

Knowledge of tenure may be important as charging behaviours may differ from home owners.

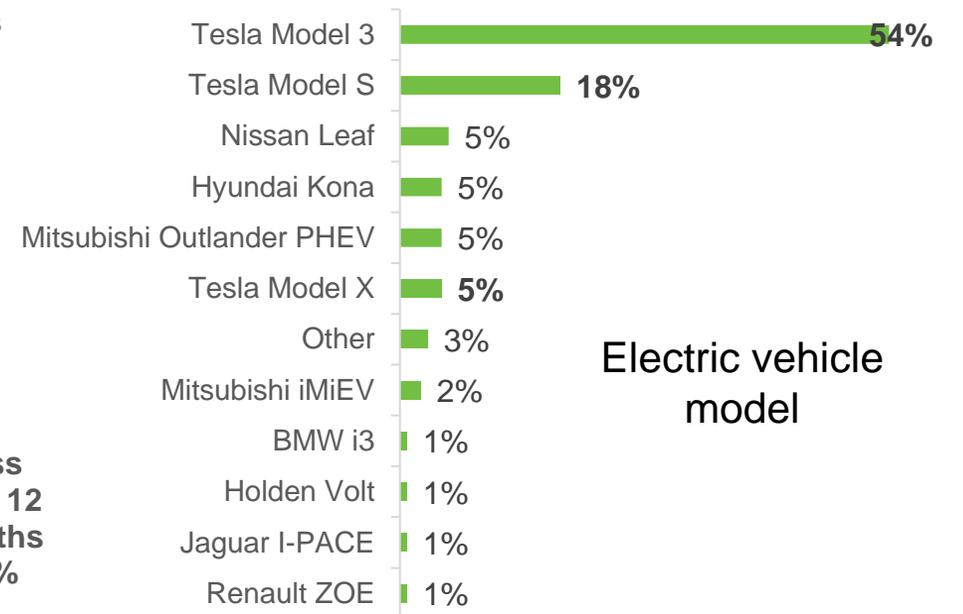
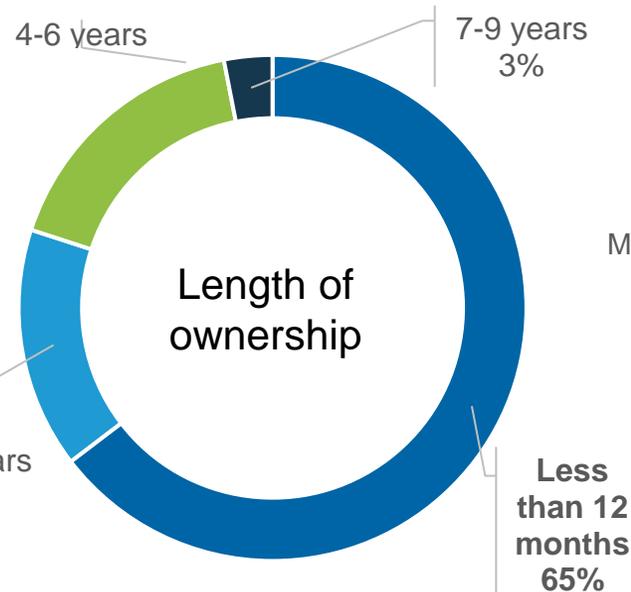
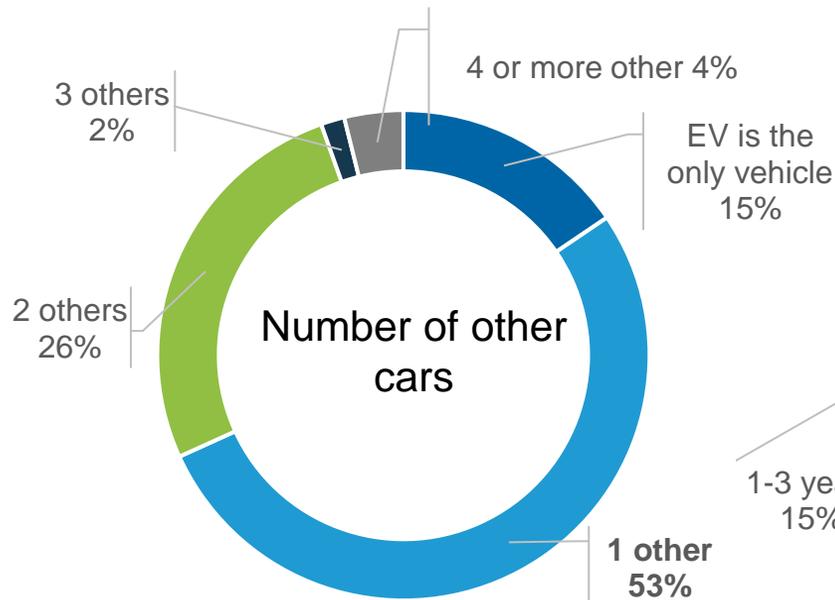
Results

- Most respondents live in a free standing house – which aligns with the ability to charge at home
- There was also a very high number of house owners indicating affluence and the ability to install a charger at home



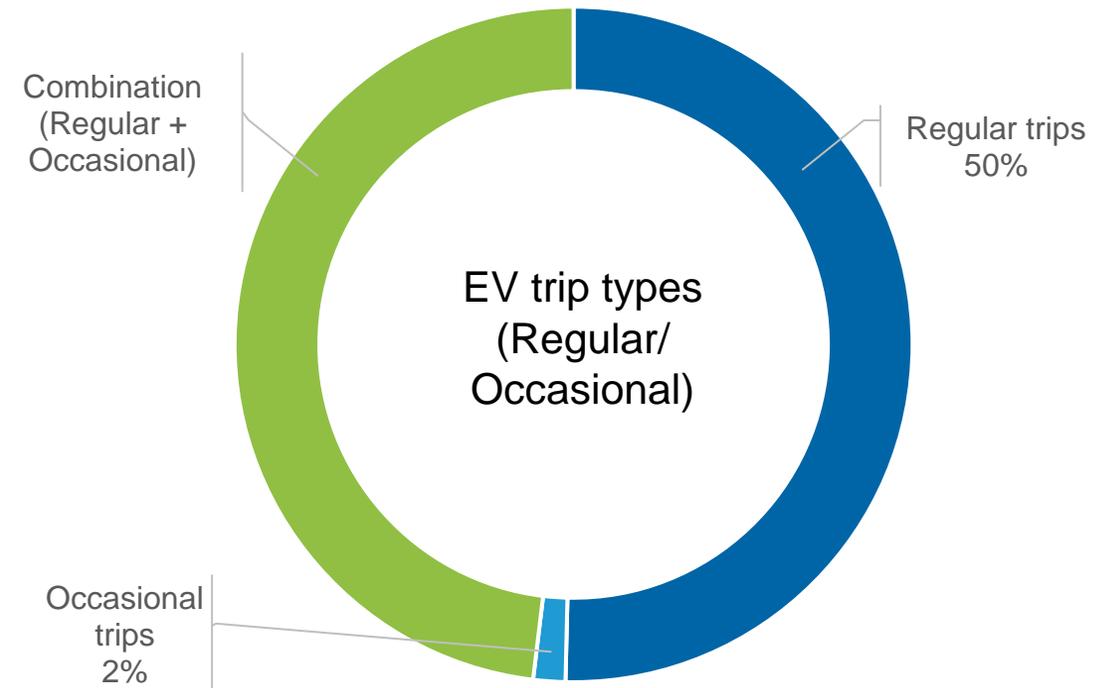
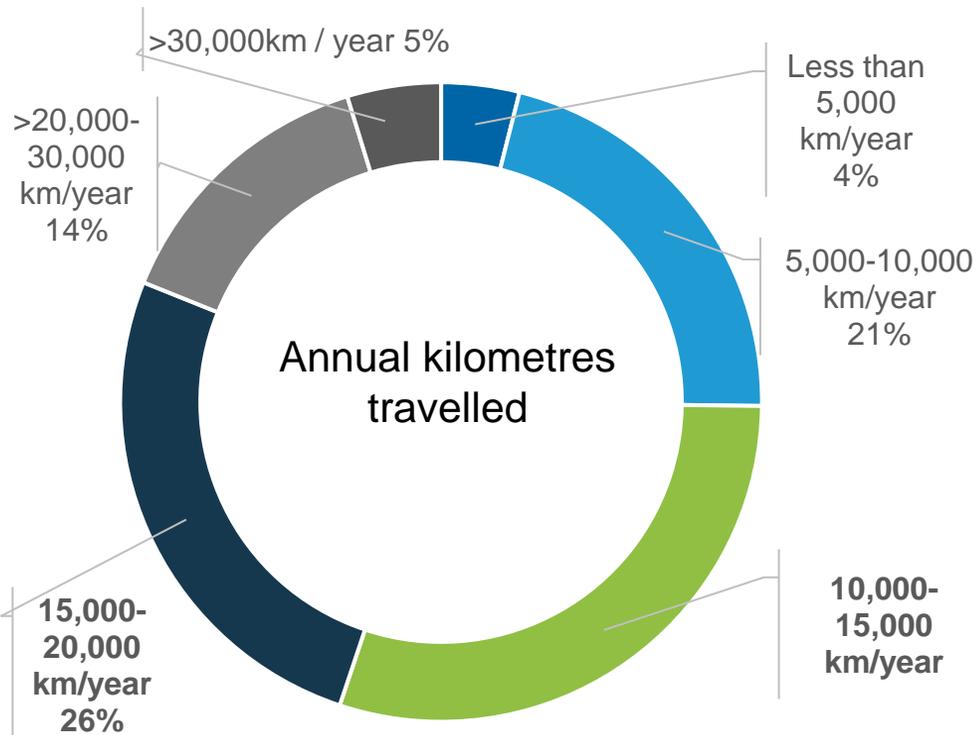
Vehicle Ownership

What we wanted to know and why	Results
<p>Understanding the types of electric vehicles indicates the range and battery charging requirements and also helps to understand the pricing and supporting EV charging “eco-system” requirements. For example, demand management solutions can be tailored for owners of different car models.</p> <p>Understanding overall car ownership and length of ownership also helps to understand trip patterns.</p>	<ul style="list-style-type: none"> • 77% of respondents were Tesla owners and only a small number of Plug-in Hybrid Electric Vehicle (PHEV) owners responded • 65% owned the EV for less than 12 months • 53% of respondents had a second car and further 32% had an additional 2 vehicles or more • Findings indicate the recent availability of models in Australia and selection bias towards Tesla owners from survey respondents



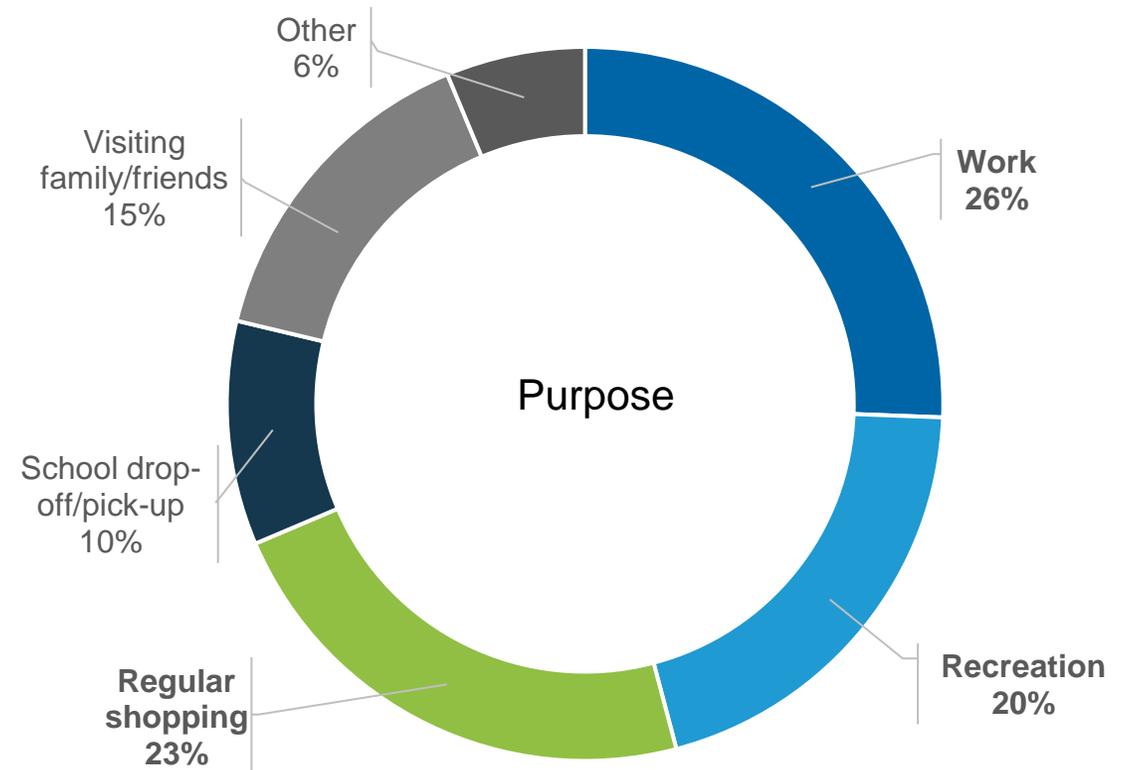
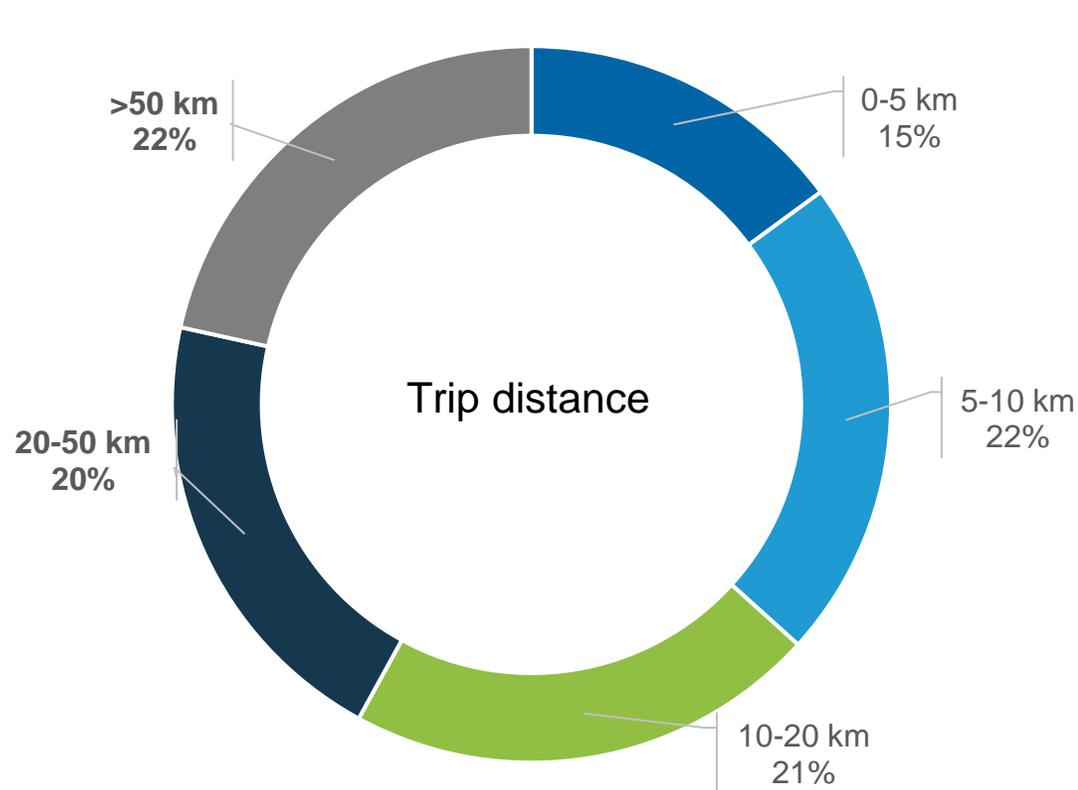
Electric Vehicle Usage

What we wanted to know and why	Results
<p>Distances travelled can help determine the amount of kWh consumption for the EV driver and electricity supply requirements. Regular or occasional usage of an EV helps to understand the potential charging locations and times of day to charge.</p>	<ul style="list-style-type: none"> • 56% of the EV owners travel between 10,000-20,000 kms annually • A high percentage of respondents used their EV for regular trips – which would indicate more predictable network impacts



Regular Trips – Distance and Purpose

What we wanted to know and why	Results
<p>Understanding the destinations of regular trips can help identify locations where EV owners will charge and guide solution design.</p>	<ul style="list-style-type: none"> 69% of regular trips could be designated into three categories (work, shopping and recreation), with work being the most common type of regular trip 42% of the regular trips travel were more than 20km per trip



(n = 129, all respondents who own a registered electric vehicle in NSW/ACT)

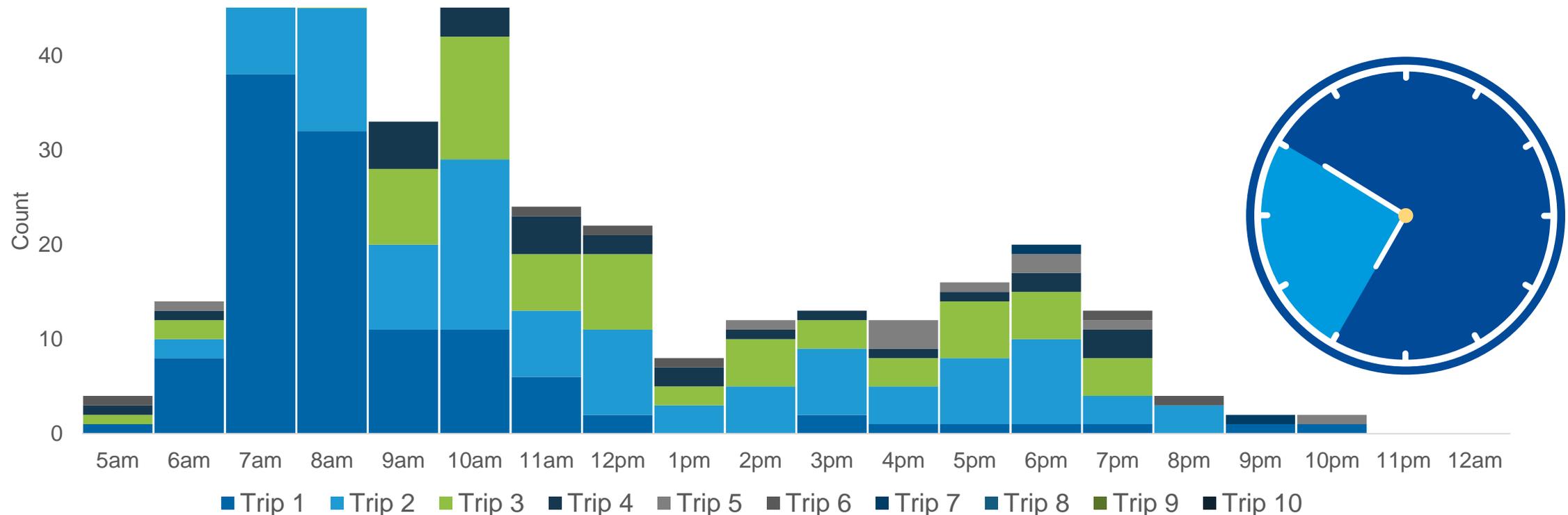
Regular Trips – Time of Day

What we wanted to know and why

Understanding the timing of regular trips can help identify when and where electric vehicle charging may occur.

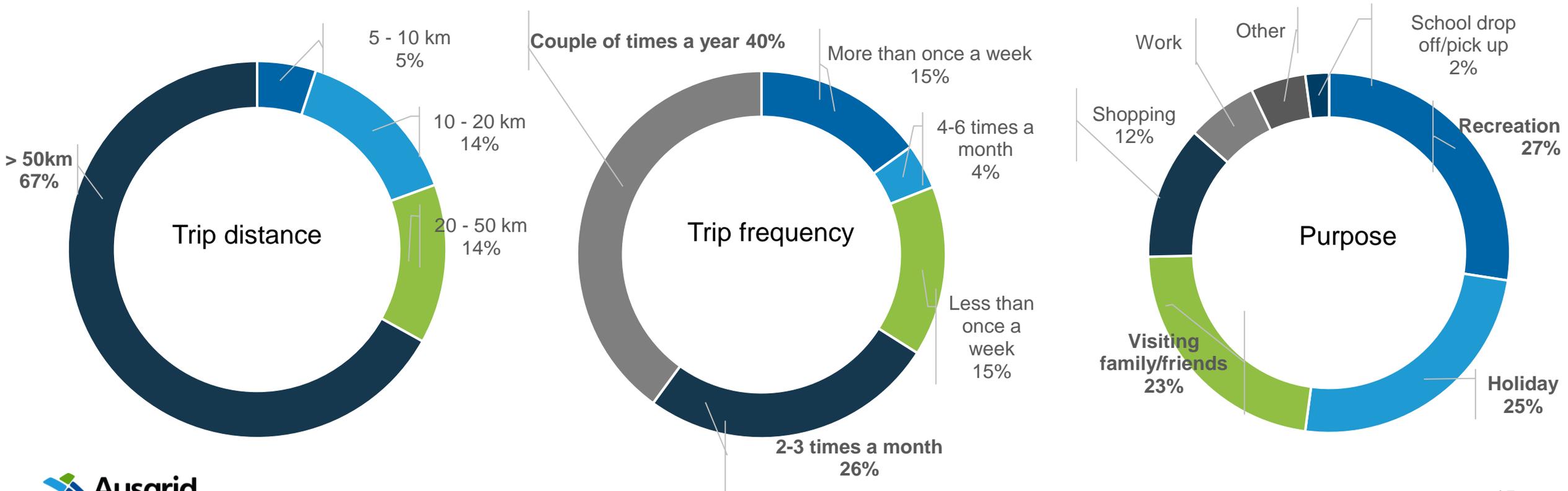
Results

- 55% of the regular trips start between 7am to 10am
- Destination charging, such as at work, before returning home could be a potential location for electric vehicle charging



Occasional Trips

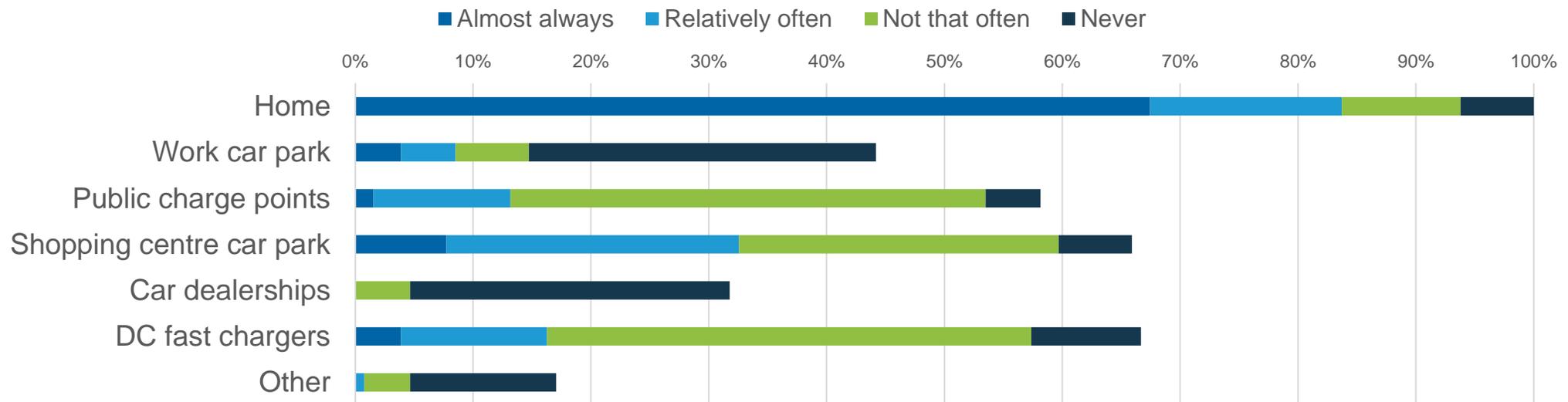
What we wanted to know and why	Results
<p>Understanding the distance, frequency and purpose of occasional trips indicates the potential electric vehicle charging requirements at destinations.</p>	<ul style="list-style-type: none"> • 66% of occasional trips are very infrequent (less than once a month) • 67% of occasional trips are over 50 km compared to 22% for regular trips • 75% relate to either holidays, recreation or visiting friends and family



Charging Location and Charging Frequency

What we wanted to know and why	Results
<p>Understanding how often EV owners charge at different locations is a significant indicator of where the electric vehicle charging may occur and guide solution design.</p>	<ul style="list-style-type: none"> • 83% charge at home almost always (67%) or relatively often (16%) • Shopping centre car parks were used by around 60% and were the next most common to be used often (33%) • Public charge points and DC fast chargers were used by around 50% to 60% but not used that often (10 to 20%) • Work car parks were only used by 15% of respondents

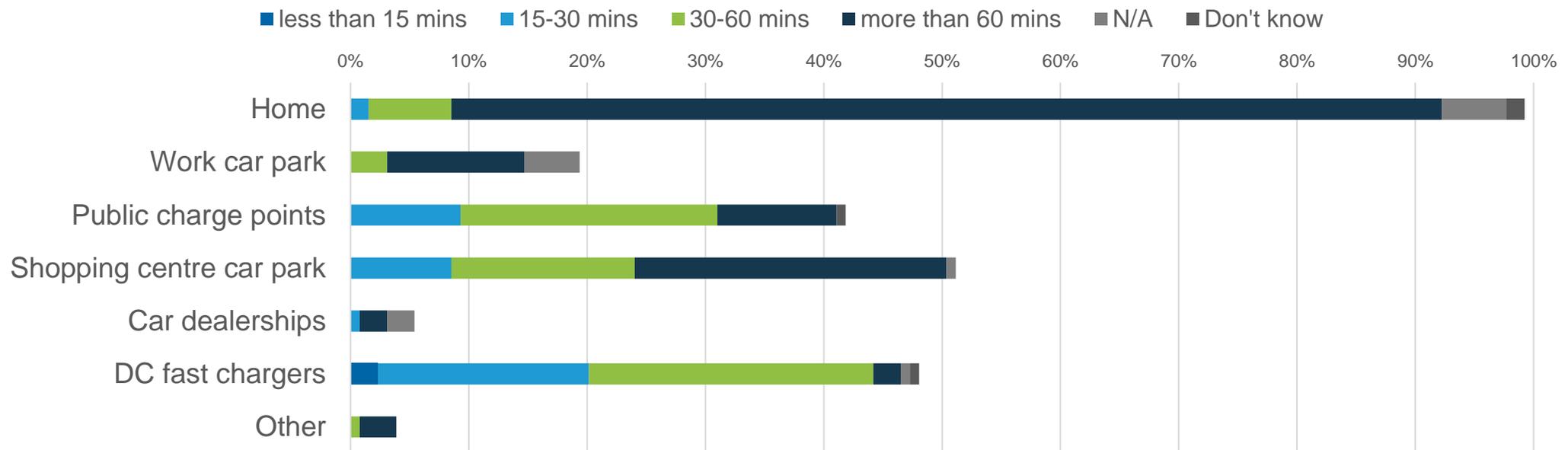
How often do you charge at the following locations?



Charging Location and Charging Duration

What we wanted to know and why	Results
<p>Understanding how much time an EV owner charges at a different location helps guide local impacts and potential to manage the charging times.</p>	<ul style="list-style-type: none"> • The majority of home charging (84%) was for longer than an hour • Charge times of under 60 minutes were most common at DC fast chargers (44%) and public charge points (31%) • Shopping centres had almost equal amount of charge times under an hour (25%) and over an hour (26%)

How long do you usually take to charge?



Public Charging

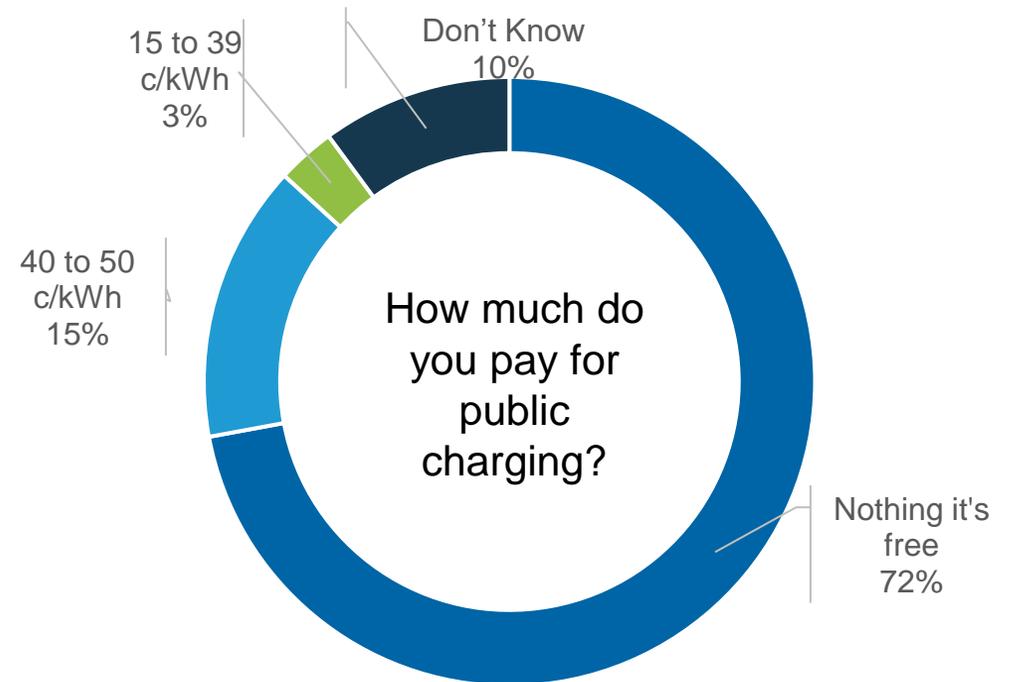
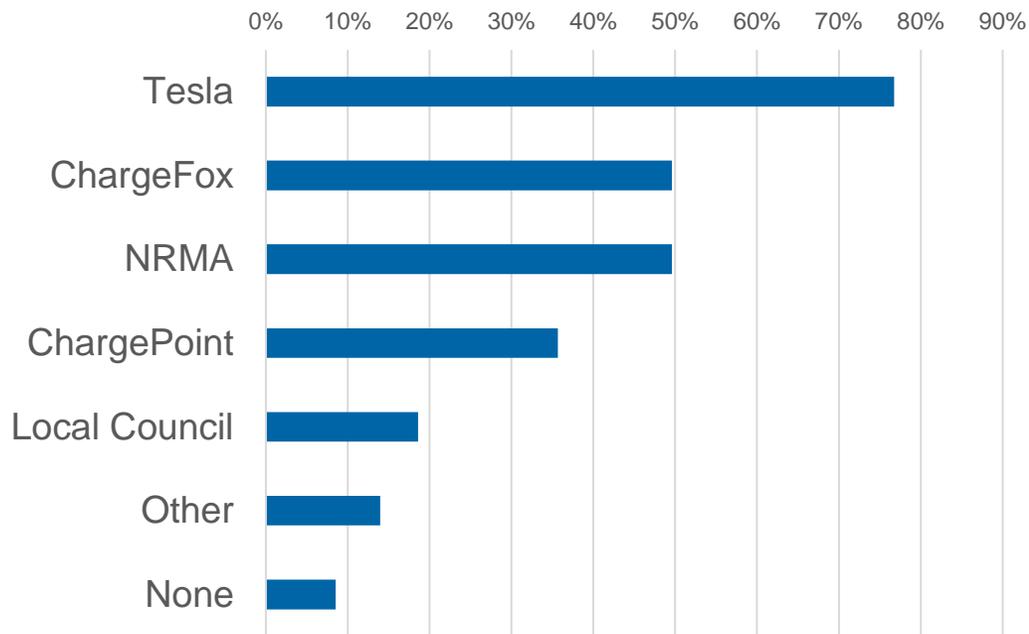
What we wanted to know and why

Understanding how much EV drivers pay at public charge points helps to understand how these charging facilities might form part of a demand management solution.

Results

- 72% indicated that public charging was free (due to the high number of Tesla owners)
- Of those that paid for public charging, the majority indicated it was in the 40 to 50 c/kWh range

Public Charging Providers Used



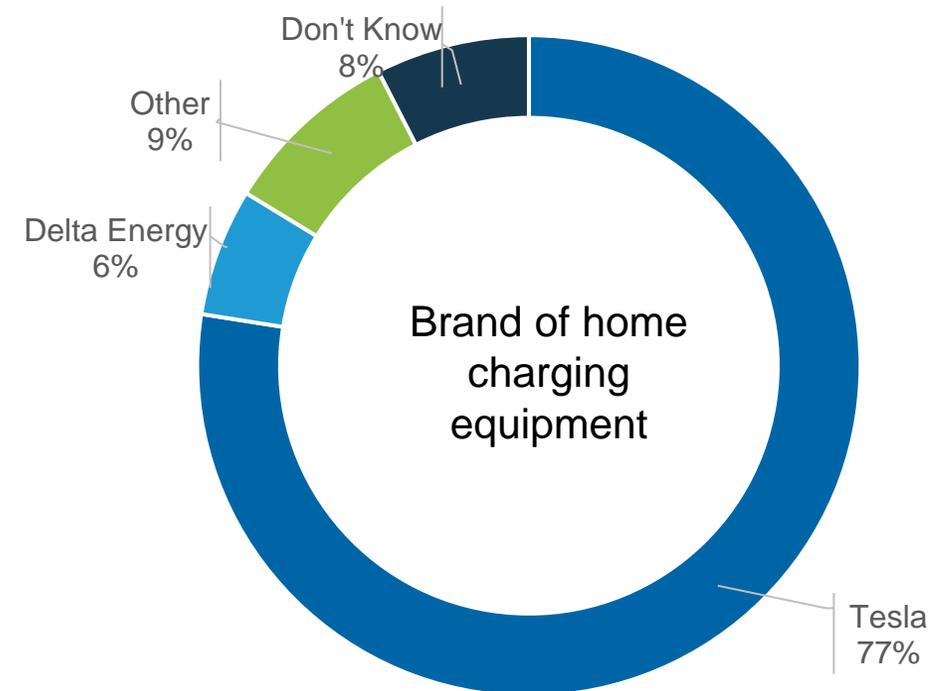
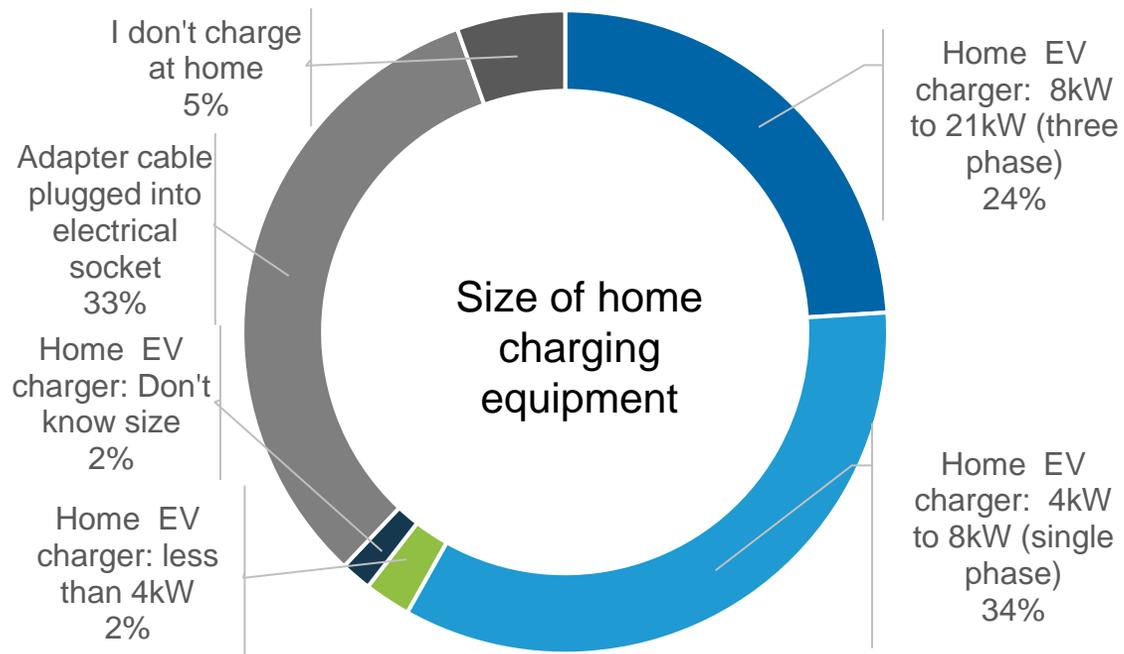
Home Charging Equipment

What we wanted to know and why

The type of home charging equipment indicates both the potential maximum electricity demand, the flex capability offered and potential for vehicle-to-grid or vehicle-to-home capability.

Results

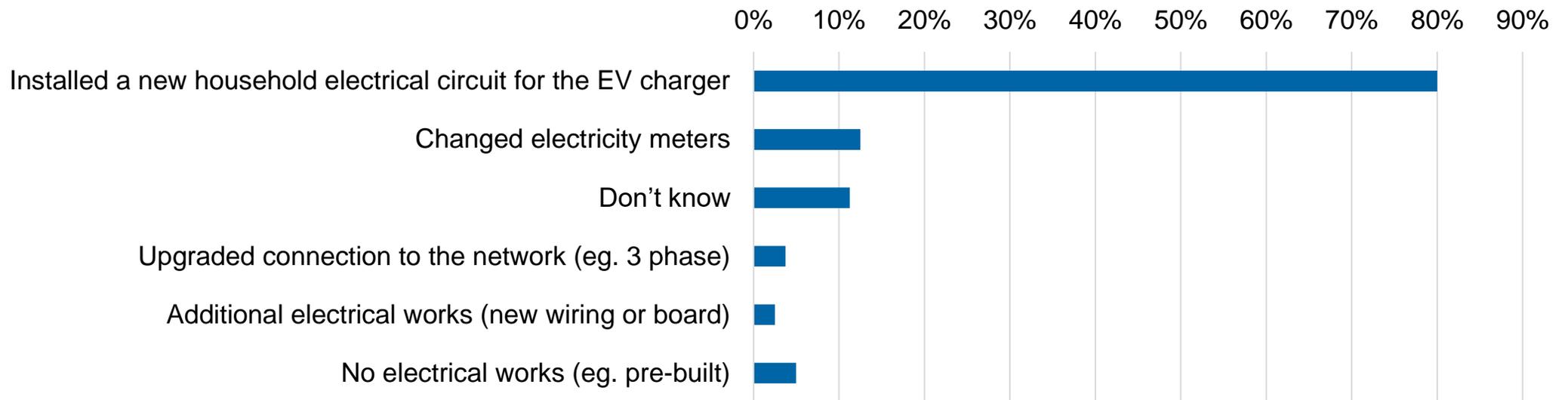
- 62% of respondents installed their own dedicated home EV charging equipment
- The majority of home EV charging equipment (77%) was Tesla indicating a more standardized electric vehicle charging “eco-system” including Tesla home chargers and free away from home charging stations



Installing Home Charging Equipment

What we wanted to know and why	Results
<p>The type of electrical works required to install home charging equipment indicates the additional upfront cost of ownership for purchasing an electric vehicle.</p> <p>The type and amount of electrical works performed also helps us understand the size and location of electric vehicles being installed.</p>	<ul style="list-style-type: none"> • Most households had some electrical work done to facilitate the EV charger installation • Only 10 respondents indicated that a connection application was completed to the network (33 said No, 37 did not know) • Only 7 respondents indicated that they received a Certificate of Compliance for the Electrical Work from the electrician

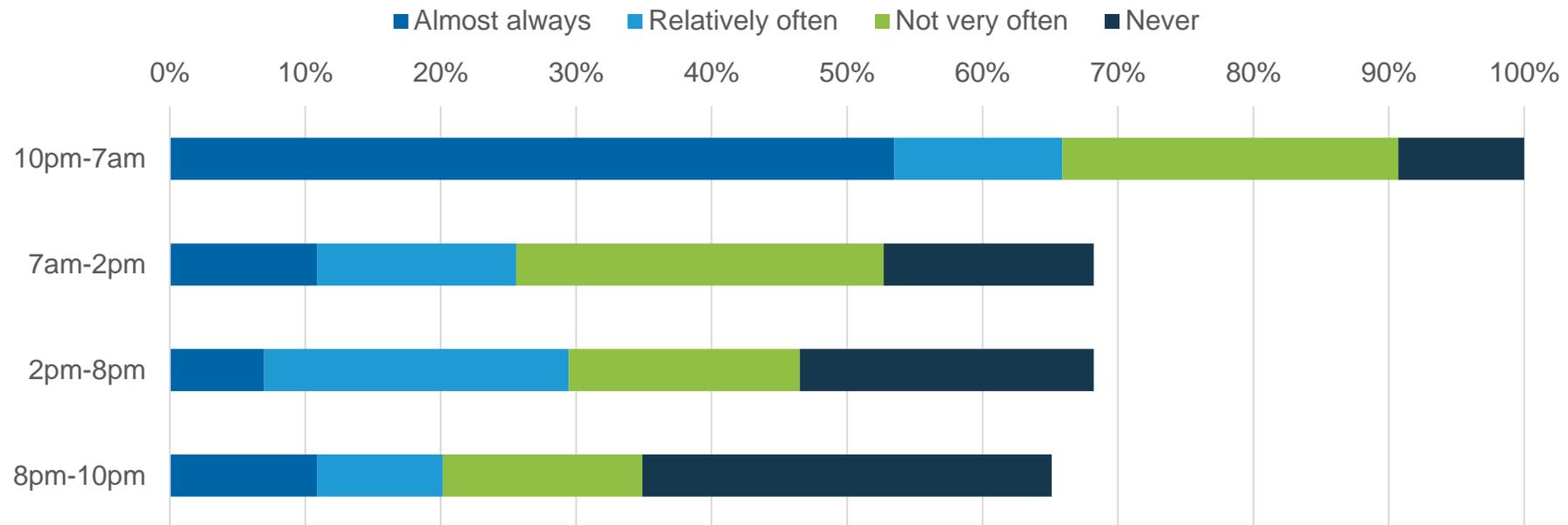
Did you require any of the following electrical work to be done to install your home charging equipment?



Home Charging Times – Frequency

What we wanted to know and why	Results
Time of day of charging is particularly important for understanding when EVs will impact demand on the network and the types of solutions which may alleviate issues.	<ul style="list-style-type: none">The most popular time to charge is 10pm-7am with 53% charging almost always at this time.

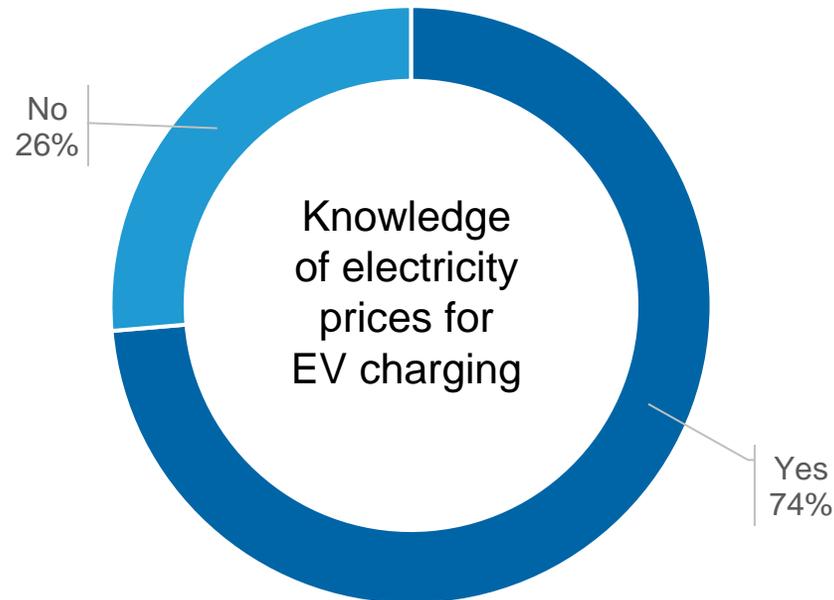
How often do you charge your electric vehicle at home during the following time periods?



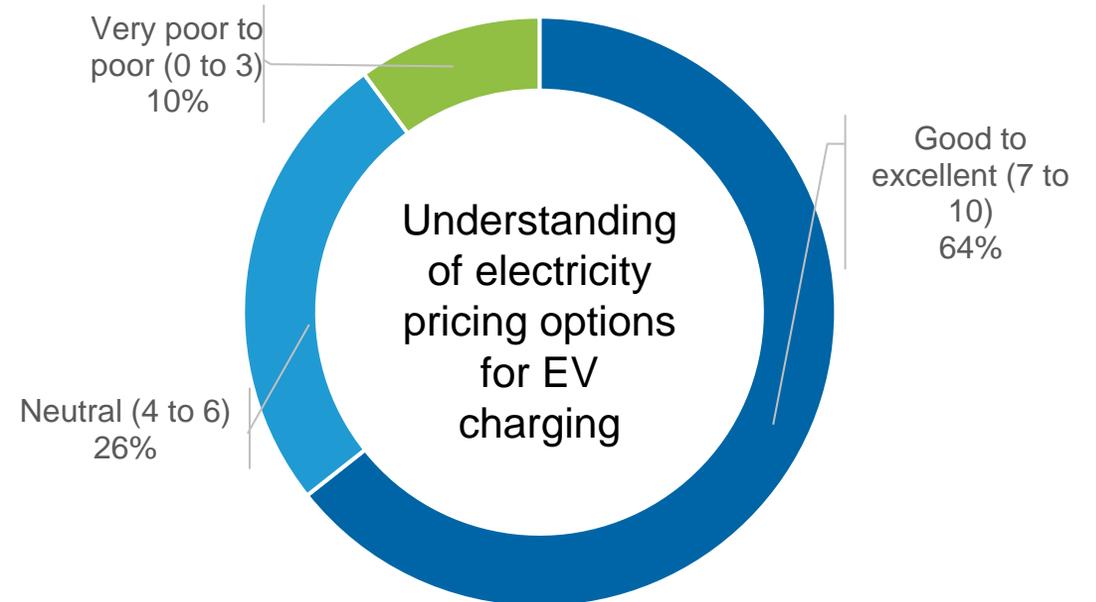
Pricing Options

What we wanted to know and why	Results
We wanted to know if EV owners had a good understanding of what they paid for charging their electric vehicle and their pricing options.	<ul style="list-style-type: none">• The results indicated a good understanding of the price they paid for charging their EV with 74% providing the rates they paid• 64% had a good to excellent understanding of their pricing options

Do you know what retail electricity price you pay to charge your electric vehicle at home?



How would you rate your understanding of your electricity pricing options for charging your electric vehicle at home? (0 to 10)

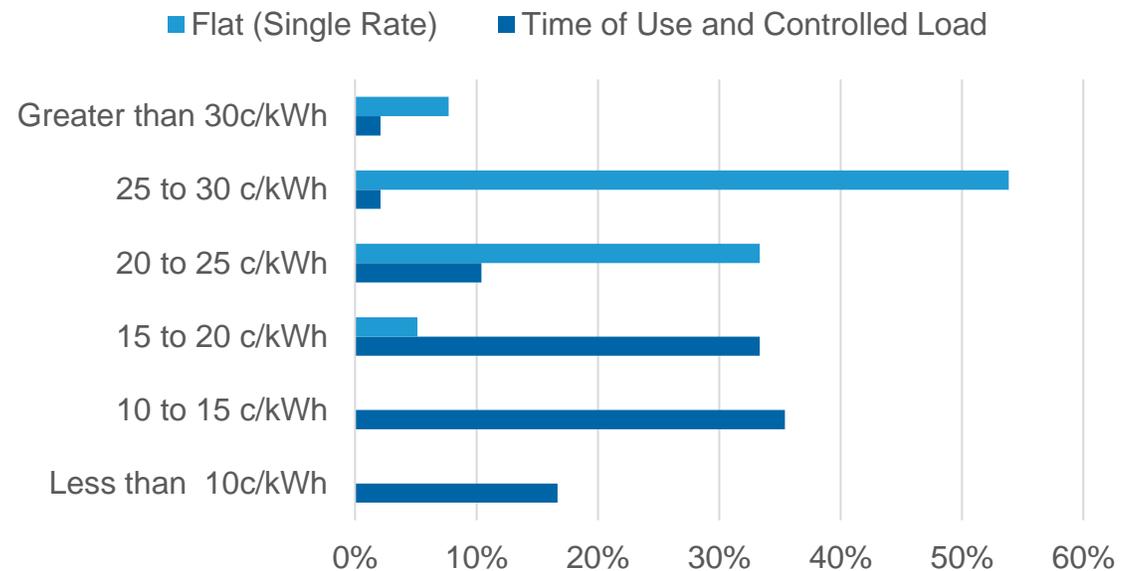
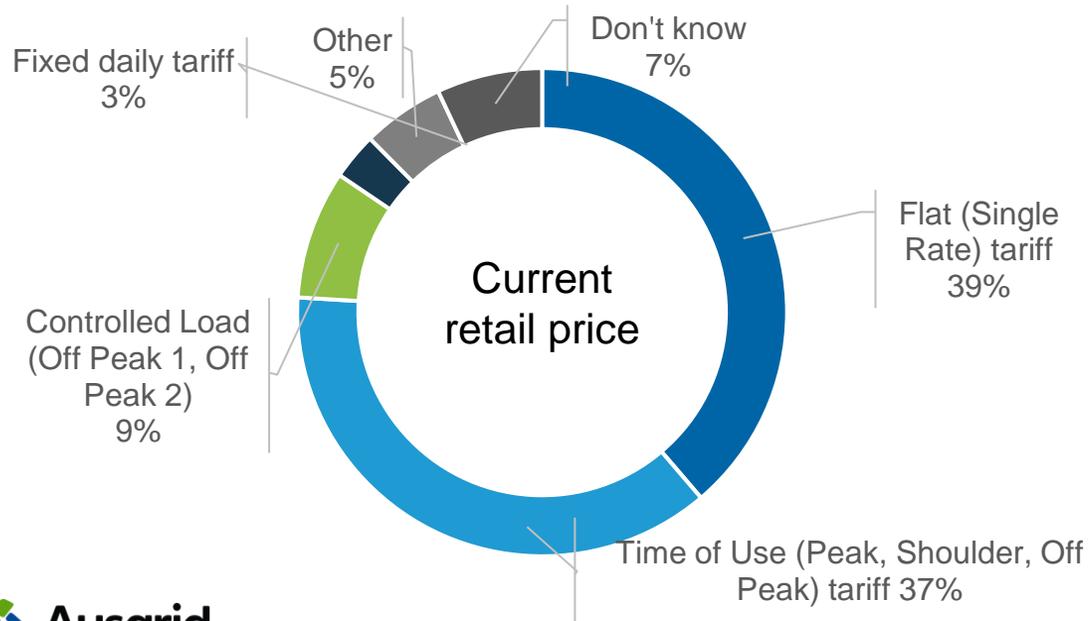


Pricing Structures and Rates

What we wanted to know and why	Results
Whether EV owners were already charging their electric vehicles in off peak times to reduce their EV charging costs.	<ul style="list-style-type: none"> A large percentage of EV drivers (46%) were already on a time of use or controlled load tariff for their EV charging 75% of customers on a time of use or controlled load pricing structure were paying less than 20 c/kWh, and 95% of those on a flat (single rate) tariff were paying greater than 20 c/kWh.

Which of the following best describes what retail pricing you are currently on for your electric vehicle?

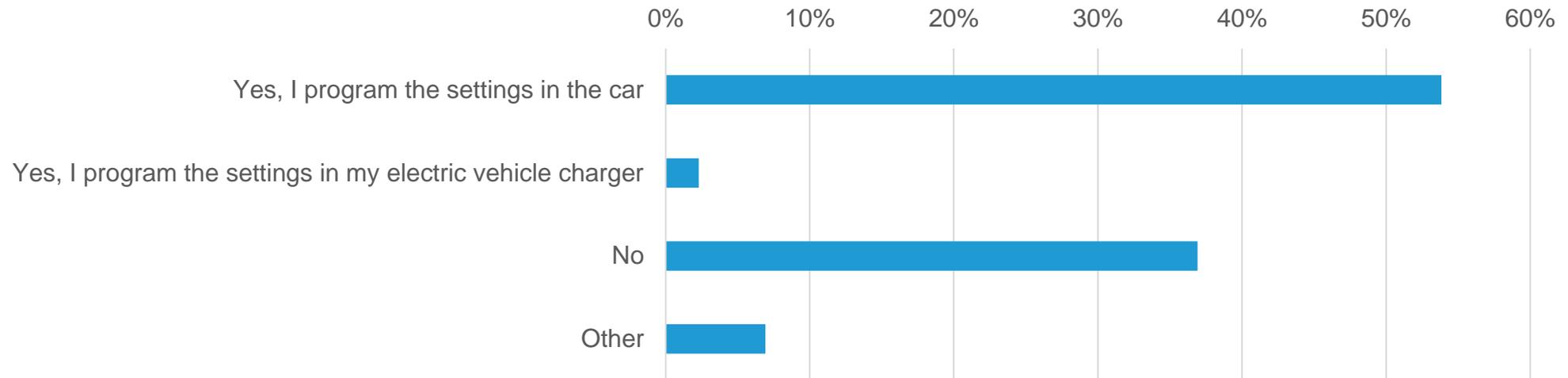
Please specify the rate (c/kWh) if you know it, or provide best estimate



Use of Timers

What we wanted to know and why	Results
Understanding whether EV drivers already use timer settings to control their EV charging helps to understand the potential for demand management.	<ul style="list-style-type: none">• 56% use timer setting to control the time of when they charge their electric vehicle• The electric vehicle was the most common place where the timer settings were programmed

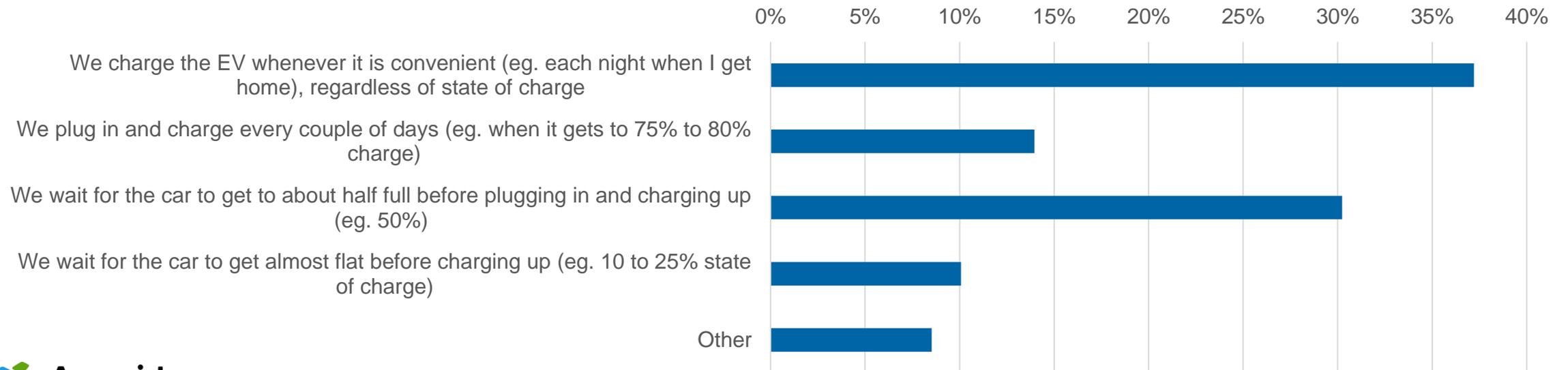
Do you use timer settings to control the time periods at which your electric vehicle charges?



State of Charging Behaviour

What we wanted to know and why	Results
<p>Understanding whether EV drivers charge (or “fill up”) their vehicles more often than conventional vehicles indicates the potential regularity and EV charging behaviours of customers.</p> <p>It also helps to understand the potential for demand management, shifting the need to charge or drawing upon stored energy for vehicle to grid applications.</p>	<ul style="list-style-type: none"> • 51% charge whenever it is convenient or every couple of days • Only 10% of drivers wait until the battery is almost flat before charging • This indicates a potential shift to a “top-up” mentality for charging electric vehicles. • This may be due to the convenience of home charging or potentially an EV range consideration (further research would be required)

Which of the following statements best describes the state of charge of your electric vehicle when you charge it?



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Demand Response Participation

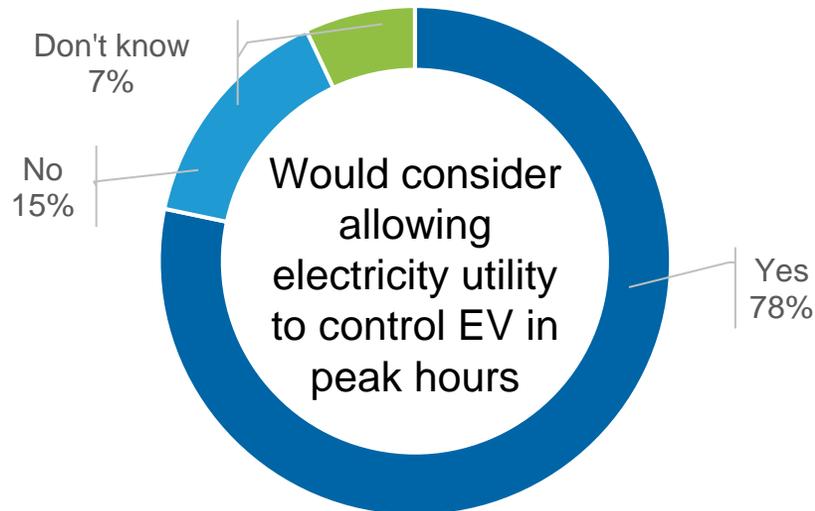
What we wanted to know and why

This question provided insight directly into the idea of an electricity company controlling the EV charger load for a financial incentive. Customer expectations around the level of payments indicates whether a demand management program may be cost effective.

Results

- A large majority of EV drivers (78%) felt comfortable with utilities controlling the charging of their EV on peak days for an incentive
- Around 51% indicated that up to \$10 per event made it worth their while to participate in a peak demand program

Would you consider allowing an electricity utility to control your electric vehicle charger during peak hours of the day for a financial incentive paid to you?



If we paid you a financial incentive for every time we wanted to reduce your electric vehicle's charging availability during peak times (4pm to 8pm weekdays) up to 10 times (or 10 'event's) per year, what amount would you expect to receive to make it worth your while to participate? Provide an approximate dollar amount (per event), without the dollar sign

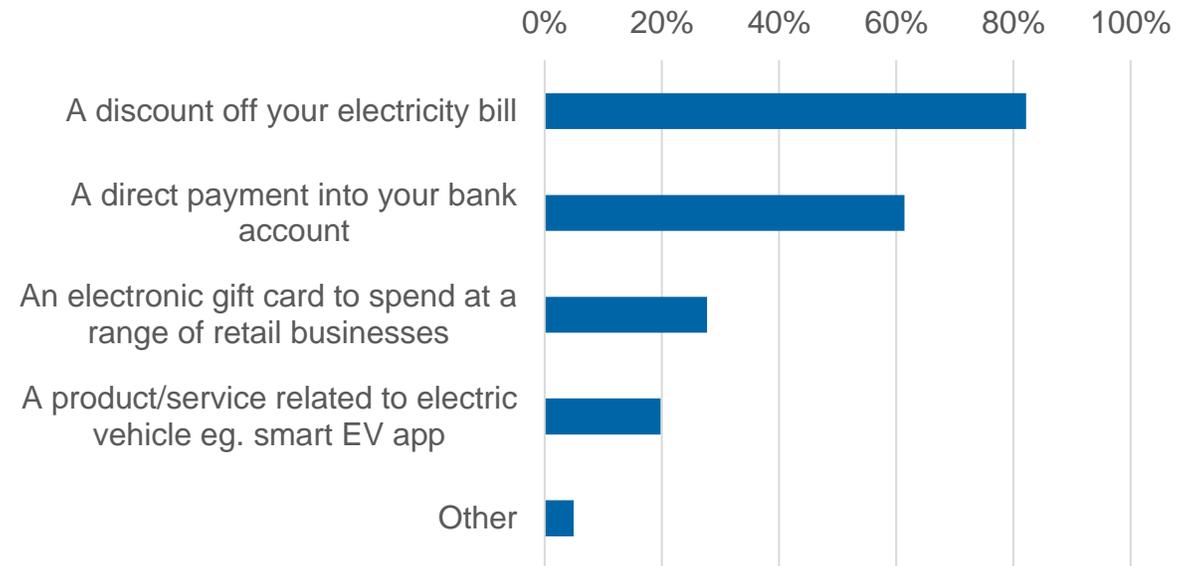
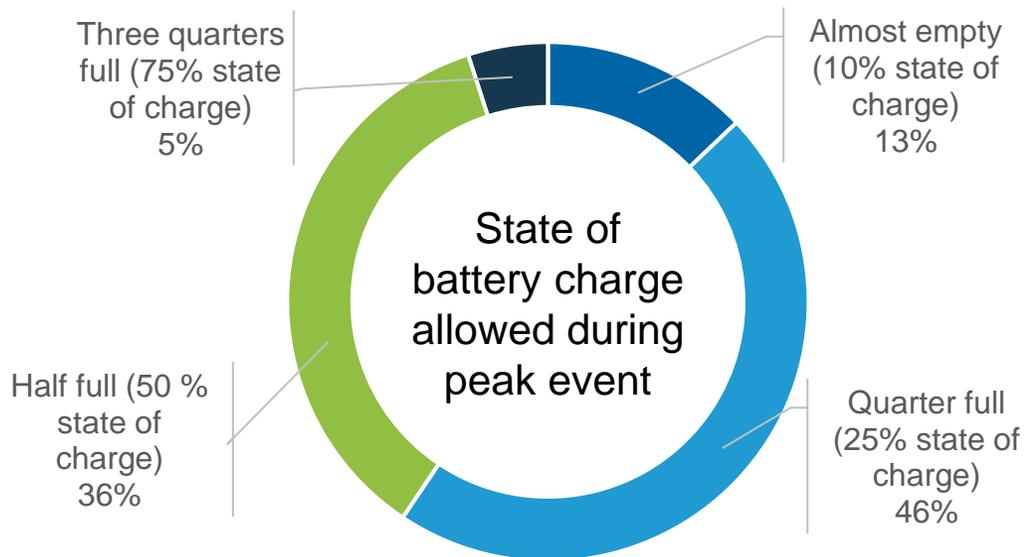


Demand Response Options

What we wanted to know and why	Results
<p>What other preferences or characteristics of a demand response program might be attractive for a customer.</p>	<ul style="list-style-type: none"> • Around 59% of respondents would allow their EV battery to be almost empty or quarter full and further 36% to be half full to participate • Most respondents indicated that a discount off their electricity bill (82%) or a direct payment (61%) was most attractive for participation

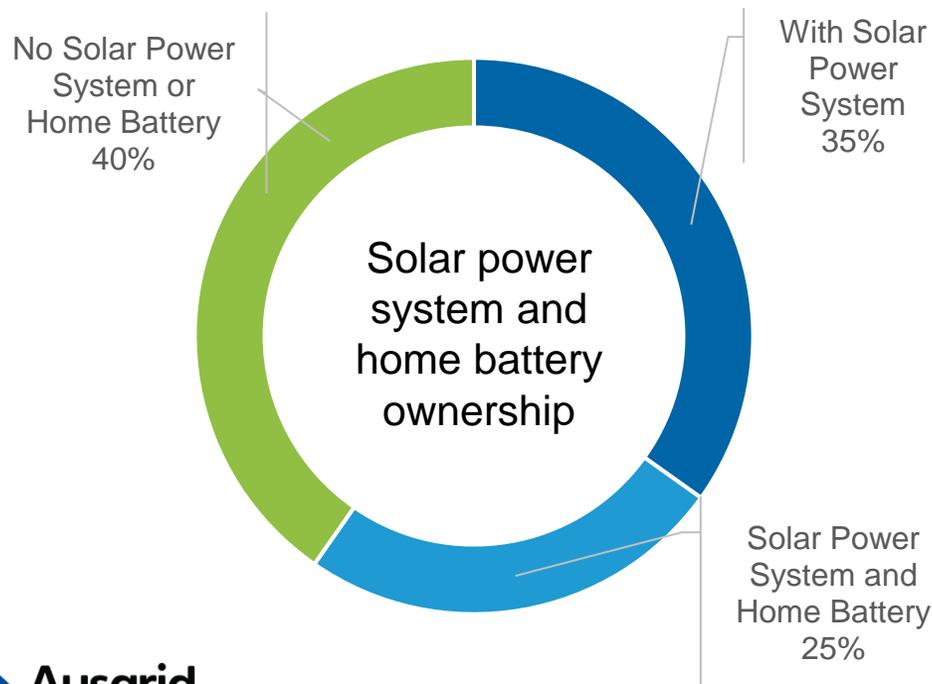
If you were going to participate in a program described above, how flat would you allow the battery in your vehicle to get before opting out?

What types of incentives would attract you to participate in such a program? (Select all that apply)

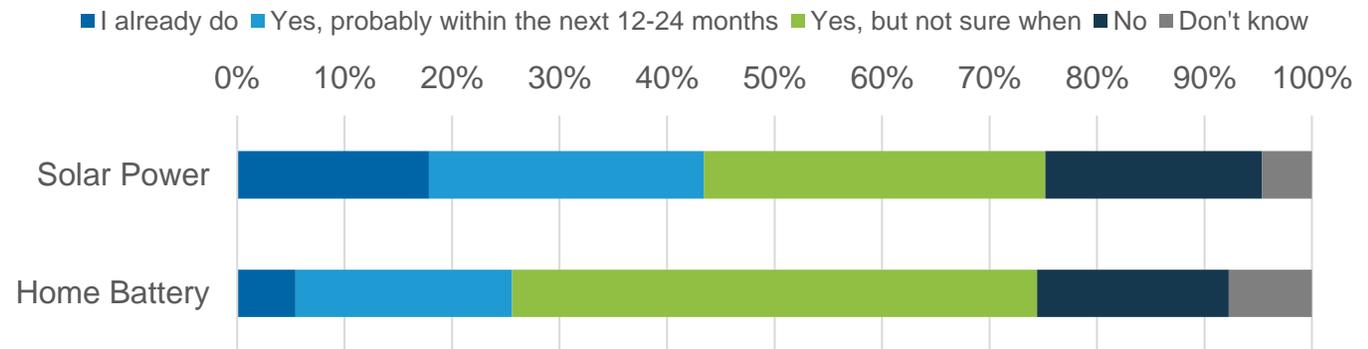


Solar and Battery Ownership and EV Charging

What we wanted to know and why	Results
<p>Whether EV owners currently own or would consider installing a solar power system or home batteries in the future for charging their electric vehicle.</p> <p>This indicates whether EV purchasing also leads to other energy technology investment that may influence the electricity demand patterns and their demand flex potential.</p>	<ul style="list-style-type: none"> 60% of respondents owned a solar power system and 25% also owned a home battery, which is much higher than the network average 30% of solar power system owners and 22% of home battery owners indicated they installed the technology specifically to charge their EV 70% would consider installing solar or a home battery to charge their EV in the future (of those who didn't already do so)



Would you consider installing a solar photovoltaic system (or home battery) in the future to charge your electric vehicle?

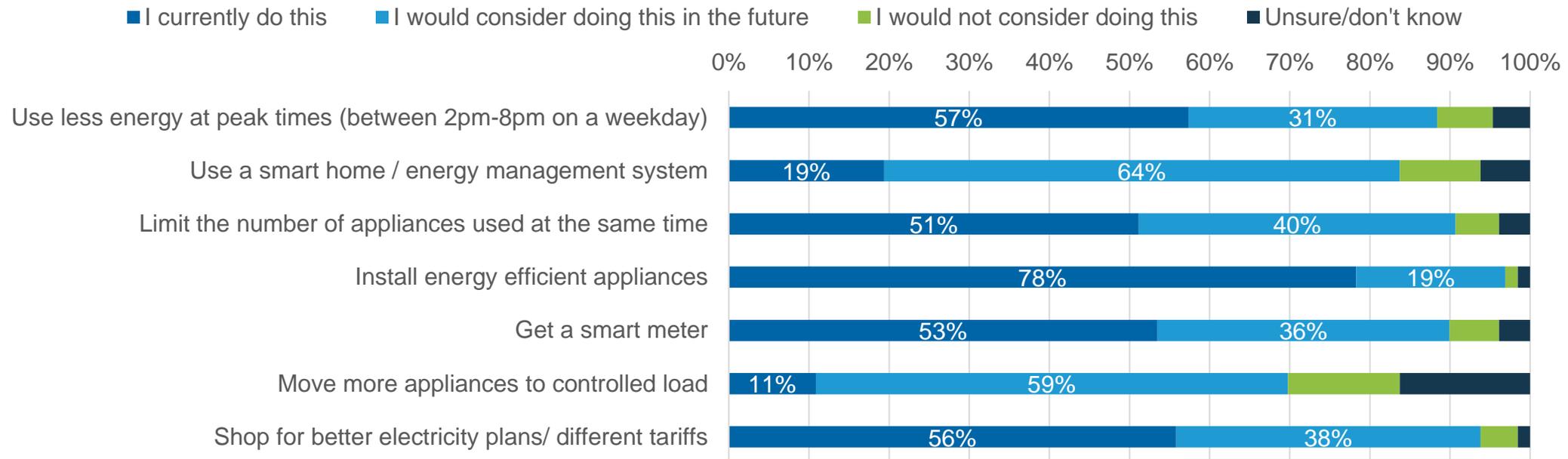


Average size of systems specifically for EV charging
 Solar Panel Capacity (kW): 6.9 kW
 Battery Storage Capacity (kWh): 15.5 kWh

Energy Use Behaviour

What we wanted to know and why	Results
Understanding what actions respondents undertake to reduce their electricity bills helps to develop future demand management programs for electric vehicle owners and EV charging.	<ul style="list-style-type: none"> There was evidence that EV drivers already use measures to reduce their electricity bills, indicating a higher awareness and understanding of electricity pricing options and energy technologies

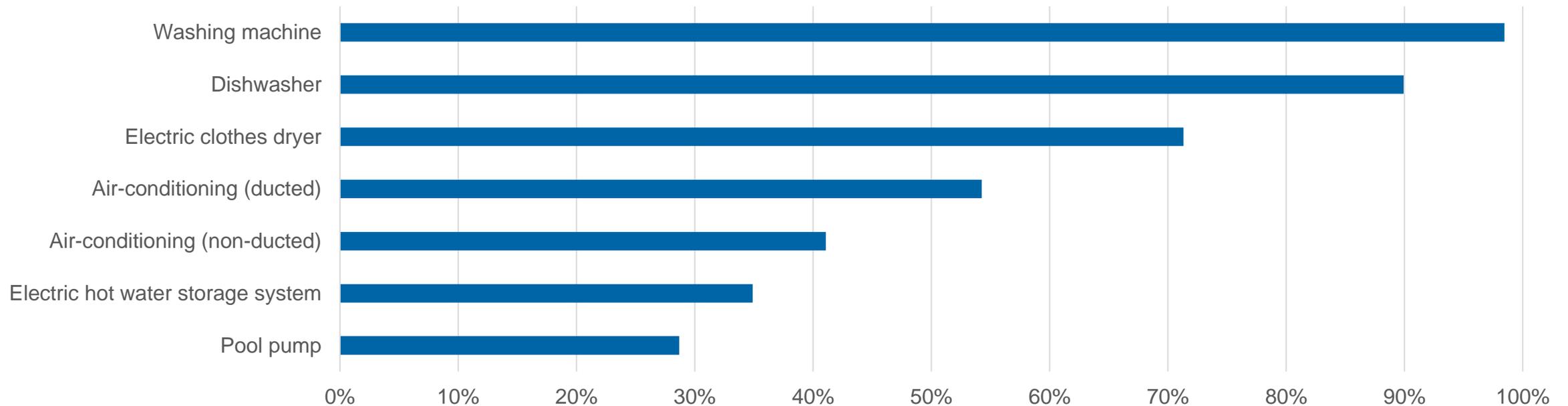
Below are listed some options that you can undertake to reduce your electricity bills. Please select the response that best describes whether you do this already or how willing you would be to consider doing it



Appliance Ownership

What we wanted to know and why	Results
<p>Understanding whether EV owners have appliance ownership similar to other customers indicates the overall household demand characteristics and potential for demand management opportunities with EV owners.</p>	<ul style="list-style-type: none">• EV owner households had higher than average air conditioner ownership (95%) with a large proportion of ducted systems (54%)• Pool pump ownership (29%) was also high in comparison to Ausgrid's total customer base

Which of the following appliances do you have in your household?



(n = 129, all respondents who own a registered electric vehicle in NSW/ACT)

To provide feedback on this survey please email:
demandmanagement@ausgrid.com.au

To find more information about electric vehicle
research at Ausgrid and our other Demand
Management research and trials please visit:

<https://www.ausgrid.com.au/dm>

