ACT Government

Electric Vehicle Charging Outlook for the ACT

Guidance for industry

December 2021

Acknowledgment to Country

Yuma
Dhawura nguna ngurumbangu gunanggu Ngunnawal. Nginggada dindi dhawura Ngunnawalbun yindjumaralidjinyin.
Mura bidji mulanggaridjindjula.
Naraganawaliyiri yarabindjula.

Hello
This country is Ngunnawal (ancestral/spiritual) homeland.
We all always respect elders, male and female, as well as Ngunnawal country itself.
They always keep the pathways of their ancestors alive.
They walk together as one.

The Environment, Planning and Sustainable Development Directorate acknowledges the Ngunnawal people as Canberra's first inhabitants and Traditional Custodians. We recognise the special relationship and connection that Ngunnawal peoples have with this Country. Prior to the dislocation of Ngunnawal people from their land, they were a thriving people whose life and culture was connected unequivocally to this land in a way that only they understand and know, and is core to their physical and spiritual being. The disconnection of the Ngunnawal people from Culture and Country has had long-lasting, profound and ongoing health and well-being effects on their life, cultural practices, families and continuation of their law/lore. The Environment, Planning and Sustainable Development Directorate acknowledges the historic dispossession of the Ngunnawal people of Canberra and their surrounding regions. We recognise the significant contribution the Ngunnawal people have played in caring for Country as for time immemorial they have maintained a tangible and intangible cultural, social, environmental, spiritual and economic connection to these lands and waters.

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Produced by the
Environment, Planning and Sustainable Development Directorate

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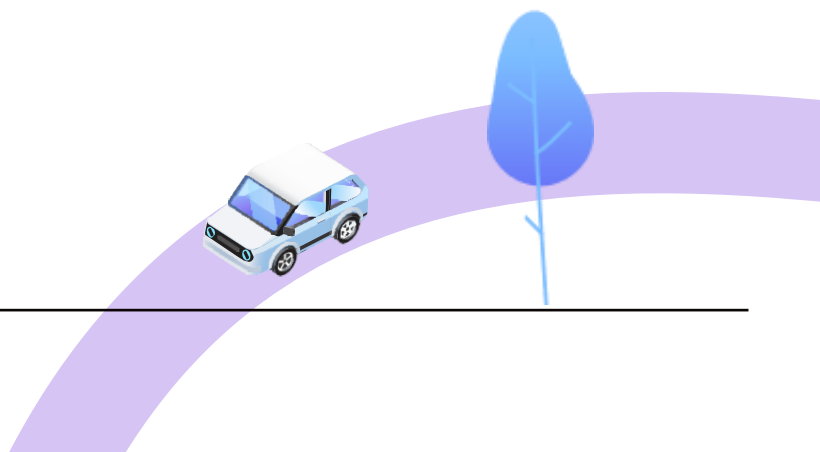


Minister's foreword

Shane Rattenbury MLA, Minister for Energy and Emissions Reduction

The ACT is proud to have world-leading emissions reduction targets, legislated in the Climate Change and Greenhouse Gas Reduction Act 2010. In 2020, we cut emissions by 45% compared to 1989-90 levels. Our target was a 40% reduction – so we met, and exceeded, our goal for the year.

To achieve this, we became the first Australian jurisdiction to shift to 100% renewable electricity. This means the ACT is powered by zero emissions, renewable energy year-round, from local solar farms, rooftop solar and wind and solar farms around Australia.

This shift allows us to focus on the next largest emissions reduction opportunity: transport. Transport emissions are now the largest single source of the ACT's emissions (over 60%).

Reducing emissions from transport will require a community-wide effort. Already, the ACT Government is addressing transport emissions through a comprehensive set of actions. The ACT has among the most generous and Zero Emissions Vehicles (ZEV) friendly policies in place to substantially increase the number of ZEVs in the ACT, including:

- two years free registration
- stamp duty waiver
- access to no-interest loans up to $15,000 for ZEVs and charging equipment
- transitioning the Government fleet to ZEVs, starting with 100% of new leases from 2021 to be ZEVs, where fit for purpose.

And work continues to substantially expand the number of ZEVs in the ACT. Government will adopt a target for 2030 ZEV sales, establish a fleet advisory service, and as part of the ACT Planning System review and reform, ensure new multi-unit residential and commercial buildings are ZEV-ready.

In addition, what we've heard from the ZEV industry and the ACT community is that more access to charging infrastructure is needed to support drivers and increase the number of ZEVs in the ACT. In light of this, Government will deliver 50 publicly accessible electric vehicle chargers for the ACT in 2022.

This Outlook document helps to not only guide investment for the 50 publicly accessible chargers, but provides our view of the future of electric vehicles and public charging in the ACT to 2030. We are technology agnostic, however we recognise the current needs of ACT electric vehicle drivers who now number above 1,000 and are growing. So, this Outlook for charging necessarily focuses on electric vehicles.

Our vision for the future is a charging market where consumers have the best possible public charging experience. Competition will deliver long term benefits, driving efficient prices and high customer satisfaction, and innovation will lead to continuous improvement. Charging will be designed for people, not vehicles – chargepoint locations numbers and speed are optimised for consumer habits to make charging as convenient as possible, and users are able to see pricing and availability of chargers before leaving the house.

The ACT is a small jurisdiction, but we have shown that we can have a big impact and support the transition to a zero-emissions transport future.

Purpose of this Outlook

This Outlook focuses on electric vehicles (EVs) due to their rapidly growing market share in the passenger and light vehicle market, and the key role they will play in decarbonising private transport. The Outlook shares an EV outlook to help EV charge point operators understand how many EVs we expect in the ACT to 2030, and provides information to support investment in charging infrastructure. We're all on the same page: we need more EVs in the ACT, and for that to occur, we need more public chargers.

- **Provide the outlook for EVs and public charging in the ACT to 2030**
- **Provide the information for you to start planning for investment in the ACT, today**

Executive summary

What you'll find in this outlook

The outlook for public charging in the ACT is for strong growth and investment opportunity. By 2030, the ACT will need at least 580 to 1,000 public chargers to support expected numbers of EVs – up from less than 60 in 2021. The number of EVs registered in the ACT is expected to reach at least 25,000 to 42,000 in 2030, up from 1,300 in 2021. This means that EV registrations are expected to increase by an average of 2,600 vehicles annually between 2021 to 2030. The outlook for public chargers is based on expected growth in EV registrations supported by policy and EV model availability, average trips and driver behaviour, combined with the ACT's priority to grow as a compact and efficient city with more dense urban development.

Optimal locations for charging within the ACT were identified through the methodology described in the "Future of charging in the ACT" section. When considering the future charging network, the ACT Government will also consider the geographic distribution of chargers to deliver an accessible and convenient charging network across the ACT.

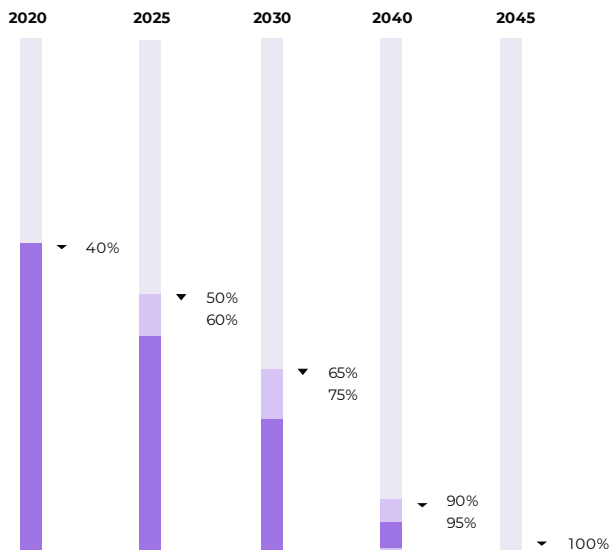
Our emissions targets

The ACT is committed to net zero emissions by 2045. To achieve this, targets have been set to reduce emissions (from 1990 levels) by:

- 40% in 2020
- 50-60% in 2025
- 65-75% in 2030
- 90-95% in 2040
- 100% in 2045

Visualisation of the ACT's emissions targets from 2020 to 2045.

Figure 1 ACT emissions reduction targets to 2045.



Policy context

The ACT's Transition to Zero Emissions Vehicles Action Plan 2018-21 and the 2021 Parliamentary and Governing Agreement set out our comprehensive action to increase ZEVs in the ACT. This is part of our broader work to reduce greenhouse gas emissions under the ACT Climate Change Strategy 2019-25.

Definitions:

Types of chargers

Public chargers are often fast and rapid chargers. Fast chargers, which may be cheaper to install, are best for destinations and rapid chargers are great when you're on your way somewhere else.

"Level 1" is used to describe slower chargers, mainly used at homes or businesses where vehicles are parked overnight. These chargers deliver anything below 7kW to the vehicle.

"Level 2" charging is mostly from an AC charging station at home or at a public charging station. These chargers typically deliver 7-22kW to the vehicle.

"Level 3" charging comes from a DC charger and for faster charging while parked for shorter amounts of time. These chargers typically deliver 22-50kW to the vehicle.

Levels 4 and 5 refer to rapid and ultra-rapid charging, typically for gaining a full charge in under 20 minutes. These chargers deliver 50 – 250kW to the vehicle.

This document focuses mostly on level 2 and level 3 charging.

What are zero emissions vehicles, are they different to electric vehicles?

Simply put, zero emissions vehicles (ZEVs) refer to vehicles that don't emit any greenhouse gasses when running. They are an important contribution to our efforts towards action to reduce emissions. ZEV registrations are used as a proxy for the number of cars on the road.

Battery electric vehicles (commonly known as EVs) and fuel cell electric vehicles (FCEVs, or Hydrogen-fuelled vehicles) are two types of ZEVs currently available in the global ZEV market. Due to the rapid market growth of EVs for passenger vehicles, and the relative ease of recharging them, this document focuses on the EVs, and not FCEVs.

Hybrid (either petrol hybrid or plug-in hybrid) vehicles are not considered as zero emissions vehicles, however plug-in hybrid vehicles are still able to use public chargers.

What are 'public' chargers?

"Public" chargers refer to chargers that are **publicly accessible**. This does not necessarily mean they are on public (ACT Government-owned) land. This includes, but is not limited to, chargers in public parking areas, near community facilities, next to tourist attractions, or in privately-owned car parks that are accessible to the public. Parking fees, and fees directly associated with charging the vehicle may still apply .

100% renewable electricity means recharging in the ACT is zero emissions

The ACT is committed to science-based action to mitigate climate change, and to transition the ACT to net zero emissions by 2045. In 2020, the ACT met the 100% renewable electricity target, which means that electric vehicle charging in the ACT is zero emissions.

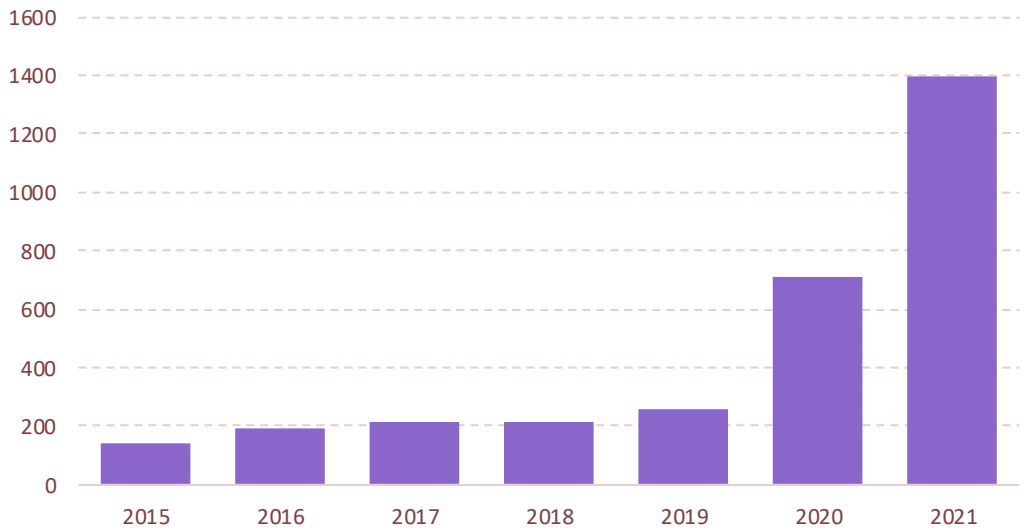
In 2021, the ACT's hydrogen refuelling station opened, which is powered by renewable electricity and means that the ACT's hydrogen is also zero emissions.

We've already achieved 100% renewable electricity, and Australia's first green-hydrogen refuelling station together with guaranteed renewable energy, means that all ZEVs, whether they are fuelled by hydrogen or electricity, are fully emissions-free – no need to purchase green certificates or offsets.

We're significantly expanding EVs on the road, while growing sustainable industries and jobs

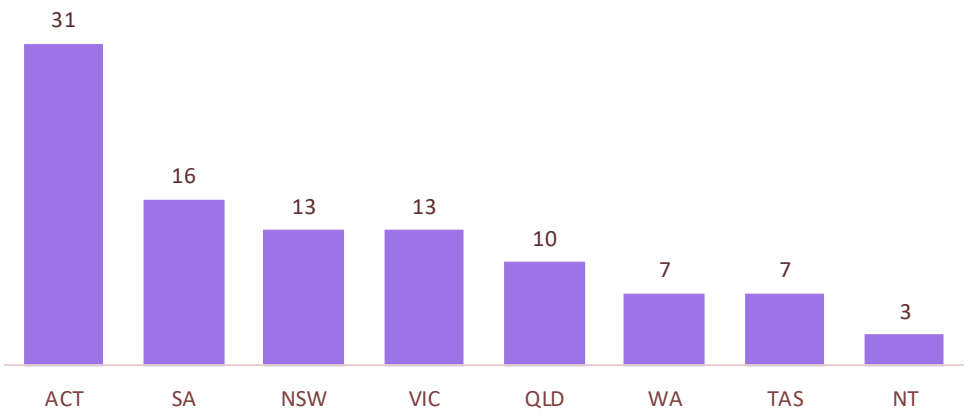
Our commitment to increasing EVs through 2-years free registration, waived stamp duty, and interest-free loans is delivering results. From 2015 to 2021 the number of registered ZEVs in the ACT increased from 140 to 1,300 (Figure 1). Currently, the ACT leads the nation in EV uptake, with 42 EVs registered per 10,000 vehicles registered (Figure 2).

Figure 2 ACT registrations of zero emissions vehicles 2015-2021



Bar graph of cumulative registration numbers of zero and low emissions vehicles across 2015-2021. Source: EPSDD derived from ACT registration data, available online from ACT data lake. Accurate as at November 2021

Figure 3 State and territory electric vehicles per 10,000 registrations



Bar graph of number electric vehicles for every 10,000 vehicle registrations, across Australian States and Territories. Source: EVC, State of electric vehicles 2021

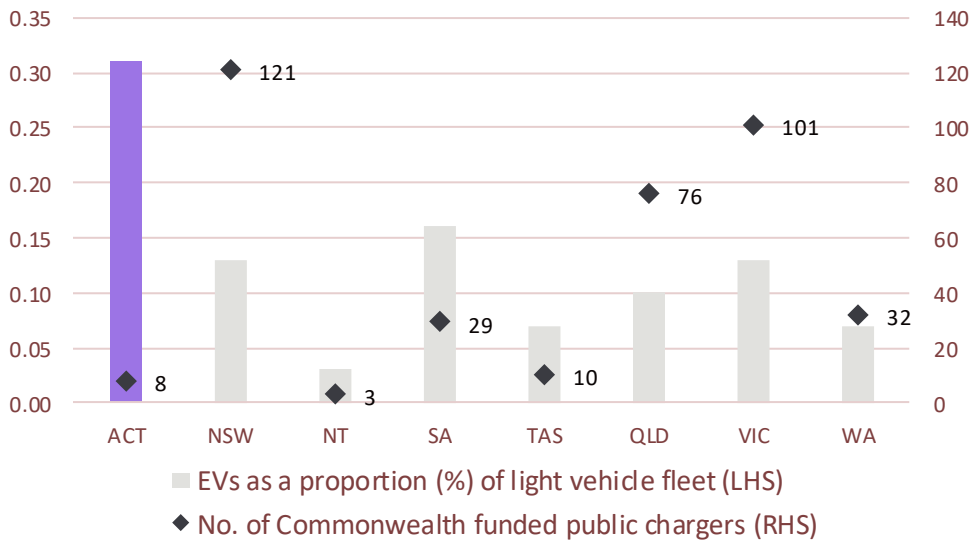
We need to grow the number of EV chargers in the ACT

Other jurisdictions are more advanced in their roll out of public EV chargers, with much of the investment to date targeting major national transport routes. Figure 4 provides a summary of investment by state and territory targeted through the Commonwealth Government's Future Fuels Fund initiative to support interconnectedness across Australia.

The ACT has the highest number of EVs to public chargers of all states and territories – 16 EVs per public charger (according to Electric Vehicle Council, 2021). EV growth and relative numbers of chargers across jurisdictions, reflects the strong uptake of EVs in the ACT relative to other jurisdictions and the way in which investment has been prioritised to date. Charging investment in other jurisdictions benefits ACT motorists by reducing range anxiety and demonstrating that all their driving needs (within and outside the ACT) can be met.

The ACT is investing in charging in the ACT, with the commitment to deliver 50 publicly accessible EV chargers. This is to support a rapidly expanding charging industry and accelerate industry investment.

Figure 4 Number of Commonwealth public charging sites awarded in 2021 (Future Fuels Fund Round 1) relative to proportion of EVs in each State or Territory



Bar graph demonstrating EVs as a proportion of light vehicle fleet, overlayed with a scatter plot chart demonstrating number of Commonwealth public charging sites which have been awarded through the Future Fuels Fund Round 1. Source: EVC State of EVs in 2021, ARENA Future Fuels Fund (Round 1), 2021

The future of charging in the ACT

By 2030, the ACT will need at least 600 to 1,000 public chargers to support expected numbers of EVs – up from less than 60 in 2021

The EV industry is small but growing rapidly and the ACT needs chargers to support this growth. The following provides practical information to help you understand what are the investment opportunities for EV charging in the ACT. This includes the outlook for EVs in Canberra and priority suburbs for charging infrastructure.

The global outlook for electric vehicles is for strong growth, lower prices and greater choice for drivers

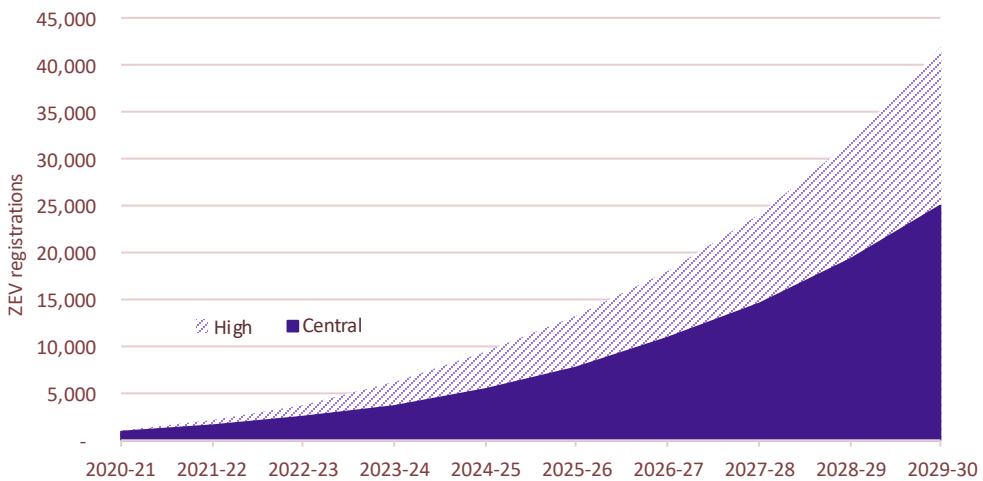
EVs only make up a small market share across Australia currently (1.57% of all vehicles sold in Australia in 2021). However, the market is showing significant resilience and growth, in spite of decreases in overall vehicle sales. There are 31 electric vehicle models available for sale in Australia, with an additional 27 anticipated by the end of 2022. Model availability and affordability are expected to increase significantly in the coming years, as prices for EVs decrease. So far, 18 of the 20 largest car manufacturers have committed to electrification targets or increased EV sales in the next decade, supported by global commitments to reduce transport emissions.

ACT public charging demand is expected to increase significantly, supported by rapidly growing registrations of EVs and densifying urban development

The number of EVs registered in the ACT is expected to reach at least 25,000 to 42,000 in 2030, up from 1,300 in 2021. This means that EV registrations are expected to increase by an average of 2,600 vehicles annually from 2021 to 2030. In the near term, most of the registrations will come from new vehicle sales due to the limited second hand vehicle market. EVs are expected to make up an increasing share of new vehicle sales increasing from 2% in 2021 to at least 30% in 2030 as the average price of EVs declines, relative to fuel vehicles and more EV models become available.

The outlook assumes that EV uptake increases as price parity with fuel vehicles is achieved in 2027, and steady improvements in battery technology improve battery range and vehicle performance. The outlook assumes a conservative view of the future with existing policy measures in place. New policy measures, including the 2030 sales target for EVs may change the outlook and increase the number of EVs beyond the high scenario shown here.

Figure 5: ACT EV registrations to 2030, central case with high possible outlook



Line chart showing forecast EV registrations in the ACT to 2030 across two scenarios: a central case and a high uptake scenario. Source: Deloitte Access Economics, 2021.

The actual level of EV registrations in 2030 could be higher than the central scenario outlined above. Under a high scenario, registrations of EVs in the ACT could be at least 42,000 depending on global and national action to accelerate growth in EVs.

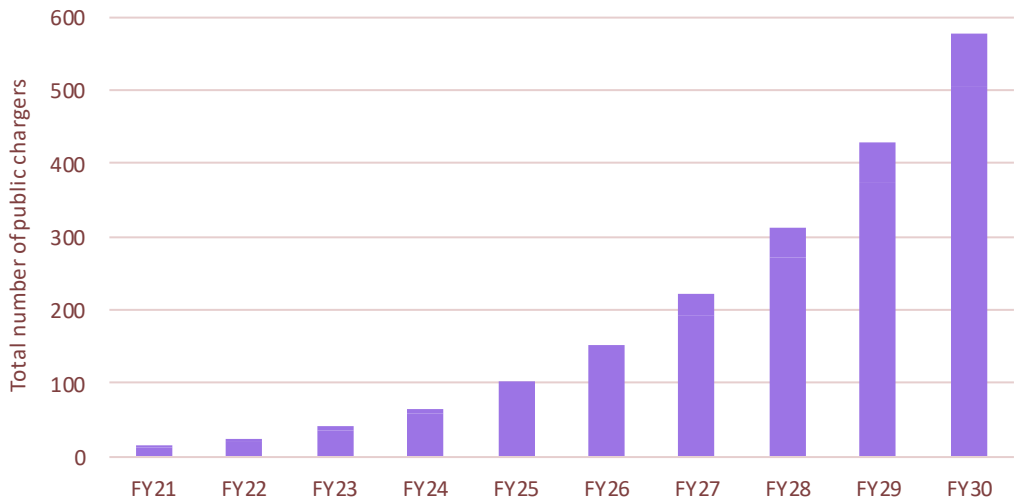
The growth in EV registrations will be determined by the pace at which EVs can reach price parity with fuel vehicles, and this scenario assumes that prices fall faster and reach parity earlier in 2025. Once price parity is reached, EV sales are expected to increase to around 50% of vehicle sales by 2030. Further scenario results are in Appendix A.

Additional details of the assumptions under each scenario used to develop this outlook are in Appendix B.

Public charging demand is expected to increase significantly in the coming decade

By 2030 the ACT is expected to require at least 580 to 1000 public chargers to meet the needs of EV drivers, up from less than 60 in 2021 (Figure 6). In 2030 under a scenario of higher EV uptake, where EV registrations in the ACT reach 42,000, the total number of chargers needed in the ACT could reach over 970.

Figure 6: ACT EV Public Charging Demand to 2030, central outlook

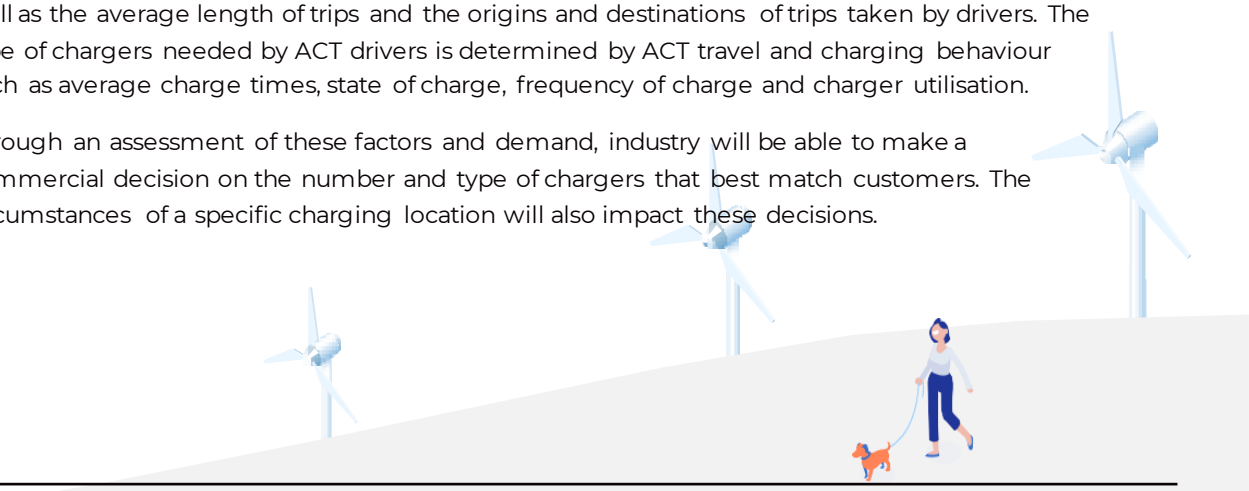


Bar graph showing forecast demand for public EV chargers in the ACT, demonstrating increasing need for public chargers in the ACT. Source: Deloitte Access Economics, 2021.

Charging technology type and speed is expected to match the location of customer parking and the reasons for parking. Public charging customers are expected to prefer to charge in locations that are convenient and co-located with other services where drivers will park for an extended length of time (at destinations). Providing slower chargers in these locations serves community need for public charging while also avoiding the need to invest in relatively more costly rapid charging.

The number of public chargers required will be determined by the uptake of EVs among drivers who do not have access to dedicated off-street parking to charge at home or work, as well as the average length of trips and the origins and destinations of trips taken by drivers. The type of chargers needed by ACT drivers is determined by ACT travel and charging behaviour such as average charge times, state of charge, frequency of charge and charger utilisation.

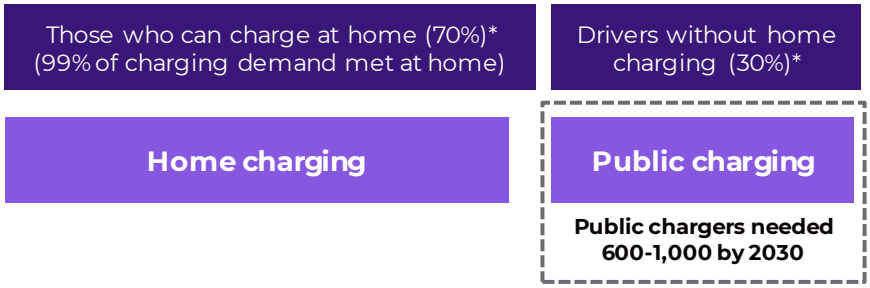
Through an assessment of these factors and demand, industry will be able to make a commercial decision on the number and type of chargers that best match customers. The circumstances of a specific charging location will also impact these decisions.



Public charging need is determined by dedicated parking access, charging preferences, ACT travel behaviour and the number of EVs

Drivers without access to home charging will rely on public charging and the Government's priority is to ensure these drivers have adequate access to charging options over the long term. The majority of EV drivers do not rely on public charging because they prefer to charge at home or work. This EV driver segment is around 70% of drivers while those who cannot charge at home or work are around 30% of EV drivers. The forecasts in this Outlook are based on a long term assumption of 30% of EV drivers relying on public charging. In reality, reliance on public charging may be different, due to ACT EV uptake and the development of Canberra over time, which could change the results. This Outlook focuses on the segment of the market that is unable to charge at home.

Figure 7 Generalised public charging customer segments



Visualisation demonstrating percentages of the population who may need to use public EV charging services. Source: EPSDD derived from Energeia, 2018 and Deloitte 2021, Commonwealth 2021.
**These values are assumed, based on Energeia's 2018 analysis of the Australian EV charging market. However, analysis of markets in the US and EU find that the proportion of EV motorists who are reliant on public charging can range from 26% to 63% (McKinsey, 2018).*

The ACT's Planning Strategy sets out the pathway for the ACT's development and includes the objective for a compact and efficient city by limiting urban sprawl and increasing density in town and group centres. Despite work to ensure multi-unit developments are EV ready, a growing proportion of people will be living in non-detaching housing and may not have easy access to at home charging. As the city develops so too will the need for easy access to public charging.

In 2021, forecasts of future charging need were developed by Deloitte for EPSDD. A description of the methodology is provided in appendix F. Estimated charging need in each suburb# to 2030 was based on:

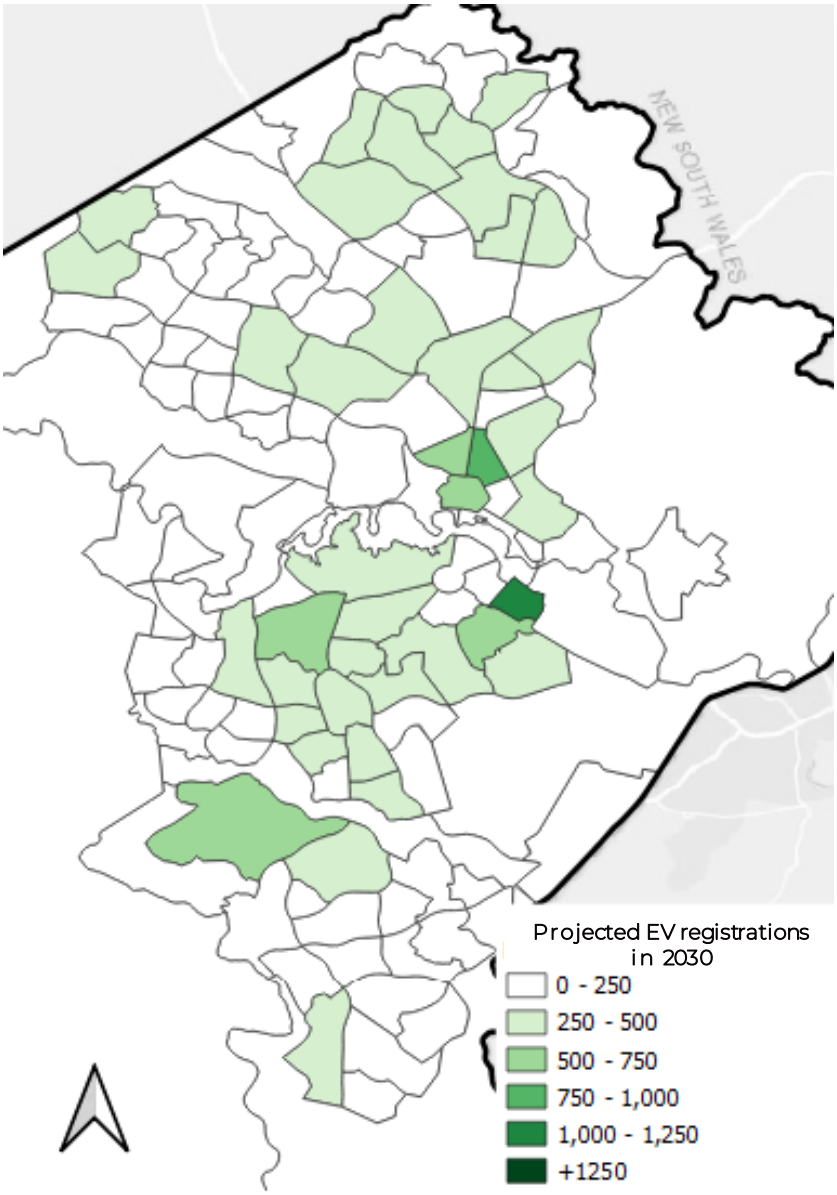
- Annual EV Vehicles Kilometres Travelled (VKT) in the ACT
- Energy consumption (kWh/100km) for available EV models (averaged across the ACT fleet)
- Total annual EV average travel distances
- Annual EV energy use served by public charging
- Composition of trips by origin and destination suburb
- Total kWh consumed by EVs, by suburb
- Anticipated charging preferences and behaviour based on destinations
- Number and type of chargers required to best match the customer needs

#For the purpose of this analysis suburb refers to statistical area level 2 (SA2) as defined by the Australian Statistical Geographic Standard, Australian Bureau of Statistics.

EV registrations are expected to grow in all suburbs of the ACT

The increase in EVs is not expected to be uniform across Canberra's suburbs with growth in some suburbs outpacing others, reflecting existing trends in EV registrations. However, toward 2030 as more EV models become available and a second hand market emerges, it is expected that EV registrations will grow in most ACT suburbs (Map 1). In 2030, Kingston is expected to have over 1,120 EV registrations, followed closely by Braddon and Civic with 880 and 620 EV registrations respectively. Suburbs in South Canberra, Woden Valley and Gungahlin are also expected to see significant growth in EVs, and by 2030 have over 30% of the ACT's total EV registrations.

Map 1 Forecast EV registrations by SA2, scenario, 2030

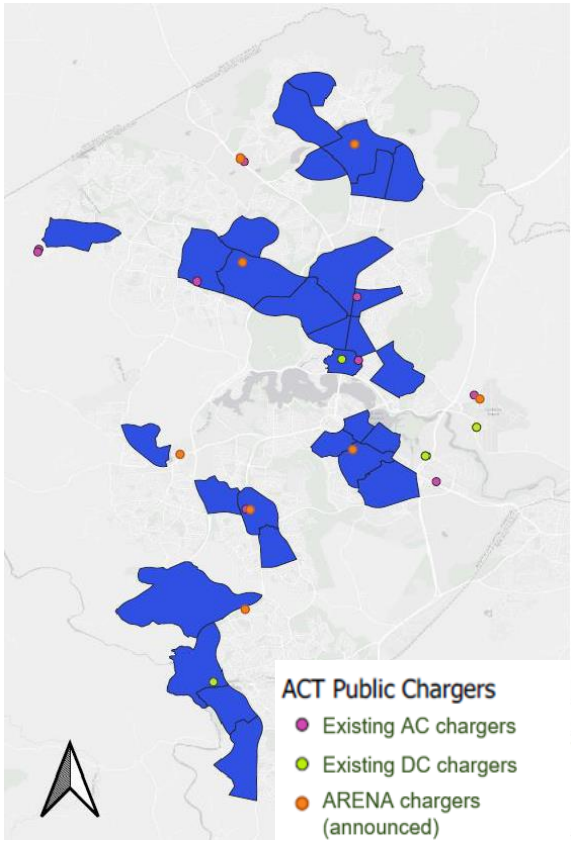


Map of the ACT demonstrating projected EV registrations in 2030, across SA2s shaded to correlate to EV registration numbers. Source: Deloitte Access Economics, 2021

EV public charging need is expected to be highest in suburbs with a high proportion of homes without access to dedicated off-street parking

Home charging comprises the majority of charging needs for people with access to dedicated charging. However, drivers who live in apartments and townhouses will have limited access to their own parking space and charging. Map 2 shows the proportion of non-detached dwellings in each suburb. Table 2 below shows the top 30 suburbs with a high proportion of non-detached housing, from highest to lowest number of people (resident population) expected in 2030.

Map 2 Top 30 SA2s as assessed by non-detached dwelling type in 2030 and existing chargers operating in 2021



Map of the ACT, with the top 30 SA2s with highest share of non-detached dwellings shaded in. Also plotted are locations of existing public EV chargers and announced ARENA-funded chargers. Source: Deloitte Access Economics, 2021, based on ACT Treasury forecast dwellings.

Table 1 Top 30 suburbs with highest share of non-detached dwellings by SA2, 2030

	Forecast dwellings, 2030
Kingston (ACT)	3,682
Braddon	3,675
Belconnen	3,552
Civic	2,388
Bruce	2,212
Phillip	2,193
Turner	1,958
Griffith (ACT)	1,865
Greenway	1,619
Gungahlin	1,520
Lyneham	1,497
Franklin	1,429
Harrison	1,136
Barton	1,084
Campbell	985
Coombs	915
Lawson	878
Dickson	832
Mawson	806
Ngunnawal	720
Gordon (ACT)	719
O'Connor (ACT)	717
Palmerston	672
Narrabundah	650
Holt	649
Bonython	610
Kambah	610
Lyons (ACT)	599
Forrest	545
Moncrieff	537

Source: Deloitte Access Economics, 2021 based on ACT Treasury dwellings forecasts

EV public charging needs are determined by trip distances and travel behaviour in the ACT

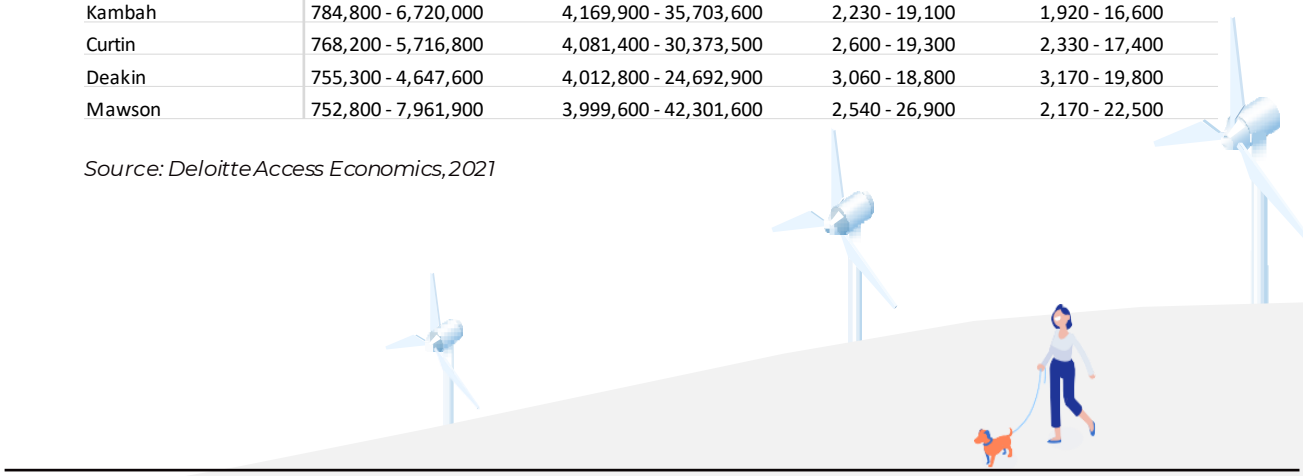
Civic is expected to account for over 30% of the EV public charging energy needs of the ACT in 2030, followed by Braddon, Belconnen, Phillip and Barton which combined will contribute to over 50% of the EV energy use in the ACT in 2030. Table 3 below shows forecast annual energy use by origin suburb, annual travel distances by suburb and trips by their suburb of origin and destination.

The ACT Transport model for 2021, 2026 and 2031 was used to extrapolate future trip movements for EV drivers in the ACT. The peak daily trips were annualised and included a seasonality factor of 70% calibrated to align with ABS total travel distances (VKT).

Table 2 Top 25 suburbs by highest EV energy need (kWh), and average travel distances, trips by origin and destination, 2030, across central and high uptake scenarios

Suburb	EV annual energy use (kWh)	EV annual travel distance (km)	EV Daily Trips (Origin)	EV Daily Trips (Destination)
Civic	15,844,800 - 215,977,800	84,183,900 - 1,147,495,800	47,790 - 651,400	44,760 - 599,000
Braddon	2,970,800 - 35,370,900	15,783,800 - 187,926,400	8,960 - 106,700	8,440 - 101,800
Belconnen	2,342,100 - 36,372,900	12,443,500 - 193,250,000	7,110 - 110,500	7,970 - 122,500
Phillip	2,091,100 - 24,044,900	11,110,000 - 127,751,200	7,070 - 81,300	7,840 - 83,600
Barton	1,921,200 - 17,008,600	10,207,400 - 90,367,100	7,780 - 68,800	8,100 - 69,000
Kingston (ACT)	1,889,300 - 25,057,200	10,037,900 - 133,129,800	7,650 - 101,400	6,890 - 92,100
Hume	1,481,400 - 16,032,600	7,870,900 - 85,181,500	4,890 - 53,000	4,930 - 54,800
Garran	1,466,600 - 11,085,300	7,792,300 - 58,896,500	4,960 - 37,500	4,990 - 38,800
Watson	1,326,900 - 10,132,500	7,050,000 - 53,834,200	4,000 - 30,600	3,660 - 27,800
Lyneham	1,243,200 - 15,116,200	6,605,300 - 80,313,000	3,750 - 45,600	3,420 - 36,900
Campbell	1,225,300 - 7,935,800	6,510,000 - 42,163,300	3,700 - 23,900	3,710 - 24,000
Bruce	1,217,200 - 10,147,600	6,466,900 - 53,914,500	3,700 - 30,800	7,920 - 67,700
Gungahlin	1,212,500 - 16,845,000	6,441,900 - 89,497,900	3,070 - 42,600	2,940 - 35,000
Turner	1,144,000 - 9,554,700	6,077,900 - 50,764,500	3,450 - 28,800	3,040 - 25,800
Acton	1,077,200 - 34,506,700	5,723,000 - 183,334,900	3,250 - 104,100	6,540 - 216,100
Canberra Airport	1,037,300 - 9,159,200	5,511,300 - 48,662,900	3,430 - 30,300	3,590 - 31,200
Griffith (ACT)	1,018,900 - 8,007,600	5,413,500 - 42,544,700	4,120 - 32,400	4,130 - 32,900
Greenway	975,000 - 10,584,900	5,180,100 - 56,237,700	2,770 - 30,000	3,040 - 31,400
Dickson	949,900 - 8,173,500	5,046,600 - 43,426,300	2,860 - 24,700	3,040 - 25,100
Franklin	787,100 - 8,094,600	4,182,000 - 43,006,700	1,990 - 20,500	1,800 - 18,900
Kambah	784,800 - 6,720,000	4,169,900 - 35,703,600	2,230 - 19,100	1,920 - 16,600
Curtin	768,200 - 5,716,800	4,081,400 - 30,373,500	2,600 - 19,300	2,330 - 17,400
Deakin	755,300 - 4,647,600	4,012,800 - 24,692,900	3,060 - 18,800	3,170 - 19,800
Mawson	752,800 - 7,961,900	3,999,600 - 42,301,600	2,540 - 26,900	2,170 - 22,500

Source: Deloitte Access Economics, 2021

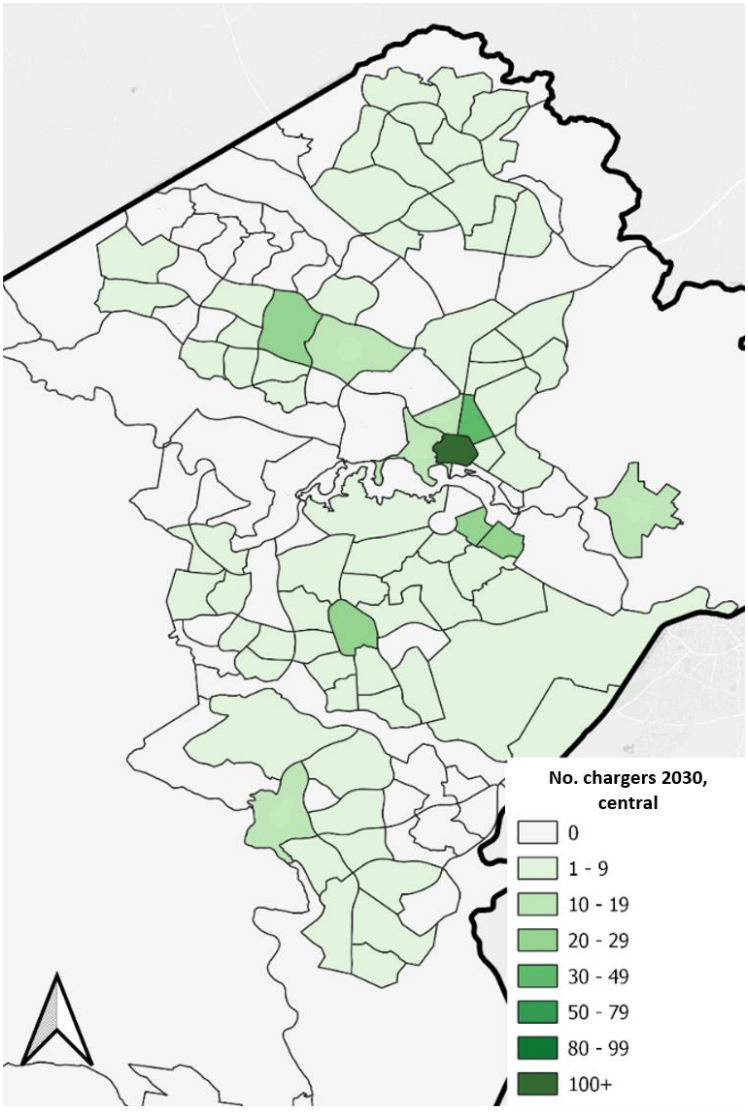


By 2030, Civic is expected to support over 200 public chargers, and public chargers will be required in suburbs across the ACT's townships

Civic is expected to require over 200 public chargers to support driver needs due to the large number of trip destinations in Civic, trip lengths of EVs and the high density living in the area. Forecasts of origin destinations, average trip lengths (vehicle kilometres travelled) and dwelling density are provided in the appendices.

The rest of the public chargers required to 2030 are needed across the ACT's town centres and suburbs reflecting the travel behaviour in the ACT and proportion of dwellings without access to dedicated private parking. The number of chargers required to meet driver needs and accounting for access to dedicated private parking is provided in Map 3 below.

Map 3 Forecast public chargers required, by SA2 2030



Map of the ACT demonstrating the forecast number of chargers required to meet public EV charging demand in 2030 by SA2. Source: Deloitte Access Economics, 2021

Consider network capacity when choosing a public charging site

Evoenergy is the electricity distribution network provider in the ACT. When electricity connections over a certain threshold are required, Evoenergy will provide information and estimates of the requirements for connection. Information about network connections is provided in the next section.

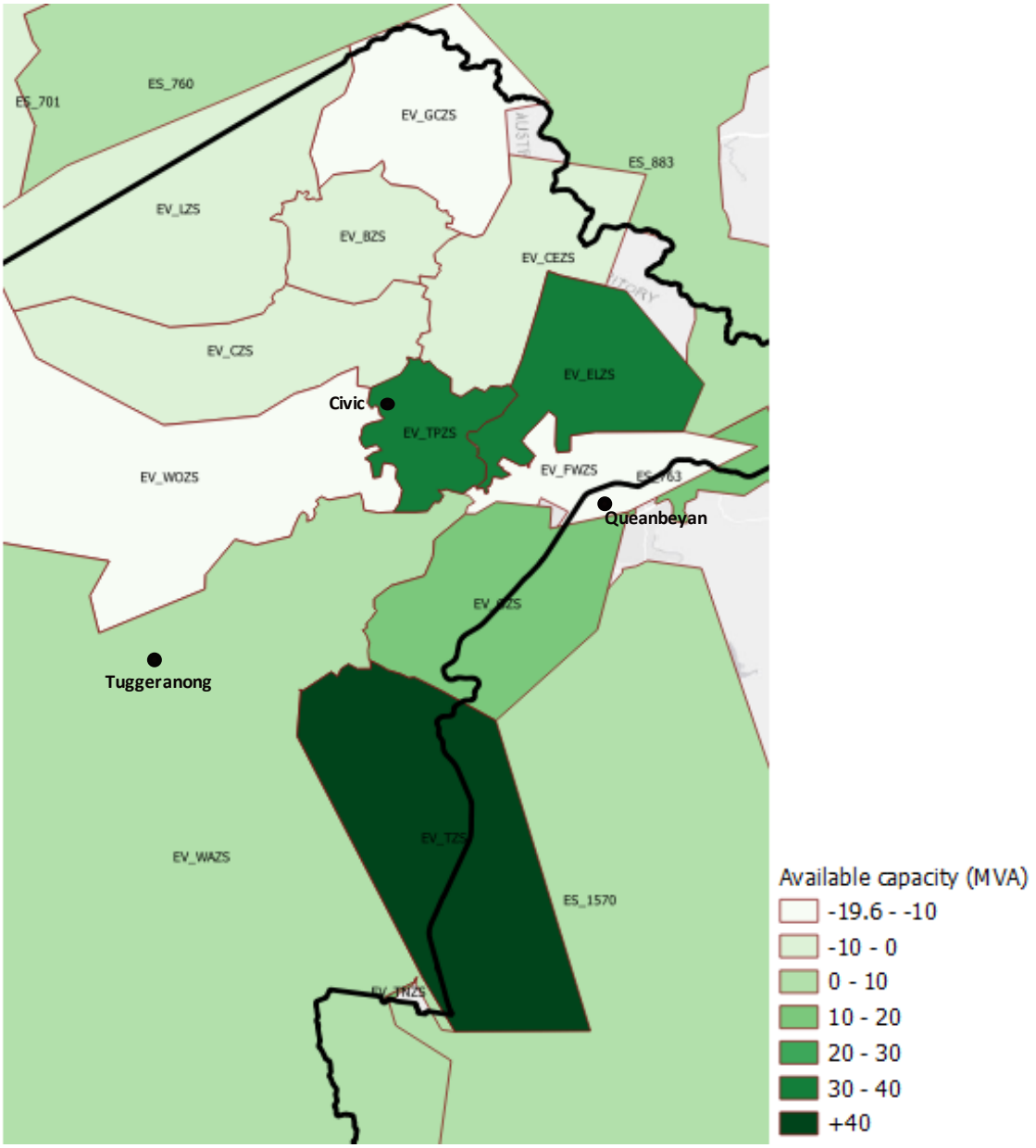
Charge point operators are encouraged to consider if smart technology, solar or battery options could be paired with their charge point to decrease peak demand on the electricity network, where suitable.

Evoenergy provides geographic information about areas with network capacity summarised in Map 4. Map 4 shows available capacity to service energy use across the network at the Zone Substation level (Asset Code) and shows broad areas that either have surplus capacity or are constrained over time. Based on expected EV uptake, regions including Gungahlin and Belconnen have capacity shortfalls which may require investment to match EV driver demand for charging. The power metric used for electricity networks is typically Mega-Voltage-Ampere (MVA) which is equivalent to MegaWatt (MW). For the purposes of the Outlook, MVA is the adopted metric.

EV charging developers that choose to operate in the ACT are encouraged to provide access to real time (or semi-real time) data to Evoenergy, which could potentially assist in understanding future network needs and building future capacity or other non-network upgrade solutions for the industry. The expected load forecasts by Zone substations are specified in Evoenergy's Annual Planning Report available online: https://www.evoenergy.com.au/about-us/reports-and-publications/annual-planning-report

Further information on available capacity can be found on Evoenergy's website: http://apr.evoenergy.com.au/

Map 4 Forecast substation available capacity in 2029, by region (MVA)



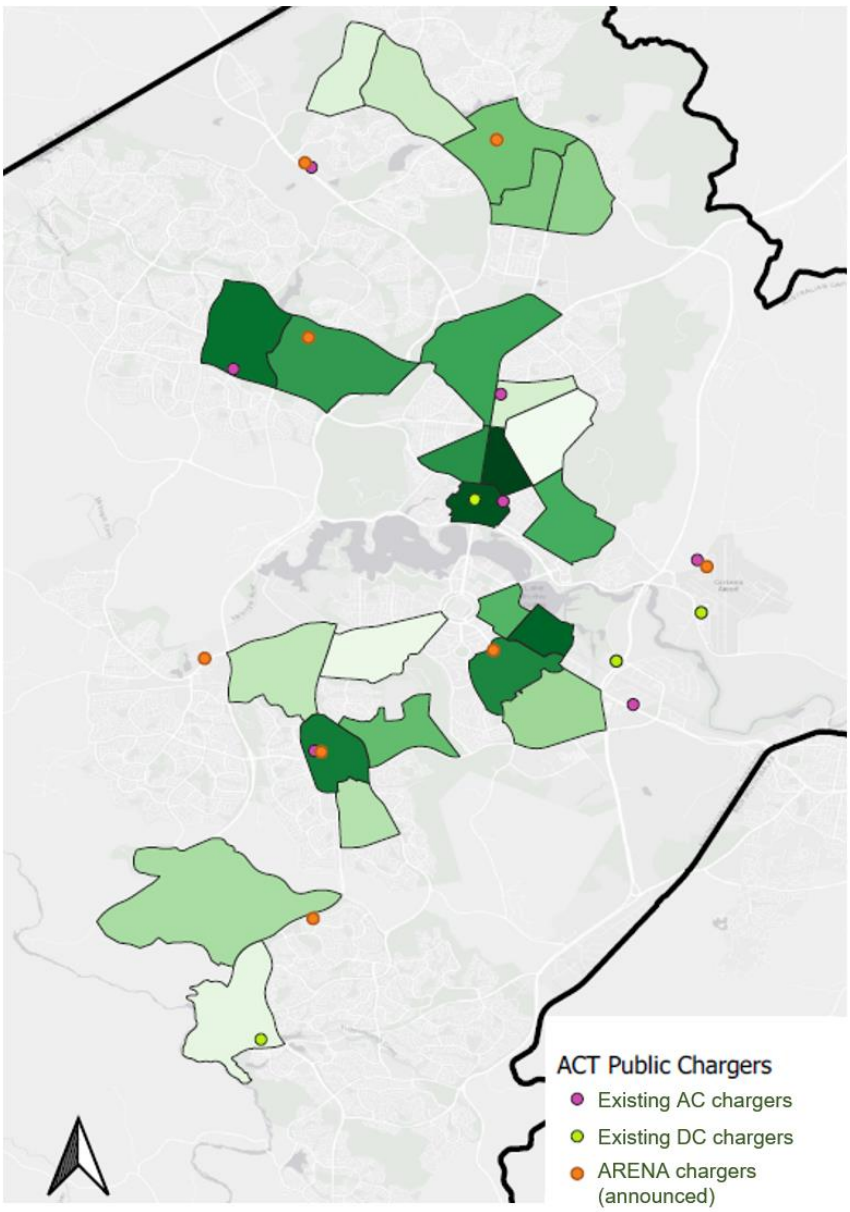
Map of the ACT demonstrating forecast substation available capacity in 2029, by region. Darker green denotes more available capacity in 2029, white denotes less available capacity in 2029.

Source: Deloitte Access Economics derived from Evoenergy, 2021

Top 25 priority suburbs for public charging to 2030

The highest priority suburbs for public charging investment, based on charging need and electricity network constraints is provided in Map 5 below for potential charging owners and operators to consider in their investment planning.

Map 5 Top 25 SA2s for charging in 2030



Map of the ACT with 25 SA2s as shaded in, demonstrating top suburbs for public charging investment. Also plotted are locations of existing public EV chargers and announced ARENA-funded chargers. Source: Deloitte Access Economics, 2021

The top 25 SA2s were determined based on charging need and forecast substation capacity, which is calculated using analysis across four factors: EV registration forecasts (p12); non-detached dwelling type numbers and forecasts (p13); trip distances and travel behaviour (p14); and network capacity (p18).

Location types for charging in the ACT

Identifying the types of characteristics which are desirable in potential charge point locations will support selection of suitable sites. Selection of the site, and charging technology, should consider the typical use case of consumers who frequent the sites. Time spent at the sites, and appropriately matched charging speeds, should be considered to ensure that vehicles are not spending too long or little time charging at their destinations and to maximise convenience for charging customers.

Potential location types in the ACT which could be considered as charge points locations are listed below:

- Institutions – schools and universities
- Service stations
- Shopping centres
- Public parking lots
- Sports and recreational facilities

Table 3 Five considerations for charging location selection

Charging location objectives	Description
Visibility	Improved visibility of charging stations can increase awareness of charging availability and encourage EV uptake
Accessibility	Charging infrastructure ensures accessibility by users through a) Usability – charging equipment is user-friendly and easy to operate; and b) Convenience – the location of charging stations provides EV users with the choice to charge when and where they choose
Journey destinations	EV users should not be restricted by the range of their vehicles when undertaking journeys
Security	EV users should feel confident and safe to use and leave their vehicles docked at charging facilities, at any time of the day or night
Commercialisation	The location of charging stations should provide reasonable opportunity for profit, through high utilisation from high levels of foot and vehicle traffic, or by targeting areas where existing charging infrastructure levels are low

Source: Deloitte Access Economics, 2021

Installing a charger in the ACT

This section outlines the regulations and standards, development approval processes and the electricity network connection process to be aware of.

Planning regulations and standards

Most electric vehicle charging stations are exempt from development approval under the Planning and Development Regulation 2008. An electric vehicle charging development that meets the general exemption criteria (other than section 1.18) as listed in the Regulation does not require development approval.

The exemption criteria include a requirement the development complies with the requirements of the ACT electricity network provider Evoenergy. So contact Evoenergy early to understand your site-specific requirements.

Undertaking any electrical work in regards to a charging station also requires adherence to Australian/New Zealand Standard 60079.10 (Explosive atmospheres). This standard outlines design, construction and maintenance requirements for electrical equipment in areas exposed to flammable gas or vapour risks. The amending regulation also adds new provisions to consider and manage risks associated with the electricity grid. The new provisions require the block to be connected to the electrical network. Also, in specified circumstances, a statement of compliance from the electricity utility provider must be obtained.

This document was prepared in October 2021, and it is the responsibility of industry to ensure adherence to regulations and standards that can change over time.

Development approvals and exemptions

The below steps describe the process for development approval (DA) to install a charger in the ACT. Please note that this is a general overview of the process, and each site will have specific requirements that apply to that location.

Step 1: Determine if your charging station is exempt from planning approval

All development, other than in designated areas, requires ACT planning approval. Your electric vehicle charging development may be exempt from requiring a DA under the Planning and Development Regulation 2008 (see section 1.113 at https://www.legislation.act.gov.au/sl/2008-2/ for exemptions applying to EV charging infrastructure).

The Environment Planning and Sustainable Development Directorate provides advice about development applications and exemptions. Exemption notices can be sought through a private building certifier.

Where development takes place within a designated area, works approval is required from the National Capital Authority. You can contact the NCA at sujie.song@nca.gov.au

Step 2: Determine land custodian or lease holder

Identify the land custodian or lease holder using the ACTmapi website and view the land custodianship layer.

If the land custodian is a Government entity you will need to prepare a proposal for a permit or license for land access.

If the land custodian is the National Capital Authority you will need to ensure your plans align with the National Capital Plan and any other commercial or technical requirements determined by the National Capital Authority. You can contact the NCA at sujie.song@nca.gov.au

Step 3: Prepare your proposal

If you identify that your potential site is leased to a business, prepare a proposal for land access and submit your proposal to the land holder.

If you identify that a Government entity is the lease holder or the custodian of the land, you will need to demonstrate your proposal meets Evo Energy's requirements prior to submitting your proposal for land access. See step 4.

You will need to contact the Government Directorate responsible for the site you have identified to submit your proposal.

Step 4: Application for land use access

Once approval is gained as mentioned in Step 3 and any relevant conditions are satisfied the following steps should be taken:

- Where a proposal is not on public land, building approval, unless exempt.
- Where a proposal is on public land, an application for land use access should be submitted to the relevant ACT Directorate for assessment and approval after receiving approval in step 3 but prior to seeking building approval, if required.

Evoenergy recommends that charge point operators provide charging data and real time information to Evoenergy. This helps to allow the charging devices to operate dynamically as required for network constraint management and will assist in keeping the costs lower for all consumers within the ACT. Smart chargers and Vehicle to Grid (V2G) chargers will also need to meet Evoenergy requirements for connecting to the network. Further details can be requested from contacting Evoenergy through demandmanagement@evoenergy.com.au

More information regarding approvals processes is also available online:

- Development applications: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/development-applications
- DA and BA exemptions: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/exempt-work
- Building approval: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/building-approval

Connecting to the electricity network

Evoenergy operates and maintains the ACT electricity and gas network. There are several different types of electricity network connections; information about connections to the electricity network and the different types of connections is detailed below.

Evoenergy's connection requirement and guidelines can be found at Evoenergy Connections Overview webpage.

Basic Residential connections

Typically for residential premises and some small businesses. Must be less than 100 amps electricity supply. This is suitable for basic new connections, and alterations and abolishments. You can register on Evoenergy's MyPortal and apply online, or complete a PDF version of the application form here.

Routine and Minor connections

These connections are typically for small commercial and industrial customers. Details on processes for this type of connection can be found in the Routine and minor connections process guide

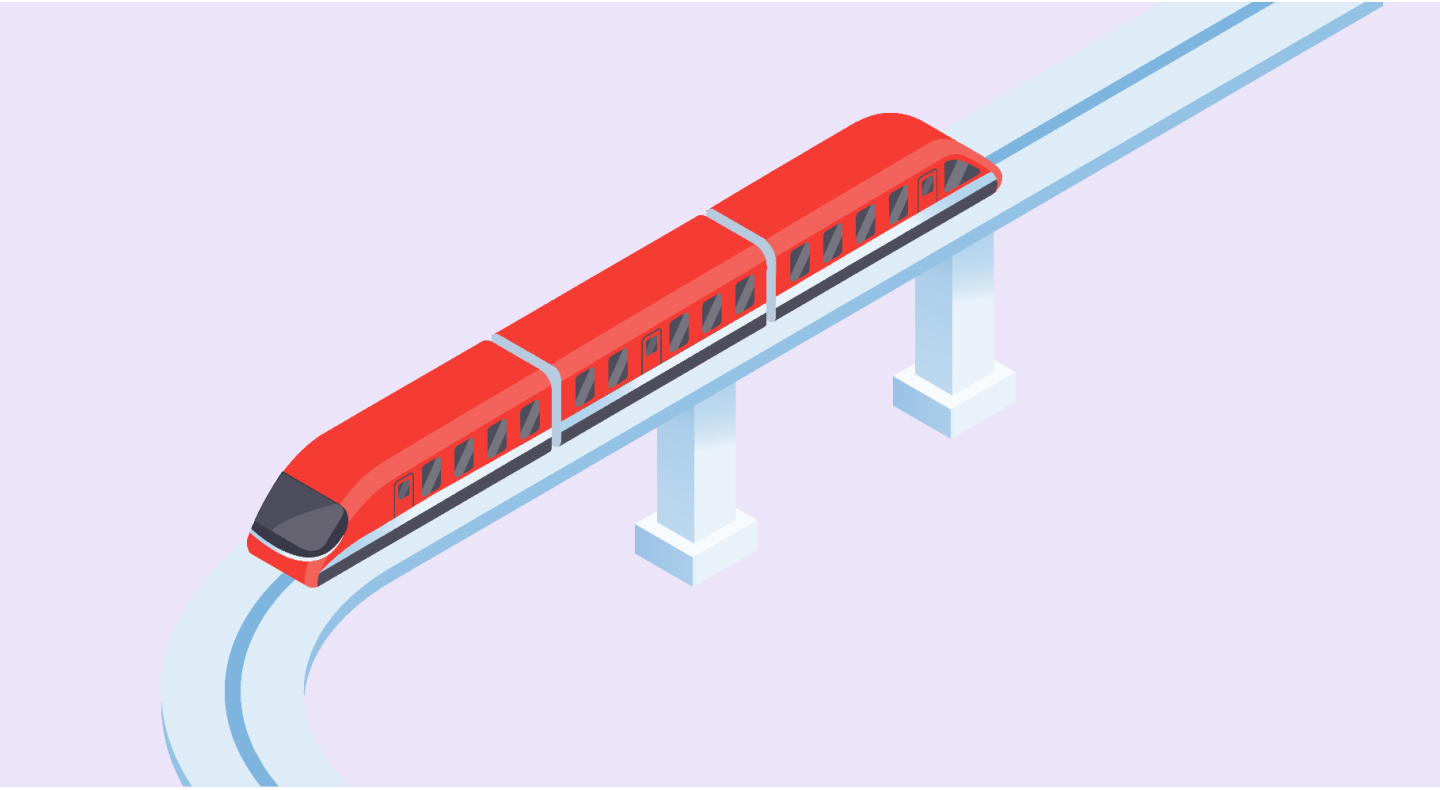
Major connections

Typically for large commercial and industrial customers. These connection types are likely to be limited to those who wish to install ultra-rapid chargers, or require significant amperage to the premises. Further information can be found in the Large customer connection process overview

Embedded Generation

Embedded generation requests to connect to the network may be relevant if you wish to incorporate works with solar panels or batteries into your network request. Further information can be found on the Embedded Generation webpage.

Please note that connection timeframes are driven by National Energy Customer Framework (NECF) requirements and are dependent on scope of works for connection.



Flattening the climate curve together

With transport being our largest source of emissions, EVs are needed to reach net zero emissions. Not only do EVs offer a clean, reliable and smart option for travel in Canberra, but they're part of our fight against climate change.

We need to work together to encourage EV uptake and establish a strong EV industry in the ACT. Together, let's get to a net zero future.

What next?

- Find out more about EVs for your fleet - contact fleet advisory service EPSDD.FleetAdvisory@act.gov.au.
- Checkout potential sites for your charging location using ACTmapi resources.
- The forecasts provided here are based on the information available in 2021, and as time goes on we will consider updates to this outlook to continue to provide practical information about the ACT's charging needs.

Appendices

Appendix A Summary charger forecasts to 2030, by scenario

The definitions and assumptions for the scenarios are provided in Appendix B.

Table A.1 Charging infrastructure requirements per scenario by Level 2 and 3 by FY2030

	2021	2025	2030
Existing			
Level 2	48	NA	NA
Level 3	10	NA	NA
Total	58	NA	NA
Lower			
Total public charging kWh	N/A	4,892,855	21,246,286
Level 2	N/A	56	245
Level 3	N/A	8	36
Total	N/A	65	281
Central			
Total public charging kWh	N/A	7,729,070	43,719,951
Level 2	N/A	89	504
Level 3	N/A	13	74
Total	N/A	102	578
Higher			
Total public charging kWh	N/A	13,369,891	73,612,962
Level 2	N/A	154	849
Level 3	N/A	23	74
Total	N/A	177	973

Appendices

Appendix B Scenario description and assumptions

To better understand the demand and supply requirements for EV uptake to 2030 and beyond, three core scenarios were modelled. Each of these included a list of key drivers and factors that would impact the rate of EV demand and uptake. An overview of each of the three core scenarios are listed below.

Lower: This scenario represents a less optimistic view of the future, relative to the base case. In this scenario, EVs fail to reach upfront cost parity with internal combustion engine vehicles and charging infrastructure availability does not improve on current day levels.

Central: This scenario assumes EV uptake increases as price parity with internal combustion engine vehicles is achieved in 2027. This scenario also assumes global steady improvements in battery technology and continued global commitments to EVs in the policy environment.

Higher: This scenario represents a more optimistic view of the future – ambitious decarbonisation - relative to the base case. In this scenario, EV uptake is assumed to increase significantly, reaching and surpassing price parity with internal combustion engine vehicles earlier in 2025. Coupled with supportive policy from the commonwealth and ACT governments, the global shift to EVs accelerates.

Each of the above scenarios describe different potential future states, including trends in society, technology and policy. They each outline the possible drivers and behavioural considerations that are assumed to impact EV uptake and the need for public charging infrastructure in ACT. These scenarios are not predictions about what will happen – they hypothesise what could happen and are designed to frame and inform strategic decisions and planning discussions

Table A.2 Key scenario outputs, EV registrations

	2021	2025	2030
Lower			
EV proportion of new vehicle sales	2.1%	4.5%	13.5%
EV registrations	851	3,399	12,106
(total % of fleet)	0.3%	1.2%	3.8%
ICE vehicle registrations	265,100	288,220	309,210
Central			
EV proportion of new vehicle sales	2.1%	8.9%	28%
EV registrations	851	5,369	24,911
(total % of fleet)	0.3%	1.8%	7.8%
ICE vehicle registrations	265,100	286,250	296,404
Higher			
EV proportion of new vehicle sales	2.1%	15.9%	50%
EV registrations	851	9,287	41,944
(total % of fleet)	0.3%	3.2%	13.1%
ICE vehicle registrations	265,100	282,332	279,371

Appendices

Appendix B Scenario description and assumptions

Table A.3 Lower scenario assumptions

Element	Area	Description
Vehicle	Battery technology and lifecycle	Vehicles below $30,000 will have battery sizes around 25kWh with limited range capabilities
	Model availability	Only high price range EV manufacturers / companies enter Australian market – limited range around price parity
Charger	Charger reliability	There is a low proportion of suitable public chargers serving the needs of the community.
	Charger availability	Charging network infrastructure availability is limited, resulting in range anxiety
Consumer	Price costs	Price parity with internal combustion engine vehicles is not achieved by 2030, with limited affordability of EVs by low to middle income brackets
	Fuel efficiency standards	Limited fuel efficiency standards are imposed to discourage the use of ICE vehicles
	Environmental awareness	Population have limited awareness to impacts on transport emissions leading to minimal increase in EV uptake
Environment	Investment and Funding	Lack of ongoing coordination between State and Federal Government to provide necessary sequential charging infrastructure rollout
	Policies and subsidies	Policy support for EVs is inconsistent, meaning Australia does not receive the model variety and benefits the rest of the world sees
	Petrol prices	Minimal variation to current petrol prices are leading to minor increase in EV sales due to lower operational costs

Table A.4 Central scenario assumptions

Element	Area	Problem
Vehicle	Battery technology and lifecycle	Vehicles below $30,000 will have battery sizes around 50kWh to enable greater range capabilities.
	Model availability	Combination of middle to high price range EV manufacturers / companies entering the Australian market
Charger	Charger reliability	There is a medium proportion of suitable public chargers serving the needs of the community.
	Charger availability	Charging network infrastructure availability is fair, enabling range anxiety for EV drivers to be reduced for frequented destinations
Consumer	Price costs	EV uptake increases as EVs reach price parity with ICE vehicles in 2027
	Fuel efficiency standards	Moderate fuel efficiency standards are imposed to discourage the use of ICE vehicles
	Environmental awareness	Population has a heightened awareness of the social and environmental benefits leading to a moderate increase in EV uptake
Environment	Investment and Funding:	Minimal support from the Federal Government means that, compared to other OECD countries, Australia is still behind the EV uptake curve
	Policies and subsidies	Adopting current initiatives such as stamp duty exemption, 2 years free registration, 20% discount on registration costs and sustainable house scheme
	Petrol prices	Moderate increase petrol prices are leading to an increase in EV sales due to lower operational costs

Appendices

Appendix B Scenario description and assumptions

Table A.5 Higher scenario assumptions

Element	Area	Problem
Vehicle	Battery technology and lifecycle	Vehicles below $30,000 will have battery sizes above 75kWh to enable greater range capabilities.
	Model availability	Mass market EV manufacturers / companies enter Australian market and increasing model availability
Charger	Charger reliability	There is a high proportion of suitable public chargers serving the needs of the community.
	Charger availability	Charging network infrastructure availability is high, significantly decreasing range anxiety across the majority/all ODs
Consumer	Price costs	EV uptake increases significantly as they reach and surpass price parity with ICE vehicles in 2025
	Fuel efficiency standards	Strong fuel efficiency standards are imposed to discourage the use of ICE vehicle
	Environmental awareness	Population are motivated to switch to EVs due to the environmental impacts leading to an exponential increase in EV uptake
Environment	Investment and Funding:	ACT has implemented a broad/credible range of policies to encourage EV uptake. Subsidies can be wound back, as the EV environment has passed beyond the need for support
	Policies and subsidies	Strong government incentives for international car manufacturers to enter Australia (i.e. lower import tax)
		Introduction of more attractive Government incentives such as free vehicle registrations, grants and exemption of stamp duty next 5-10 years
	Petrol prices	Major increase in petrol prices are leading to higher EV sales due to lower operational costs

Appendices

Appendix C EV registrations

Table A.6 Forecast EV registrations, by SA2 in 2030

	SA3	SA2	2030
1	South Canberra	Kingston (ACT)	1,124
2	North Canberra	Braddon	879
3	North Canberra	Civic	621
4	Woden Valley	Curtin	569
5	South Canberra	Griffith (ACT)	549
6	Tuggeranong	Kambah	536
7	North Canberra	Turner	500
8	Woden Valley	Phillip	497
9	North Canberra	Watson	488
10	Gungahlin	Franklin	470
11	Belconnen	Belconnen	466
12	South Canberra	Narrabundah	453
13	Woden Valley	Garran	420
14	Gungahlin	Harrison	389
15	Gungahlin	Ngunnawal	377
16	North Canberra	Campbell	366
17	Woden Valley	Farrer	357
18	North Canberra	Lyneham	356
19	North Canberra	Ainslie	353
20	Woden Valley	Hughes	334
21	Woden Valley	Mawson	330
22	Weston Creek	Weston	329
23	Gungahlin	Gungahlin	329
24	Gungahlin	Casey	303
25	Belconnen	Bruce	298
26	North Canberra	Downer	294
27	Woden Valley	Pearce	293
28	Woden Valley	Lyons (ACT)	293
29	Gungahlin	Bonner	287
30	Gungahlin	Moncrieff	282

Appendices

Appendix C Public EV charger need

Table A.7 Forecast EV chargers needed by highest 30 SA2s and charger type, 2030

	Region (SA3)	Suburb (SA2)	Charging need 2030
1	North Canberra	Civic	100+
2	North Canberra	Braddon	30-49
3	Belconnen	Belconnen	30-49
4	Woden Valley	Phillip	20-29
5	South Canberra	Barton	20-29
6	South Canberra	Kingston (ACT)	20-29
7	North Canberra	Acton	10-19
8	Canberra East	Canberra Airport	10-19
9	North Canberra	Turner	10-19
10	Belconnen	Bruce	10-19
11	Tuggeranong	Greenway	10-19
12	North Canberra	Lyneham	10-19
13	Gungahlin	Gungahlin	10-19
14	South Canberra	Griffith (ACT)	10-19
15	North Canberra	Campbell	1-9
16	North Canberra	Dickson	1-9
17	Gungahlin	Franklin	1-9
18	Woden Valley	Garran	1-9
19	North Canberra	Watson	1-9
20	Woden Valley	Mawson	1-9
21	South Canberra	Forrest	1-9
22	Gungahlin	Harrison	1-9
23	Canberra East	Hume	1-9
24	North Canberra	Reid	1-9
25	Woden Valley	Lyons (ACT)	1-9
26	Belconnen	Macquarie	1-9
27	South Canberra	Deakin	1-9
28	Gungahlin	Casey	1-9
29	North Canberra	Downer	1-9
30	South Canberra	Narrabundah	1-9

Appendices

Appendix D EV vehicle kilometres travelled

Table A.8 Forecast EV vehicle kilometres travelled, by highest 30 SA2s in 2021, 2025 and 2030

SA2	2021	2025	2030
Civic	1,790,553	14,234,516	84,183,861
Braddon	342,844	2,639,100	15,783,807
Belconnen	227,200	1,878,823	12,443,509
Phillip	214,317	1,761,059	11,109,973
Barton	271,109	1,937,442	10,207,402
Kingston (ACT)	193,711	1,580,515	10,037,870
Hume	122,375	1,048,332	7,870,910
Garran	291,720	1,790,463	7,792,258
Watson	208,038	1,417,576	7,049,996
Lyneham	197,251	1,214,437	6,605,299
Campbell	247,954	1,510,944	6,510,010
Bruce	216,824	1,378,887	6,466,866
Gungahlin	141,593	1,058,400	6,441,901
Turner	182,147	1,219,484	6,077,858
Acton	96,075	748,549	5,722,978
Canberra Airport	144,583	1,057,830	5,511,302
Griffith (ACT)	181,330	1,163,969	5,413,544
Greenway	127,346	945,009	5,180,053
Dickson	129,520	947,339	5,046,606
Franklin	108,799	782,556	4,181,975
Harrison	161,869	1,025,983	4,170,167
Kambah	137,456	882,093	4,169,873
Curtin	149,808	924,737	4,081,388
Deakin	168,759	988,907	4,012,776
Mawson	92,582	708,745	3,999,591
Ainslie	173,165	957,995	3,630,315
Casey	99,127	660,137	3,336,818
Ngunnawal	117,190	719,406	3,309,356
Narrabundah	120,642	740,914	3,262,950
Bonner	116,255	692,336	2,947,292

Appendices

Appendix E EV origin destinations

Table A.9 Forecast EV trips by origin, destination and ordered by highest number of trips by SA2s, 2030

	Origin		Destination	
	SA2	**Trips**	**SA2**	**Trips**
1	Civic	47,788	Civic	44,759
2	Braddon	8,960	Braddon	8,439
3	Barton	7,775	Barton	8,101
4	Kingston (ACT)	7,646	Belconnen	7,973
5	Belconnen	7,112	Bruce	7,917
6	Phillip	7,067	Phillip	7,837
7	Garran	4,957	Kingston (ACT)	6,890
8	Hume	4,895	Acton	6,545
9	Griffith (ACT)	4,124	Garran	4,991
10	Watson	4,002	Hume	4,932
11	Lyneham	3,750	Griffith (ACT)	4,129
12	Bruce	3,696	Campbell	3,714
13	Campbell	3,696	Watson	3,662
14	Turner	3,450	Canberra Airport	3,591
15	Canberra Airport	3,427	Lyneham	3,418
16	Acton	3,249	Reid	3,352
17	Gungahlin	3,068	Deakin	3,170
18	Deakin	3,057	Turner	3,044
19	Dickson	2,865	Greenway	3,040
20	Greenway	2,767	Dickson	3,038
21	Curtin	2,596	Gungahlin	2,936
22	Mawson	2,544	Curtin	2,332
23	Narrabundah	2,485	Narrabundah	2,244
24	Kambah	2,227	Mawson	2,166
25	Forrest	2,196	Forrest	2,146
26	Ainslie	2,061	Harrison	2,082
27	Franklin	1,991	Kambah	1,924
28	Harrison	1,986	Franklin	1,802
29	Downer	1,668	Pearce	1,776
30	Casey	1,589	Ainslie	1,730

Appendices

Appendix F Methodology and limitations

The Deloitte EV Vehicle Charger Consumer Environment (VCCE) framework incorporates four key areas across the end-to-end lifecycle for EVs including vehicle, charger, consumer and environment. The Deloitte VCCE framework is designed to be an iterative measurement process to monitor the dynamic market factors within a jurisdiction to allow agile policy decisions for the emerging EV market.

Analysis methodology
Deloitte has developed a three-stage methodology to forecast anticipated EV uptake, energy consumption and priority locations for potential charger locations, outlined in the figure below. Understanding the number of EVs likely to be registered within the ACT provides the necessary insights to inform the number and priority areas for public charging based on customer need.

Demand
A variety of factors including demographic and existing vehicle ownership across the ACT has been taken into consideration in modelling the future uptake of EVs. The geographic spread of EV uptake considers current EV registrations as an indicator of future uptake, in addition to future sales based on an assumption that there may be a faster rate of uptake among higher income groups.

1. The establishment of the model baseline of total vehicle registrations by ICE and EV in the ACT to apply the projected EV proportion of new vehicles sales
2. Income class adjustments were made by adopting 2016 ABS Census data to determine the EV uptake rate relative to the associated percentage of new EV sales developed for the respective scenarios.
3. The incorporation of current percentage of EV registrations, proportioned relative to the EV uptake by SA2, to determine the number of EV registrations by SA2.

Supply
The modelling approach to understand the charging requirements and the number of chargers required comprise the following three key elements:
1. Determine the total EV kWh per year on the basis of annual projections sourced from the demand model.
2. Estimate charging requirements on the basis of anticipated charging patterns and travel behaviours.
3. This information is used to determine the number of Level 2 and Level 3 public chargers required to meet demand.

Limitations
The analysis presented in the Outlook is indicative and is intended to inform those interested in public charging in the ACT. The analysis shown above does not include consideration of site specific factors including:
- Land access arrangements, including the viability of commercial terms for land access
- Costs for site specific works
- Land use restrictions
- Site specific costs or benefits
- Customer segmentation or targeting for specific public charging user groups

Each of these factors may make an individual site relatively more or less attractive within a suburb. Investors will need to consider each site on its own merits within a given suburb.

References

ACT Government, 2018, Planning Strategy 2018, https://www.planning.act.gov.au/__data/assets/pdf_file/0007/1285972/2018-ACT-Planning-Strategy.pdf

ACT Government, 2020, Transport Strategy 2020, https://www.transport.act.gov.au/__data/assets/pdf_file/0016/1613302/200601-ACT-Transport-Strategy_web.pdf

ACT Government, 2019, Climate Change Strategy 2019-25, https://www.environment.act.gov.au/__data/assets/pdf_file/0003/1414641/ACT-Climate-Change-Strategy-2019-2025.pdf/_recache

Climate Change and Greenhouse Gas Reduction Act 2010 (ACT)

Deloitte Access Economics, 2021 [unpublished]

Electric Vehicle Council, 2021, State of Electric Vehicles 2021, https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021.pdf

Energeia, 2021, Australian EV market study, ARENA, https://arena.gov.au/assets/2018/06/australian-ev-market-study-report.pdf

Evoenergy, 2021, Evoenergy Rosetta APR Mapping Portal - network constraints, https://apr.evoenergy.com.au/

Evoenergy, 2021, Connections overview, https://www.evoenergy.com.au/connections-overview

McKinsey, 2018, Charging ahead: Electric-vehicle infrastructure demand, https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand

Development approval resources

Development applications: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/development-applications

DA and BA exemptions: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/exempt-work

Building approval: https://www.planning.act.gov.au/build-buy-renovate/build-buy-or-renovate/approvals/building-approval