LITHGOW'S ELECTRIC CAR PARKS

An EV charging strategy for the Lithgow LGA and Main Street precinct

UTS Institute for Sustainable Futures

Prepared for the Lithgow Community Power Project and Lithgow City Council by UTS Institute for Sustainable Futures

September 2022

Lithgow Community Power Project

Lithgow City Council

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A foreword from Lithgow City Council Mayor

Maree Statham
Mayor, Lithgow City Council

Lithgow is switched on to electric vehicles (EVs). With each year that passes, more of us will make the choice to drive EVs. Maybe to avoid high petrol prices, or to take advantage of lower maintenance costs. Maybe to enjoy the superior drive quality or because EVs have zero emissions. Regardless of the reasons, your Council needs to act as the pace of EV adoption increases.

At the moment the numbers are only a trickle, but by 2026 – when new EVs are anticipated to cost the same as petrol driven vehicle equivalents – the numbers will begin to climb more rapidly. Lithgow City Council is preparing for this future.

We asked: How will Lithgow people charge their vehicles when they are away from home? How can visitors to Lithgow recharge while going to local shops, businesses and events?

The Council secured funding from the NSW Government, and commissioned a local expert body, Lithgow Community Power Project Inc, to do the research.

This EV Charging Strategy is the result, and I am very pleased to present it to the community.

As a first step, there is a detailed plan for 16 Level 2 charge points near Main Street in Lithgow with plans for more across Lithgow City and other parts of the LGA once we receive feedback from the community.

We are planning for public charge points to be available to residents and visitors across 20 of our town centres and villages. Both the NSW and Australian Governments provide support for local government initiatives of this kind.

I agreed with business owners that it is important to ensure high-turnover parking remains available in Main Street. Our advisers, Lithgow Community Power Project, identified the peripheral car parking bays as better options. We'll begin with enough charge points to meet projected demand and increase the number as needs grow.

By working with our community, the approach identified in this strategy will meet everyone's needs. In this way, Lithgow will be well equipped to approach the future with confidence, and I thank the Lithgow Community Power Project for having provided such thoughtful and constructive technical support to the Council in order for us to achieve this.

THE REPORT

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About the authors

The Institute for Sustainable Futures (ISF) is an interdisciplinary research and consulting institute that has been setting global benchmarks since 1997 by helping governments, organisations, businesses and communities achieve change towards sustainable futures.

For further information visit: www.isf.uts.edu.au

Disclaimer

The authors have used all due care and skill to ensure the material is accurate as at the date of this report. ISF and the authors do not accept any responsibility for any loss that may arise by anyone relying upon its contents.

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Abbreviations

ARENA Australian Renewable Energy Agency (Australian Government)

BEV Battery Electric Vehicle

CBD Central Business District

EU European Union

EV Electric Vehicle

EVE Electric Vehicle Evaluation (model)

GPO General Purpose Outlet

ICE Internal Combustion Engine

LCC Lithgow City Council

LCPP Lithgow Community Power Project

LGA Local Government Area

LOS Level of Service

MSP Main Street Precinct

NSW New South Wales

PHEV Plug-in Hybrid Electric Vehicle

RAP Revitalisation Action Plan

TBI to be investigated

TfNSW Transport for NSW (NSW Government)

UTS University of Technology Sydney

UNSW University of New South Wales

V2G Vehicle to grid

ELECTRIC CAR PARKS

Help shape the future

70%

of petrol and diesel consumed in Australia is imported

Lithgow Community Power Project

- Greg Mortimer OAM
- David Peters
- Jeremy Dawkins
- Dr Michelle Zeibots

Our community owes an enormous debt to the men, women and families of Lithgow who have worked in the coal and power industries, bringing wealth and security to so many, including regions far beyond our own.

Historically, alongside coal and power, Lithgow pioneered extraordinary new enterprises – a state-of-the-art shale oil refinery, the first powered shearing shed, a modern woollen mill, iron and steel production, small arms manufacturing and others – and many innovative activities and financial institutions as well as valuable agricultural production.

The Lithgow Community Power Project is a community-based association, championing ideas and technologies that encourage new industries and jobs in the Lithgow region for the benefit of our community.

Our region's tradition of innovative industry, agriculture and social institutions will serve Lithgow well, as the Australian economy transitions to greater local production, advanced technology and renewable energy.

In the next few years, transition in the transport sector will be highly evident, with the advent of electric vehicles and farm machinery, solar trains and hydrogen powered trucks and locomotives for hauling freight.

Australia currently imports over 70 per cent of its petrol and diesel, with imports often costing close to 4 per cent of GDP and bowser prices regularly climbing above $2 per litre. This is hurting households right across the country, making the shift to EVs an urgent priority. Powered by low-cost, domestically produced renewable energy, EV uptake provides an opportunity to eliminate household petrol bills and cut emissions. But to support this shift, public charging infrastructure needs to be provided – a priority of the Lithgow Community Power Project.

Working closely with Lithgow City Council and the Institute for Sustainable Futures at UTS, the Lithgow Community Power Project wants to position Lithgow to take full advantage of state and federal policies and grants that support EVs.

This strategy is the result, and we thank Lithgow City Council, the Institute for Sustainable Futures and the NSW Government's *Resources for Regions* Program for their foresight in backing this initiative.

Lithgow City Council will be asking for comments and ideas relating to the strategy, and we encourage everyone to read the report and provide feedback.

Lithgow Community Power Project would also welcome feedback on initiatives including regular public forums on the future of our region, information and training in new energy technologies, and ways for Lithgow's major energy suppliers to keep the public well informed, to ensure a just transition to our new energy future.

INTRODUCTION

Why write a strategy for charging electric vehicles?

The uptake of electric cars across the world will have a major impact on local transport networks and infrastructure – necessitating access to 'destination' charge points.

Lithgow needs a plan to enable any resident, business or visitor to charge their electric vehicle at a charge point in a public place. Unlike charge points in homes, businesses and private spaces, 'destination charging' can be used by anyone where users pay for the service, like paying at a parking meter.

Destination charging requires chargers that are faster than those typically used in homes. They may be low-cost medium-speed chargers called Level 2 chargers, or high-cost high-speed chargers called Level 3 chargers. These are both described on page 26.

Who produced and funded the strategy?

Recognising the economic benefits of innovation, the NSW Government provided funding to enable local governments to respond to the uptake of EVs. Lithgow City Council in collaboration with the Lithgow Community Power Project successfully bid for funds to prepare a strategy and business case for the installation of EV charging infrastructure at key points within the Lithgow LGA.

Lithgow Community Power Project worked with the Institute for Sustainable Futures at the University of Technology Sydney (UTS) to estimate future demand for publicly available charge points and the best ways to meet this demand.

A team of academics at the UTS Business School lead by Prof. John Rose, developed a model to provide cautious estimates of EV ownership rates for residents living in the Lithgow LGA up to 2040. The model is called the Electric Vehicle Evaluation (EVE) model. Outputs from the model are shown on page 29. Standards adopted by the European Union were then used to recommend the number of publicly available destination charge points that Lithgow should install to provide basic service levels needed by the community.

Is the strategy really needed?

There is plenty of evidence to suggest that EVs will ultimately replace internal combustion engine (ICE) vehicles. It is widely predicted that, by 2026, EVs will cost the same as ICE vehicle equivalents. The proportion of EVs on the road will rise rapidly after 2026.

What is the strategy?

Council's investments in infrastructure should be based on agreed principles, clear strategies and carefully considered policies and investments.

Five principles and seven strategies relating to EVs were presented which are drawn from workshops and discussions. These are shown on pages 15-16. Actions needed to implement the seven strategies are listed on pages 17-19.

On pages 30-31, the first steps to implement the strategy are recommended as follows:

- The early installation of 16 Level 2 medium-speed charge points in peripheral car parks near Main street, supplemented by a further 19 medium-speed charge points by 2026.
- By 2026, the installation of two more high-speed charge points, to supplement the existing two NRMA high-speed charge points at Lithgow Workies.
- Regular monitoring and evaluation of user responses to charge points until 2026, in accordance with detailed recommendations.
- Installation of 23 medium-speed and two high-speed charge points in key towns and villages across the Lithgow LGA, following planning and community engagement prior to 2026.

The transition

At a surprisingly fast pace, transport is going electric, becoming quieter, safer and ultimately cheaper. Vehicles will require less maintenance, use infrastructure more efficiently and have zero emissions. This applies not just to cars, but is already emerging in trucks, buses and farm machinery.

The challenge

Electric vehicles (EVs) need infrastructure, the most important being charge points. While up to 90 per cent of EV charging is expected to be done at home, 'destination charging' is essential when on the move.

As demand increases, state and local governments will need to provide efficient public charge points, in sufficient numbers and in the right places.

Understanding the need

Lithgow City Council successfully applied for a *Resources for Regions* grant to engage the Institute for Sustainable Futures (ISF) at the University of Technology Sydney (UTS) to estimate future numbers of EVs, assess the need for public charge points, and develop a strategy to meet those needs.

Meeting the need

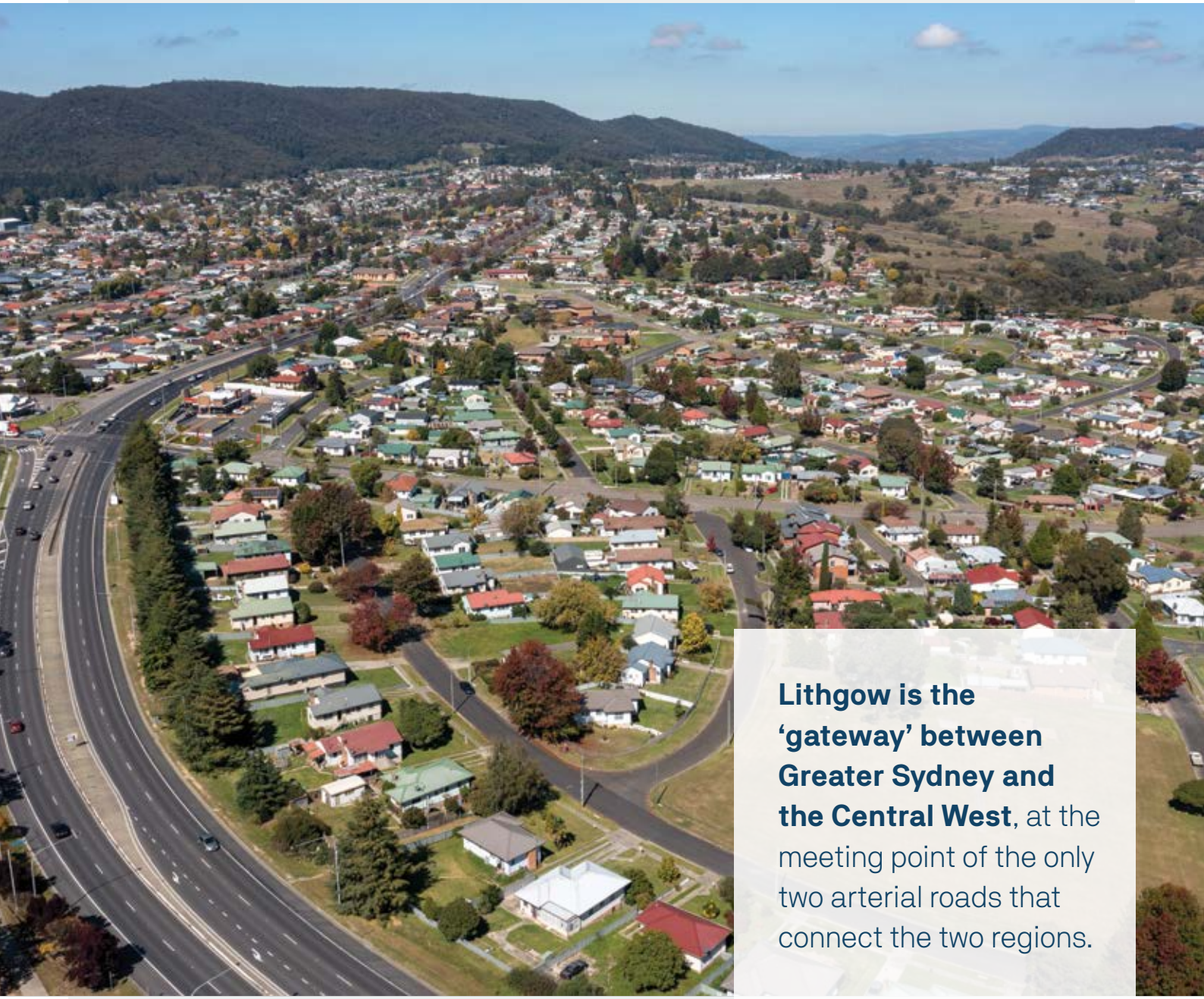
Lithgow City currently has two high-speed (Level 3) charge points installed by the NRMA in the Lithgow Workies car park. This strategy identifies the need for the progressive installation of 35 medium-speed (Level 2) charge points and two additional Level 3 charge points across Lithgow City by 2026, starting with 16 Level 2 charge points across three peripheral car parks along Main Street in 2023 (see pages 30-31).

Across the Lithgow LGA in areas outside of Lithgow City, there are currently no destination charge points. The strategy identifies the need for two Level 3 and 23 Level 2 charge points by 2026. Identification of specific sites will begin in 2023 with installation starting once community feedback has been received.

Comprehensive planning

The strategy identifies where destination charge points should be located, the type of charge points to install, how many to install, and when their installation should take place. The strategy calls for monitoring the performance of charge points once they are in use, to inform future planning. The principles and methods would then be applied to the progressive installation of charge points in twenty of Lithgow's towns and villages (see page 16). A second report provides background on the technology of EV charging (Nagrath et al, 2021a). A third report provides an overview of different business models for the provision of charge points (Nagrath et al, 2021b).

	CURRENT CHARGE POINTS	FUTURE NEED (2026)
Lithgow City	2 **High speed (Level 3)** charge points	4 **High speed (Level 3)** charge points
	0 **Medium speed (Level 2)** charge points	35 **Medium speed (Level 2)** charge points
Lithgow Region	0 **High speed (Level 3)** charge points	2 **High speed (Level 3)** charge points
	0 **Medium speed (Level 2)** charge points	23 **Medium speed (Level 2)** charge points



Lithgow is the 'gateway' between Greater Sydney and the Central West, at the meeting point of the only two arterial roads that connect the two regions.

Vision & purpose

The strategy supports a vision of Lithgow as an innovative industrial city in an historic, productive and beautiful agricultural region. It sees EVs as a complement to motorised public transport (rail and bus services), providing low-emission travel options for long distance trips across Lithgow, the Central West and regions beyond.

The purpose of the strategy is to ensure that EV travel is supported by adequate EV charging infrastructure, enabling drivers to confidently recharge their vehicles when covering the long distances between homes, workplaces, recreational destinations and places of natural beauty throughout the Lithgow LGA.

Lithgow is also the 'gateway' between Greater Sydney and the Central West located two-hours drive from Sydney where the only two arterial roads connecting the two regions meet, and where motorists need to stop for a rest-break if continuing to more distant parts of the Central West and the regions beyond.

A far-sighted strategic plan for EV charging is an essential component of this vision, ensuring local businesses and residents have access to the charging services they need to support their daily routines and business activities. The plan will enable long distance travel by EVs, and ensure drivers and passengers feel confident that they will be able to charge their vehicles easily, quickly and without feeling anxiety.

The strategy is based on five principles and seven implementation strategies (see pages 15-19 for more detail).

5 Principles

1. Access to all

Convenient and easy access irrespective of differences in mobility.

2. Equity

Access to destination charging across the LGA, ensuring nobody is left behind.

3. Sustainability

Economic, social and environmental outcomes without compromising future generations.

4. Economic opportunities

Leveraging EV charging to attract customers to local businesses.

5. Participation in decision-making

Community input on charge point types and locations.

7 Strategies

1. Leadership

Where Lithgow City Council leads by example and adopts best practices.

Actions

2. Planning

An evidence-based approach to planning for EV charging.

Actions

3. Infrastructure

Adequate charging infrastructure for all across the entire Lithgow LGA.

Actions

4. Partnerships

Collaboration with electricity and EV charging service providers.

Actions

5. Community

Collaboration with local communities in decision-making to ensure actions are appropriate and timely.

Actions

6. Incentives

Appropriate incentives to promote EV adoption and benefits.

Actions

7. Smart Technology

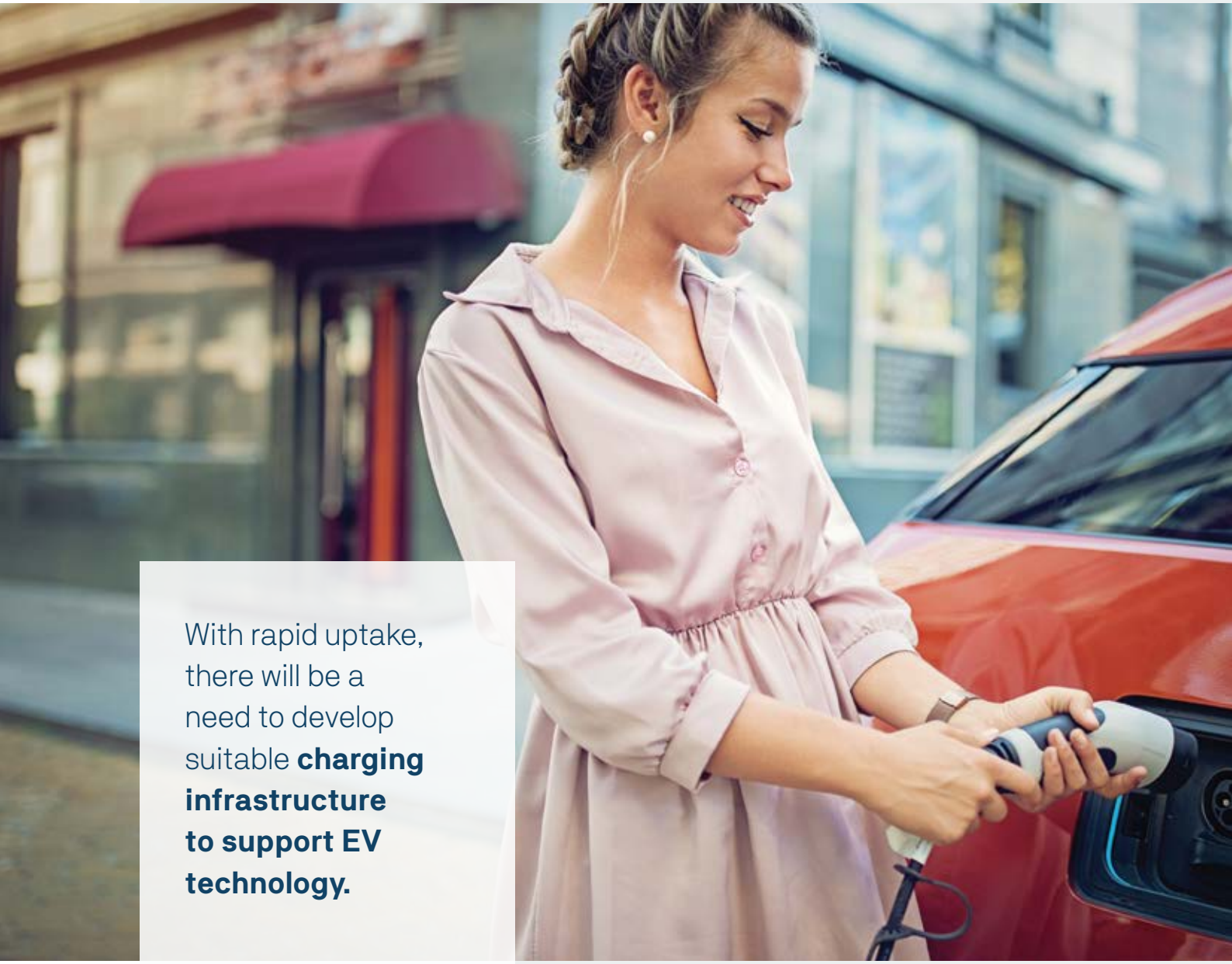
Maximise access and sustainability benefits for everyone in the community.

Actions

Projects in Implementation Plan

PART 1

Lithgow electric vehicle charging strategy



With rapid uptake, there will be a need to develop suitable **charging infrastructure to support EV technology.**

The need for EV destination charging infrastructure

The transport sector is on the precipice of a period of profound change with the growing demand and availability of EVs.

As more governments around the world place restrictions on emissions from vehicles powered by internal combustion engines (ICE), more car manufacturers are shifting their production to EVs. Many have set dates for when they will cease to manufacture ICE vehicles, which is driving change, creating more choice and reducing prices for new EV owners.

While Australia does not have a substantial domestic car manufacturing sector, international trends have significant implications for new car purchases in the Australian market. By 2026 many EVs are anticipated to sell for the same purchase price as their ICE vehicle equivalents, making EV purchase and use the norm rather than the exception.

International experience has shown that the majority of EV charging currently takes place at home. For those travelling long distances or motorists who must charge when away from home, charging will often need to take place at destination charge points. This includes charge points at work, shopping, recreational and visitor/tourist locations sited in public car parking bays at these destinations.

While most households in Lithgow have access to their own garage and power supply, some do not and will be reliant on publicly available charge points. Some residential dwellings in Lithgow are accessed by laneways and have limited or no off-street car parking, with 2-3 car households needing to use on-street parking. For this segment of the community, the availability of destination charging could be critical in determining the viability of EV ownership.

Destination charging facilities are also critical for people making long distance trips, visitors, guests, and tourists. Appropriate siting of the infrastructure will create economic and social opportunities for local businesses given the potential redistribution of pedestrian traffic as more motorists make choices based on the availability of charging services.

This strategy aims to ensure the Council is able to meet these needs of the Lithgow community and visitors to the region.

Scope

This EV Charging Strategy for the Lithgow LGA and Implementation Plan for the Lithgow Main Street precinct provides a framework for a consistent, community-driven approach to the deployment of EV destination charging infrastructure by Council and third-party service providers.

It sets out a long-term vision (10 years) with a short-term (3 years) Implementation Plan for how publicly accessible EV charging infrastructure will be deployed within the Lithgow LGA. The resulting services are intended to benefit residents, visitors, and businesses with an initial focus on the Lithgow Main Street precinct.

The strategy has been prepared to ensure strategic alignment with other relevant policies, funding opportunities and plans at local, state and national levels.

Role of the Council

Local government has an important role to play in developing EV charging infrastructure because it is largely responsible for the management and implementation of parking policies, as well as the delivery and maintenance of many local car parking services.

The nature of EV technology means that parking bays – both at home, at work and in the public domain – are where most EVs will be charged, given the longer time periods needed to charge an EV in comparison with the time needed to refuel an ICE vehicle at a petrol station.

A key goal of Lithgow City Council is to ensure there is adequate charging infrastructure to support EV users wanting to make the best use of their time.

Lithgow City Council sees itself as playing a key role in determining the type and location of EV charging infrastructure at public car parking facilities across the LGA.

Local governments around Australia are demonstrating leadership by also transitioning their own vehicle fleets to electric, from passenger vehicles to refuse collection vehicles. This is helping to normalise and promote the benefit of electrification in the transport sector to communities. Ex-council fleet vehicles will also be an important source of more affordable EVs via the second-hand car market.

In the future two-way or bidirectional charging, which enables EVs to discharge and support the grid as well as to charge, will emerge as an important new feature of Australia's transport and energy infrastructure. This means the owner can potentially power their home or sell power to the grid when demand is high and the EV has energy to spare, helping to balance the energy supply from intermittent sources such as solar and wind. Through fleet electrification and workplace charging, local governments will in the future be able to use bidirectional charging to minimise costs and generate new revenue streams, while helping increase the availability of renewable energy and supporting local energy systems.

Policy alignment

NSW has taken a leading role in developing a vision for the future of transport, and EVs are a key part of that future. The NSW Government is investing almost half a billion dollars in tax cuts and incentives to support the uptake of EVs by removing stamp duty and providing a $3,000 rebate for all new EV purchases. At the Federal level of government, ARENA's Future Fuels Fund also aims to increase EV uptake through making an additional $16.5 million available to fund public fast charging infrastructure for EVs in capital cities and regional centres.

Lithgow City Council has a suite of plans and strategies that guide economic development and community engagement in the LGA. These plans embody many of the principles used to drive actions described in this strategy. This strategy provides the first explicit references to EVs and makes the case for investment in publicly available EV charge points. This considers the future transport needs of the community, as well as promoting economic development and enhancing tourism by enabling Lithgow City Council to build a reputation as a Council that supports residents, local businesses and visitors who own and operate EVs.

This EV charging strategy is well aligned with the funding opportunities, priorities and principles identified through these plans and will ensure investments in providing a public EV charging network align with regional and national investments.

65%

Increase in demand for EVs in Australia in 2022

Principles for Lithgow's EV charging network

During a series of collaborative workshops with the Council, the following principles were identified as important to Lithgow. These will be embodied in the deployment of EV destination charging infrastructure.

Access

All people (local community and tourists) have **fair access to affordable, convenient charging services** to meet their needs and improve their quality of life. The charging infrastructure is safe and accessible to all and reduces barriers to community movement and participation.

Equity

There is fairness in decision making, that includes allocation of resources, selection of providers that support relevant EVs and charging types.

Sustainability

There is a shift towards **sustainable modes of transport** in line with NSW's Future Transport Strategy, where electrification of vehicles, smart grid management and **use of renewable energy** are prioritised.

Economic opportunities

There are enhanced economic opportunities provided by EV charging, such as increased visitation to tourist locations and shopping districts, and increased connection of people to local jobs and services.

Participation

Community engagement and participation in identifying options are key approaches to seeking support on future EV charging site locations and charging infrastructure.

Strategies

The strategies articulate how to encourage and support the Lithgow community and businesses towards the transition to EVs and more sustainable transport.

These strategies are supported by actions to be implemented over the next ten years with 2026 marking an important milestone – the point at which purchase price parity between EVs and ICE vehicles is anticipated to be reached.

1. Leadership

Leading by example: Lithgow City Council will lead the way for a broader transition by moving its fleet to electric and positioning itself as an ambassador to reduce carbon emissions and protect the environment. This complements our ambition on providing environmental and sustainability leadership for the community.

2. Planning

Adopting an evidence-based approach to planning: Lithgow City Council will adopt an evidence-based approach for planning and future decision-making on EV charging, with a focus on infrastructure that supports smart transport options for all parts of the community.

3. Infrastructure

Deploying charging infrastructure in the Lithgow Main Street precinct: Lithgow City Council will deploy appropriate charging infrastructure at their key sites in the Main Street precinct and facilitate deployment of critical public charging infrastructure at other locations to ensure a core network of charge points accessible to the public. We will work with partners and provide consistent guidelines, tools and resources to support businesses, residents and developers installing their own EV charging infrastructure.

4. Partnerships

Fostering cross sectoral partnerships for building the charging network in Lithgow: Lithgow City Council will develop regional and cross sector partnerships to support our region's transition to EVs. This will enable us to coordinate the efforts of multiple parties to achieve a fit-for purpose, regional EV charging network and leverage collaborative opportunities.

5. Community

Engaging with local community and businesses to encourage uptake: Lithgow City Council will engage and inspire residents, businesses, and other local governments to take action and join the transition into the future of zero emission transport. It will ensure that everyone has a chance to participate and that all opinions are considered when making decisions.

6. Incentives

Incentivising EV drivers and local businesses: Lithgow City Council will investigate incentives to encourage uptake of EVs among the Lithgow community and businesses. We will seek to attract economic opportunities for local businesses by encouraging tourists to stop, dine and discover.

7. Smart Technology

Future proofing/Smart Charging: Lithgow City Council will ensure that EVs are charged using renewable energy, while also actively exploring the best ways to improve EV charging management. We will facilitate appropriate data sharing to improve charging outcomes.

Actions

Several actions were identified that embody the strategies listed opposite.

The following tables identify who has responsibility for the action, within what timeframe the action should be carried out and where resourcing might come from where infrastructure installation is required.

Strategy 1: Leading by example

Action	Primary Responsibly	Timing	Resourcing
Develop an EV charging strategy for the broader LGA, encompassing all 20 town and village centres	LCC Infrastructure Services	2022-2026	Federal and NSW Govt. grants with support from UTS
Develop a plan for 100% electrification of the Council's fleet by 2030, where appropriate electric models are available	LCC Infrastructure Services	2022-2023	LCC
Develop Council car parks to showcase best practice (e.g. signage, lighting, safety, access, etc.)	LCC Infrastructure Services	2022-2024	NSW Govt. grants with support from UTS
Share the Council's experience and benefits of using EVs; promote local ambassadors for the transition	LCC Infrastructure Services and LCPP	Ongoing	LCC

Strategy 2: Adopting an evidence-based approach to planning

Action	Primary Responsibly	Timing	Resourcing
Collect and use EV charging data to inform the Council decisions and monitor progress	LCC Infrastructure Services	Ongoing	Service Providers with support from UTS
Review opportunities to support EV charge points in the Council's development control plan and guidelines	LCC Infrastructure Services	2023	LCC with support from UTS
Develop information and advice on the approval pathways and planning matters for the provision of charge points	LCC Infrastructure Services	2023	LCC
Develop and adopt best practice on safety and access of charge points	LCC Infrastructure Services	2023	LCC with support from UTS
Explore different business models and payment mechanisms for public charging in Lithgow	LCC Infrastructure Services	Ongoing	LCC with support from UTS

Actions (continued)

Strategy 3: Deploying charging infrastructure in the Lithgow Main Street precinct

Action	Primary Responsibly	Timing	Resourcing
Deploy appropriately rated charge points at strategic locations identified	LCC Infrastructure Services	2023-2024	Federal and NSW Govt. grants
Incorporate universal design principles into design/technical specifications for infrastructure	LCC Infrastructure Services	2023-2024	TBI
Define clear signage and approach to parking enforcement	LCC Infrastructure Services and TfNSW	Ongoing	LCC and TfNSW
Ensure charge points are easy to locate on other Council facilities websites (tourism, aquatic centre) and EV charging location apps, with all relevant information available (good signage, number and availability of charge points, proximity to public toilets)	LCC Infrastructure Services and TfNSW	Ongoing	LCC and TfNSW
Explore different business models and payment mechanisms for public charging in Lithgow	LCC Infrastructure Services	Ongoing	LCC with support from UTS

Strategy 4: Fostering cross sectoral partnerships for building the charging network

Action	Primary Responsibly	Timing	Resourcing
Establish partnerships with ROCs, key infrastructure providers, transport operators, EV retailers and member-based organisations for joint procurement, efficient charge point placement, marketing, policy development opportunities	LCC Infrastructure Services	Ongoing	LCC
Work with tourism, retail and hospitality operators to install appropriate charging infrastructure	LCC Infrastructure Services	Ongoing	NSW Govt. grants with business contributions
Investigate opportunities with Council suppliers (e.g. Meals on Wheels, Health Services, etc.), taxi and tour operators to co-locate EV car charging at core sites	LCC Infrastructure Services	Ongoing	TBI
Encourage large local employers to offer workplace charging opportunities to their employees.	LCC Infrastructure Services and LCPP	Ongoing	NSW Govt. grants with business contributions
Seek funding and partnerships for deployments at other identified locations	LCC Infrastructure Services and LCPP	Ongoing	Federal and NSW Govt. grants

Strategy 5: Engaging with local community and businesses to encourage uptake

Action	Primary Responsibly	Timing	Resourcing
Engage with stakeholders on how the location of EV charging infrastructure could support an expansion of travel choices	LCC Infrastructure Services	2022-2023	LCC with support from UTS CCE/FEIT
Encourage and support the community to achieve a shift towards sustainable transport modes e.g. EV community engagement program, displays and educational materials	LCC Infrastructure Services and LCPP	2022-2023	NSW Govt. grants
Explore opportunities for electric vehicle charging facilities, including electric bikes and scooters	LCC Infrastructure Services	Ongoing	LCC and NSW Govt. grants

Strategy 6: Incentivising EV drivers and local businesses

Action	Primary Responsibly	Timing	Resourcing
Explore parking and driving privileges for EV drivers	LCC Infrastructure Services	Ongoing	LCC and TfNSW
Explore opportunities to encourage EV tourism and boosting patronage of local businesses e.g. heritage walks (with EV parking), local pub/café crawls, theatre patrons, vouchers for local businesses, etc.	LCC Infrastructure Services	Ongoing	TBI

Strategy 7: Future proofing/Smart Charging

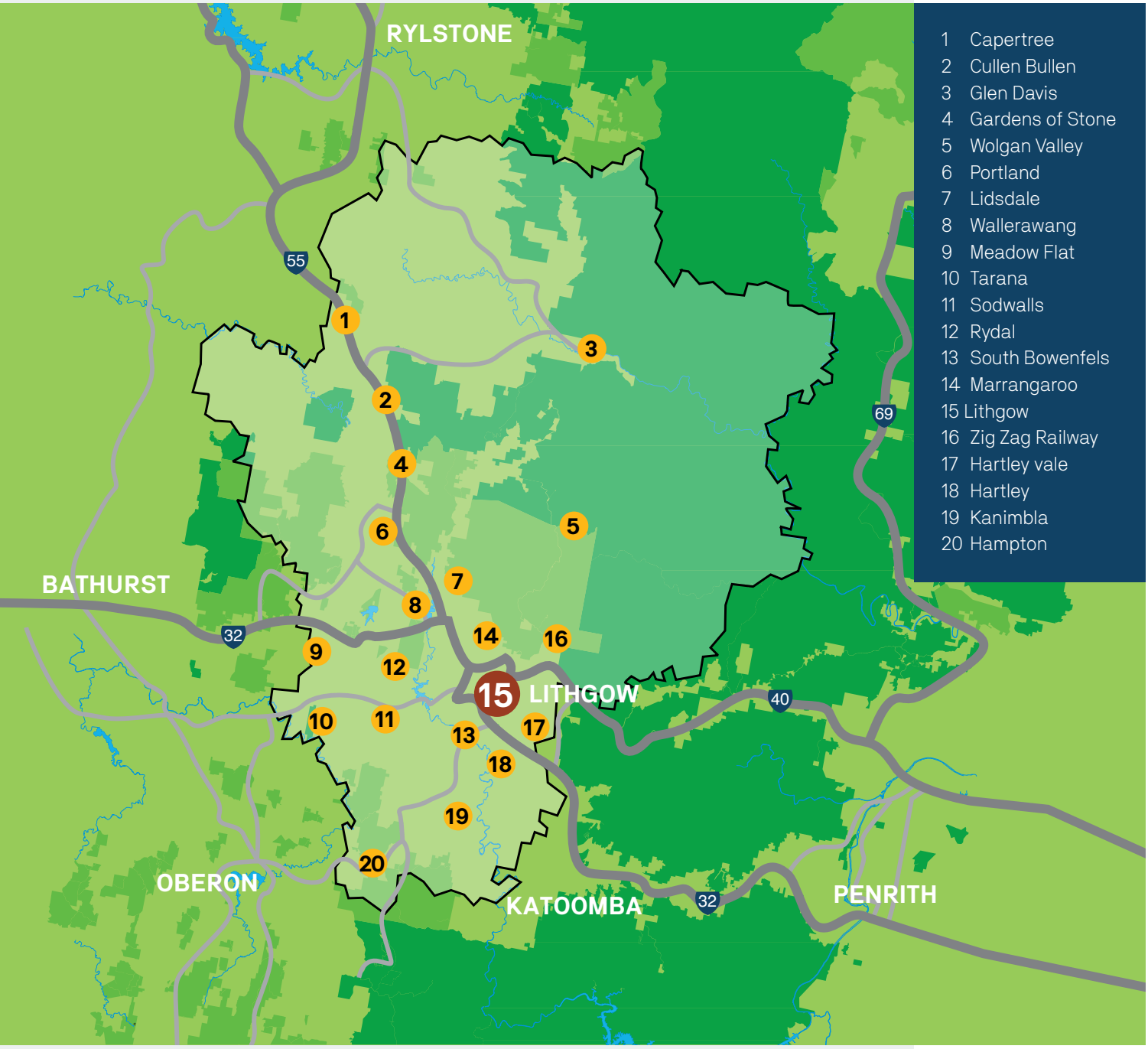
Action	Primary Responsibly	Timing	Resourcing
Investigate smart energy management methodologies	LCC Infrastructure Services	Ongoing	TBI
Engage with local distribution network/electricity providers to explore locations to pilot smart and sustainable public EV charging such as solar panels to power charge points, fleet V2G trials	LCC Infrastructure Services	Ongoing	TBI

2026 Purchase price parity between EVs and ICE vehicles is anticipated

PART 2

Implementation plan for charge points across the Lithgow LGA

Figure 1: Locations across the Lithgow LGA selected for future EV destination charging



This section of the Strategy provides more detail about the publicly available destination charge points that Council should look to deploy at various locations across the Lithgow LGA.

The map opposite shows the locations of the town centres and villages that have been identified as locations where local residents and visitors to the Lithgow LGA would need and benefit from having access to destination charging infrastructure.

In selecting these sites, a primary aim has been to ensure all major arterial roads through the LGA – Great Western and Castlereagh Highways in particular – will have access to charge points at regular intervals.

Access at locations some distance away from arterial roads has also been considered. Local residents and businesses located in off-grid homes and business sites may from time-to-time be unable to carry out at-home charging. In which case they will need to access public destination charge points. Similarly, visitors to more remote areas within the LGA may be disadvantaged if they are unable to access destination charging (for instance, Glen Davis, Wolgan Valley, Kanimbla and Hampton).

An implementation strategy for each of these centres and villages will be developed by 2026 with reference to the following points of consideration:

- **Where destination charge points should be located within the town or village.** In larger centres such as Lithgow, multiple charge points will be needed. In small villages, it may be that only a single charge point is needed to ensure adequate services for local residents and visitors.
- **What type of destination charge points, or mix of charge points, are needed.** These would include consideration for Level 2 (medium speed) or Level 3 (fast and ultra-fast) charge points.
- **How many charge points will need to be deployed.** This may take place in stages as demand increases with the uptake of EV technology by the community. These numbers have been estimated using the Electric Vehicle Evaluation (EVE) model created at UTS.
- **When these charge points should be installed.** A relatively small number of charge points may be installed to begin, with a larger number proposed after 2026 once EV purchase prices reach parity with those for ICE vehicle equivalents. After this time, manufacturers will begin to phase out production of ICE vehicles and uptake rates will become much higher.

60%

of the LGA's total population live in Lithgow City

Transport for NSW has identified a total of nine regional areas across NSW for which Regional Transport Plans have been developed. Lithgow is located within Region 6 (Central West and Orana). An implementation strategy has been developed for the Lithgow Main Street precinct that is commensurate with Lithgow's regional role as the 'Gateway between Greater Sydney and Region 6' (TfNSW, 2021). Around 60 per cent of the population resides in Lithgow City, making it the area where the highest concentration of EVs is most likely to be located.

The implementation strategy for the Lithgow Main Street precinct demonstrates how the principles for EV charging infrastructure discussed in Part 1 can be made actionable by identifying the four key points of consideration listed.

Implementation Plan for the Lithgow Main Street precinct (MSP)

Lithgow City has the highest concentration of shops, businesses and light industry within the LGA. It is the first large town centre that people encounter when travelling from Greater Sydney to the Central West after passing through the Blue Mountains.

Lithgow is located at the point where the only two arterial roads connecting Sydney to the Central West meet (Great Western Highway and Bells Line of Road) and at the critical two-hour drive period from Sydney where motorists should stop for a rest-break before continuing safely to more distant parts of the region.

With an estimated population of almost 21,420 for the Lithgow LGA in 2020, 12,840 (60%) live in Lithgow City and 8,580 (40%) live within the towns, villages and regions located in the remainder of the Lithgow LGA. The Lithgow Main Street precinct sits at the heart of Lithgow, hosting a wide variety of activities used by local residents, service employees and visitors to the area.

The boundaries of the Lithgow Main Street precinct chosen for this strategy are shown below in **Figure 2**.

Main Street in Lithgow is in the centre of a pedestrian friendly precinct that hosts the Lithgow Train Station, the majority of the city's pubs, cafés and nightlife venues, civic and public service functions as well as many of Lithgow's cultural and heritage listed buildings. It's concentration of 'ribbon strip' building facades provides high quality pedestrian amenity and access to shopfronts and services.

The Lithgow Main Street precinct plays a critical role in defining the identity and character of Lithgow.

Main Street is currently the subject of a revitalisation program, affording an opportunity to consider appropriate destination charging infrastructure at the same time to potentially reduce long-term costs.

Figure 2 Lithgow Main Street precinct

A series of parallel collector roads (Railway Parade and Mort Street) skirt the precinct and carry the bulk of through traffic, protecting the amenity of Main Street. The precinct contains nine areas of peripheral car parking that provide free public parking for unlimited time periods. These parking areas are currently underutilised and are accessed by car mainly from either Railway Parade or Mort Street. Access from these parking areas to Main Street is provided via laneways (highlighted by arrows in the Figure below), many of which have been the subject of revitalisation and beautification programs. A diagram showing this structure of the Lithgow MSP is shown below in **Figure 3**.

Kerbside parking is also available along Main Street with stay periods ranging from fifteen minutes to one hour. These parking bays have a high turnover and are used by people accessing shops and services on Main Street for relatively short stay periods.

While foot traffic is currently low as businesses recover from the recent pandemic, discussions with the NSW Government are taking place that would see InterCity Train Services that currently terminate at Mt Victoria extended to Lithgow.

This has the potential to increase pedestrian activity within the Lithgow MSP while also increasing the number of people needing to park their cars at Lithgow to interchange with train services heading into Greater Sydney. Commuters parking to access the rail interchange usually make use of the peripheral car parking areas located to the north of Main Street.

In addition to providing adequate services for the Lithgow community, a second objective of the strategy is to support revitalisation of the town centre by strategic placement of facilities that will attract more local and visiting travellers to the precinct, creating greater foot traffic that will support local businesses located on Main Street.

The following four sections outline the reasons for the recommended types and locations of charge points in the Lithgow precinct. This is followed by a summary of the demographic analysis and modelling that led to the recommended number of charge points and the timeframe for their installation.

Figure 3: Lithgow Main Street precinct parking facilities and access

Adapted from: SGS Economics & Planning. 2010, *Business and retail strategy: final report*. Lithgow City Council. p. 41.

Where should charge points be located within the Lithgow MSP?

EV destination charge points need to be located in areas where motorists – local residents and visitors – can park their vehicles as part of their daily routine or special trip to Lithgow and destinations in the Central West.

Given the structure of the Lithgow Main Street precinct, the best locations for EV charge points are in currently underutilised peripheral car parking areas that have good pedestrian access to Main Street via laneways. Charge points in these locations will not disrupt the use of high turn-over car parking on Main Street, while still enabling easy access to Main Street shops in addition to other activities within the precinct. These positions are shown in **Figure 4**.

At these locations, four principles described in Part 1 – Access to all, Equity, Sustainability and Economic Opportunities – can be achieved.

Some buildings are vacant with significant sections of underactive streetscape on the northern side of the precinct. Installation of destination charge points within these areas reduces the risk of conflict with the parking needs of motorists driving ICE vehicles.

Peripheral parking areas located along the Main Street precinct also lend themselves to providing charge points that would support adjoining land-uses at Lithgow Council Chambers and other government administration buildings, Lithgow Public School, Lithgow Uniting Church and the public transport interchange at Lithgow Rail Station.

Feedback from Main Street business owners

During the development of this strategy, important feedback was received from business owners located in Main Street. The feedback expressed concerns at the prospect of locating EV charge points in the Main Street at kerbside parking bays that would potentially impact negatively on business turnover. This feedback changed the criteria used to identify the best locations for EV charge points, highlighting the importance of our fourth principle – participation in decision-making.

Figure 4: Locations suitable for destination charge points within the Lithgow Main Street precinct

Adapted from: SGS Economics & Planning. 2010, *Business and retail strategy: final report*. Lithgow City Council. p. 41.

Achieving our principles:

Access

Equity

Sustainability

Economic opportunities

Participation

The best locations for EV charge points are in underutilised peripheral car parking areas that have good pedestrian access to Main Street

What type of chargers should be used?

In a companion report to this strategy – Lithgow's Electric Car Parks: summary report (Nagrath et 2021a) – a description is provided of the three different types of EV charger technology, which can be briefly summarised:

- **Level 1 chargers use simple GPOs that accept Australian 3-pronged plugs and work on alternating electrical current (AC).** These typically charge at 10 or 16A and require an adaptor from the common GPO to the AC inlet plug of the car. A charge-time of around 9 hours would typically be required to add 100km of range to an EV.
- **Level 2 chargers also use AC but are located on a dedicated circuit without competition from other appliances.** They typically charge from 3.3kW if on a single-phase power supply but can charge at up to 22kW (32A), if operating on three-phase. A charge-time of 3 hours for a 7kW charger to under 1 hour for a 22kW charger would add 100km of range to an EV.
- **Level 3 chargers use direct current (DC) and are known as fast or ultra-fast ranging from 50-475kW.** The chargers look similar to a petrol bowser. A 50kW charger can add 100km of range in 25 minutes, a 120kW charger takes 10 minutes, while chargers rated at 350kW or more have charge-times similar to refuelling ICE vehicles at petrol stations.

A selected range of Level 1, 2 and 3 chargers are shown in **Figure 5**. Level 2 chargers that operate at high amperage rates and the full range of Level 3 chargers are potentially suitable for public destination charging. A significant difference between the two is the cost, with Level 2 chargers costing from around $2,000-$3,000 up to $25,000 per unit depending on whether three-phase power is available, while Level 3 chargers cost upwards from $50,000 per unit.

From a strategic perspective, there is a potential trade-off between the availability of charge points and the speed of chargers. Or in other words, if funding is limited, multiple Level 2 charge points can be supplied, which increases availability to multiple EV users needing to charge their vehicles at the same time. Or else a Level 3 charge point can be provided that will reduce charge-times for users, but with reduced availability during periods of high demand, requiring users to queue.

Figure 5 Level 1, 2 and 3 charge points[2]

Figure 6 Example of multiple on-street Level 2 charge points for longer term stay periods[3]

2. Source: Nagrath, K., Dwyer, S. & Zeibots, M.E. 2021. *Lithgow's Electric Car Parks: summary report*. Institute for Sustainable Futures, University of Technology Sydney, pp. 17-18.

With this trade-off in mind, Level 2 charge points, such as those shown in **Figure 6**, are suited to locations where vehicles are parked for moderately long time periods such as workplaces, shopping and recreational locations. These are similar to peripheral car parking in the Lithgow Main Street precinct. In these cases, long distance drivers can top-up their vehicle, stop for a break and fully recharge at their final destination.

Tourists, visitors and motorists passing through and not wishing to stay in Lithgow would benefit most from access to multiple Level 3 charge points.

A facility like this would most likely be provided by a commercial operator located on the Great Western Hwy, providing a service similar to that shown in **Figure 7**. With ultra-rapid 175kW charge points, these charge most cars to 80 per cent of battery capacity within 30 minutes.

When approaching the question of what type of charge points should be located within the Lithgow Main Street precinct, a mix of Level 2 and 3 charge points would appear to be the most appropriate. This would reflect the land-use activities that take place within the precinct and the different types of users, while at the same time serving the needs of visitors to the area, who stop at Lithgow on their journey to other parts of the LGA or destinations within the Central West.

Multiple Level 2 charge points ensure high availability for everyone

Figure 7: EV charging station similar to a petrol station (Fulham, London)

4. Source: https://www.shell.com/energy-and-innovation/mobility/mobility-news/shells-growing-public-ev-charging-network.html
Images: Reproduced with permission from Photographic Services, Shell International Ltd.

How many charge points should be installed within what timeframe?

If a mix of Level 2 and 3 charge points are to be installed within the Main Street precinct, the next point of consideration is how many and within what time frame. This might be easily answered if comparisons with other locations within Australia could be made. However, Australia currently has very low rates of EV adoption making international comparisons necessary.

In many countries throughout the European Union (EU), EV ownership rates are far higher than in Australia. The EU experience has enabled government bodies to learn and make recommendations as to what numbers of charge points are appropriate given EV ownership rates. The standard for EU member countries is a ratio of 1:10 for Level 2 and 1:100 for Level 3 charge points (see Nagrath et al 2021a, p. 25, for a more detailed explanation).

If EU standards are used as a guide, data on current EV ownership levels within Lithgow is needed in addition to estimate projections for future EV ownership levels before calculating the number of charge points needed. A household microsimulation model developed at UTS has been used to estimate EV ownership rates within the Lithgow community (see Nagrath, et al 2021a, pp. 23-25 for a more detailed explanation of the model). Estimates for EV ownership for key milestones within Lithgow City are shown in **Table 1**.

While this part of the implementation strategy focusses on Lithgow City, access to destination charge points in the Lithgow City Centre has implications for the entire LGA as it is the largest centre and currently the primary location for charging. EV estimates for the many towns and villages located in Lithgow Region, outside Lithgow City, are shown opposite in **Table 2**.

As can be seen, around 60 per cent of EVs adopted by households residing in Lithgow are anticipated to be taken up by residents living in Lithgow City, with the remaining 40 per cent by households located in towns and villages in other parts of the LGA.

If the number of Level 2 and 3 charge points located in Lithgow City and across Lithgow Region are to be supplied at levels in line with EU standards, the number required is shown in **Table 3**.

The EV ownership estimates outlined above do not incorporate financial incentives from governments into the calculations, such as removing sales tax or providing rebates. The NSW Government currently offers a $3,000 rebate for all new EV purchases in addition to the removal of sales tax.

Similarly, the aggregate estimates do not take into account impacts on demand resulting from high petrol prices due to restrictions and declines in global supply, suggesting that the number of charge points recommended above is cautious and likely to err on the low side of what actual demand will be.

Given restrictions to the road network and Lithgow's role as gateway to the Central West, the demand from tourist and visitor traffic may also be higher than in many other parts of the region.

Lithgow currently has two Level 3 publicly available charge points located in the Lithgow Workies car park, enabling Lithgow to currently meet EU standards for Level 3 charge points. By 2026 however, an additional one to two Level 3 charge points will be needed.

In relation to Level 2 charge points, there is a significant shortfall with nineteen needed within Lithgow City to meet EU standards by 2022, increasing to thirty-five by 2026. In all towns outside Lithgow City, including Capertee, Portland, Wallerawang and Hampton, thirteen Level 2 charge points and one Level 3 are needed in 2022, increasing to twenty-three and two respectively by 2026.

35 Level 2 and two additional Level 3 charge points required in Lithgow City by 2026 to meet EU standards

Table 1 BEV and PHEV ownership rates for Lithgow City (2022-2040)

EVE model estimates for BEV and PHEV component of total passenger car fleet for Lithgow Statistical Area (SA2) – Lithgow City							
	Petrol and Diesel	BEV	BEV %	PHEV	PHEV %	Lithgow City only	Total vehicles
2022	9,073	18	0.19%	175	1.87%	193	9,331
2026	9,112	183	1.91%	169	1.77%	352	9,550
2030	8,923	512	5.28%	156	1.61%	668	9,700
2040	6,214	3,485	35.14%	108	1.09%	3,593	9,916

Source: Rose, JM. & Pellegrini, A. 2021, *Electric Vehicle Evaluation (EVE) model outputs*. School of Business, University of Technology Sydney.

Table 2 BEV and PHEV ownership rates for Lithgow Region outside Lithgow City (2022-2040)

EVE model estimates for EV (BEV and PHEV) component of total passenger car fleet for Lithgow Region (SA2) – towns and villages outside Lithgow City in Lithgow LGA							
	Petrol and Diesel	BEV	BEV %	PHEV	PHEV %	Lithgow Region	Total vehicles
2022	6,049	12	0.20%	116	1.92%	128	6,177
2026	6,075	121	1.90%	112	1.76%	233	6,367
2030	5,949	341	5.27%	105	1.61%	446	6,467
2040	4,143	2,323	35.14%	72	1.09%	2,395	6,610

Source: Rose, JM. & Pellegrini, A. 2021, *Electric Vehicle Evaluation (EVE) model outputs*. School of Business, University of Technology Sydney.

Table 3 Charge point estimates for Lithgow City and the rest of the Lithgow LGA needed to meet EU standards

Charge point types and numbers needed in Lithgow City and Lithgow Region to meet EU standards							
	Lithgow City			Lithgow Region			Lithgow LGA
	EV total*	L2	L3	EV total*	L2	L3	Total vehicles
2022	193	19	2	128	13	1	15,552
2026	352	35	3-4	233	23	2	15,917
2030	668	66	7	446	45	4	16,167
2040	3,593	359	36	2,395	240	23	16,526

*Estimates for total EVs include both BEV and PHEVs.

Applying principles and charge point numbers to specific car parks

This section describes the specific car parking bays recommended for the installation of Level 2 EV charge points.

These have been selected with reference to the principles on page 15, in particular ensuring access to all, and providing economic opportunities.

Figure 8 below, shows potential locations for the installation of the initial 16 Level 2 charge points that would be distributed across four clusters.

These car parks have high capacities. Installing charge points in these car parks fulfils two aims: to maximise the likelihood of the parking bays being available to drivers of EVs because the drivers of ICE vehicles have many other options, and to ensure that the latter are not disadvantaged if EV parking bays are empty.

Eskbank Street car park (eight Level 2 charge points by 2022)

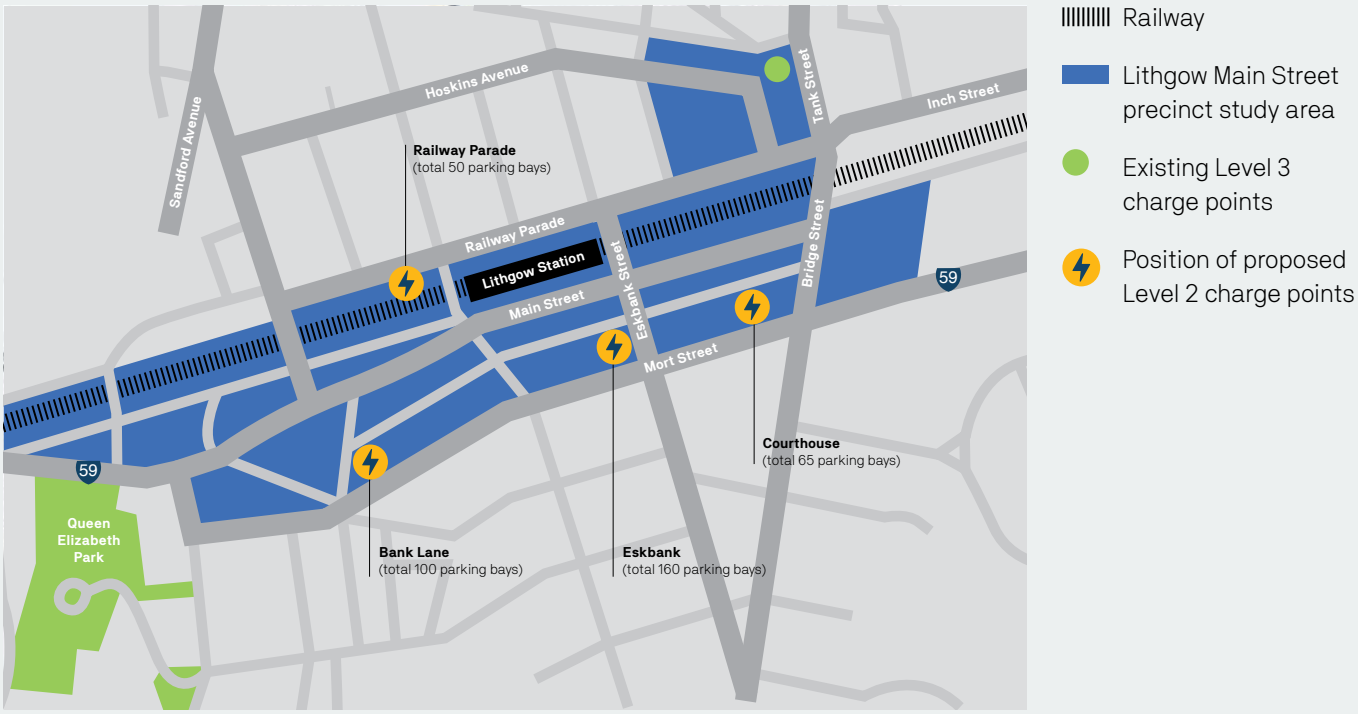
This location is within clear view of Eskbank Street in a position central to the Main Street precinct and public buildings such as Lithgow Council Chambers and Lithgow Public School. It has highly visible access to public toilets and is serviced by high quality footpaths. It is recommended that eight Level 2 charge points be installed to serve parking bays as shown in **Figure 9**.

Access to the main electricity supply is provided along the western side of Eskbank Street, requiring minor excavation to access subterranean power supply to the double row of car parking bays that run parallel to Eskbank Street shown in Figure 9. EV charge points could be located on the nature strip between the back-to-back parking bays, enabling access by cars parked along both sides of the nature strip. An EV charge point located next to the parking bay allocated for people with disabilities could potentially serve both.

Railway Parade (four Level 2 charge points by 2022)

There are two rows of car parking bays that provide commuter parking along the southern side of Railway Pde to the east and west of Lithgow Rail Station. While direct access to the electricity

Figure 8 Locations for potential Level 2 charge points in peripheral car parks



mains supply is located on the northern side of Railway Parade, there is possible access within the rail easement that could also serve EV parking bays as shown in **Figure 10**. Electrification of these bays might be supported by commuter parking schemes that support public transport.

Court House car park (four Level 2 charge points)

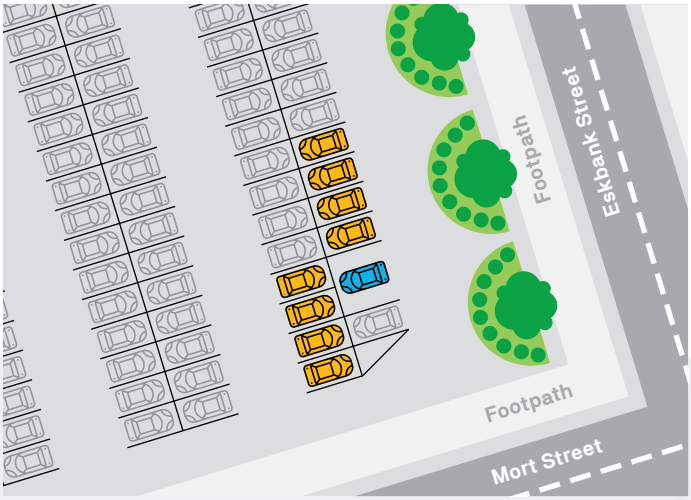
The Court House car park has direct access to the electricity mains supply with a distribution transformer located on the north-western corner of the car park – potentially enabling installation of Level 3 charge points. This car park is not directly visible from surrounding streets, but all areas are well-lit and have high quality surfaces on footpaths enabling easy access for the elderly and people with disabilities.

Bank Lane car park (location for future EV parking bays)

This position is located next to Lithgow Police Station in a well-lit area, providing high levels of safety for EV drivers during the evening. The car park is on a sloping surface however, making it more difficult for people with mobility difficulties to use. A distribution transformer in the car park enables access to the electrical mains supply that could support Level 3 charge points. This public car park is located across a laneway from the car park used by Woolworth's customers. It is recommended that electrification of parking bays in this position be pursued in the future.

The next section describes how ongoing monitoring and evaluation should take place to identify future charge point needs, matching the supply of charge points to demand using an evidence-base.

Figure 9 Parking bays at western end of Eskbank St



Electric Vehicle parking bays Disabled parking bay

Figure 10 Parking bays to west of entry to Lithgow Rail Station from Railway Parade

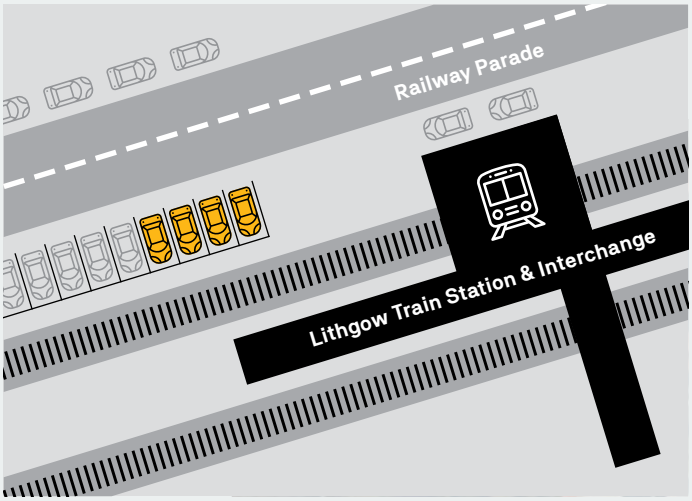


Figure 11 Parking bays at the rear of Lithgow Court House to the eastern end of Lithgow Main Street precinct

MONITORING PROGRESS

As the uptake of EVs increases, monitoring the demand for destination charge point infrastructure will be critical to gauging how effective early implementation has been and what augmentation might be needed to maintain positive user experiences into the future.

To do this, service providers will need to commit to sharing data on charge point usage rates. This will enable regular monitoring and evaluation used to inform decisions regarding additional charge point infrastructure.

Transport professionals throughout the world use Level Of Service (LOS) frameworks to monitor and evaluate the performance of a wide range of transport infrastructures.

Monitoring the effectiveness of the EV charging roll-out can be done using the Level Of Service (LOS) criteria devised for Lithgow, shown in **Table 4**. This use of LOS will monitor charge point availability – measured as the percentage of time EV charge points are in use.

At LOS A, EV users do not need to wait to access a charge point as they are only being used for 20 per cent of the monitoring period. At LOS C and D charge points are in use for 41 to 80 per cent of time, with users potentially waiting to gain access. At these LOS, service providers should assess the data to gauge whether queueing is occurring and if further charge points are needed.

If Levels of Service E and F are regularly reached, further charge points should be added to the network.

Table 4 Level of Service for EV charging with respect to charge point availability

LOS	Time in active use	Customer experience	Service provider response
A	0–20%	Customers do not need to wait to gain access to a charge point	Ensure signage to destination charge points is clear to enable customers to easily find charge points within a precinct
B	21–40%	Customers may need to wait briefly to gain access to a charge point during peak use periods	Ensure systems are in place to advise customers of available charge point locations
C	41–60%	Customers may need assistance to identify available charge points and potentially wait for short time-periods to gain access to a charge point	Ensure systems are in place to advise customers of locations of available charge points. Assess LOS C duration and if additional charge points would stop service slipping into LOS D.
D	61–80%	Customers will need assistance to identify available charge points and most likely need to wait for time-periods that interrupt planned activities to access a charge point	Ensure systems are in place to advise customers of locations of available charge points. Assess LOS D duration and plan provision for additional charge points to return system to LOS C or B.
E	81–100%	Customers will need assistance to identify available charge points and queue for access	Ensure systems are in place to advise customers of available charge point locations. Assess LOS E duration and ensure provision for additional charge points to return system to LOS C or B.
F	>100%	Customers must queue to gain access to a charge point	Ensure systems are in place to advise customers of available charge point locations. Assess LOS F duration and ensure provision for additional charge points to return system to LOS C or B.

Source: Zeibots, M.E. 2022, *Level Of Service criteria for EV charging infrastructure with reference to charge point availability*. School of Civil & Environmental Engineering, University of Technology Sydney.

FINDINGS

Recommendations for the charge point array in Lithgow

It is recommended the following criteria be adopted for identifying and prioritising appropriate locations for EV charge points:

- **Parking bays available:** The first preference is for the bays to be located in peripheral car parks that are currently underutilised, with easy and safe access.
- **Distance to Main Street:** The destination charge points should be within easy walking distance from Main Street, enabling convenient access to businesses and services.
- **Capacity on electricity feeder:** The electricity supply infrastructure capacity of the existing electrical supply network is suitable for supporting multiple Level 2 charge points, or can be reasonably upgraded to support Level 3 fast charging.
- **Existing EV charging vs demand:** New charge points need to be balanced between existing facilities and demand.

It is recommended that the following considerations be applied when considering proposals for commercial EV charging stations and when designing and deploying EV charge points:

- **Is EV charging permissible** under the relevant legislation at the proposed location/s?
- Charging infrastructure should support, or be easily adapted to support, **all types of EVs**.
- Some or all charge points should **support bidirectional charging** now and in the future.
- **Renewable energy** should be used as the EV charging energy source (for example, accredited GreenPower, onsite solar, battery storage or a renewable power purchase agreement).
- **Appropriateness of the location** for Level 2 and Level 3 charge points given differences in the technology and differences in user needs at those locations.
- EV charge points need to be designed and constructed in accordance with relevant **Australian Standards** and current industry best practice as well as compliant with relevant Australian Standards and Regulations for occupational health and safety.
- **Ancillary infrastructure** (including signage, parking bays and charging infrastructure) is easily visible and accessible to all.
- **Environmental constraints** and characteristics need to be considered.
- **Facilities are safe with adequate lighting**, and have pedestrian and vehicular access available at all times of the day and night.
- **Accessible** to elderly people, people with disabilities and mobility constraints.

It is recommended Council aim to install 32 Level 2 charge points in Lithgow City with a high proportion located in peripheral car parking areas in the Lithgow Main Street precinct by 2026 to meet EU standards.

A further 23 Level 2 charge points should be installed across Lithgow Region by 2026 to ensure all residents and businesses have access to adequate charging infrastructure.

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