Draft Electric Vehicle Discussion Paper

February, 2024 Prepared for the City of Yarra

Institute for Sensible Transport

The Institute for Sensible Transport acknowledges the people of the Wurundjeri Woi Wurrung language group of the eastern Kulin Nation on whose unceded lands we work.

We respectfully acknowledge their Ancestors and Elders, past and present.

We also acknowledge the Traditional Custodians and their Ancestors of the lands and waters across Australia where we conduct our business.

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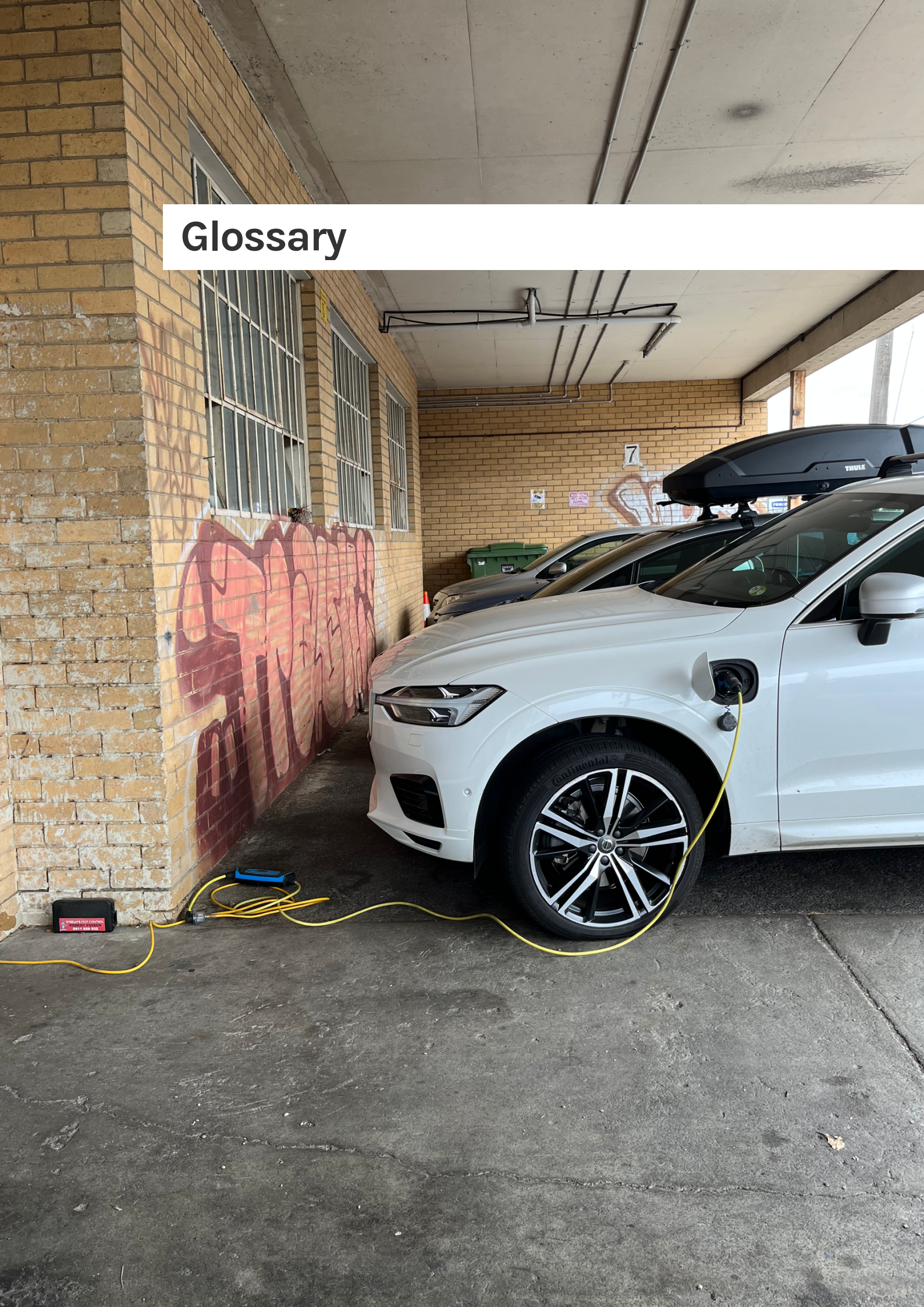

AC Alternating Current. An electric current that reverses its direction many times a second at regular intervals.

BEV Battery Electric Vehicles. A type of electric vehicle that exclusively uses chemical energy stored in rechargeable batteries. BEVs use electric motors and motor controllers instead of internal combustion engines.

DB Distribution board. An electrical cabinet that contains circuit breakers and fuses for each electrical circuit within a building or part of a building.

DC Direct Current. An electric current that flows in one direction only.

DNSP Distribution Network Service Provider. They are the organisations that own and control the hardware of the distributed energy network such as power poles, wires, transformers, and substations that move electricity around the grid.

DoT Department of Transport. A government department in Victoria that is responsible for the ongoing operation and coordination of the Victorian transport networks, and the delivery of new and upgraded transport infrastructure.

EPA test The United States Environmental Protection Agency test. This is a testing standard for a vehicle's driving range and is typically the most conservative of the three.

EV Electric Vehicle. A vehicle that is either partially or fully powered on electric power.

EVSE Electric Vehicle Supply Equipment. Commonly called charging stations or charging docks, EVSE provide electric power to electric vehicles and recharge the vehicle's batteries. EVSE systems include electrical conductors, related equipment, software, and communications protocols that deliver energy efficiently and safely to the vehicle.

FCEV Fuel Cell Electric Vehicle. A type of electric vehicle that uses a fuel cell, sometimes in combination with a battery or supercapacitor, to power its onboard electric motor. They are powered by hydrogen and do not produce tailpipe emissions.

GHG Greenhouse gas. A gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect.

HEV Non-plug-in Hybrid Electric Vehicle. A type of vehicle that combines an internal combustion engine system with an electric propulsion system that can work either simultaneously or independently.

ICE Internal Combustion Engine, powered by either diesel or petrol.

ICEing The act of deliberately parking an ICE vehicle in an EV charging bay to prevent EVs from being able to charge.

NEDC New European Driving Cycle. This is a testing standard for a vehicle's driving range.

PHEV Plug-in Hybrid Electric Vehicle. A vehicle that is powered by petrol or diesel as well as an electric motor and a small battery, able to be charged by plugging into an electrical socket.

Smart charging refers to a charging system where a data connection is shared between electric vehicles, charging stations, and electricity network operators to allow users to monitor, manage and adjust energy consumption. Smart technology can alleviate pressure from the grid system and save associated charging costs for EV users.

V2L Vehicle to Load, whereby the electricity stored in a vehicle's battery is used to power an external device, typically offering a standard 240V outlet.

V2H Vehicle to Home, whereby the electricity stored in a vehicle's battery is used to power a home.

V2G Vehicle to Grid describes the capability of a vehicle to supply energy from the battery to the electricity network.

SA1 Statistical Area Level 1. A classification used by the Australian Bureau of Statistics to describe the smallest unit for the release of census data.

SA2 Statistical Area Level 2. A classification used by the Australian Bureau of Statistics to describe medium-sized general-purpose areas built up from whole Statistical Areas Level 1 (SA1s). Their purpose is to represent a community that interacts together socially and economically.

SB Switchboard. The main electrical cabinet containing the incoming electricity supply and distributes it across a building or to smaller distribution boards.

WLTP Worldwide Harmonised Light Vehicle Test Procedure. This is a testing standard for a vehicle's driving range.

Executive Summary

To be completed following Council's approval of the material in this draft.

1. Introduction

The City of Yarra (Council) understand the importance of supporting the community's transition to low carbon transport. Enabling the community to charge electric vehicles can be seen as one of the many actions Council can take to assist the community lower their transport emissions. This report has been commissioned by Council to inform Yarra's EV charging policy, to ensure equitable access to charging and aid the transition away from internal combustion engine vehicles.

Council is experiencing an increase in requests from residents for the provision of public charging infrastructure. This is often from households without off street parking.

Many properties in Yarra do not have off-street parking and/or the capacity to retrofit EV chargers and are unable to install EV charging infrastructure within their properties.

A lack of visible EV charging infrastructure prevents or postpones the decision to purchase an electric vehicle.

1.1 Project objective

A key objective of this report is to assist in the development of a clear policy position from Council. This will assist in responding adequately to growing community interest in EVs and charging.

This report provides a firm foundation for Council to articulate a clear, robust policy on EV charging.

1.2 Why is this project important?

The City of Yarra have committed to achieve zero-net emissions across the municipality by 2030. Yarra was one of the first local governments in the world to declare a climate emergency and remains committed to help tackle climate change. Transport is responsible for approximately 15% of the Yarra community emissions, with the majority being a result of car use. To achieve this goal by 2030, Council has recognised that reducing Yarra's transport emissions largely depends upon reducing non-essential car use, increasing the portion of trips taken by public transport, walking and cycling, and rapidly transitioning to EVs. There are considerable opportunities for Yarra to reduce its transport emissions and realise a range of co-benefits including improved air quality, health and overall liveability of the city.

The City of Yarra have committed to achieve zero-net emissions across the municipality by 2030.

The Australian government has a legislated target of reducing Australia's greenhouse gas emissions by 43% by 2030. Figure 1, which uses BITRE data, shows that on current projections, Australia is on track to *increase* rather than reduce emissions from transport. Interventions that are more ambitious in scale are required, and must include a suite of measures, beyond transitioning to EVs. This must include planning controls to avoid car dependency and greater investment in active transport.

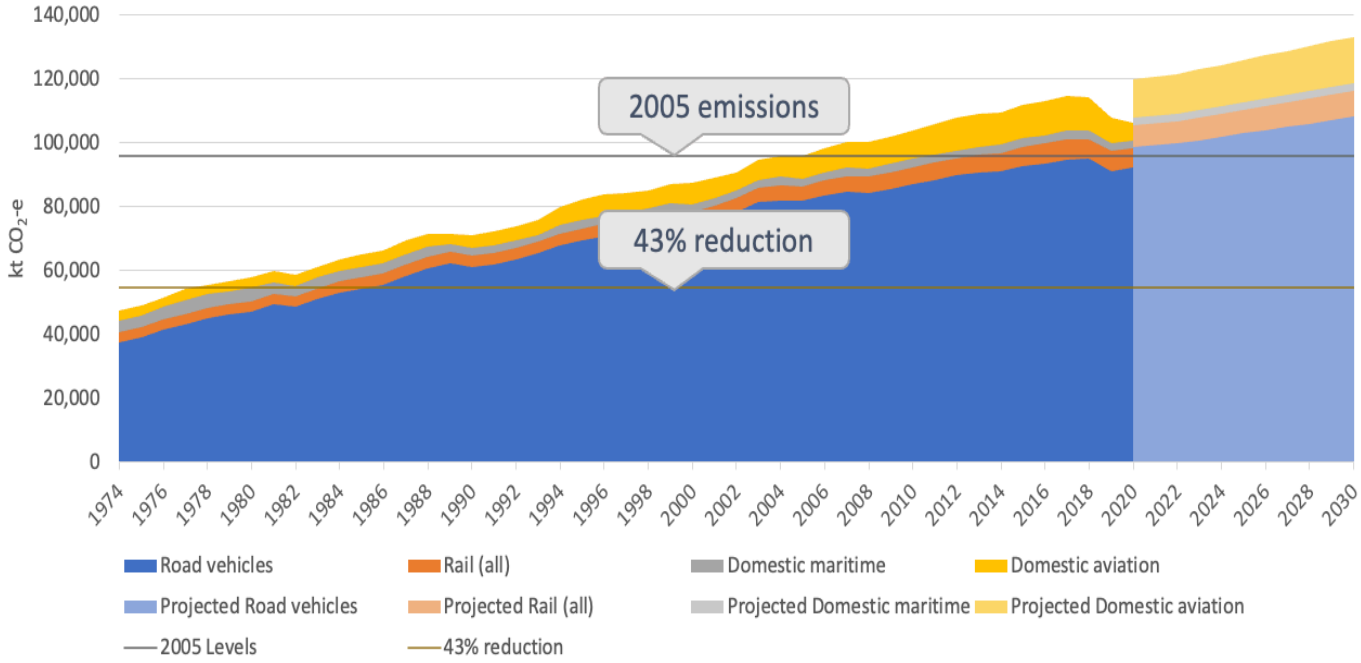

Figure 1 Projecting Australia's transport emissions

Source: Institute for Sensible Transport, using BITRE (2021) data

1.3 What this report covers - summary

This project delivers advice to Council on the following areas:

- Analysis of EV market trends, and developments within the EV and charging industry.
- Demand assessment model of future uptake of EVs among residents in Yarra, between now and 2035. This includes a forecast of public charging infrastructure required.
- Advice on a series of domestic and international case studies outlining what other councils have done to support EV charging.
- Policy recommendations to strengthen and modernise the City of Yarra's approach to the EV transition.
- Advice on pricing and ownership structures for maximising charging opportunities at minimal cost to Council.
- Advice on the barriers and facilitators to e-micromobility uptake and outlining the potential planning considerations to meet Council's strategic objectives.

1.4 Existing chargers within the City of Yarra

There are currently 12 public EV chargers in the City of Yarra, with one planned to be installed on Hull Street in Richmond. Richmond currently has the most EV charging infrastructure with five EV chargers (though some are only for Tesla vehicles), followed by Abbotsford with three. Collingwood, Cremorne, and Burnley each have one existing EV charger. Table 1 provides address, charger type, and number of ports of all operating public EV chargers in the City of Yarra.

A spatial representation of their locations and in surrounding LGAs is shown in Figure 2. There is a significant gap in EV charging infrastructure in the northern portion of the City of Yarra. This is particularly true for Clifton Hill, where the closest EV charger is in Collingwood more than 1.3km away.

Table 1 Locations of existing EV chargers in the City of Yarra

EV Charger	Suburb	Address	Charger type	Ports
1	Abbotsford	13 Stanton St	Level 3 (DC)	4
2	Abbotsford	313 Victoria St	Tesla Supercharger (DC)**	4
3	Abbotsford	611 Victoria St	Level 1 (AC)	5
5	Burnley	588 Swan St	Level 2 (AC)	4
6	Collingwood	1 Sackville St	Level 1 (AC)	2
7	Cremorne	650 Church St	Tesla Supercharger (DC)*	8
8	Richmond	630 Richmond St	Level 2 (AC)	5
9	Richmond	620 Victoria St	Level 3 (DC)	4
10	Richmond	620 Victoria St	Level 2 (AC)	2
11	Richmond	230 Church St	Level 1 (AC)	3
12	Richmond	261 Bridge Rd	Level 1 (AC)	8
13	Richmond	649 Bridge Rd	Tesla Supercharger (DC)*	2
Total ports				52

* Charger is restricted to Tesla drivers only

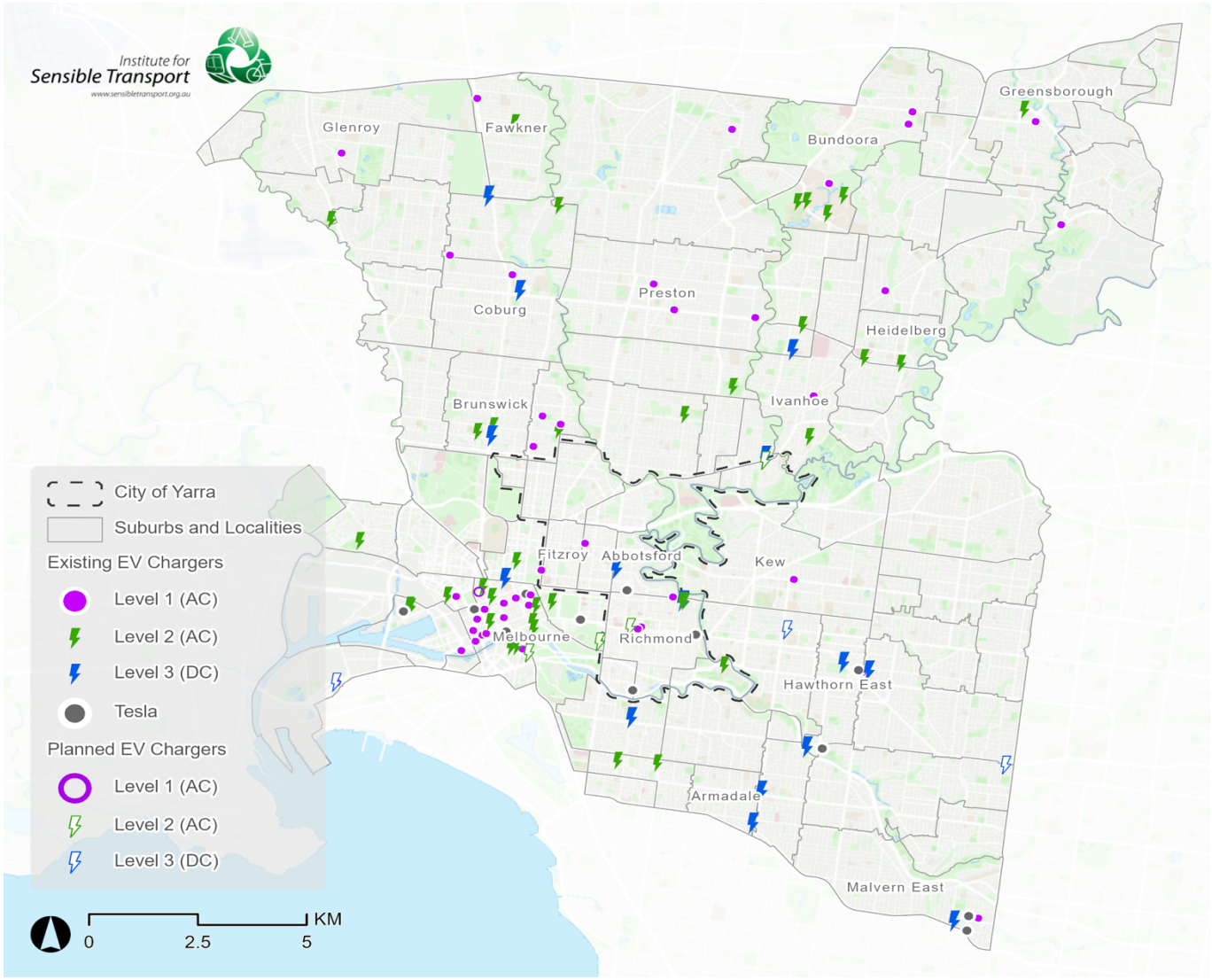

Figure 2 EV Charger locations in the City of Yarra and surrounding LGAs

Source: PlugShare

2. Electric vehicle charging fundamentals and trends

The EV market is evolving rapidly, with a greater range of more affordable vehicles and an expanding network of charging options. The growth of the EV market is expected to continue, and it has been estimated that price parity may occur in ~2026/27.

2.1 What is an electric vehicle?

There are several distinct categories of vehicle drive train, and it is important to identify the main types, as shown in Figure 3.

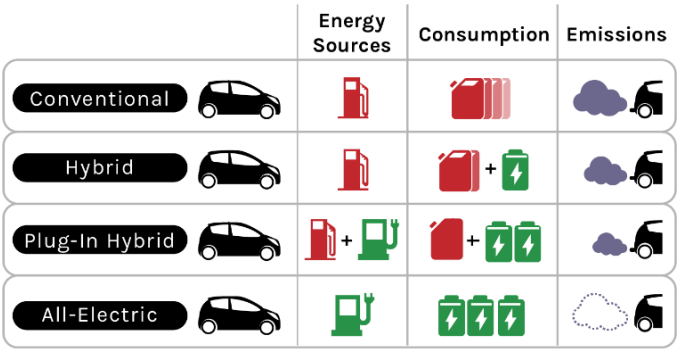

Figure 3 Different types of consumption and electric vehicles (EVs)

Source: Adapted from Adnan et al (2017)

The following provides a brief description of each of the vehicle categories listed in Figure 3.

- *Conventional vehicle* – also referred to as an Internal Combustion Engine (ICE) vehicle, is the standard vehicle type widely known and used since the invention of the motor vehicle. It is *not* an EV.
- *Hybrid vehicle* – a vehicle that uses petrol/diesel as its only fuel source, but also has an electric motor and battery that can store energy from regenerative braking. A *Toyota Prius* is a common example of a hybrid vehicle.
- *Plug-in Hybrid Electric Vehicles* (PHEV) - combines a mixture of fuel combustion and electricity. It is like the hybrid vehicle described above; however, it can take electricity from a socket and can store this in a battery. A *Mitsubishi Outlander* is an example of a model available as a PHEV.
- *Battery Electric Vehicles (BEV),* or *All-Electric*, take electricity from a socket and rely entirely on the electricity stored in an on-board battery for propulsion. A *Tesla Model 3* and *BYD ATTO 3* are two common models of BEV.

2.2 Electric vehicle sales in Australia

While Australia has among the lowest levels of EV adoption in the OECD, it has begun to increase rapidly, from around 2% of new vehicle sales a couple years ago, to ~8.5% for 2023. Figure 4 captures recent EV sales in Australia, both in total and as a percentage of light vehicle sales.

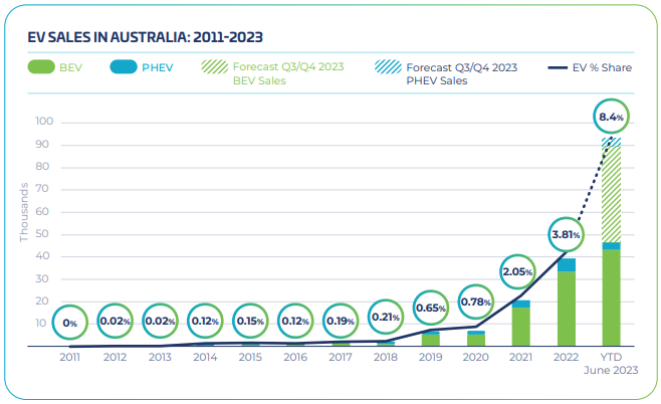

Figure 4 EV sales in Australia

Source: Electric Vehicle Council, 2023

Several surveys have found around 50% of consumers are considering an EV for their next vehicle purchase.

Around half of consumers are considering an EV for their next vehicle purchase.

2.3 Electric vehicle advancements

Electric vehicle technology has advanced rapidly in recent years. Electric vehicles avoid the tailpipe emissions of ICE vehicles, have lower running and servicing costs, and last longer. Compared to just five years ago, EVs:

- Have become cheaper
- Offer longer battery range, and
- Are available in a wider variety of vehicle types.

Electric vehicles also now have access to more chargers, including publicly available fast chargers, in more locations in Melbourne and this is set to grow further in coming years. Range anxiety is still a key stated barrier to the greater uptake of EVs and more chargers will reduce this barrier.

The next 12 months are set to see the introduction of several lower cost models that, while still more expensive to purchase than their ICE equivalents, will compete strongly in terms of *whole of life* costs.

Electric vehicles are important because they:

- Improve local air quality
- Eliminate tailpipe GHG emissions
- Reduce noise pollution
- Reduce vehicle running costs.

2.4 EV Chargers

The three main EV charging equipment characteristics that differentiate chargers from one another include (International Energy Agency, 2018):

1. Level: the power output range of the EV charging outlet. The maximum is lower for Alternating Current (AC) for most cars.
2. Type: the socket and connector used for charging.
3. Mode: the communication protocol between the vehicle and the charger.

The number of chargers and the speed with which a battery can be changed has improved significantly over recent years. Victoria is building networks of fast chargers to facilitate long distance travel. Table 1 provides a snapshot of different charging types.

One critically important observation from EV owners regarding their charging habits is that *over 90% of charging happens at home, or work*. This has implications for the selection of appropriate sites for charging infrastructure, and the speed of charger selected. It also has particularly important implications for the City of Yarra, with large numbers of dwellings without easy access to on-site (at home) charging.

Table 2 EV Charging types[1]

	Power	Range added per hour	Charging Time	Typical Application
Level 1 - single phase (domestic)	2.4 - 3.7kW	10 - 20km range / hour	5 - 6 hours	Home
Level 2 - slow single phase (domestic or public)	7kW	30 - 45km range / hour	2 - 5 hours	Home, work, shopping centres, car parks
Level 2 - fast three phase (public)	11 - 22kW	50 - 150km range / hour	30mins - 2 hours	Urban roadside
Level 3 - fast charge (public)	50kW	250 - 300km range / hour	20 - 60 mins	Activity centres, and near highways, motorways and key routes
Level 4 - super-fast charge (public)	120kW	400 - 500km range / hour	20 - 40 mins	Highways, motorways and key routes
Ultra fast charge (public)	350kW	1,000+ km range / hour	10 - 15 mins	Major highways and motorways

Vehicle manufacturers are continuing to upgrade their cars to accept high-capacity chargers. What this means from a usability perspective is that an EV can be fully charged in as little as 15 minutes. It is important to recognise that this will be rare (few vehicles will be able to) and expensive (it is based on a battery optimised for high-speed charging with other downsides). The reality is that most fast-charging sessions, even now, are only ~30 minutes – enough to get you to where you are going.

Over 90% of EV charging occurs at home or work.

2.5 Key trends

Several trends are identified that are important to the development of an EV charging policy for the City of Yarra:

- Greater range of vehicle types
- Extended range and battery size
- Vehicles capable of Ultra-Fast Charging
- Vehicle to Grid (V2G), Vehicle to Home (V2H) and Vehicle to Load (V2L) capabilities, enabling

[1] Relatively few cars can use full capacity of three phase AC chargers.

greater flexibility, enhanced resilience and grid stability. This also has implications for soaking up excess solar power during the middle of the day.

- Vehicles with towing capabilities, including a potential need for 'drive-thru' bays for long vehicle charging.

2.6 Understanding market segmentation for EV charging

It can be helpful to consider the different elements of the EV charging market. These can be broadly classified into three different types, as highlighted in Figure 5.

A charging site catering to the *passing through motorist* will generally be restricted to locations in which one or more motorways/freeways are located. These vehicles will be travelling a large distance and require a fast to ultra-fast charge. Three of the highest volume roads in Victoria pass through or alongside the City of Yarra (Monash Freeway, Hoddle Street and Eastern Freeway/Alexandra Parade). Sites proximal to these corridors may offer suitable locations for the *passing through motorist.*

The *opportunistic charger* is someone that was visiting the location anyway, and is taking the opportunity to charge while they are visiting a business. The charger speed does not have to be very fast as the user is not as time sensitive.

A local resident, without off street parking, will generally require a public charger close to where they would have parked overnight. An AC charger is generally sufficient, as the vehicle is usually parked for more than 6 hours. Residents of the City of Yarra are most likely to fit this category, for the bulk of their charging needs.

Figure 6 offers a conceptual illustration of the EV charging ecosystem, showing suitable locations for different types of chargers. This is primarily a function of the typical duration of stay for different land uses.

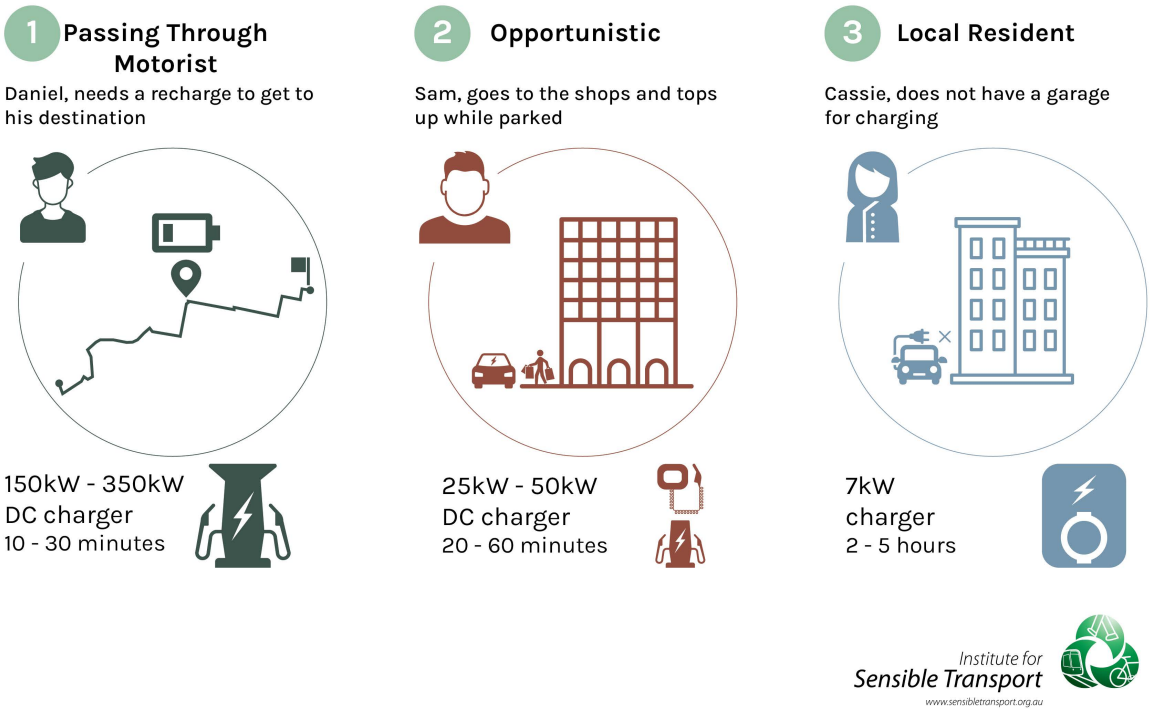

Figure 5 Three types of chargers

Source: Institute for Sensible Transport

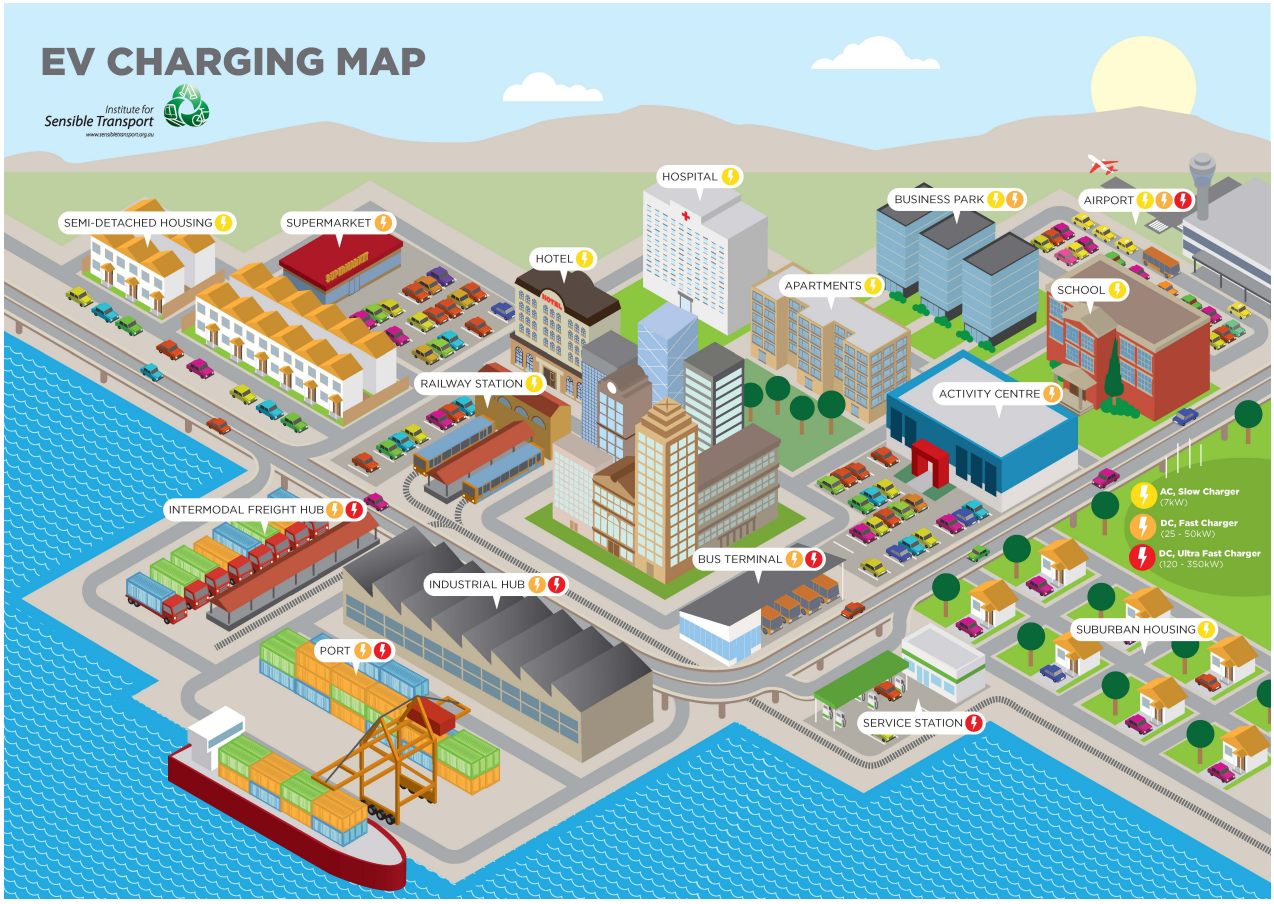

Figure 6 Understanding the EV charging ecosystem

Source: Institute for Sensible Transport

2.7 EV adoption factors

Figure 7 captures the three broad areas in which government can influence the uptake of EVs. Purchase incentives and traffic priority are largely the domain of national and state government – though councils may wish to undertake an advocacy role to encourage adoption of policies in these areas.

Figure 7 Policies for boosting EV adoption - 3 categories

Source: Institute for Sensible Transport

Purchase incentives and enhanced capabilities are focused on measures designed to make the *vehicle* more attractive to the market. This includes policies such as sales tax exemptions and accelerated depreciation arrangements. This category also includes enhanced vehicle capabilities, such as extended battery range or a diversity of vehicle types. Disincentives for ICE vehicles can also be used to increase the relative value proposition of EVs.

Traffic priority relates to measures such as free use of toll roads and congestion zones, as well as the ability for a single occupant EV to use High Occupancy Vehicle lanes.

Factors required to be in place for higher EV uptake

The factors required to be in place before EVs are preferred (or at least equal to ICE) for typical consumer preferences is summarised below (adapted from AEVA[2]):

1. Awareness and social norms: People need to be familiar with EVs and their capabilities.
2. Range: EVs should have an adequate range (distance) for the vehicle's intended purpose.
3. Charging infrastructure: A perception must exist that there is adequate charging infrastructure.
4. Variety of vehicles: It is important that the EV market contains a sufficient diversity of models to meet the needs of the community.
5. Cost comparability: Financial incentives and/or lower sticker (official) price will assist consumers. There are two thresholds here; whole of life and sticker price.

Box 1 EV adoption factors

A number of recent studies, conducted separately by the RACV and the Electric Vehicle Council (EVC) have found that around 54 – 60% of respondents state they would consider an EV for their next vehicle purchase.

The EVC conducted a consumer survey in 2021, and presented the results in Figure 8. This indicates the degree to which the factors on the left hand side of the figure act to either encourage or discourage EV adoption. As will be discussed in this section, current purchase price and availability of charging infrastructure are acting as discouraging factors.

Lower running costs and safety features are the two top factors encouraging consideration of EV purchase. It is interesting to note that while lower emissions performance might be the key factor for government encouragement of EVs, the three most

[2] Australian Electric Vehicle Association Inc.

popular responses in Figure 8 all relate to the *individual*, rather than global factors.

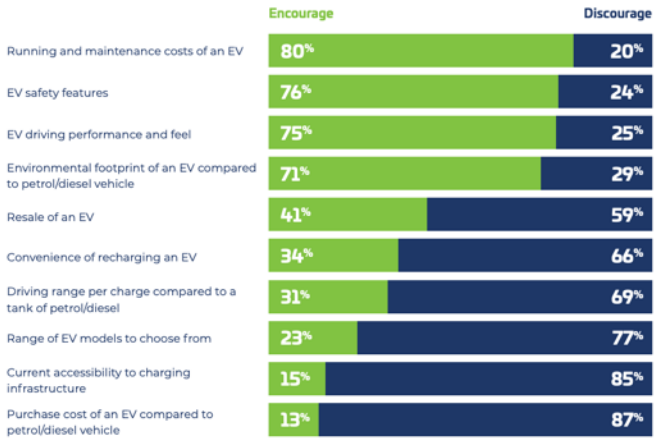

Figure 8 Encouraging and discouraging factors for EV adoption

Source: https://tinyurl.com/9wa6k6tm

2.7.1 Barriers to EV adoption

There are a number of known barriers to the adoption of EVs, and these vary by country. The main barriers being purchase price and driving range, as identified in Figure 8. A global consumer survey by Deloitte in 2021 found that driving range and lack of charging infrastructure were the two most commonly reported concerns. These two issues can be viewed as two sides of the same coin and concerns around driving range can be mitigated against via additional charging infrastructure.

Table 3 provides an overview of Deloitte's study of common concerns regarding EVs. Upfront cost was the third highest ranking barrier. These results support the findings from the previously mentioned EVC study.

Many previous studies have cited cost as the main barrier. For instance, the RACV, in conjunction with the EVC conducted a study with over 1,000 participants. Seventy seven percent of respondents said they were discouraged by the high purchase price.

Other barriers to EV adoption found in the RACV study include:

- Limited range of EV models. Australia, due in part to the lower levels of government support have a small range of EVs to choose from than other Organisation of Economic Cooperation and Development (OECD) markets. This is expected to change over coming years, and since the study was published (2020), more EV models have entered the market.
- Range anxiety. As with many other studies, people responded that limited range, coupled with patchy fast charging possibilities acted as a barrier to EV adoption. Interestingly, the minimum range people said on average that they would find acceptable was 461km. This is on the high end of the spectrum of range for the existing models currently available. Some EV drivers often note that concerns around range anxiety diminishes with experience. It is also likely that acceptable range will lower over time as the fast charging network develops into the regions.

Table 3 Concerns regarding EVs

Concern	United States	Germany	Japan	Rep. of Korea	China	India
Driving range	28%	28%	22%	11%	25%	13%
Lack of charging infrastructure	25%	22%	29%	32%	20%	26%
Cost/price premium	20%	16%	23%	17%	9%	16%
Time required to charge	13%	13%	15%	18%	13%	14%
Safety concerns	8%	12%	10%	19%	29%	25%
Lack of choice	4%	5%	1%	3%	4%	6%
Other	2%	4%	0%	0%	0%	0%

Source: Deloitte (2021) Global automotive consumer study

2.7.2 Requests for EV charging among City of Yarra residents

A lack of convenient options to charge an EV can be a barrier to ownership. This is relevant to the City of Yarra, with many residents lacking off street parking. Council have been receiving requests from the community for public EV charging. Figure 9 illustrates the spatial distribution of these requests. This map makes it clear that there are clusters of requests both the northern and southern suburbs of Yarra. These include Fitzroy North, Carlton North, Princess Hill, Richmond and Cremorne. This pattern likely stems from the evident scarcity of EV chargers in these areas, coupled with homes that may lack easy access on charging, on site.

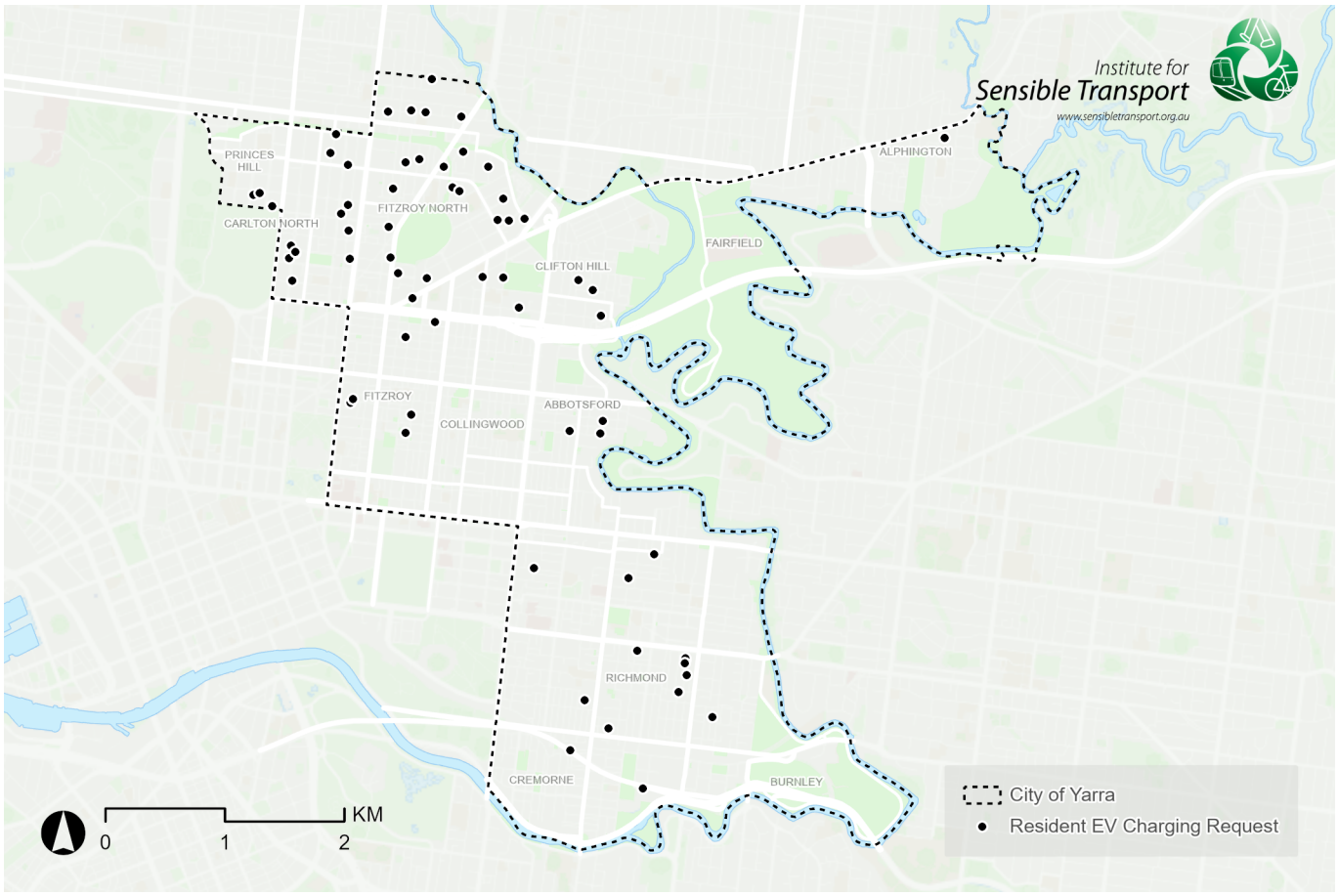

Figure 9 Yarra residents EV charging requests

Source: City of Yarra

2.7.3 Why EV charging near home is important

Having convenient access to charging will not only impact those looking to purchase an EV, but it will also impact those who have already purchased an EV. A study of EV ownership in California[3] found that roughly one in five EV owners switched back to owning an ICE vehicle. Of those who switched, over 70% lacked access to Level 2 charging at home, and slightly fewer than that lacked Level 2 connections at their workplace. The findings noted that the main reason drivers said they made the switch back was the inconvenience of charging. It therefore should not be assumed that once a consumer purchases an EV, they will continue to own one. For the market share of EVs to continue to grow and reach 100% of new vehicle sales, it is essential that convenient charging opportunities are provided. Section 4 provides an overview of what other local governments have done to provide charging opportunities for their residents.

In a US study, 20% of drivers who owned an EV, switched back to a petrol or diesel vehicle. Of those who switched, 70% lacked access to adequate charging at home.

Figure 10, based on the Californian studies referred to earlier, illustrates the variations in home and work charging access, encompassing charging levels. It also delves into respondents' reported use of public charging, examining the charging levels among those who continued and discontinued EV ownership.

[3] https://doi.org/10.1038/s41560-021-00814-9

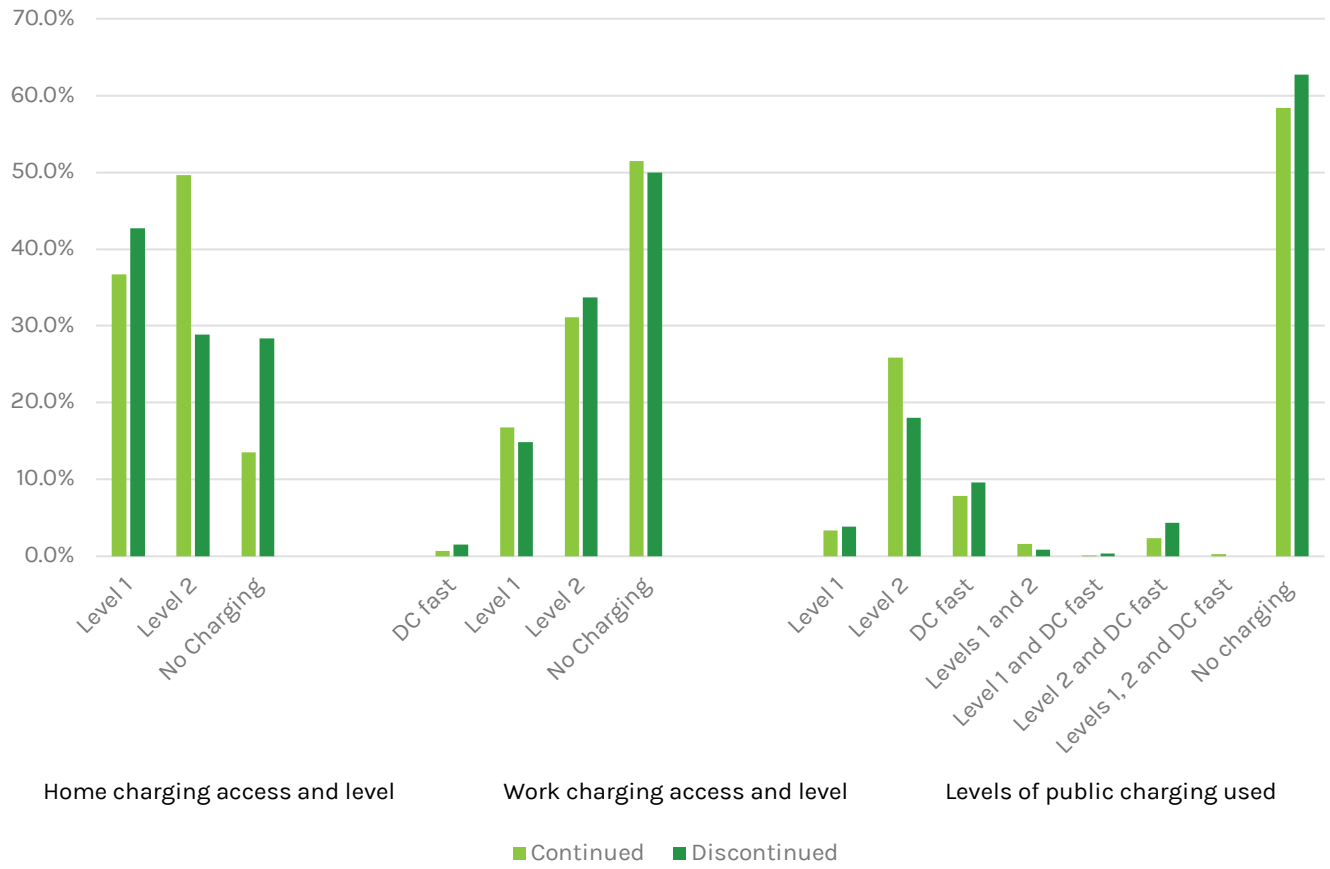

Figure 10 Usage of different charging types

Source: Hardman, S., & Gil, T. (2021)

3. Policy review

This section provides an overview of relevant Yarra, State and Commonwealth policies related to electric vehicle charging.

3.1 Local government policies

3.1.1 Moving Forward: Yarra's Transport Strategy 2022-32

The *Moving Forward: Yarra's Transport Strategy* is a 10-year plan designed to establish an innovative, accessible and sustainable transport system for the City of Yarra. Aligned with the *Yarra 2036 Community Vision*, this strategy aims to foster a forward-thinking and inclusive transport network that is net-zero by 2030.

The key priorities of the strategy include delivering:

- A well-connected transport network that safely accommodates space-efficient, sustainable modes of transport.
- Enhanced utilisation of environmentally sustainable modes of transport in response to the climate emergency.
- New Deals for walking and cycling that support active travel for all ages and abilities.
- A mode shift away from car trips to, from and through Yarra by prioritising walking, cycling and using public transport over car use.
- Safer streets in Yarra by reducing traffic speeds and volumes, and addressing safety concerns by reducing, delaying, or eliminating vehicle turning movements where they pose risks to other road and path users.

Encouraging the transition to zero-emission road vehicles is identified in the strategy as a method to reduce transport related emissions in the City of Yarra. It outlines that zero-emission cars have the potential to reduce transport emissions, however it also acknowledges that changing the propulsion method of vehicles from petrol or diesel to electric will not address many of the transport issues that Yarra is facing. Figure 11 offers an indication of the emissions reduction impact of various changes in behaviour.

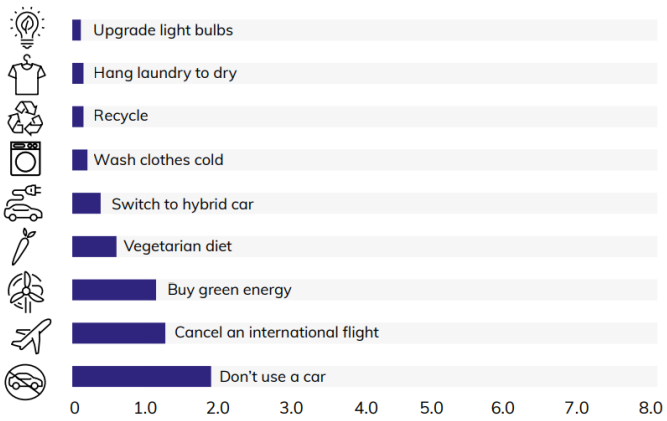

Figure 11 Choices to reduce personal contribution to climate change

Source: Moving Forward: Yarra's Transport Strategy 2022-32

Yarra's Transport Strategy outlines the primary role for Council in the transition is facilitation and promotion of EV infrastructure rather than direct operation. It commits to develop policies and strategies to manage the fair and sustainable transition, with the development of a future *Electric Vehicle Strategy* to guide decision-making.

Yarra's Transport Strategy outlines the primary role for Council in the transition is facilitation and promotion of EV infrastructure rather than direct operation.

3.1.2 Council Plan 2021-25

The Council Plan for the City of Yarra lays out the strategic direction, guided by the 2036 Community Vision. The 4-year plan outlines the six strategic objectives which have been summarised below:

- Climate and Environment: Council is committed to urgent climate change mitigation, adaptation and fostering resilience
- Social Equity and Health: Council will ensure its residents have equitable
- Local Economy: Yarra envisions thriving and connected neighbourhoods, major activity centres, nightlife, and employment precincts that actively support and inspire diverse creative communities, cultural activities,

businesses, and local employment opportunities.

- Place and Nature: Yarra strives for cohesive and sustainable community spaces, streets, and green areas that unite residents, manage growth, preserve unique character, and emphasise the harmonious coexistence of people and nature.
- Transport and movement: Council envisions a sustainable transport network that views streets as vital shared public spaces, ensuring accessibility, safety, and seamless connectivity in transportation and movement.
- Democracy and Governance: Council aspires to be a smart, innovative, and sustainable community where decisions and advocacy are grounded in evidence and meaningful engagement, placing good governance at the core of its processes and decision-making.

There is a strong focus on tackling the climate crisis by accelerating emissions reductions in Council's operations, aspiring to be net-zero emissions by 2030. To achieve this target and support the transition toward a more sustainable future, several transport related initiatives have been outlined in the Plan. These include:

- Working with key stakeholders to advocate for the rapid move towards 100% renewables.
- Developing a *roadmap to zero* that will include costed initiatives for community carbon emissions.
- Support measures which facilitate the uptake of EVs in the community.

Becoming net zero by 2030 is an integral element of Council's response to the climate emergency.

Additionally, the City of Yarra has committed to the transition of Council's fleet to low or zero emission vehicles where it is both practical and available by 2025, meaning Council will need to increase charging infrastructure to support its fleet.

3.1.3 Parking Management Strategy Action Plan

There is a close relationship between an EV charging policy and parking, as EVs can only charge while parked. The City of Yarra has prepared the *Parking Management Strategy Action Plan* to manage all aspects of parking in Yarra. Its vision is to promote sustainable transport and to optimise the access to homes for residents. The overarching aim of the plan is outlined in the three main points summarised below:

- Reduce the number of cars requiring parking on residential streets.
- Optimise the use of road pavement space for parking with community benefits, especially benefiting pedestrians, cyclists, public transport, and individuals waiting for public transport.
- Strategically plan and manage transport and urban development to reduce reliance on car travel, effectively containing and managing the demand for parking.

There is no mention of EVs or charging infrastructure within the Strategy, however the *Paid Parking Policy* outlines that visitors to the City of Yarra should contribute to the cost of maintaining and providing the parking infrastructure they use by paying for parking. This could include the future provision of EV charging.

Additionally, the Strategy outlines that Council will consider incorporating off-street car parking where necessary when developing community resources and facilities. This again has the potential to include future provision of EV charging.

3.1.4 Yarra Climate Emergency Plan 2020-2024

The Climate Emergency Plan sets out the City of Yarra's longer term climate targets and lays out the path ahead for the life of the 4-year plan. Yarra was one of the first local governments in the world to declare a climate emergency and remains committed to help tackle climate change through the implementation of the Plan. The main objective is to achieve zero-net emissions across the entire municipality by 2030.

Yarra Council was one of the first local governments in the world to declare a climate emergency.

The *Climate Emergency Plan* cites the development of a future Integrated Transport Strategy (ITS). This would be adopted by Council in 2022 under the title *Moving Forward: Yarra's Transport Strategy 2022-32.* The *Climate Emergency Plan* outlines several initiatives that would eventually be a part of the *Yarra's Transport Strategy* such as transitioning councils' fleet to EV's by 2025. It is also then worth noting that not all the actions and targets that were outlined in the *Climate Emergency Plan* were adopted into *Yarra's Transport Strategy*.

Some of the transport actions from the *Climate Emergency Plan* that were not included in the *Yarra Transport Strategy* include:

- Using parking provisions and other mechanisms to encourage car-share and EVs.
- Work to support the installation of public use EV charge points.

3.2 Victorian government policies

The Victorian government has articulated Its support for the EV market, with the publication of Its Zero Emissions Vehicle Roadmap. They have a target of 50% of vehicles sold in 2030 to be zero emission. The Victorian government has been heavily criticised by some for introducing an EV specific tax of 2.5 cents per kilometre, with some labelling it as '*climate vandalism*'. The High court in 2023 ruled this to be unlawful and the Victorian Government has committed to repay with interest the money collected through its unconstitutional EV tax. The state has also provided a number of incentives for EVs adoption, including:

- Additional funding ($22.65m) for public charging infrastructure
- Trialling electric buses
- A Zero Emission Vehicles – Expert Advisory Panel
- Including more EVs into the government fleet
- $100 off registration fees for EVs.
- Exemption from the 'luxury vehicle' rate of stamp duty, paying only a flat rate of $8.40 per $200 of market value (Only for vehicles worth more than the $68,750 threshold).
- There are currently more than 129 DC Fast Charging sites in Victoria and well over 400 locations with chargers offering speeds below 24kW available for public use. As of 2023, there were 20,376 registered EVs in Victoria according BITRE data.

A selection of the key actions included In the Zero Emissions Vehicle Roadmap are shown in Table 4.

Table 4 Key actions – Victorian *Zero Emissions Vehicle Roadmap*

Actions	Description
Public education	• Addressing concerns about ZEVs and their performance • Supporting an improved understanding about ZEV options and transition
Advocacy	• Working with other State and Territories to look at options for developing a harmonised approach to vehicle emissions standards, given the lack of action at the national level, and allowing parallel imports from other right-hand-drive markets
Promoting 'ZEV-readiness'	• Investing $19 million to accelerate the rollout of battery electric vehicle charging infrastructure across regional Victoria, and support electric vehicle fleets • Supporting changes to the National Construction Code from 2022 to reduce barriers to future installation of EV charging in new buildings • Undertaking a $298,000 study on ZEV-readiness in new developments

Actions	Description
	• Developing an online guide for apartment owners and body corporate committees to assist them in identifying and assessing options to enable EV charging in existing buildings • Investigating the need for, and feasibility of, hydrogen re-fuelling stations and other supporting infrastructure
Transition our fleets	• Investing $46 million for Australia's first public ZEV subsidy program - supporting the purchase of more than 20,000 ZEVs • Setting a target of 50% of new light vehicle sales to be in ZEV by 2030 • Establishing an expert panel to recommend policies, enabling investments and timelines to support the achievement of the 2030 target • $10 million to green the Victorian Government Fleet, including replacement of 400 vehicles with ZEVs by 2023 • $5 million to establish a Commercial Sector Zero Emissions Vehicle Innovation Fund • $20 million to undertake a ZEV bus trial • Setting a target for all public transport bus purchases to be in ZEVs from 2025
Transitioning our energy sector	• Managing the integration of ZEVs into our energy system through participation in inter-jurisdictional forums and research activities
Transitioning Victorian industry and workforce	• Commencing work on an industry development and transition plan to explore opportunities for Victorian industry associated with ZEV manufacturing, maintenance, repair and recycling • Identifying industry development pathways for emerging technologies, including investigating the potential for hydrogen in transport • Planning to support our workforce through the transition to zero emissions road transport as part of Victoria's clean economy workforce development strategy

3.3 Commonwealth government policies

The Australian government has begun funding EV charging infrastructure via their *Future Fuels Strategy*[4]. The chargers must at a minimum, provide a 50kW DC charge to two vehicles simultaneously.

Through the Australian Renewable Energy Agency (ARENA), in 2023 the Australian government dedicated $70 million to support innovation in public EV charging opportunities and the management of charging in the *Driving the Nation Program*.

In January, 2024, the Australian government proposed a set of New Vehicle Efficiency Standards, due to come into effect in early 2025. It had previously published a national EV Strategy and Labor's *Electric Car Discount*[5] which aims to make EVs cheaper and accessible to more households through exemptions from:

- $2,500 lower purchase prices thanks to the removed 5% import tariff for EVs priced under the Luxury Car Tax limit.

[4] https://www.industry.gov.au/data-and-publications/future-fuels-and-vehicles-strategy
[5] https://electricvehiclecouncil.com.au/electric-car-discount/

- Higher Luxury Car Tax (LCT) threshold for low-emission vehicles: $84,916 as compared to the standard vehicle LCT standing rate of $71,849.
- Removed Fringe Benefits Tax (FBT), which saves $4,700 annually for individuals with a salary sacrifice agreement for a $50,000 EV.
- $62.6 million funding package for small businesses to decarbonise, which can include fleet electrification.

3.3.1 National Electric Vehicle Strategy, 2023

In April, 2023, the Commonwealth Government released Australia's first *Electric Vehicle Strategy*. A key commitment was the adoption of a *Fuel Efficiency Standard*. The Strategy highlights the need to begin the transition to an electrified transport system immediately, given the Commonwealth's commitment to reduce emissions. The utilisation of EV and other emerging vehicle technologies presents a valuable chance to lower emissions. However, given that light vehicles have an average lifespan of 15 to 20 years, it will take many decades to complete a full turnover of the fleet.

Ensuring an ample supply of publicly accessible EV charging stations is a central objective of the *Electric Vehicle Strategy*. This was highlighted in the feedback received from stakeholders in response an earlier discussion paper. The stakeholder consultation also identified the urgent need to address the specific charging needs of renters and individuals residing in apartment buildings.

Figure 12 provides a snapshot of the key elements of the Electric vehicle Strategy. The development of more charging opportunities is a key foundation of approach the Commonwealth will use to enable the transition towards an electrified national fleet.

The Commonwealth recognise the importance of addressing the charging needs of renters and apartment dwellers.

Electric vehicle charging has seen a significant boost in investment over the past four years, with an increasing focus on public charging options. In order to ensure convenient and reliable travel for all EV drivers in Australia, the Commonwealth has collaborated with the NRMA to establish a network of 117 fast-charging stations along major highways, spaced approximately every 150 kilometres. These chargers will be compatible with all EV models and accessible to all motorists. While these chargers are unlikely to be located within the City of Yarra, they can be expected to give Yarra's residents the confidence that if they buy an EV, most places they are likely to go in regional Australia may have charging coverage. This has the potential to induce higher rates of EV ownership in the City of Yarra.

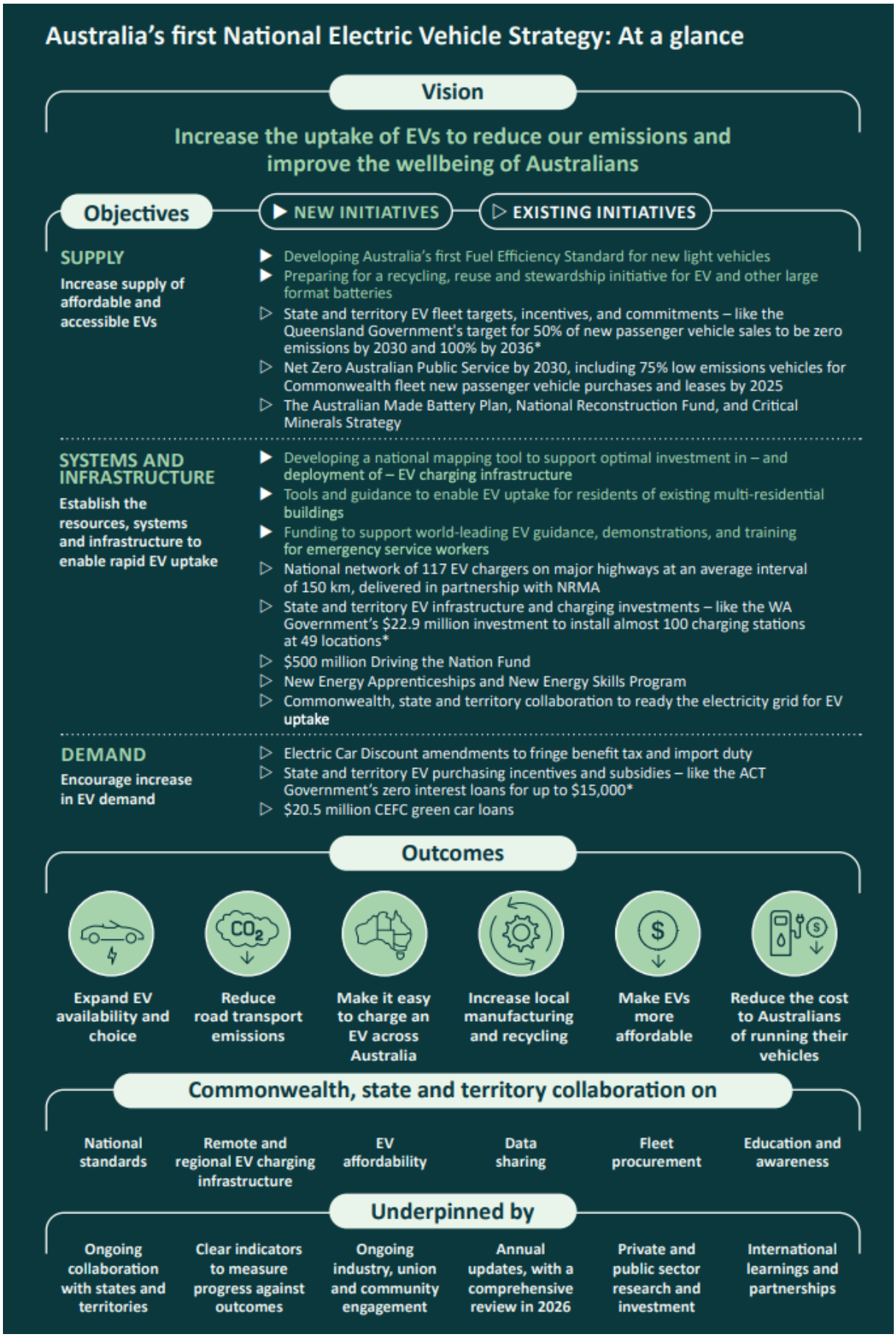

Figure 12 National Electric Vehicle Strategy - at a glace

Source: Commonwealth Government, 2023

One of the objectives of the Strategy is to *'establish resources, systems, and infrastructure to enable rapid EV uptake.'* In this regard, the Australian government has undertaken to invest in a national mapping tool for EV charging infrastructure to enhance deployment and accessibility nationwide.

The key implication from the National Electric Vehicle Strategy is that a more supportive approach has been adopted by the Commonwealth. This will act as a catalyst for demand. The accelerated demand will exacerbate the lack of public charging within the City of Yarra. This may result in more residents driving outside of the LGA to charge their EVs. In other cases, the lack of chargers in Yarra may continue to limit the willingness of households to convert to EV.

3.3.2 National Building Code

The Commonwealth Government announced changes to the National Construction Code to support increased sustainability outcomes in new buildings. The National Construction Code is Australia's primary building and construction code. It sets the minimum standards which buildings must meet, regarding a variety of factors including safety, health, amenity and sustainability. The National Construction Code is produced and maintained by the Australian Building Codes Board on behalf of Australian Commonwealth, State and Territory governments.

As part of this, all new multi-dwelling units (apartment buildings) are required to facilitate the future installation of EV charging equipment (see section J1P4 and J9D4 of Volume 1 of the Code).

The Building Code stipulates that a separate distribution board be provided to serve EV charging and fitted with a control system that can manage and schedule charging in response to total building demand. Separate distribution boards are required for each storey of car parking.

While this change to the Building Code sufficiently addresses future EV charging installation barriers for apartment dwellers, additional work will be required to overcome barriers for existing buildings.

The National Construction Code 2022 contains provisions for EV charging, which are expected to come into force in 2024. The National Construction Code 2022 contains two provisions which support EV charging. J1P4 states that 'a building must have features that facilitate the future installation of on-site renewable energy generation and storage and electric vehicle charging equipment.'

J9D4 lays out the detailed requirements to support J1P4. Car parks in build classes 2, 3, 5, 6, 7b, and 9 (as shown in Table 5), must be provided with the electrical distribution boards and wiring to support EV charging. In effect, this applies to all multi dwelling units, office buildings, retail, factories and public buildings. Interestingly, car parks are exempt.

The number of bays which are required to be capable of supporting EV charging varies per building class (as shown in Table 5). The code requires all dwellings in multi-dwelling units to be capable of supporting charging, at 7kW. Further, the code requires one electrical distribution board for every 24 EV car parks, per level of car parking. These changes to the National Construction Code will effectively ensure that future buildings in Yarra will be capable of providing EV charging.

Table 5 National Construction Code building classes

Building Class	Details	Charging requirement
Class 1	Housing: • Class 1a: Single dwelling (attached or detached) • Class 1b: Boarding houses, guest houses, or hostels under 300m^2.	Not required.
Class 2	Apartment buildings.	100% of car parking spaces must support 7kW type 2 chargers.
Class 3	Residential buildings which are not Class 1 or Class 2.	20% of car parking spaces must support 7kW type 2 chargers.
Class 4	Sole dwellings as part of a non-residential building (e.g., caretaker's house).	Not required.
Class 5	Office buildings.	10% of car parking spaces must support 7kW type 2 chargers.
Class 6	Shops, restaurants, and cafes.	10% of car parking spaces must support 7kW type 2 chargers.
Class 7	Storage buildings: • Class 7a: Car parks	Not required.
	• Class 7b: Warehouses and storage	20% of car parking spaces must support 7kW type 2 chargers.
Class 8	Factories	20% of car parking spaces must support 7kW type 2 chargers.
Class 9	Public buildings: • Class 9a: hospitals and like • Class 9b: Places of assembly • Class 9c: residential care	20% of car parking spaces must support 7kW type 2 chargers.
Class 10	Non-habitable buildings: • Class 10a: Sheds, carports, garages • Class 10b: Structures (e.g., fence or pool) • Class 10c: Private bushfire shelter	Not required.

3.3.3 Austroads: Guidelines for low and zero emission vehicle charging infrastructure installation

Austroads new technical document provides guidance for EV charging installation in Australia[6]. This report fits within the Future Vehicles and Technology program at Austroads, which will develop guidance for road agencies on infrastructure to support the uptake of low and zero emission vehicles.

In particular, this report outlines charging guidance to support passenger vehicles and light commercial vehicles that are BEV or PHEV seeking to charge in the public domain.

Site selection guidance is provided, including:

- Charger type and station design
- Proximity to vehicle
- Proximity to amenities
- Access to energy supply
- Appropriate signage and wayfinding
- Safety.

Other considerations, such as accessible parking designs, maintenance of chargers, data collection, payment systems, and decommissioning of chargers is also explored.

The report also provides a gap analysis to guide future work. This includes:

- Planning EV chargers for commercial operations
- Payment system inter-operability
- Operator standardisation and data
- Medium-long term servicing plans
- Cyber-security requirements.

Consideration of future technology is also highlighted for further research. This includes induction (wireless) charging, battery swap technology, bidirectional charging, as well as consideration for residential on-street charging, heavy vehicle charging, autonomous vehicles, and buses.

[6] https://austroads.com.au/latest-news/austroads-releases-new-guidelines-for-low-and-zero-emission-vehicle-charging

4. International and local case studies

This section presents a series of domestic and international case outlining what other councils have done to support EV charging. A particular focus on the charging needs of those without easy access to charging on private property is offered, as this is currently an issue in the City of Yarra and is likely to increase in the future.

4.1 Local case studies

4.1.1 Merri-bek City Council (Inner Melbourne)

To promote zero-emission transport within the community, the City of Merri-bek installed Victoria's first electric vehicle (EV) fast charge station in 2013 as part of the Victorian Government's Electric Vehicle Trial. Over a decade later, Merri-bek provides a network of free, 7kW, 22kW AC and 50kW DC chargers for residents to use, as well as those outside of the municipality. A total of eighteen chargers capable of charging fourteen cars simultaneously, are located at publicly accessible off-street parking spaces. These are powered by electricity generated by renewables. Council is also looking at whether EV chargers could be installed on power poles and will be monitoring the performance of other municipalities pilot programs, such as some Inner Syndey councils before deciding whether to proceed with something similar for kerbside charging.

Merri-bek do not require the user to pay to use the EV charging equipment. This means that Merri-bek ratepayers are subsidising EV drivers' energy costs. A significant proportion of these users do not reside in Merri-bek. Additionally, there are likely to be market effects, with no-cost EV charging making private operators business models more difficult to implement within the LGA. Whilst it was understandable that Council's sought to support EV uptake in earlier years, the scale of adoption is now at a level which is unlikely to require such support, especially given the costs to Council.

4.1.2 City of Stonnington (Inner Melbourne)

The City of Stonnington has recently undertaken its electric vehicle charging consultation, which ran during October 2023. During this period, residents had the opportunity to share their input on potential locations for power-pole mounted kerbside electric vehicle chargers in residential areas and near parks and reserves. A screenshot of this map is provided in Figure 13. This engagement aimed to gather insights from the community, especially focusing on those without access to off-street parking or residing in strata-managed buildings.

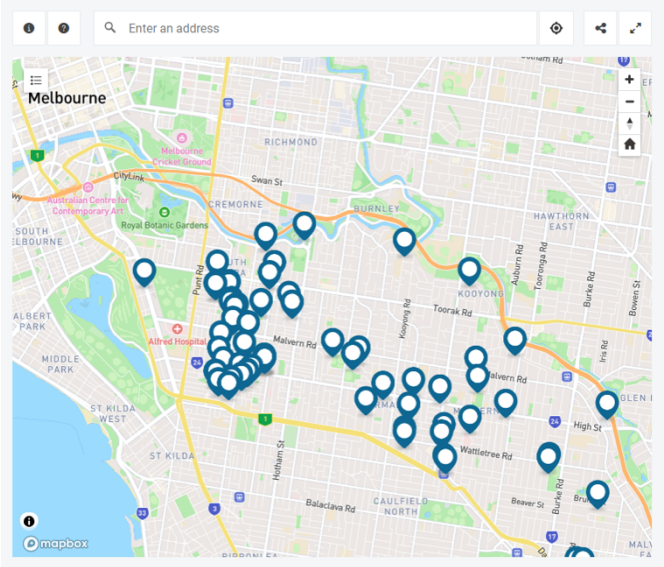

Figure 13 City of Stonnington interactive EV charging map

Source: City of Stonnington

Currently, there are few public EV chargers available in Stonnington. Council manages an AC charger at Prahran Square (22kW) and a DC charger at 290 Glenferrie Road, Malvern (50kW). There are also DC fast chargers at Malvern Central (50kW) and various charging options available at Chadstone Shopping Centre.

Stonnington is committed to supporting EV adoption, as outlined in the recently adopted *Electric Vehicle Charging Plan.* It includes an implementation plan that provides estimated costs for the development of a comprehensive EV charging network for Stonnington, to 2030. It details how Council will collaborate with infrastructure providers to establish a fast-charging network focused on activity centres. In order to identify suitable locations and numbers for

chargers, a prioritisation framework was developed, including predictions based on future EV ownership and public charger usage. This project is currently underway as of 2024.[7]

Additionally, the Plan outlines that Council is investigating and trailing models to provide additional support for those without off-street parking such as kerbside and power-pole mounted chargers. These chargers are expected to be offered through partnerships with EV infrastructure providers on a user paid basis, offering universal charging systems for all EVs. Information gathering for this project has begun, in order to be prepared for future grants or other funded trial opportunities. Figure 14 provides an example of a typical pole mounted EV charger.

Figure 14 Example of EV pole mounted charger
Source: City of Stonnington

4.1.3 Eastern councils of Sydney (Waverley, Woollahra, and Randwick councils)

This coalition of three councils works together to develop their EV charging policy and network. The installation of chargers in different locations across Waverley, Woollahra and Randwick councils has taken place in a number of phases. In 2019 during phase 1, the 3-councils were the first in NSW to establish a network of council owned public charging stations in a program they called 'Charging the East'. The network of chargers now comprises of 16 public AC stations and 4 public DC stations located in carparks, activity centres and on-street.

Many of the residents in this area of Sydney do not have access to off street parking, which is a characteristic shared with the City of Yarra. While their AC charging program does not explicitly respond to individual charging needs for residents without off street parking, around one third of users are local. In December 2021, the 3-Councils were selected to be part of an Australian first pilot of street pole charging which would eventually be Phase 2 of the program set for implementation in 2024. The Pilot Program aims to assess the viability of using existing power poles for EV charging to minimise the need for extra on street charging infrastructure. Community consultation processes were used to identify locations, with installation led by Intellihub and funded by ARENA.[8]

Following the consultation process and approval from the respective Councils' Traffic Committees, there have been 26 potential sites selected for the installation of EV street pole chargers under the pilot program. Over the next 2 years as a part of Phase 3, the councils will ultimately install an additional 35 AC chargers.

4.1.4 City of Parramatta, Sydney

The City of Parramatta adopted new planning and design guidance for EV charging infrastructure in December 2022. This was ahead of the changes to the National Building Code (refer to Table 5) coming into effect in mid 2023. Part 6.8.4 of the Parramatta City Centre DCP specifies the new controls for EV parking spaces.

The new controls are similar to the changes in the National Building Code, with requirements focused on multi-unit dwellings. The main differences between the two are:

- The Building Code require all car parking spaces to be EV-ready but the DCP only requires one per dwelling.
- The Building Code specifies the minimum charger type (Type 2, 7kW), the DCP does not.
- The DCP specifies a maximum distance of 50m from the parking bay where the EV distribution

[7] More information can be found at: https://connectstonnington.vic.gov.au/kerbside-ev-charging-2023
[8] More information can be found at: https://haveyoursay.waverley.nsw.gov.au/public-electric-vehicle-charging-infrastructure

board must be located. The Building Code does not.

- The DCP requires all car share spaces and visitor parking lots to have a Shared EV connection, while the Building Code only requires those spaces to be EV ready.
- While the Building Code and DCP both have similar requirements for commercial buildings, the DCP specifies that 10% of car parking must have 1 shared EV connection. The Building Code only requires 10% of the parking space to be EV-ready.

Council has also released *Draft Electric Vehicle Charging Guidelines*, which provides clarity on the provision, installation, management, maintenance, and removal of EV charging infrastructure on Council Land. In Section 4.3 of the document, Council specifies that all EV charging bays should be DDA compliant.

With the introduction of the National Building Code, many of these requirements will not be required to be implemented by council. However, City of Parramatta offers a good example of a council using its own planning mechanisms to drive innovation.

This has resulted in council now Installing 3 new 22kW, type 2 charging stations at Parramatta station car park. Charging at Council's EV stations is included in the parking fees.

4.2 International case studies

Some cities have mature kerbside charging programs. London, Oslo, Amsterdam, and Utrecht all have over ten years' experience managing programs focused on the provision of publicly accessible kerbside charging to address the issue of households that lack the ability to charge at their dwelling. This section provides an overview of the experience of these cities, with a focus on the issues of most relevance to the City of Yarra.

4.2.1 London, England

The City of London has established three schemes since 2016 to deliver on-street residential EV charging for residents who have limited access to off-street parking. The *Local EV Infrastructure* (LEVI) Pilot Scheme was introduced in 2022 and builds on the *On-Street Residential Chargepoint Scheme* (ORCS), and the now suspended *Go Ultra Low City Scheme* (GULCS).

The UK recognises that growing the EV charging network is fundamental to decarbonising road transport and introduced a new £450 million LEVI fund in early 2023 to support local EV charging. Figure 15 provides an example of a typical lamp post charger from London.

Figure 15 Typical London lamp post kerbside charging

Source: Ubitricity

4.2.1.1 Go Ultra Low City Scheme (GULCS), 2016

The GULCS provided £13.2 million in national funding by the Office for Low Emissions Vehicles (now called OZEV). More than half of the funding was allocated to London boroughs to deliver on-street residential charge points for residents who do not have access to private off-street parking and rapid charge points for commercial use. Approximately 4,000 charge points were installed in residential areas across the country through this program.

The geographic coverage of the program included London and seven other cities: Oxford, Milton Keynes, Nottingham, York, Dundee, the West of England and the North East. The Scheme was active from 2016 for 5 years and ended in 2021.

4.2.1.2 Lessons Learnt

The GULCS program demonstrated the advantages of retrofitting lamp post columns for kerbside charging. The benefits of this approach included limiting the impact on streetscapes, were easy to install and low cost. Lamp post columns also provided a slower charger suitable for residential overnight charging and reduced pressure on the

grid. Lamp post charging typically has an output of 3.5 – 5.5kW. One key difference between London and the City of Yarra is that London's lamp posts are generally hollow, whereas those in Melbourne are generally solid.

In London, partnerships between key stakeholders enabled individual boroughs with limited resources to draw on additional knowledge and expertise to install and manage new charge points. The partnerships formed between 33 London boroughs, Transport for London (TfL), Highway England and Energy Saving Trust. A taskforce was also established to develop a delivery plan addressing problems and barriers to successful implementation. London diverted the majority of grant funding towards community hub solutions, where charge points are provided in car parks near residential areas to allow for business use during the day.

4.2.1.3 On-Street Residential Chargepoint Scheme (ORCS), 2021

ORCS was established in 2021 following the conclusion of the GULCS program. The objective of ORCS is to continue expansion of the EV charging network across the country to support residents without private driveways or convenient off-street parking.

The Scheme provides grant funding for local authorities to install EV charging infrastructure at up to £7,500 per charge point. The program has currently installed 2,900 charge points, with 10,000 more to be installed by July 2024.

4.2.1.4 Governance and ownership

The Scheme is funded by the Office for Zero Emission Vehicles (OZEV) which is a national government agency part of the Department for Transport and Department for Business, Energy and Industrial Strategy. The program is run and managed by Energy Saving Trust, an independent organisation working to address climate impacts and support the UK in meeting 2050 carbon targets.

OZEV reserves the right to approve or reject applications on a case-by-case basis.

Ownership depends on the model of implementation. Where the local authority chooses to own and operate, they can sign maintenance contracts with the CPOs or maintain it themselves.

4.2.1.5 Program funding

The Scheme is funded by £10 million in the national grants from the Office for Zero Emission Vehicles (OZEV), £9 million in private funding and £1.9 million in public funding from participating local authorities.

Each local authority can receive a grant to co-fund up to a maximum of 60% of capital costs relating to the procurement and installation of residential EV charge point infrastructure. OZEV will fund up to a maximum of £13,500 per charge point for exceptional circumstances where electrical connection costs are exceptionally high.

Successful applicants will receive 75% of grant funding upfront, with the remaining 25% claimed on completion of the project. If the total project cost comes in under the 75% upfront grant funding, the local authority will be required to reimburse OZEV.

Why government funding is required for kerbside charging

The private sector in the UK has had a preference for rapid charging, as each unit is better able to generate revenue through kWh purchased. For this reason, government has had to provide sufficient funding to encourage the private sector to install kerbside slow chargers in residential areas. As EV ownership grows, the level of government subsidy is reducing but is still necessary to make it a commercial proposition for the private sector.

Source: Energy Savings Trust, UK

4.2.1.6 Installation types

Charge points installed include a combination of 3.5-23kW AC chargers and 10-22kW DC chargers. DC fast charging points are only permitted in unrestricted on-street residential parking.

4.2.1.7 Charge point conditions

Proposed charge points meet the following criteria. Charge points must:

- Be in predominantly residential areas.

- Have Type 2 connection sockets
- Be maintained in serviceable condition and accessible for at least three years from date of installation
- Have a minimum payment method, such as contactless, for all charge points at or above 7.1kW
- Be registered with the National Charge Point Registry (NCPR), an Open Data initiative to share public charge point data.
- Adhere to OZEV technical specifications[9].

Charge points capable of charging two vehicles at once should be installed where possible. For 22kW charge points, detailed justification must be provided and include a reason as to why 7kW charge points cannot be used.

4.2.1.8 Siting considerations

The Energy Savings Trust (EST) provides guidance for identifying suitable locations for EV kerbside charging installation. Proposed sites should respond to current and future demand and, as highlighted earlier, be locate in predominantly residential areas.

For areas where there is a mix of residential and commercial buildings, applicants must be able to demonstrate that local residents will be the primary users.

Charger locations should consider accessibility and select locations with minimal street furniture to limit streetscape impact for pedestrians. Narrow pavements and lamp posts positioned further away from the kerb requiring longer charging cables should be avoided to avoid trip hazards.

Local authorities should also consider high grid connection costs in some locations and prepare alternative sites if some sites are unfeasible.

If a local authority chooses to install in a car park, an explanation as to why the local authority is not installing on residential streets must be provided and the car park must be situated in or close to a residential are that lacks off-street parking. The car park must also be owned or leased to the local authority.

4.2.1.9 Application process

Only local authorities and charge point operators are eligible to apply for ORCS.

Residents who would like a charge point installed near them must contact and request their local authority to apply for the Scheme. Some local authorities are collecting resident requests as evidence of demand in ORCS applications.

Only local authorities and charge point operators are eligible to apply.

To apply to the scheme, local authorities can complete an application form available on the EST website and submit their draft application to EST with a:

- Budget breakdown specifying where costs are coming from for each site (e.g., DNO costs, hardware costs, installation costs).
- Project plan detailing specific installation activities;
- Risk register; and
- Council band details on a council-headed letter.

The EST will then review the application and determine project eligibility[10]. The application process is cooperative and offers a few rounds of feedback on the application before final

[9] Details about the specifications can be found at https://www.gov.uk/guidance/residential-chargepoints-minimum-technical-specification

[10] More details regarding eligibility available at https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints/grants-to-provide-residential-on-street-chargepoints-for-plug-in-electric-vehicles-guidance-for-local-authorities#application-criteria

submission to OZEV. OZEV will review the application and determine whether it is successful and issue a grant to the local authority.

4.2.1.10 Accessibility and time restrictions

For car park installations, the car park must be accessible on a 24/7 basis. At a minimum, local residents must have access to the car park for free overnight stays between 6pm to 8am.

It is the general practice for kerbside charging in residential areas to allow all vehicles to park in the bays with charging. Should a local authority receive a significant number of complaints from local EV owners who have had consistent trouble accessing the charger due to the presence of ICE vehicles, the bay can be converted to EV only. This is particularly relevant to the City of Yarra, where there can be high demand for limited parking in residential streets. It is likely some residents may submit complaints should a kerbside parking bay in their street be converted to an EV only bay (unless they have or plan to purchase an EV).

4.2.1.11 Local EV Infrastructure (LEVI) pilot scheme, 2022

The LEVI pilot scheme builds on ORCS and aims to further support the roll-out of EV charging infrastructure across England. The scheme aims to:

- Promote an equitable EV charging experience for those without off-street parking
- Increase consumer confidence in transitioning to EVs and ensure uptake across all regions of England
- Use additional private sector investment to promote sustainable and innovative business models and deliver local charge point projects in the short-term.

The LEVI pilot scheme was launched to test the design of the new LEVI scheme currently in development. The £10 million pilot scheme has funded nine projects shown in Figure 16.

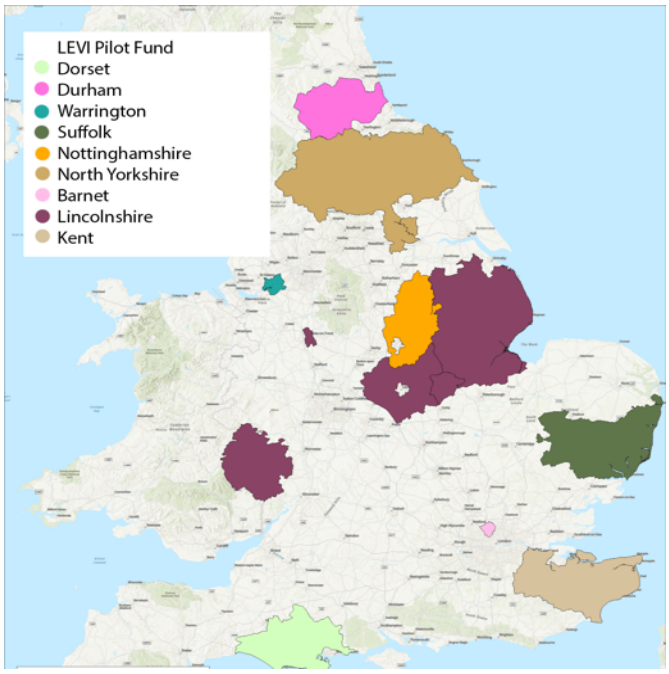

Figure 16 LEVI Pilot Fund recipients

Source: Energy Saving Trust, 2022

LEVI Pilot Scheme supports the same installation types, charge point conditions and siting considerations as ORCS.

4.2.1.12 Governance and ownership

The LEVI pilot scheme is funded through government and industry funding and is run and managed by OZEV and the LEVI Support Body which is made up of EST, technology organisation, Cenex[11] and management consulting group, PA Consulting.

4.2.1.13 Application process

Local authorities and partnerships in England apply for funding under the pilot scheme by sending an expression of interest email to the EST. The EST and the LEVI Support Body (Cenex and PA Consulting) provide ongoing support and guidance through the application process.

The LEVI pilot fund application form assessed eligibility of applicants and the project proposal through a series of questions that shows how the proposal will respond to gaps in demand and ensure that local residents will have access to charge points. The applicants are also required to provide information on land arrangements including details of lease agreements where present, proposed breakdown of funding and costs

[11] https://www.cenex.co.uk/

and how the proposal fits strategically with the local area.

Applications that demonstrated project innovation through trialling a business model or new/previously unused technologies were awarded additional points in their assessment.

4.2.1.14 Lessons Learnt

The Scheme has undergone several changes to improve the consumer experience by:

- Mandating a minimum payment method. Paywave is preferable but does add to the program's cost. Without Paywave, customers complained they needed multiple apps to use the chargers.
- Providing pricing transparency to guarantee a consistent pricing metric across the public network (standardised to a pence per kWh basis).
- Implementing a data standard for all charge points with all open and dynamic data made available to consumers.
- Contract management is crucial. Initially there was a significant number of contractors that were not complying with the key performance indicators of the contract. They have learnt that they need to be enforceable to be effective.
- Maintenance was a larger problem than they had anticipated and they then introduced an 99% uptime mandate.
- Providing a 24/7 charging network helpline.
- Avoid installing a charging bay outside someone's home, unless they are a strong proponent of the program.

ORCS have also increased benefits of funding across more local authorities by lowering maximum capital costs coverage by grant funding from 75% to 60% to allow for more projects.

EST has also increased flexibility in charge point installation on land not owned by a local authority (such as a community hall car park) on a discretionary basis where it can be shown that a lack of suitable local authority land poses barriers to installation of residential charge points.

4.2.1.15 Future directions

Kerbside charging authorities in the United Kingdom are looking at a range of new products and technologies that will help in the transition to EVs. These include:

- New business models, including crowdsourcing the funding for community use chargers for those without off street parking. Eg. See https://chargemystreet.co.uk/
- Bidirectional charging. It is not currently mandated, but will be an area of increasing focus in the future.
- New hardware solutions, such as Charge Arm (see https://chargearm.com/en/) and cable channels that carry a cable across a footpath while maintaining the level of the footpath (e.g. see https://chargedevs.com/newswire/low-tech-charge-cable-channel-could-be-a-solution-for-drivewayless-ev-drivers/). The Charge Arm is shown in Figure 21.
- Plug and Charge (ISO 15118) is something the Energy Saving Trust is looking at, to maximise the ease with which a person can charge their vehicle and interact with the grid. This is expected to become available in the next few years.

4.2.2 Oslo, Norway

Norway is the world leader in electrifying their passenger vehicle fleet. EVs constitute ~85% of new vehicle sales in Norway and the national government plans to end sales of new petrol and diesel vehicles by 2025.[12]

Oslo began their kerbside EV charging program in 2007. The city now has some 2,300 charging ports within this program, and it is intended to service the need of those without easy access to private off-street charging.

Oslo has taken a leadership role in the provision of slow, AC kerbside chargers. The DC network is a separate program, not discussed in this section.

[12] https://electrek.co/2021/09/23/norway-bans-gas-cars-in-2025-but-trends-point-toward-100-ev-sales-as-early-as-april/

The DC network has had much stronger private sector involvement.

Some 30% of residents in Oslo do not have access to at home charging, and this is the focus on their kerbside charging program. Much of the residential built form in Oslo is similar to that of the City of Yarra.

Figure 17 provides an illustration of a typical kerbside charger in Oslo.

Figure 17 Kerbside charging, suburban Oslo
Source: Plugshare.com

4.2.2.1 Early phase

Oslo was the first city in Europe to introduce a wide spread program of kerbside EV charging. It formed part of their emissions reduction strategy.

When the program began, there was an explicit focus on locating these charging stations in high viability areas, such as outside the Town Hall. This was done to raise awareness. Their rationale for this decision was that *'seeing is believing'*. By seeing the opportunity to charge being placed on the street, the Council felt that more people would feel comfortable to purchase an EV, even if they did not have parking on their property.

The chargers were typically single phase, 2.3kW outlets, with non-network connecting infrastructure. Over time, Type 2 plugs became standard, and connectivity was introduced, to enable backend functionality/monitoring.

During the period 2007 – 2009, Oslo installed around 200 kerbside AC chargers.

4.2.2.2 Incentives

One of the reasons why Norway leads the globe on EV adoption is that the government has provided incentives. Initially, these included:

- Free charging and parking
- EV access to transit lanes
- Purchase subsidies.

Oslo's EV incentives have now begun to be scaled back, as they are only practical when there are low numbers of EVs on the road.

4.2.2.3 2018 to current period

This period has been characterised by a much faster roll out. Around 400 kerbside chargers are installed each year.

4.2.2.4 Ownership and Install costs and pricing

Oslo City Council own and operate the kerbside chargers. The chargers use a standard Type 2 plug with a 7kW AC output (see Figure 17).

A kerbside charger costs around €11,000 per charging port, when all costs associated with the install are included. This is some 8 to 10 times more expensive than a charger located in an off-street location. Increased costs are generally due to connection to grid costs, switchboard/distribution board installation and/or upgrades and the requirement to have publicly accessible equipment being more robust (e.g., vandalism resistance).

Kerbside chargers are 8 – 10 times more costly than a similar charger in an off-street location, for private use.

Pricing was initially free to the end user. In 2018, Oslo introduced a fee to charger at kerbside chargers. The fee was introduced primarily to act as

an incentive to the owner to move the car once charging was complete, rather than to recover the cost of the electricity. The fee introduced was €1 per hour, which includes both electricity and parking costs. This price has now risen to €2 per hour.

Oslo City Council own and operate the kerbside chargers.

As the price of electricity has risen considerably following Russia's invasion of the Ukraine, charging an EV in Oslo will become more expensive.

Oslo City Council are currently preparing a large public tender that will allow the fee to be based on the kWh of electricity consumed during charging. The Council intend on adding a 25% margin on top of what they pay for electricity to help cover the cost of providing the chargers and expect a 3 – 5-year return on investment.

The Council intend on adding a 25% margin on top of what they pay for electricity to help cover the cost of providing the chargers and expect a 3 – 5-year return on investment.

4.2.2.5 Lessons learnt

There are a number of lessons the Oslo experience provides other cities interested in kerbside charging.

- Make it simple. Complex systems that are difficult for the end user to understand, such as complicated permit requirements and billing structures are to be avoided.
- Don't be afraid to take risks. While there is an inherent risk in doing something for the first time, Oslo's view is that the biggest risk is doing nothing. Don't be afraid to take a risk and be ready to learn from mistakes.
- Create a system that incentivises people to move their car once sufficiently charged. It is inefficient to have EVs occupying an EV charging bay unless it is charging. The pricing structure must incentivise people to move their car once it has sufficient charge.
- Don't put all your eggs in one basket. Pilot a number of different technologies or policies to test what works and what doesn't.
- Be flexible. An example of where Oslo had to demonstrate flexibility was in the incentives it offered EV owners. In the early days, an EV could use a bus lane. When the number of EVs increased significantly, they needed to re-consider this policy, as it could reduce the speed buses were able to travel.

4.2.2.6 Future technologies

Oslo City Council is closely following, and involved with trials for new EV charging technology. A brief summary of these programs is offered below.

Bidirectional charging

While Oslo has an interest in the potential for bidirectional charging, there have been limited *at scale* activities to date in this area. This is primarily due to the lack of OEMs currently manufacturing EVs with this potential. Oslo has been involved in smaller scale trials across European cities on bidirectional charging and expect this to be a more mainstream option in the future. Oslo sees a strong future in this technology, especially as the price of electricity increases and the bidirectional charging technology becomes more widespread.

Wireless charging

Oslo is currently involved in developing pilots for wireless charging for specific user groups, such as taxis. One of the main limiting factors to the widespread adoption of wireless charging is the ability of EVs to accept a wireless charge. The advancement in wireless charging technology has been evolving rapidly and it is expected in the next 5 – 10 years, wireless charging will become more widespread as a factory installed feature.

4.2.3 Utrecht, The Netherlands

Since 2010, the City of Utrecht has been installing kerbside, publicly available EV chargers. The built form in Utrecht is similar to many parts of Yarra, with buildings typically of 2 – 4 stories and limited off street parking.

The kerbside chargers are generally AC chargers, providing an output of ~7kW.

4.2.3.1 Scale, budget and contract arrangements

There are currently 1,300 charging stations, with each station having two charging ports.

The charging network is growing by 4 – 6 chargers per day. Contractors are provided with a bonus if they install a charger in an off-street parking location, as this is considered a better public amenity outcome, and is less controversial to residents.

Figure 18 indicates the existing and potential charging sites in Utrecht.

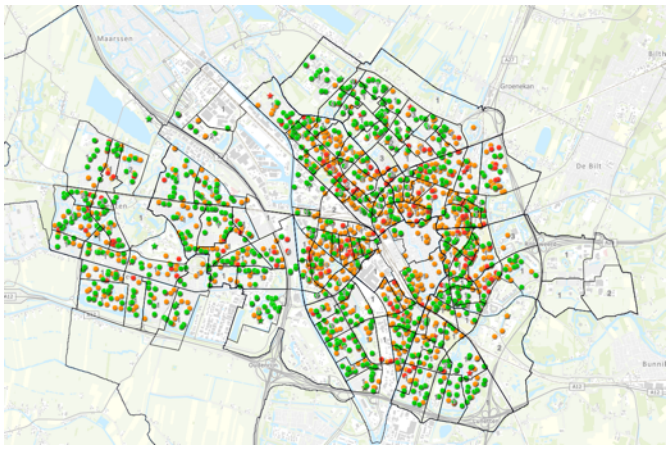

Figure 18 Existing and potential charging sites in Utrecht, The Netherlands

Source:
https://rhk.maps.arcgis.com/apps/webappviewer/index.html?id=40ad8c213c264f01970fed24f61344bd

Contractors are provided with a bonus if they install a charger in an off-street parking location, as this is considered a better public amenity outcome, and is less controversial to residents.

The City of Utrecht has a budget of €1.5m per annum for the EV charging program, but this is scheduled to be reduced, as the cost per unit is becoming cheaper.

4.2.3.2 Contract arrangements

The City of Utrecht is responsible for site selection and managing the process with the community, but the cost and responsibility of installing and maintaining chargers is handed to a commercial contractor. Currently only one contractor (Engie) has an agreement with the City of Utrecht to install and manage the kerbside charging network.

The contracts generally last ten years.

The contract includes specific requirements regarding costs to user, as well as clauses regarding the occupancy threshold after which they are responsible for adding more chargers to the network (at their cost). In return, the contractor receives the revenue from the usage of the chargers, but is required provide around 2 cents per kWh to the City of Utrecht.

4.2.3.3 Usage and costs

On average, each charger is used around four times per day. The current cost to the user is 36 cents per kWh, but this is scheduled to increase soon, due to the price rises in the electricity market in the Netherlands. Residential electricity costs 78 cents per kWh and this has meant that the price for kerbside charging is considerably cheaper than what is available in the private setting. This has meant that EV owners with a private (on site) charging option are electing to use the chargers in the public domain. In response, the City of Utrecht has taken the decision to increase the price to 48 cents per kWh and this change took effect on the 8th of October, 2022. There is a clear lesson for the City of Yarra; any future public chargers should always have a cost to the user that is equal or higher than the cost of charging at home.

If a contractor chargers the user a higher price than what is agreed in the contract, they receive a warning from the City of Utrecht. If they continue to charger a higher price, they are fined.

An online dashboard provides an interface to see key metrics on usage:
https://evdata.irias.nl/data?lang=en

4.2.3.4 Site selection

For the first eight years of the program, site selection involved a demand responsive process, in which residents were able to complete an

application to have a charger installed close to their home. There was an approvals process that included different departments within the local government, as well as discussions with emergency services etc. This was a very time consuming process.

In the past four and a half years, the City of Utrecht has been able to streamline the process by selecting suitable sites internally. Around 2,500 potential sites were identified and a team of around 20 staff within Council assess these sites before seeking community feedback.

Many residents said they did not want the EV chargers near their home, but the Council's elected officials voted that simply *'not wanting one near their home'* was not a legitimate reason to oppose them. While this specific objection did not influence the final location of the chargers, there were about 300 of the 2,500 sites that were altered based on important considerations that the community identified, and the Council responded to.

4.2.3.5 Lessons learnt

The City of Utrecht's experience over the last 12 years installing kerbside EV chargers has involved a number of lessons that could be useful for the City of Yarra. The following provide a synthesis of the lessons Utrecht has learnt:

- Use reliable, proven technology that has very high uptime, and cloud connected network capabilities. The operator is liable for fines when the uptime drops below 99.5% and pays a steeper fine when uptime drops below 97.5%. Many of the older chargers in these system have high failure rates and even though the chargers may work, the billing system sometimes does not, meaning charging a vehicle is possible without a payment.
- Embed EV charger installation in new developments. This has not occurred in many significant growth areas in Utrecht and is considered a lost opportunity, given the higher complexity and cost associated with retrofits. A national policy on EV charging for new neighbourhoods would be useful. In Australia, this is now covered via the new National Building Codes referred to earlier.
- Amenity and visibility. The early approach was to site chargers in an area that maximised visibility. The current approach is to locate the chargers in less visible locations, as they are considered visual clutter than can limit the amenity of an area.

Bidirectional charging in Utrecht[13]

Utrecht is the site of the largest bi-directional charging pilot project in the world. All kerbside chargers must be capable of bi-directional charging. Commercial organisations have agreements with vehicle owners to be able to take small amounts of energy out of a vehicle's battery to help support the grid. The vehicle owner is paid for the electricity taken from their battery.

EVs with bidirectional charging capability soak up excess renewable energy during the day, and are then able to support the grid at times when renewable energy is not being produced (e.g., night time).

Box 2 Bidirectional charging in Utrecht

4.2.4 Amsterdam, The Netherlands

The City of Amsterdam currently has around 3,700 public and 4,100 private recharging points and has one of the most well-developed EV charging networks in Europe. Their ambition is that by 2030 all traffic within the city's urban area will be emissions-free.

Amsterdam's ambition is that by 2030 all traffic within the city's urban area will be emissions-free.

Currently, some 94% of the passenger vehicles in Amsterdam are ICE vehicles, which helps to illustrate the scale of the 2030 target Amsterdam has set. Amsterdam charging demand models estimate that 82,000 charging points will be

[13] https://www.youtube.com/watch?v=L_BYDKz3_Jg&t=31s

needed by 2030, with only 800 being ultra-fast. This helps to highlight the role that slower, overnight charging is likely to have in Amsterdam in the future.

The City of Amsterdam has established the *Recharge Me: Strategic Plan for Recharging Infrastructure 2020-2030*. Public access charging is one element of the *Strategic Plan*, an example of which is shown in Figure 19.

Figure 19 Amsterdam kerbside charging
Source: City of Amsterdam

The City of Amsterdam's position is that charging should occur in the private setting wherever possible, and in off street parking garages. It is only as a last resort that on-street, kerbside chargers are provided.

The extent of central Amsterdam's charging network can be seen in Figure 20. The blue dots represent an existing charger, while the blue dots identify future charging sites.

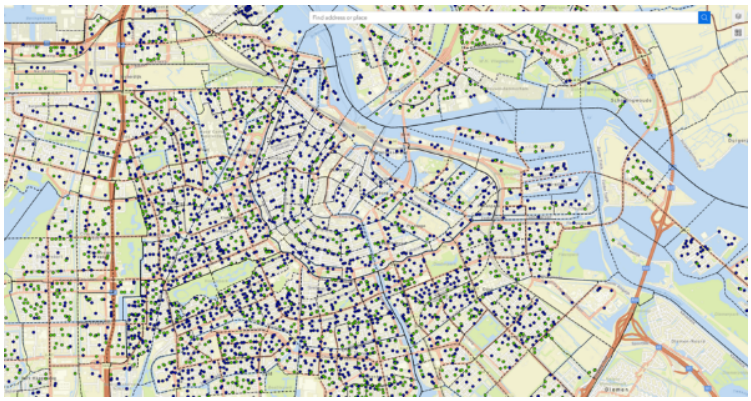

Figure 20 Map of existing (blue) and planned (green) chargers
Source: https://tinyurl.com/3wdzryzh

Recharging on private land offers the greatest degree of charging confidence and is cheaper for users

City of Amsterdam

4.2.4.1 Governance and ownership

Network operator – Liander

4.2.4.2 Installation types

There are a number of different charging categories identified by the City of Amsterdam. These includes:

- Private chargers – chargers located on private land that is not available for use by other parties.
- Semi-private charging – chargers located on private land, but able to be used by members of the public. A charger in an underground car park at a supermarket would be an example of a semi-private charger.
- Public chargers – located on public land, for public use. Kerbside charging is an example of a public charger. By 2030, Amsterdam plans to have 18,000 public charging points, the majority of which will be slow, kerbside chargers. Their goal is for 1 in 15 kerbside

parking bays to have access to an EV charging port.

- For public chargers servicing the overnight, residential charging market (the majority of kerbside charging), 7 - 11kW AC chargers are sufficient. The City of Amsterdam also provides higher capacity chargers, but these are generally for special use vehicles, such as trucks or buses, as well as passing through motorists that are more time sensitive than residents.
- By 2030, it is expected that only 30% of EV charging will occur at fully public chargers. This is lower than it is currently, and results from the City of Amsterdam's policy to encourage drivers to charge in private and semi-public locations wherever possible.

Safety of charging facilities in Amsterdam

All public charging installations must adhere to relevant national guidelines for electrical safety. In addition, *cyber security* is an important consideration and strict standards have been introduced to ensure the chargers function effectively and the privacy of the user is maintained.

4.2.4.3 Siting considerations

As highlighted earlier, the City of Amsterdam's policy is that charging should occur in the private setting wherever possible, and in off street parking garages. It is only as a last resort that on-street, kerbside chargers are provided.

Accessibility is one of the core siting considerations. Disability access, as well as access by all those that may need EV charging, including residents, visitors and tourists must be able to use the public EV charging. All public charging facilities must also be available to the public 24/7, with no barriers or gates blocking entry. After the installation of the EV charging station, and associated signage, the width of the footpath should be no less than 0.9 to 1.5 metres. Additionally, service hatches in the recharging poles must be accessible to enable maintenance and repair.

Clustering is an important principle in the decision of where to locate public charging. The City of Amsterdam prioritises a clustering of charging rather than the installation of single recharging plugs.

Siting close to the electricity grid is another important consideration. Installing less than 25 metres from the grid is preferable.

Installation on one, rather than both sides of the street is another important principle. In addition to reducing installation costs, this also means that should the City choose to make street design changes in the future they are able to do this without having to relocate charging facilities on both sides. This is considered important for the City of Yarra, given the important Council places on enhancing the network of protected bicycle lanes.

Where *not* to install kerbside chargers

The City of Amsterdam has identified some factors that inhibit some locations from being suitable for EV charging. The following factors are identified by the City of Amsterdam as sites to *avoid:*

- In green spaces and under tree canopies
- On main roads
- In locations with strict time limits
- In locations where the street is scheduled for re-development in the next 12 months
- Where a parking barrier/boom gate is located
- In parking bays expected to be removed in the future

Source: City of Amsterdam

The City of Amsterdam prioritises a clustering of charging rather than the installation of single recharging plugs.

A Dutch firm providing charging to the kerbside, from a private residence is shown in Figure 21. This solution will not be suitable in a range of contexts, such as apartments, vegetation prevents its installation and when the footpath width is incompatible. The parking bay may also be occupied by another vehicle. Nevertheless, it may be one solution that simplifies the problem of reliably charging an EV in a terrace house context.

Figure 21 One solution to terrace housing without off street parking

Source: ChargeArm, Haarlem

Figure 22 provides an extract from the City of Amsterdam's future charging strategy. This is similar to the City of Utrecht's policy and is an example of the process in mature EV markets.

Policy for provision of public recharging infrastructure: district location plans

The municipality is introducing a new procedure for providing recharging facilities. We no longer make traffic decisions at the level of individual recharging poles but at district level based on district location plans. A district location plan is drawn up based on forecasts of the use of recharging infrastructure for a period of two to three years. Potential locations for recharging infrastructure across the district are then marked on the plan. Broadly speaking, the new procedure is as follows:

- We draw up a draft district location plan for each district based on the assessment framework for expanding public recharging infrastructure[23], which contains guidelines for providing recharging infrastructure in Amsterdam, and based on the current and predicted use of any existing recharging points.
- We agree the potential locations with Liander so that we can take grid capacity into account and to ensure that Liander is alerted in good time if grid capacity is insufficient and needs to be upgraded.
- The district is invited to an information event at which residents:
  - are informed about electric transport and forecasts of recharging demand in their district;
  - are informed about the starting points and the procedure for drawing up the draft district location plan;
  - are asked for input for the draft district location plans.
- The information event is used as an opportunity to further refine the district location plan.
- A traffic decision will be taken on the locations identified in the district location plan in batches of shorter periods (e.g. six months, to be determined in consultation with the new concession holder). Stakeholders will also be given the opportunity to respond to this. Once the traffic decision has been adopted, provision of recharging poles can commence at district level. This method significantly shortens the provision procedure.

Figure 22 Process for future residential charger locations, Extract from City of Amsterdam

NB: Liander is the electricity network manager (DNSP)

As with Utrecht, once the demand for EV charging in a public area reaches a certain threshold, a new charger will be installed, without residents needing to submit an application.

4.2.4.4 Application process

People living or working more than 18 hours per week in Amsterdam are able to apply for an EV charging installation. These are public and the applicant does not have exclusive use of the charger. The applicant must also satisfy a range of other criteria, such as not having access to a private parking garage, and owning an EV with a range in excess of 45km. The online application form (available in Dutch) can be found at https://www.amsterdam.nl/en/parking/electric-charging/.

The application process is summarised below (City of Amsterdam):

- Application: The EV owner submits an application
- Assessment of application: The pole operator processes the application and decides whether the applicant meets the requirements. The operator also looks at whether it is necessary and technically feasible to install a new public charger. This includes an assessment of:
- The presence of other nearby charging possibilities
- The occupancy rate of nearby chargers
- The ease with which it can be connected to the electricity grid
- Traffic related issues, such as the width of the footpath, and access for emergency vehicles.
- Decision of whether to install or not based on the above factors.
- Objection period: The community is given six weeks to object to the location.
- Preparation for installation: The DNSP, the charging network provider and the contractor prepare to install the charger.
- Installation, the charger is installed. This typically occurs 13 – 30 weeks from the time the initial request was submitted.

4.2.4.5 Time restrictions

The City of Amsterdam's model assumes slow charging sites will be occupied from 0.9 to 1.2 vehicles per day. The current experience however sees vehicles parked at charging locations for longer than necessary. To incentivise users to leave the charging bay once charging has finished, a *'connection tariff'* is being considered, whereby the owner continues to be charged once the charging session has ended, if their vehicle remains at the charging bay.

4.2.4.6 Estimating future demand

The City of Amsterdam has developed a model to anticipate the future charging requirements based on their goal of a carbon free transport system by 2030. As part of this process, they have estimated the number of new chargers that will be required to support the future EV fleet, and broken this down by different charging types.

Figure 23 offers a snapshot of the expected growth in EVs, and the charging infrastructure required. Some 18,000 public recharging points are required, the majority of which will be slow, overnight charging, often at the kerbside.

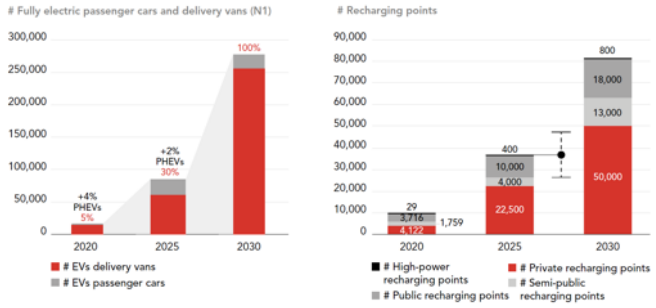

Figure 23 Estimating EV and charger growth to 2030

Source: City of Amsterdam

4.2.4.7 Future directions

As the City of Amsterdam works towards its goal of a zero-emission transport system by 2030, a number of new developments are expected to be implemented in Amsterdam. These include:

- Ultra-fast charging, of up to 1MW, to assist with the rapid charging of buses and trucks
- Smart charging, providing the network manager with the ability to remotely influencing the duration, and direction of EV charging.

- Bi-directional charging, to enable EVs to support the grid by supplying electricity from the battery at times of high network demand. The City of Amsterdam see kerbside charging as an ideal opportunity to offer bidirectional charging, as the vehicles are typically parked for a longer duration. This enables the vehicle to recharge slowly (or not at all) during high demand times, and more rapidly when there is limited demand on the network. The City of Amsterdam see bidirectional charging technology evolving rapidly and something that will become an integral element of their public charging network in the future.

4.2.4.8 Battery buffers.

The City of Amsterdam sees benefit in the use of batteries to buffer against peaks in energy demand. When excess electricity is available (e.g., during peaks in solar generation), the batteries can store energy, which can then be used to charge vehicles at other times.

5. Understanding Yarra's context and future demand for EV charging

This section provides an overview of the housing types in Yarra and car ownership. This offers the contextual foundation for understanding future EV charging requirements and the infrastructure necessary to support it.

5.1 Housing typologies

There were 49,966 private dwellings in Yarra at the 2021 census. The composition of Yarra's housing stock, by structure is shown in Figure 24. Unlike many areas of Melbourne, separated housing makes up only a small portion of Yarra's housing, at around 12.5%.

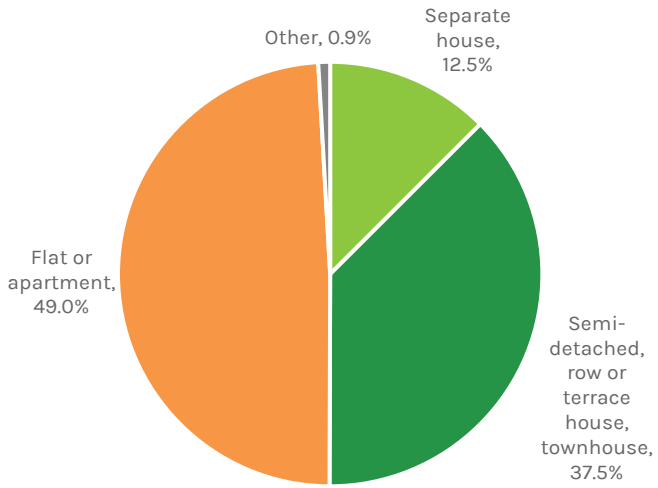

Figure 24 Dwellings in Yarra, by structure, 2021
Source: ABS 2021

49% of Yarra's housing are flats or apartments, with another 37.5% consisting of terrace or town houses.

The three dwelling structures have varying capacities for off-street (i.e. on-site) charging. In general, separate housing is most likely to have access to off-street parking and should easily be able to support EV charging without any involvement by Council (unless subject to a heritage overlay). Semi-detached, row and terrace housing are less likely to have off-street car parking. Where it does, it is likely to be able to support EV charging. While flats and apartments will often have off-street car parking, these parking bays are in common space, which can make installation more complex. There is also the added complexity associated with gaining agreement and support from the body corporate. Renters face additional hurdles, as discussed in Section 5.3.

Overall, it is likely that around 85% of dwellings in Yarra could have challenges charging EVs on the premise either due to a lack of off-street parking, or difficulties in wiring parking spaces. To participate in the EV transition, residents of these dwellings will need to have access to charging in the public domain.

Around 85% of dwellings in Yarra could have challenges charging EVs on or near the dwelling.

5.2 Impact of flood zones

Under the Victorian Planning Scheme, areas liable to inundation are identified by the Land Subject to Inundation Overlay (LSIO) and Special Building Overlay (SBO). SBOs make Melbourne Water a determining referral authority, giving them the power to refuse a permit. Approximately 12.2% of all land in the City of Yarra is liable to flooding and affected by a LSIO. The SBO only accounts for a small portion of land (4%) in the part of the municipality. Figure 25 shows the extent of the overlay in Yarra. Of the 12 existing EV chargers installed across the local government area, none are currently impacted by the flood overlays.

Approximately 16.2% of the City of Yarra is liable to flooding.

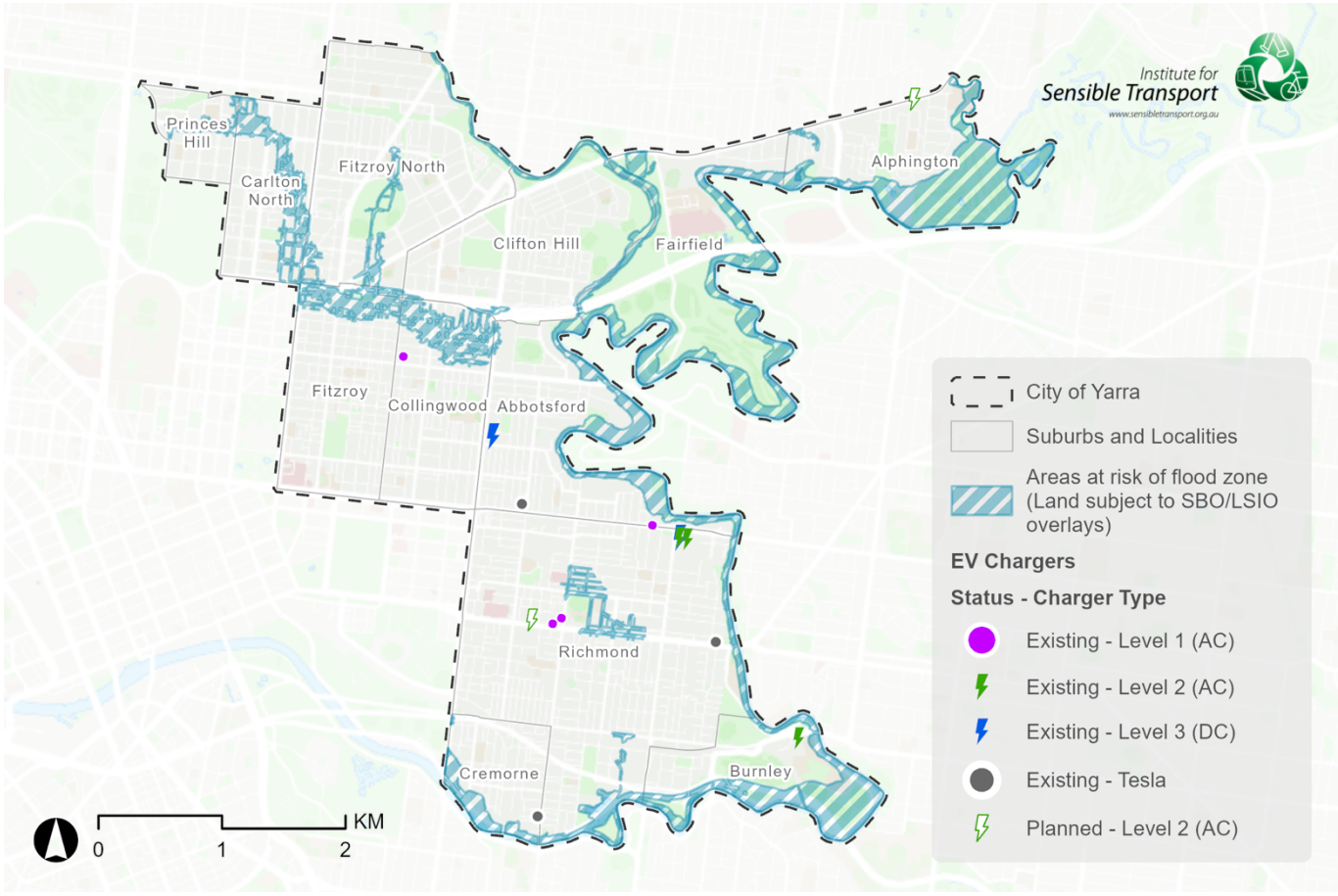

Figure 25 Areas liable to flooding in the City of Yarra

Source: DPE, Plugshare

5.3 Tenure status

Home ownership is also an important consideration. Owners have more autonomy in making alterations to dwellings, and have an incentive to invest in long-term improvements. Conversely, renters lack the security of tenure, and this can be a barrier to installing charging infrastructure. Additionally, gaining approval from a landlord represents another barrier.

Tenure, by dwelling structure, for Yarra is shown in Figure 26. This shows that 71.8% of separated houses are owner occupied, while less than a third of flats or apartments are owner occupied. Conversely, only 26.8% of separated housing is rented, while 68.6% of flats or apartments are rented. Semi-attached dwellings are more evenly split by renters and owner occupiers, with 54% being owner occupied and 44.2% renting.

Less than a third of flats or apartments are owner occupied in Yarra.

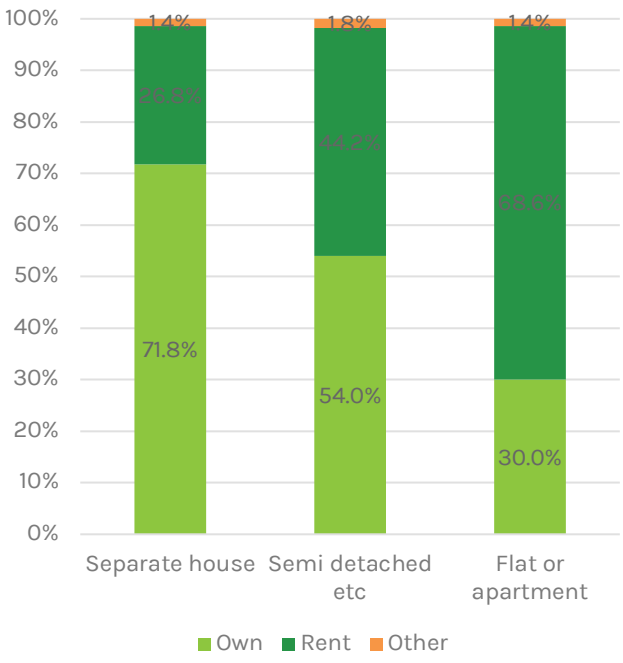

Figure 26 Dwellings in Yarra by structure and tenure, 2021

Source: ABS 2021

5.4 Car ownership

The City of Yarra will see significant population growth in the next few decades, with the number of dwellings projected to grow from 49,966 in 2021, to 69,289 in 2035. This trend is expected to result in an increase in motor vehicles in the municipality. Understanding the dynamics of these changes in car ownership is crucial for informing the Council's efforts to efficiently facilitate EV charging infrastructure.

Figure 27 captures the projected number of dwellings and cars in Yarra between 2021 to 2035. The 2021 ABS Census reveals that across Yarra, there are an average of 1.2 cars per dwelling. This model assumes this ratio of cars per dwelling over this period. In 2021, there were 59,959 vehicles in the municipality. This figure is expected to grow to 83,146 in 2035, an increase of 38.7%.

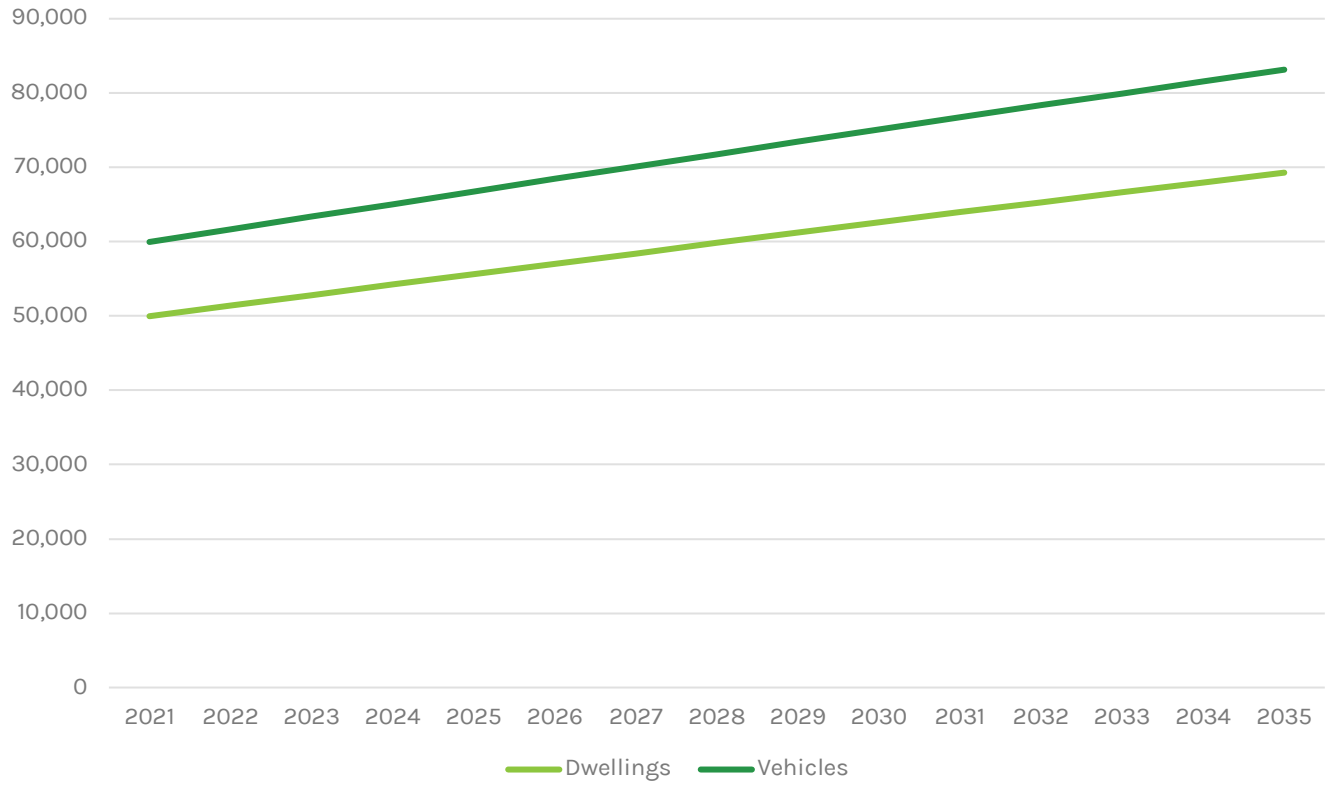

Figure 27 Projected number of dwellings and residential vehicles in Yarra, 2023 to 2035

Source: ABS Census Data

Analysis of Census data reveals that there is variation in car ownership, depending on dwelling type, as shown in Table 6.

Table 6 Vehicles by dwelling structure, 2021

Housing structure	Vehicles per dwelling
Separate house	1.4
Semi-detached etc	1.3
Flat or apartment	0.8

Source: ABS 2021

There is also variation in car ownership amongst different households in Yarra, as shown in Figure 28. Across Yarra, 20% of households do not have a car. This varies depending on dwelling structure, with 9% of households in separate households not owning a car, and 28% of flat households not owning a car.

Across Yarra, 80% of households have a car.

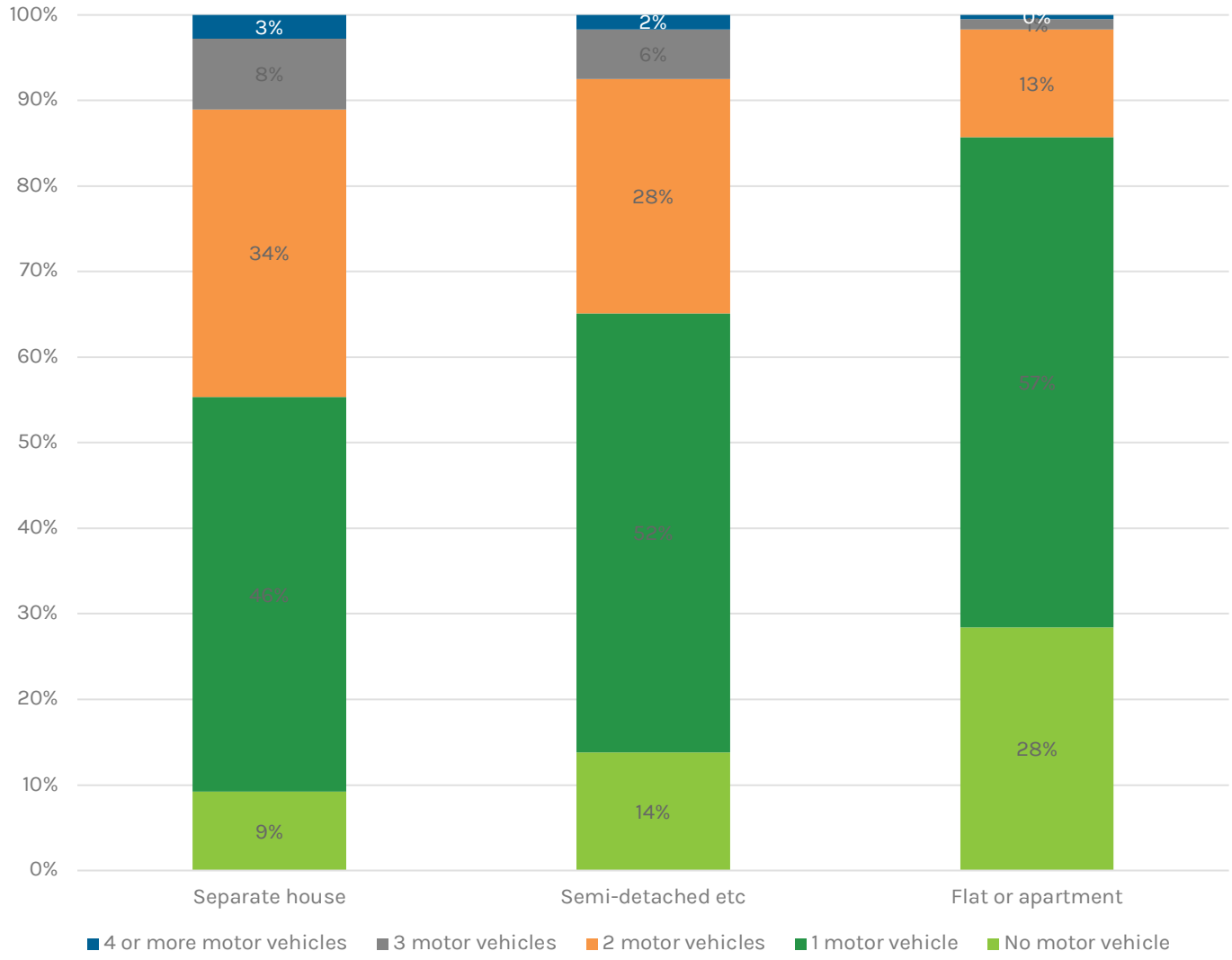

Figure 28 Vehicles per dwelling, by dwelling structure, 2021

Source: ABS 2021

5.4.1 Current EV Ownership

According to the Australian Automobile Association, there are approximately 575 BEVs and 1,444 hybrid/PHEVs registered in postcodes in Yarra.

Figure 29 indicates the distribution of EVs registered in areas across the municipality. The suburbs of Burnley, Cremorne and Richmond currently has the highest adoption of BEVs, at 247 vehicles, while Carlton North, Princes Hill and Collingwood recording the lowest number of EV registrations. Burnley, Cremorne and Richmond also have the highest number of PHEV registrations.

In total, EVs currently make up only 3.2% of vehicles in Yarra, with BEVs accounting for only 0.9% all vehicles in the municipality.

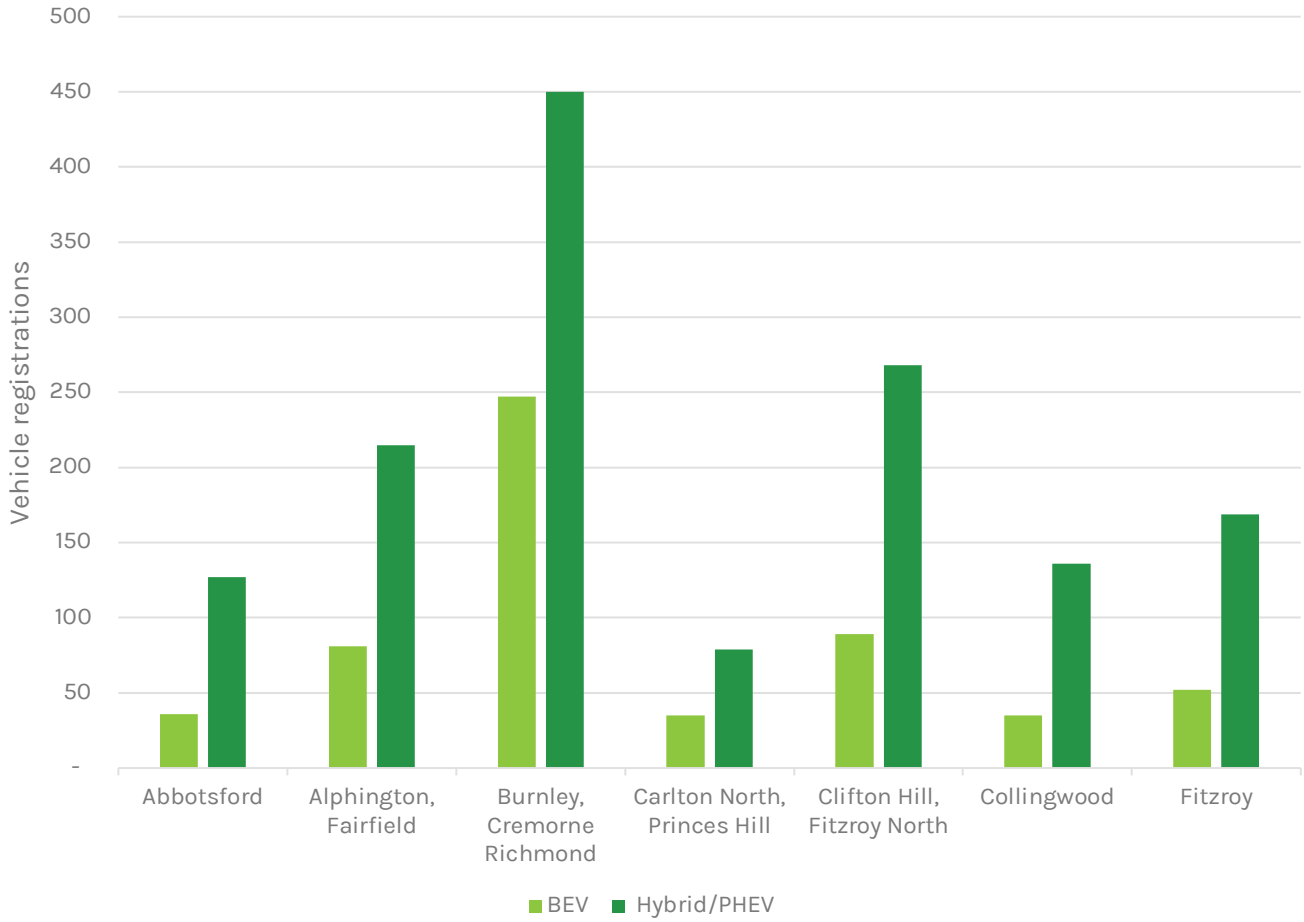

Figure 29 EVs registrations in postcodes that make up the City of Yarra

Source: Australian Automobile Association

5.5 EV ownership forecast

Projections of the potential size of Yarra's EV fleet are shown in Figure 30. Three EV ownership projections have been used[14]:

- **AEMO**: 8.5% EV by 2030, then projected forward to 2035, assumed to hit 17.9%
- **CSIRO Rapid decarbonisation**: 20% EV by 2030, then projected forward to 2035, assumed to hit 43% of all vehicles.
- **Yarra trend**: using registration data, 0.54% in 2022, projected (via regression analysis of observed trend) to reach 1.6% by 2030 and 3.7% by 2035

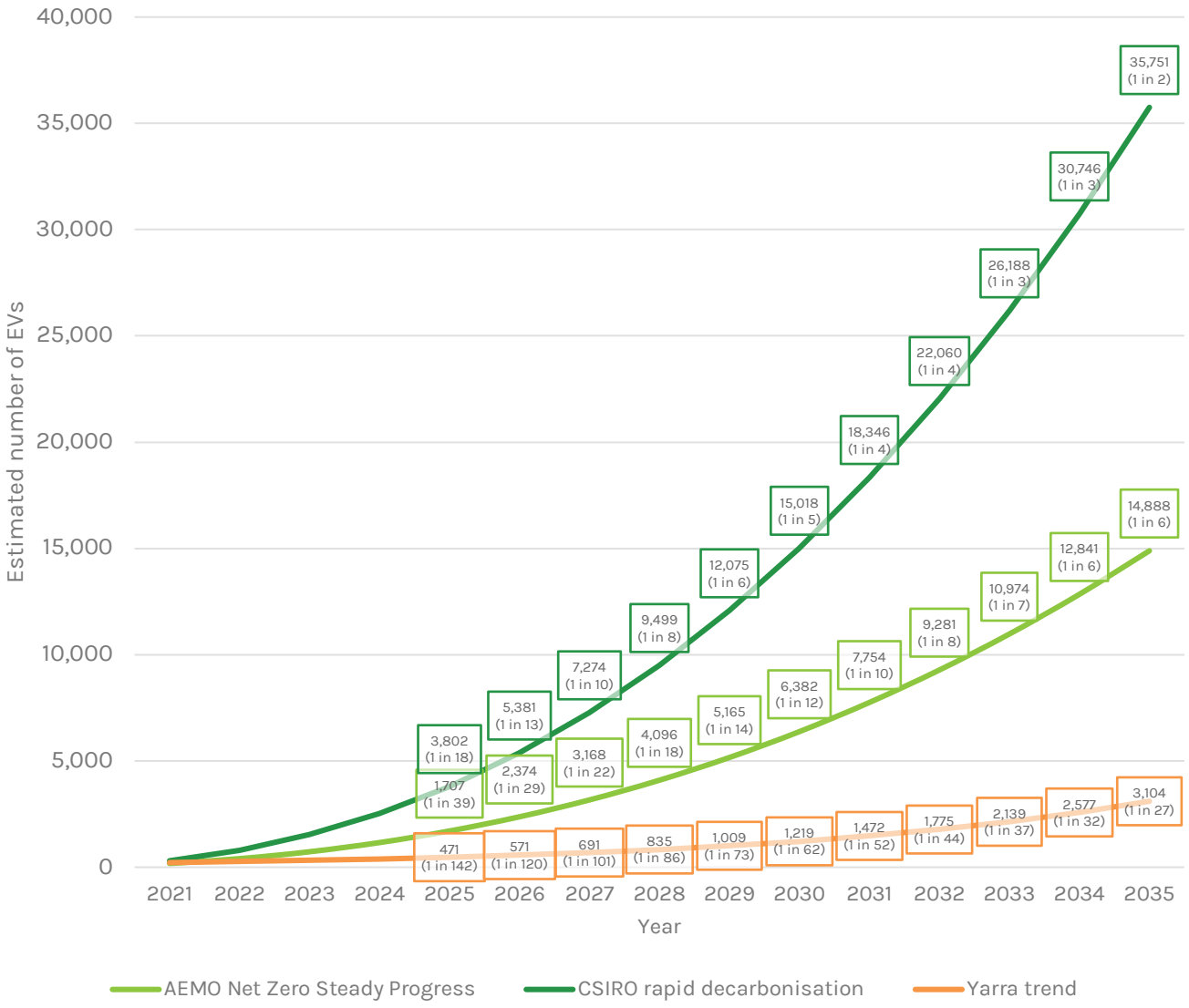

Figure 30 Yarra EV fleet projections to 2035

Yarra appears to be well behind the CSIRO and AEMO pathways. A significant upward change in the rate at which Yarra residents transition to EV will be required to meet even the *Steady Progress* forecast from AEMO.

[14] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2022/2023-inputs-assumptions-and-scenarios-consultation/supporting-materials-for-2023/csiro-2022-electric-vehicles-projections-report.pdf

5.5.1 Estimated EVs in the fleet

The growth in EVs in Yarra is shown in Figure 31. This is based on BITRE postcode level motor vehicle registration data. It is estimated that there were around 334 EVs in Yarra in 2022, up from around 120 in 2019.

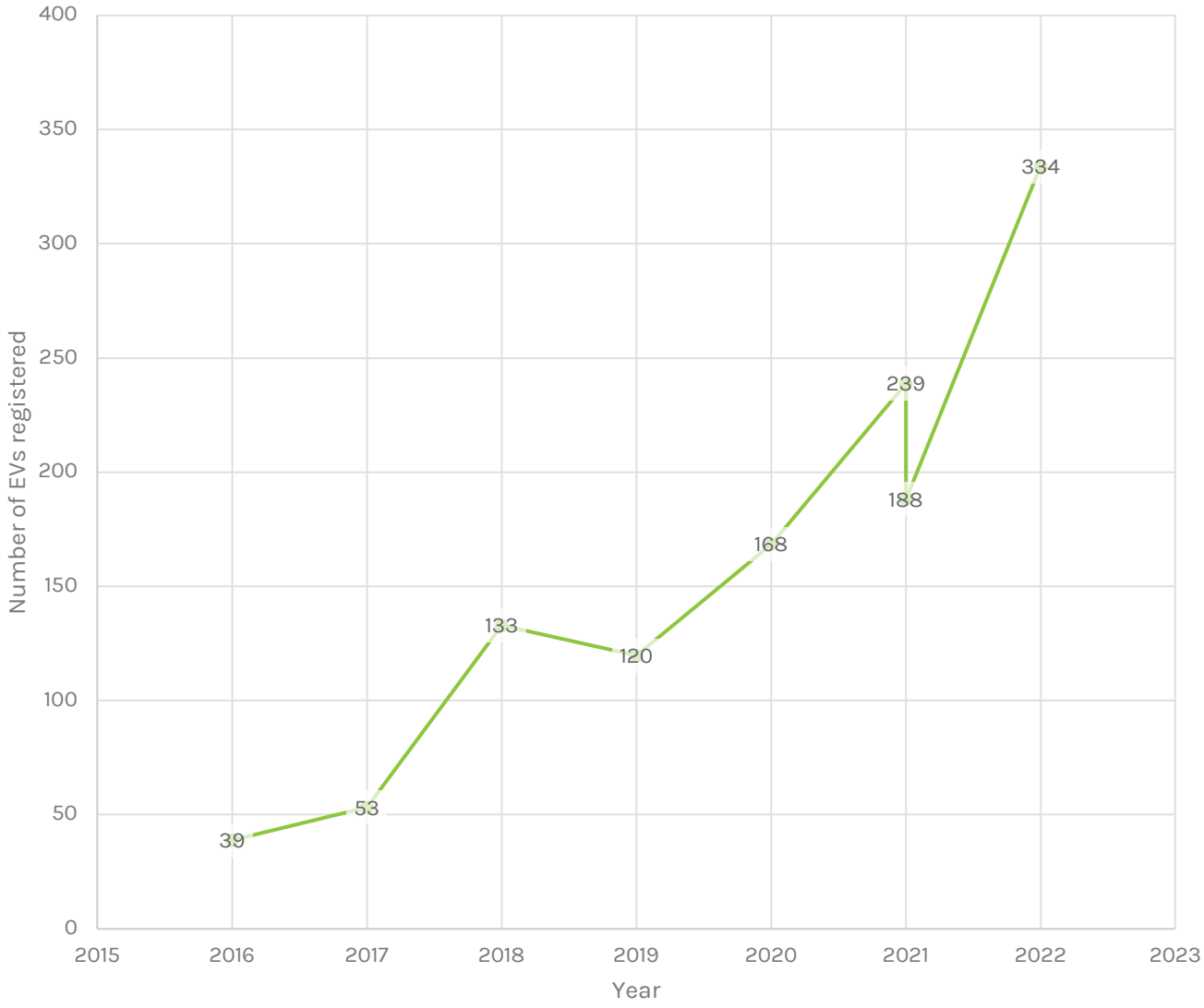

Figure 31 Number of EVs registered in Yarra, 2016 to 2022

Source: ABS Motor Vehicle Census; BITRE Motor Vehicle Census

NB: Two data points are included for 2021, as both ABS and BITRE reported in this year.

5.6 Future demand projections for electricity to support EV charging in Yarra

Providing the right amount of public charging infrastructure will be critical to supporting the growth of EVs. Figure 32 provides estimates for electricity requirements to support the public charging demand under the three scenarios introduced earlier, from 2025 to 2035.

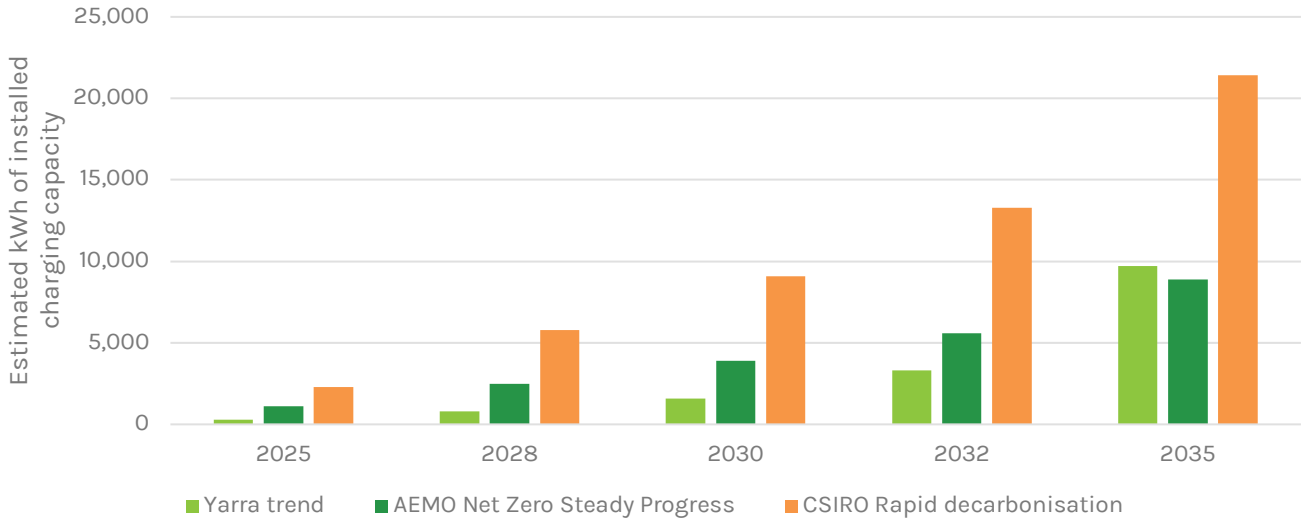

Figure 32 Estimated demand for installed charging capacity, in kWh, by scenario

To best support the various needs of users, a range of charging solutions should be provided. The mixture of charging speeds also affects the total number of chargers required. Table 7 provides an illustration of the implications of the above projections for EV ownership and public charger demand in terms of the *number of ports*. These show how the different scenarios and charger type result in a greater or lesser number of ports. For instances, in the CSIRO *rapid decarbonisation* scenario, an estimated 405 kerbside chargers would be required, in addition to 91 destination chargers and 2 fast chargers by 2030. Finally, it is important to recognise that these different charging speeds will have different usage profiles. A 7kW AC charger might have just two charging sessions per 24-hour period, but high levels of occupancy (including throughout the night) A fast charger at 250kW will have many more sessions, of much shorter duration, including no overnight sessions. These faster chargers are generally restricted to a maximum of 60 minutes.

Table 7 Number of ports required under different scenarios and charger types

Scenario	Charger type	2030 ports	2035 ports
Yarra trend	Kerbside (7/11kWh)	55	435
Yarra trend	Destination (50kWh)	16	97
Yarra trend	Fast charging (250+kWh)	1	2
AEMO Net Zero Steady Progress	Kerbside (7/11kWh)	170	395
AEMO Net Zero Steady Progress	Destination (50kWh)	39	89
AEMO Net Zero Steady Progress	Fast charging (250+kWh)	1	2
CSIRO Rapid decarbonisation	Kerbside (7/11kWh)	405	945
CSIRO Rapid decarbonisation	Destination (50kWh)	91	214
CSIRO Rapid decarbonisation	Fast charging (250+kWh)	2	5

5.7 Future charging demand

Table 8 AEMO Net Zero Steady Progress VKT and kWh projections, 2024 to 2035

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual kWh of public charging demand from EV fleet	998,376	1,468,034	2,041,836	2,724,313	3,522,268	4,441,630	5,488,329	6,668,296	7,981,472	9,437,873	11,043,221	12,803,235
Annual VKT from EV fleet	880,920	1,295,325	1,801,620	2,403,806	3,107,883	3,919,085	4,842,643	5,883,791	7,042,475	8,327,535	9,744,018	11,296,972
Annual kWh consumption from EV fleet	1,879,295	2,763,359	3,843,456	5,128,119	6,630,151	8,360,715	10,330,972	12,552,087	15,023,947	17,765,409	20,787,239	24,100,207

Table 9 CSIRO Rapid decarbonisation VKT and kWh projections, 2024 to 2035

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual kWh of public charging demand from EV fleet	2,169,206	3,269,597	4,627,759	6,255,393	8,169,317	10,384,411	12,915,553	15,777,623	18,971,262	22,520,935	26,440,994	30,745,791
Annual VKT from EV fleet	1,914,006	2,884,939	4,083,317	5,519,464	7,208,221	9,162,715	11,396,076	13,921,432	16,739,349	19,871,413	23,330,289	27,128,639
Annual kWh consumption from EV fleet	4,083,212	6,154,536	8,711,076	11,774,857	15,377,538	19,547,126	24,311,629	29,699,055	35,710,610	42,392,348	49,771,283	57,874,430

Table 10 Yarra EV adoption trend, forecast to 2035 VKT and kWh projections, 2024 to 2035

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Annual kWh of public charging demand from EV fleet	334,514	405,432	491,067	594,088	718,320	868,065	1,048,493	1,265,804	1,526,296	1,839,627	2,216,393	2,669,296
Annual VKT from EV fleet	295,159	357,734	433,294	524,195	633,811	765,940	925,141	1,116,886	1,346,732	1,623,200	1,955,641	2,355,261
Annual kWh consumption from EV fleet	629,673	763,166	924,362	1,118,284	1,352,131	1,634,006	1,973,634	2,382,690	2,873,028	3,462,828	4,172,035	5,024,556

6. Yarra's role in the charging network - Potential approaches

The purpose of this section is to compare the different approaches Council can take in terms of their involvement in facilitating EV charging opportunities in Yarra. It builds on the earlier components of the project to prepare recommended guidelines and an outline of the suggested Council procedure for the assessment and implementation of both fast and slow charging within the City of Yarra.

The review of international cities with mature kerbside charging programs outlined in Section 4.2 has revealed that there are three key components to the approaches taken in the development of public EV charging opportunities. These are highlighted in Figure 33. Cities need to assess who is best placed to fund the program, who will own the chargers, and who maintains their operation. For the purposes of this document, *government* and *private* are the two categories to each of the three components identified in Figure 33.

Figure 33 Three components to public access chargers

Table 11 provides examples from some of the international case studies, in terms of the approach they have taken to either government or private responsibility for different components of their kerbside charging program. In later stages of this project, a list of the pros and cons of each will be provided.

Table 11 Summary of different approaches to kerbside charging

Example City	Majority funding	Ownership	Operations
Amsterdam	Government	Private	Private
Utrecht	Private	Private	Private
Oslo	Government	Government	Government
London	Government	Government	Private (mostly)

6.1 Approaches to charging – comparing the options

A comparison of different charging options is provided in Table 12. For each element in the table, the more stars, the better. Charge Arm (Figure 21) is considered an individual option, while the other options are public. Charge Arm is in essence a method of delivering electricity to an EV from a private property, and swings over the footpath.

There are a wide range of considerations included in the comparison shown in Table 12. These include user considerations, such as up-front costs to users, use costs, and convenience. There are also equity considerations, such as how many people may use the charger, the inclusion of renters, and the ability to scale to include those in multi-dwelling properties. Lastly, considerations of Council asset management and commercial costs are included.

Table 12 Comparison of different charging options

Consideration	Individual option	Public options				
	Charge Arm	Public kerbside	Public utility pole	50kW DC	150kW DC	350kW DC
Up front cost to user	★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Use cost to user	★★★★	★★★	★★★	★★	★	★
Ability to scale	★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Ability for multiple users to use	★	★★★	★★★	★★★★★	★★★★★	★★★★★
Vehicle to House connection	★★★★★	★	★	★	★	★
Proximity to users' home	★★★★★	★★★★	★★★★	★★★	★	★
Reliability of accessibility by user	★★	★★★★	★★★★	★★★★★	★★★★★	★★★★★
Accessible to renters	★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Market competition	★	★★★	★★★	★★★	★★★	★★★
Control over land/road use change	★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Administration of council (per kWh installed)	★★	★★★	★★★	★★★	★★★★	★★★★
Capital cost to CPO	N/A	★★★★★	★★★★	★★★	★★	★

The individual *Charge Arm* option scores higher in terms of use cost to user, proximity and the ability to support Vehicle to Home connections. However, they score lower in capital cost, capacity to scale and for multiple people to use them, and may have reliability issues, whereby residents may not be able to access them at the times they need. Additionally, the individual options offer challenges to Council in terms of administrative oversight and capacity to change landscapes and/or road spaces in future. While public options do not offer the same levels of individual convenience, and have higher use costs (per unit of electricity), they have other attractive features. Public charging allows multiple users to access the one charger, bring asset utilisation rates up and meaning fewer will be needed. They can also be more reliably accessed by residents, as they are usually marked for exclusive use by EVs which are charging.

Figure 34 below outlines how different charging speeds impact charging time. It becomes clear that for origin on-street charging, kerbside or pole mounted AC chargers of 7kW will be effective in meeting the average daily and weekly needs of residents. A *local resident* without the ability to charge in an off-street car park will generally find a slow, 7kW public charger suitable for their needs, as overnight charging is possible. Faster charging options are more suited to destination or passing through motorists as they are likely going to be used for shorter periods of time. *Opportunistic charging* describes the charging that takes place when someone was going to that particular location anyway, and takes the opportunity to top up, because of the availability of a charger.

A local resident, without off-street parking, will generally require a public charger close to where they would have parked overnight. An AC charger is generally sufficient, as the vehicle is usually parked for more than 6 hours.

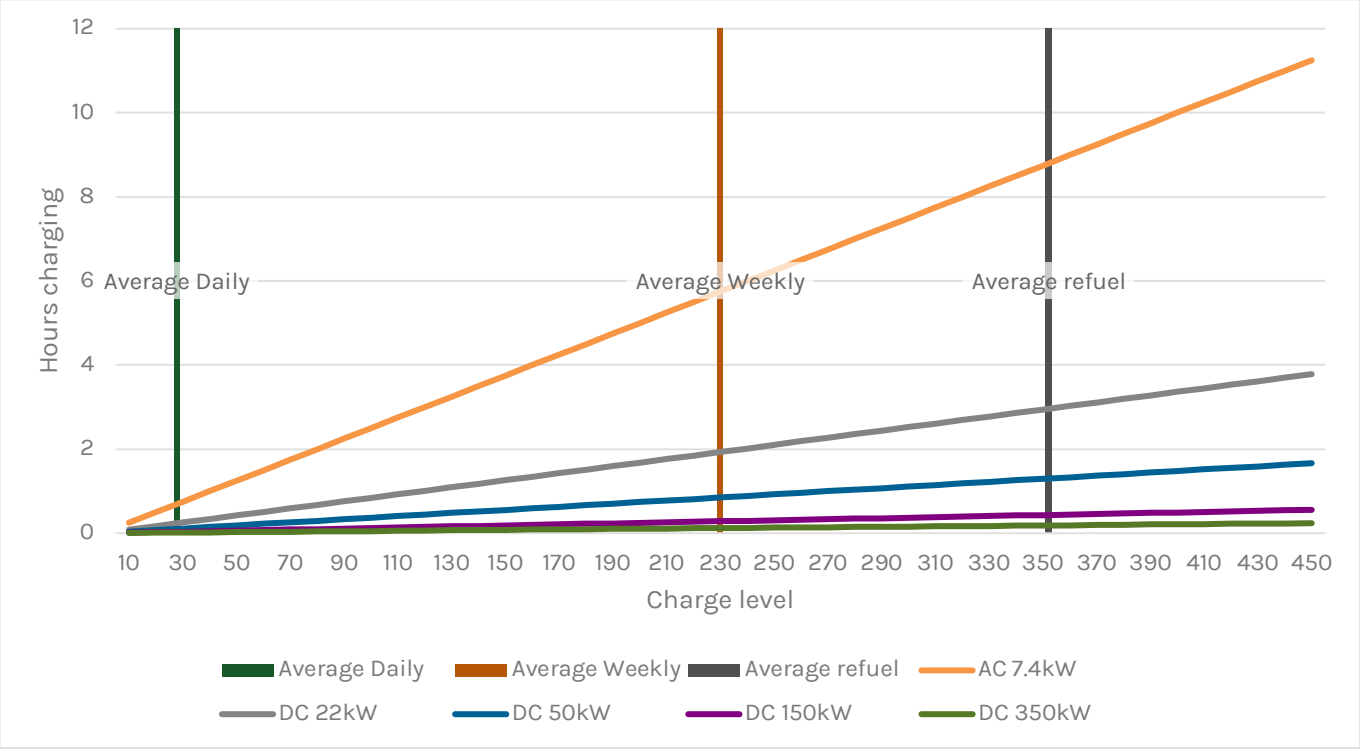

Figure 34 Comparison of different charging speeds to charging time

Source: Institute for Sensible Transport

6.2 End user cost comparison

Costs to users can be considered as three elements: upfront cost; use cost; and whole of life cost. An assessment of annualised whole of life cost is presented in Table 13.

Table 13 Comparison of annualised end user costs for different charging options

Charging option	Annual user cost
Charge Arm	$432 to $2,592
Public (kerbside or utility pole)	$3,240
Public 50kW DC	$4,320
Public 150kW+ DC	$6,480

Table 13 is underpinned by the following assumptions:

- Vehicles travel an average of 12,000 km per year.
- 90% of charging is done on that piece of infrastructure.
- Individual solutions have a lifespan of 10 years.
- For the individual options, a range is given due to different potential electricity costs. The lowest figure is based on the most tactical approach, whereby a user has a solar system, and charges exclusively from that system, between the hours of 10am and 2pm (3.9c/kWh feed-in tariff). This is unlikely to occur in reality, but presents the absolute lowest cost scenario. The higher figure is based on a default offer tariff of 21.7c/kWh.
- Per kWh costs for the public options are based on current market prices:
- 30c/kWh – 7/11kWh
- 40c/kWh – 50kWh
- 60c/kWh – 150kWh+

The annual cost estimates in Table 13 are sensitive to equipment lifespan and average kilometres driven per year.

The other aspect that Table 13 shows is that a heavy reliance on 50kW and 150kW+ chargers will result in significantly higher user costs than with slower (7/11kW) kerbside or utility pole mounted chargers. For most residential purposes, a slower charger will meet user needs, while simultaneously providing a lowest cost option.

6.3 Off Street and Kerbside Charging options

The overwhelming majority of public EV charging in Australia takes place in off street parking bays. There are several reasons for this, including:

- Easier to use an EV charger in a bay that you can either enter nose first or reverse into. This provides maximum flexibility given that some models of EVs have the charging port on the front of the car and some have it located at the rear of the vehicle.
- There is generally more certainty regarding the continued use of a parking bay in an off-street location. On street parking bays are more subject to re-allocation of road space (e.g., protected bike lane, bus lane etc).
- In built up areas, on-street parking bays often have stricter/shorter time limits.
- It is often easier to connect off street parking bays to the electricity system.

For the reasons identified above, the general preference is for EV chargers to be installed in off street parking bays. However, there are at least three instances in which it is likely to be appropriate to install EV chargers in kerbside locations in the City of Yarra:

1. In residential streets with a prevailing building type that does not easily allow off street charging. Terrace style housing is a common building type in which it is not possible to charge an EV at home. Kerbside EV charging in these locations are typically slow chargers that provide residents without off street parking to be able to charge over an extended period of time (i.e., 4 – 12 hours). As highlighted earlier, in many instances, charging will occur overnight. This is particularly pertinent for the City of Yarra, in which the dominant built form lacks off street parking.
2. In street catering to opportunistic chargers, where an 11 to 22kW output is possible. This user case will be rare given that it is generally more economical to provide higher output chargers in off-street locations.
3. To facilitate longer vehicles (e.g., trucks or vehicles with trailers) to access chargers. In these instances, the chargers will be located in a regional area and the user will be driving a longer distance. This category is not highly relevant to the City of Yarra.

6.4 Challenges for EV-ready buildings

As EV adoption continues to grow across the municipality, Yarra residents will increasingly want access to affordable and convenient home charging. Yarra residents are far more likely to live in dwellings that do not have easy access to charging. While around 1 in 4 Victorians live in strata-managed residential buildings, in Yarra, this rises to 1 in 2. Retrofitting residential buildings can pose challenges, mainly due to potential issues with electrical infrastructure and the complexities of navigating strata rules. This becomes particularly challenging when there's low adoption of EVs among residents and committee members. Such a situation can lead to frustration for current or would be EV owners and, in some cases, prompt them to explore other buildings that offer these services.

Approximately 1 in 2 Yarra residents live in strata-managed residential buildings that are not yet setup for EV charging.

As part of the new requirements under the *National Construction Code 2022* energy efficiency standards (commencing in Victoria on 1 May 2024) there must be space for switchboards and EV charging infrastructure in new builds for

- 100% of parking car spaces in apartment buildings
- 10% of spaces in offices and retail
- 20% of spaces in other commercial buildings.

These new building codes ensures that new builds will be EV-ready for new residents, however it does not address existing strata-managed residential buildings that are not yet setup for EV charging.

6.4.1 State and Territory Government initiatives

The NSW and ACT governments have both undertaken pilot programs to overcome barriers to charging in strata developments. Both programs have either closed for applications or the funding pool has been used, however they provide an example of how governments are working to encourage existing buildings to become EV ready. Incidentally, NSW and ACT led Australia in terms of EV market share, with 20% of new vehicles sold in the ACT being EV.

6.4.1.1 NSW Government Electric Vehicle ready buildings grant

The Electric vehicle ready buildings grant has seen a positive reception with many stage 1 applications submitted since its launch in mid-October 2023. As a limited amount of funding is available, the program will not accept new applications until the assessment of submitted applications is complete and remaining funding is identified.

The grant operates in two stages:

- Stage 1 consists of a subsidised feasibility assessment to understand current conditions and assess the options available for EV charging. The cost to the applicant will be $2,000 ex-GST and the NSW Government will cover the remainder of the fee.
- Stage 2 consists of the infrastructure upgrades required to make the building EV ready. The grant will co-fund 80% (up to $80,000 per building) of eligible infrastructure costs and also cover 50% (up to $1,200 per building) of eligible software subscription costs for 2 years.

6.4.1.2 ACT Government Residential Strata EV Ready Pilot Study

The Residential Strata EV Ready Pilot Study is the ACT governments' plan to explore the opportunities, challenges and costs of retrofitting EV charging infrastructure into existing multi-unit apartment and townhouse complexes. In September to October 2023, interested owners' corporations and strata managers were invited to apply to take part in the Pilot. The Pilot had $300,000 to support owners corporations:

- who have support from their members to install EV charging infrastructure.
- that live in a strata which can showcase different types of EV ready configurations or solutions.
- whose members are willing to raise community awareness, and support education activities aimed at assisting strata become EV ready.

The Pilot worked in a similar fashion to the NSW example, however there was a slight difference in its structure. The Pilot was designed to fund:

- Up to 10 EV ready feasibility studies in eligible strata.
- At least two EV ready grants in eligible strata.

The successful applicants will see funding up to 100% of eligible costs for both the feasibility studies and EV ready infrastructure. However, owners' corporations that were deemed appropriate to contribute towards the cost score favourably against the relevant assessment criteria.

6.4.1.3 Victorian Government EV-ready owners corporation guide

The Victorian Government has published a guide intended for owner's corporations to provide high-level and simplified information to step owners' corporations through the process of installing EV chargers in multi-unit residential buildings. Whilst this does not provide any funding or incentives for owners' corporations to make their buildings EV-ready, it does provide basic information on how

they can best approach it. The guide[15] is broken into 9 steps, outlined below (verbatim):

1. Determine building suitability for EV charging.
2. Assess the level of interest from residents.
3. Determine the building's level of EV-readiness and how to reduce your energy consumption.
4. Determine your preferred approach.
5. Discuss the type of EV chargers and charging preferences.
6. Consider how to manage safety for your residents.
7. Determine your budget, including who pays and how costs are recovered.
8. Develop user agreements with residents to formalise charging arrangements.
9. Approvals and installation process.

More detailed information from the Victorian Government on EV ready buildings can be downloaded from the link in footnote at the bottom of this page.

6.5 Managing charging spaces

As EV charging equipment and operation comes at a cost, and can be scarce, it is important the asset is used efficiently. This helps to ensure each charger maximises its contribution to meeting the charging needs of the vehicle fleet.

Without effective parking controls, there is a significant risk that non-EVs will park in EV charging bays. This is known as 'ICE-ing' and can occur intentionally or unintentionally, with the effect being the same; the EV charger becomes unusable.

Introducing signage to prohibit ICE vehicles from parking in EV charging bays is recommended. Council must ensure that signage clearly outlines the requirements of the space, such as the signs outlined in Figure 35.

EV charging equipment and operation comes at a cost, and can be scarce, it is important the asset is used efficiently.

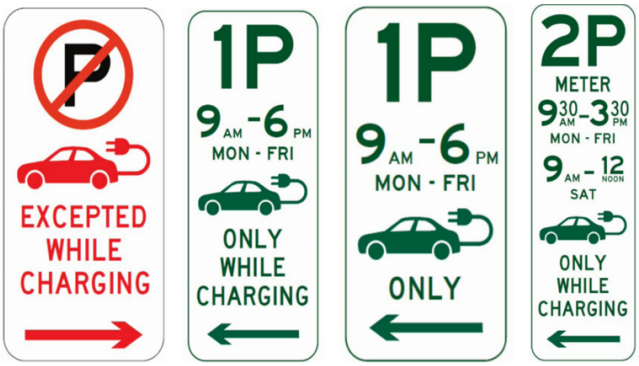

Figure 35 New regulatory signage for EVs

Source: Transport for NSW

To make best use of the asset, publicly available EV charging bays should be used only for *EV charging*, not EV storage. Figure 36 offers an example of what happens when signage allows EVs to park in a bay even when not charging. This blocks the bay for EVs that do require a charge.

[15] https://www.energy.vic.gov.au/__data/assets/word_doc/0040/599377/EV-ready-buildings-for-owners-corporations.docx

Figure 36 EV not charging in EV space in the newly constructed public charging in the City of Darebin

Source: Institute for Sensible Transport

6.5.1 Scenarios for managing charging bays

Six scenarios have been developed to explore how different types of restrictions on EV charging bays can be implemented, as well as outlining the benefits and risks of each scenario. These scenarios are intended for slow, AC charging in residential streets. Faster, DC charging must be handled differently, to ensure the charger is only ever used by EVs, and only whilst charging.

6.5.1.1 Scenario 1: Charging space that any car can use.

EV charging space can be used by any vehicle regardless of the propulsion method.

Pros:

- Easiest scenario for council to manage as it does not have any restrictions on the use of the space.
- Lower setup and maintenance cost due to lack of restrictions on use and therefore no enforcement costs.
- No perceived loss of parking by residents owning ICE vehicles, as they can park in the bay.

Cons:

- Highest likelihood of ICE-ing due to the lack of restrictions and signage on charging spaces.
- EVs that have completed charging are not required to move which may block the space for an EV requiring charging.
- Charging bays will likely be busier than other scenarios due to the lack of restrictions for other vehicles which may cause frustration for users.
- Commercial providers may be discouraged from investing in the network, as their chargers may be blocked for a considerable portion of the day.

6.5.1.2 Scenario 2: Charging space that any car can use, with courtesy signs

This scenario is very similar to scenario 1, but with the addition of a courtesy sign outlining the parking space is for EV charging.

Pros:

- Lower setup and maintenance cost due to lack of restrictions on use and therefore no enforcement costs.
- Signage to deter vehicles that are not charging from using the space.
- No perceived loss of parking by residents owning ICE vehicles.

Cons:

- High likelihood of ICE-ing due to the lack of restrictions.
- Requirements of signage are not mandatory and are followed at the discretion of the user, meaning spaces may still be used by vehicles not requiring charging.
- Cars that are not charging may deny access to EVs needing to charge.
- Commercial providers may be discouraged from investing in the network.

6.5.1.3 Scenario 3: Charging space that only EVs can use, with optional charging.

EV charging space can only be used by an EV with restrictions for other vehicles. The space is

designated for EVs, however active charging is not required (as depicted in Figure 36).

Pros:

- Restrictions prohibit ICE-ing.
- Ensures spaces are available for only EVs.

Cons:

- Allows for EVs that are not charging to block spaces, preventing an EV requiring a charge to utilise the bay.
- Only allows for EVs, regardless of if the space is being used or not, which may result in low utilisation rates and frustration at being unable to use car parking space.
- Perceived loss of parking by residents owning ICE vehicles.
- Commercial providers may be discouraged from investing in the network.

6.5.1.4 Scenario 4: Space that only EVs can use, only while charging with significant leeway.

EV charging space can only be used by an EV, only whilst charging. For slow, AC charging it may be necessary to consider a policy that helps to ensure the asset is utilised effectively. The signed regulation might be: *EV Only and Plugged In*, with a notice to see App for additional conditions. The conditions may include:

- Cost per kWh
- Please move vehicle once charging complete
- Vehicles must be moved within one hour following the end of the charging period, or ½ the time spent charging (e.g. if you charged for four hours, you must move your vehicle within two hours following the completion of charge).

Whilst this above conditions may appear complex, these are only for slow, AC chargers in residential areas (where the customer base is likely to be regular (charging between 20 – 60 times per year). It is recommended charging occur via an App (e.g. Chargefox) and this enables the conditions to be presented to the user prior to charging commencing. The infringement can also potentially be billed via the App, or the information provided to the Council for preparation of the infringement notice.

Pros:

- Restrictions prohibit ICE-ing.
- Ensures that EVs that have completed charging are moved within a timely manner, thus increasing turnover.
- Incentivises people to charge for longer periods, less often (for overnight charging), but still provides the flexibility to charge for brief periods.
- More commercially attractive, as this scenario has an emphasis on higher utilisation rates.

Cons:

- Only allows for EVs, which may result in low utilisation rates (at least initially) and frustration at being unable to use car parking space.
- Significant amounts of leeway may mean that vehicles that have completed charging are still occupying the space and thus blocking it for another user.
- Perceived loss of parking by residents owning ICE vehicles.

6.5.1.5 Scenario 5: Space that only EVs can use, only while charging with some leeway.

This scenario is essentially identical to Scenario 4, but with a smaller amount of leeway.

Pros:

- Restrictions prohibit ICE-ing.
- Shorter leeway times ensure charging space is available more often by ensuring EVs are not overstaying when they're not charging.
- High level of commercial favourability, as the conditions increase the number of kWh transferred via the charger.

Cons:

- Only allows for EVs, regardless of if the space is being used or not, which may result in low utilisation rates (of the bay) and frustration at being unable to use car parking space (for ICE and non-charging EVs).

- Shorter leeway times may result in users needing to move their EVs more often and at inconvenient times such as overnight when it is unlikely that additional EVs will be searching for charging space.
- Perceived loss of parking by residents owning ICE vehicles.

6.5.1.6 Scenario 6: Space that only EVs can use, only while charging (no leeway)

This scenario describes where an EV charging space can only be used by an EV, only whilst charging. This would mean that vehicles that have completed charging are required to vacate the spot once completed.

Pros:

- Only EVs that require charging can use the space.
- Restrictions prohibit ICE-ing.
- Charging spaces are likely to be available more often than other scenarios due to the restrictions on their use.
- Highest level of commercial favourability, as the conditions increase the number of kWh transferred via the charger, compared to earlier scenarios.

Cons:

- Only allows for EVs, regardless of if the space is being used or not, which may result in low utilisation rates and frustration at being unable to use car parking space (for ICE vehicles).
- No leeway time can cause inconvenience to EV users who have completed charging and are then required to move their vehicle immediately, particularly overnight charging.
- Perceived loss of parking by residents owning ICE vehicles.
- Restricting the use to only while charging may lead to low utilisation rates during low demand times such as overnight.
- Highest setup and maintenance cost due to heavy restrictions on use that may require vehicle detectors and therefore enforcement costs.

6.5.2 Recommended scenario for the City of Yarra

It is recommended that for residential street, slow charging in the City of Yarra, *Scenario 4* and *5* present the most appropriate conditions to enable Yarra to achieve its goal to boost charging opportunities for residents without the ability to charge at their dwelling.

6.6 Recommended role of Council in facilitating EV charging in Yarra

Council can play an important role in the planning and provision of EV charging infrastructure, as they:

- Assess planning mechanisms, applications and issue permits. This includes parking provision for new developments, both residential and commercial.
- Own and manage many of the off street car parks that serve as potential publicly available EV charging sites.
- Are leaders in their community and can influence the strategic direction of the build environment and the transport system.
- Have the potential to address disparities in the provision of chargers, by facilitating public charging networks, which may occur under a purely commercial model. Councils are in a position to create a cross subsidy negotiation with the private sector in which they provide access at high value sites, in return for the commercial provider installing chargers in sites that have less commercial attractiveness.
- Have the ability to seek amendments to the local planning policies and advocate for changes to the state policies.

Have a role in ensuring that charging locations are accessible to all in the community (including those with mobility issues). This applies to all future publicly accessible charging locations, whether on public or private land.

Table 14 below offers a step-by-step process for Council to consider in the process of assessing expressions of interest or requests for public chargers.

Table 14 Public Charging - Recommended guidelines for Council

Public charging considerations	Recommended Council position/approach	
	Public fast charging	**Public kerbside (slow) charging**
Objective	To facilitate fast charging (25+kW) opportunities for those visiting activity centres and other key destinations in Yarra. This can also serve to bolster the economic competitiveness of Yarra.	To facilitate slower charging (7/11kW AC) opportunities in residential areas of Yarra, with a demonstrated need.
Role of Council	To facilitate the private sector to provide charging on either public or private land that is publicly accessible. In most cases Council will not need to financially support the CapEx or OpEx, but may be required to provide land (via leases or other agreement) as well as in kind support. In some cases, it may be possible to charge a small monthly fee to CPOs for the use of high value parking bays.	To facilitate the private sector to provide charging on public land that is publicly accessible. This will primarily be kerbside. Council may need to seek additional funding in order for kerbside charging to be commercially viable. This could be from bodies such as ARENA and in collaboration with other councils (e.g., M9). Future state government funding may support kerbside charging (as it currently the case in NSW).
Application process	Public expressions of interest process. Council should enter negotiations with shortlisted EOIs.	Installation locations should be determined based on community demand (via online portal), assessment on likely need and adequacy of electricity network. Public expressions of interest process. Council should enter negotiations with shortlisted EOIs.
Planning Scheme considerations	Flooding overlays (LISO and SBO) and Heritage Overlay areas are planning scheme considerations for public fast chargers. Installations must meet design requirements of Melbourne Water. The presence of flooding or heritage overlays should not prevent installation, but may alter design.	Flooding overlays (LISO and SBO) and Heritage Overlay areas are planning scheme considerations for charger installations. Installations must meet design requirements of Melbourne Water. The presence of flooding or heritage overlays should not prevent installation, but may alter design.
Council owned site	Council should use existing car parks in identified activity centres for EV charging. Off-street should be preferred over on-street. Of kerbside must be used, only angled on-street parking should be used. Council to enter into a lease or other agreement for the land to be used for the installation of EV charging equipment.	Council should use existing car parking in residential areas. Angled on-street parking should be preferred, where available, but parallel is suitable on low-traffic streets. Council to enter into a lease or other agreement for the land to be used for the installation of EV charging equipment.

Public charging considerations	Recommended Council position/approach	
	Private sector only interested in leases of 10+ years.	Private sector only interested in leases of 10+ years.
Crown owned site	Council should play a facilitator role between the landowner and the proponent to explore opportunities for installation.	Unlikely to be suitable.
Privately owned site	Council should play a minor role between the landowner and the proponent to explore opportunities for installation.	Unlikely to be suitable.
Engagement with DNSPs	Council should require the proponent to liaise with the DNSP to gain necessary approvals and upgrades.	Council should require the proponent to liaise with the DNSP to gain necessary approvals and upgrades.
Process for receiving requests from residents and local businesses	Areas with a high level of request should be prioritised for the release of expressions of interest.	Areas with a high level of request should be prioritised for the release of expressions of interest.
Role of the State and Commonwealth governments	State and Commonwealth Government have a significant role in ensuring there are funding opportunities to support the development of a public charging network.	State and Commonwealth Government have a significant role in ensuring there are funding opportunities to support the development of a public charging network.
Permits, fees and other chargers to the private sector	Council should seek to keep costs to CPOs low, in initial years, to support the development of a public charging network. In future when base network has been established, Council may be in a position to charge lease costs or revenue sharing.	Council should seek to keep costs to CPOs low, in initial years, to support the development of a public charging network. In future when base network has been established, Council may be in a position to charge lease costs or revenue sharing.
Costs to user	Market rate. Ultimately this will be a decision for the CPOs, but Council should avoid measures that artificially lower costs to users. It is expected the cost to the user will be higher for faster charging than slower charging.	Market rate. Ultimately this will be a decision for the CPOs, but Council should avoid measures that artificially lower costs to users. It is expected the cost to the user will be lower for slow charging than fast charging.
Policy on advertisements	Advertising should not be permitted on EV charging equipment.	Advertising should not be permitted on EV charging equipment.

6.7 Risk management

The introduction of publicly available EV charging infrastructure comes with a set of risks. While well-planned EV charging will not eliminate these risks, their identification is necessary to a) mitigate against them and b) create an operational model that ensures a timely response to any interruption of quality service. The way in which EV charging spaces are provided and managed in Yarra will affect how they are ultimately used.

Table 15 Risks and mitigation options

Risks	Description	Mitigation

Charge point operator ceases operation	The charge point operator stops operating, leaving equipment stranded.	Council should write clear conditions into all contracts which layout processes for if a charge point operator ceases operation. This may include a bond or lien on assets, or for the assets to become council property (allowing council to contract operations).
Street space allocation difficulties	The increase in space required to provide EV charging infrastructure reduces opportunities to use the space for other modes/uses.	Council should use angle parking as a preference for EV charging spaces. Ideally, 90-degree parking is preferred, as some EVs have the charger port on left hand side of vehicles, others the right etc. Angled parking bays also often have more space to accommodate large charging infrastructure without losing valuable road and pedestrian space. Where large charging infrastructure cannot be provided due to space issues, Council should then consider smaller, kerbside options that have a smaller physical footprint which can also more easily be provided in a parallel parking scenario. Charging spaces should also only be provided on one side of the. This is to preserve one side of the street for other uses (e.g. wider footpaths). EV charging should not be provided on streets in which renewal activities are scheduled, or where there is a current proposal for a protected bicycle lane, priority bus lane or other use that may replace car parking.
Obsolescence	Chargers no longer used as not compatible or more desirable equipment is available.	Replace chargers with newer models; ensure power supply can provide useful charging rates even if initial charger not using the full capacity; buy over-capable equipment in expectation of users seeking higher rates in future (e.g. three phase 32A chargers even if few cars can use now) as additional cost is low.
Hydrogen technology	Hydrogen technology becomes more popular and eventually overtakes battery electric vehicles.	It is highly unlikely that hydrogen technology will overtake lithium battery EVs as: • There are no current or planned hydrogen filling stations in or near Yarra. • Green hydrogen is not available and existing sources are more carbon intensive than electricity. • Filling a vehicle with hydrogen is significantly more expective than electricity. • Very few car companies have plans for introducing fuel cell (hydrogen) vehicles.
Charge point operator fails to meet performance standards	The charge point operator fails to meet performance standards within the contract. This could include poor maintenance (for example, leading to safety risk), lower than stipulated up-time, failure to	Council should write clear conditions into all contracts which layout clear performance requirements which are objectively measurable. Contracts should also clearly state actions taken by council in the event of non-compliance. These should escalate, based on duration, severity, and number of non-compliance incidents. Penalties could include

	implement user interface requirements, or incompliant usage fees.	fines, exclusion from future contracts, and/or forfeiture of assets.
Vandalism	Intentional damage to equipment; highest occurrence where poor public oversight, near late-night venues and isolated sites with limited passive surveillance.	Good public oversight (passive surveillance). Avoid areas near pubs, late night venues. CCTV cameras (with signs), unremarkable hardware to reduce appeal/attention.
Accidental damage	Most often vehicle impacts, running over cords or connectors not returned to holders.	Bollards carefully places to avoid reduced accessibility to those with mobility issues. Equipment designed to bill customer until charger replaced to holder. Design of charger and holder to minimise misuse.
Denial of access by blocking charger (ICE-ing)	Cars not charging denying access to EVs needing a charge; may include non-charging EVs as well as ICE vehicles.	Use vehicle detector in pavement and link to charge status indicator; if a vehicle is present but not connected, alert an enforcement officer after 5 minutes; charge vehicles for connected time whether charging or not (for DC); intense enforcement for short periods will lead to compliance with low level of effort on average.
Low utilisation rate	Chargers installed but under use leading to frustration from ICE vehicle owners at being unable to use car parking space and complaints.	Transitional signs: "Please park elsewhere if space available if not charging"; "5/10/15 minute parking if not charging" (in an otherwise one or two-hour zone); put chargers in low demand parts of a parking area to reduce annoyance; don't over-invest early in parking spaces.
Very high utilisation rate	Chargers always busy causing frustration for users.	Raise the price; charge per minute, not per half hour or longer period; install chargers in groups making it easier to find a free charger, more likely that someone in the group will leave soon; have a time-based charge that increases the price per minute for longer charger sessions; if profitable, install more chargers and encourage private providers to do so.
Ongoing costs	Maintenance, insurance, and billing costs are higher than expected.	Plan and budget for all costs up front and price accordingly (if for a fee) or ensure sufficient budget available (if free). Monitor costs closely and adjust as required; if not competitive with other suppliers of charging services, allow traffic to go to others and gradually close sites down.

6.8 Recommendations

This section provides a series of recommendations which will help the City of Yarra achieve its strategic objectives in supporting the communities' EV transition. It is recommended that Council:

- Facilitates the installation of neighbourhood chargers (7/11kW kerbside units), of either

podium or pole mounted styles, prioritising coverage and need.

- Facilitates the installation of destination chargers (25-kW DC) in Activity Centres, prioritising coverage.

To support these actions, Council needs to:

- Resolve ambiguity regarding installation on Crown land.
- Work with Melbourne Water to develop an acceptable installation typology suitable for SBO affected land.
- Identify desirable areas for EV charging equipment, and engage with CPOs to deliver in these areas.
- Identify locations for pilot installation of publicly accessibly kerbside charging. Council may need to provide some level of funding support to facilitate these installations. Exercising the competitive forces in the CPO market can help to lower these costs.
- Set pricing for any Council owned charging equipment at competitive market rates.

To support a user friendly, and future proof charging network, Council should ensure that:

- Activity Centre charging is DDA compliant, where possible.
- Activity Centre charging be placed in well lit off-street car parks, where possible.
- Activity Centre charging be placed in a way that maximises the number of bays able to be reached by the charging cable.
- Neighbourhood kerbside charging be installed in angle parking, where available.
- Neighbourhood kerbside charging be installed adjacent to parking bays which residents can park for an unlimited amount of time.
- Neighbourhood kerbside charging be installed only on one side of the street, to protect the other side for alternative uses.
- Neighbourhood kerbside charging is not located in streets slated for change in the next ten years.
- Neighbourhood kerbside charging is not located in streets with speed limits exceeding 40km/h.

7. Battery charging for micromobility

Micromobility, such as e-scooters, and other forms of 'small footprint' transport is rapidly evolving in Melbourne. Everything from children scooting to school through to food delivery riders are captured within the term micromobility.

7.1 What is Micromobility?

Micromobility does not have a strict, universally accepted definition. For the purposes of this document, micromobility can be thought of as 'small footprint transport' that:

- Travel at less than 45km/h. Laws in Victoria require e-scooters to travel no more than 20km/h and motors on e-bikes to cut out at 25km/h.
- Typically weigh less than 350kg. In most cases, the devices weigh closer to 15 – 35kg.

Yarra currently has shared e-bike and e-scooters, operated by the private sector. Figure 37 provides an example of a rapidly growing form of shared e-cargo bike. This is useful primarily by families with young children, as well as those moving items unable to be easily carried on standard bicycles. Users pay an hourly fee. This type of micromobility service only operates in cities that have a well-developed network of connected bicycle infrastructure. These vehicles essentially act as a replacement for a family's motor vehicle, or avoids the need for a second household car.

Figure 37 e-cargo bike share, The Netherlands
Source: Institute for Sensible Transport

7.2 Barriers and facilitators to micromobility uptake

The role local government plays in micromobility is crucial to achieving their long-term sustainability vision and strategic objectives. The role that council can play is captured in Figure 38.

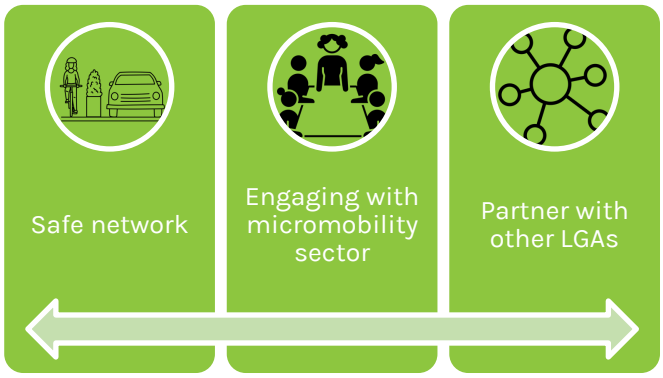

Figure 38 Council's role in growing micromobility in Yarra

The single most important responsibility Council has for enabling micromobility to flourish is to create a safe network. Creating a connected, high quality network of protected bicycle lanes, shared paths and quiet streets directly supports Yarra's *Community Vision 2036*, to create a transport system that is innovative, efficient, sustainable and accessible.

The single most important responsibility Council has for enabling micromobility to flourish is to create a safe network.

Yarra's *Transport Strategy* has a number of objectives that will also be directly supported through the creation of an improved network, these include:

- Enhanced places for people on Yarra's streets.
- Increased use of space-efficient forms of transport in Yarra.
- Increased independent mobility for vulnerable road users in Yarra.

- Reduce car use for trips within, to, from and through Yarra.
- Increase use of environmentally sustainable forms of transport in response to the climate emergency.

Prioritising sustainable and space-efficient transport modes is embedded in Yarra's Transport Strategy.

While Council will be dependent on cooperation with the state government for protected lanes on declared roads, the majority of the street network in Yarra is managed by Council. By implementing the network identified in current Council strategies, Yarra will become a safer, more welcoming environment in which to use micromobility.

7.3 Charging considerations

The role of e-micromobility charging is vastly different from that of EV charging which has been explored in this report. Charging of micromobility devices will mostly take place at home or at work via a regular (10A) wall outlet. One of the major obstacles in planning for micromobility infrastructure is the absence of standardised and universally compatible charging equipment. This means that e-bike/e-scooter owners are required to carry a charging cable with them if seeking to charge their battery out of home.

Micromobility devices often employ proprietary charging cables, either attached or detached from the devices.

Micromobility devices may also have removable or fixed batteries, which inherently causes more issues for charging infrastructure. Micromobility devices with a non-removable battery may have significantly different charging requirements compared to devices with removable batteries. For instance, a removable battery can be charged in a user's home or work without having to bring the bike with them. E-bikes with a non-removable battery can only be charged with the device still attached.

It generally takes around 6 hours to fully charge an e-bike/e-scooter battery. This makes it impractical for public charging, as it is unlikely the user will be willing to stay with their bicycle for this period of time. There a no security/locking features on charging cables, unlike EVs. Concerns around security risk will often prevent an e-bike/e-scooter owner leaving their device in the public domain while charging.

There are also issues around the safety of e-micromobility batteries and charging. A lack of regulation covering lithium-ion batteries has resulted in lower quality products on the market, increasing the fire risk from charging devices such as e-bikes. The CFA[16] has outlined the following main reasons for lithium-ion batteries to catch fire:

- Incorrect charging cable, not designed for the device or battery. This can result in overcharging or overheating.
- Have been damaged by an impact, cracked, dented, punctured, crushed or exposed to overheating.
- Have been in fresh or salt water for a long time, causing corrosion within the battery.

The Australasian Fire and Emergency Service Authorities Council (AFAC) also recognises the risks posed by light Electric Vehicles such as e-bikes, e-scooters and mobility scooters and recommends that a separate and dedicated area is provided for charging of these devices.

See Section 7.5 for recommended approaches to supporting the growth of micromobility in Yarra.

[16] https://www.cfa.vic.gov.au/plan-prepare/fires-in-the-home/charging-and-battery-safety

7.4 Parking priority and consistency for shared micromobility programs

To ensure the growth of shared micromobility options progress in an orderly way and minimises any inconvenience to other road or path users, it is important to have a coherent plan to park shared e-scooters and e-bikes. Priority parking locations offer three key advantages. They:

- offer well defined locations for people to end their trip.
- help to increase the reliability of where people should go when looking to start a ride.
- limit instances of poorly parked devices and therefore reduce safety concerns and some of the nuisance of having micromobility devices blocking footpaths etc.

As with motor vehicles, the majority of the time, shared micromobility devices are stationary. It is therefore important for Council to effectively manage the parking of shared micromobility devices. There are two main approaches to the parking:

- *Unmanaged parking*. Users are free to end a trip at any point. The device must be parked in a manner that does not pose a safety or access risk to others. It must not be located on a roadway, or block a footpath.
- *Managed parking*. Users must end their trip by parking the device in a designated parking area. These areas will be marked out on the footpath, or marked out on the roadway (e.g., in a bay formally used to park cars).

For most areas of Yarra, unmanaged parking is sufficient. However, in areas where micromobility and public space is in high demand, parking may need to be more formally managed.

7.5 Recommended approach to supporting micromobility

The most effective approach for Yarra City Council to maximise the contribution of micromobility, the following actions are recommended:

- Continue to build a high quality bicycle infrastructure network and slow speed streets.
- Maximise the contribution of *modal filters* to offer long stretches of low speed, low traffic volume routes.
- Work with other councils and the micromobility sector to grow the scale of shared micromobility programs.
- Investigate the establishment of a voluntary program of partnering with cafes, and other Yarra businesses, as well as Council managed facilities such as libraries, to allow the charging of e-bike/scooter batteries. This could involve a sticker on the shop window, letting people know they can charge their device. The owner would need to remain near their battery and be responsible for supplying their own charger. The charging would occur via a standard 10A power outlet.

  To designate a business as 'micromobility friendly', a sticker or sign could be used as well as a page on Council's website that shows participating venues.

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