

Project Business Case (Moderate)

Wellington Public Places EV Charger Rollout

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Senior Responsible Owner	Liam Hodgetts	Business Owner	Alison Howard
Funding sought by this Business Case	\$3,310,000 <i>(repaid within 10 years)</i>	Responsibility Centre (RC)	(As reported in the Funding Approach)
Funding Source	(As reported in the Funding Approach)	Recorded on Annual Plan	(Yes/No)



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Document History

This table provides a history of changes made when completing this document.

Version No.	Date	Summary of Changes
V0.1	19 Feb 2020	Initial draft
V0.21	29 June 2020	Updated draft with feedback from colleagues
	August 2020	Final draft
Final	19 May 2021	Final update to match LTP budget – Judy Ryan

Related Documents

This table lists the documents that support the Business Case (delete/add as applicable)

Document	Name and Link
Council Paper(s)	<ul style="list-style-type: none">• Te Atakura (First to Zero)• Towards 2040: Smart Capital• Wellington City Council Long-term Plan 2018-2028• Taone matua, taone warokore (Zero Carbon Capital)• Feedback from Taone matua, taone warokore (Zero Carbon Capital)
Overall business case for Te Atakura package	<ul style="list-style-type: none">• Business Case #0 - Te Atakura Business Case Package

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1. Purpose of this Document

The purpose of the Business Case is to enable a robust process that captures what the project (business problem or business need) is, what investment is required, what are the available options and associated costs to deliver the preferred solution.

The five sections used within this document are based on good practice in both central and local government and cover the following:

- 1. The Case for Change**
Reason for the project– provides supporting information as to why the project is required
- 2. Options Analysis**
Compare solutions – provides possible solution options and the preferred option
- 3. Procurement Approach**
Procurement strategy – provides options on how the solution will be obtained and from where
- 4. Funding Approach**
Funding arrangements – provides funding options, project/programme and ongoing costs
- 5. Project Management Approach**
Delivery plan – provides high level information as to how the project/programme is going to be managed and delivered

2. Executive Summary

The Business Case seeks formal approval to fund the installation of around 60 electric vehicle fast chargers across approximately 30 public locations around our city by June 2025, in concert with the adoption of electric vehicles in our city.

Council would select sites at our highly visited pools, libraries, sports facilities, and parks, addressing the needs of communities and where regional visitors congregate. Because the public typically park for 60 to 90 minutes at these locations, the speed of charging equipment installed will be appropriately set to be neither ultrafast nor too slow. Users are to enjoy our recreational facilities, and recharge while doing so.

This investment would complement charging stations installed by supermarkets, fuel retailers, and other organisations, who by themselves are assumed to deliver at least half of the needed number of charging stations, and may offer much more rapid recharge facilities, but still not in the quantity or geographical coverage to address our full anticipated electric vehicle uptake.

2.1. Recommendation

That Council,

- Updates internal policy to state that new builds and major upgrades to our public facilities incorporate electric vehicle charging in their car parks. The specification will change from time to time, and to begin with for any given location would be:
 - *two 25kW DC fast chargers with two perpendicular car parks;*
 - *with transformer and cabling capacity of 100 kVA enabling future expansion to a total of four chargers, where practical, cost effective, and appropriate.*
- Sets a capital budget of \$3,310,000 phased from 1 July 2021 to 30 June 2025, to install the above specification at 30 locations. (This aligning to supporting the lower estimate for electric vehicle uptake by 2024; assumes conservative market conditions and low government policy impact).
- *Tasks officers to look to set up a commercial return on investment of 10 years or less. (For example by seeking government funding and private sector investment to reduce the capital investment by 50% to ~\$1.5M, and by collecting revenue paid by drivers charging their vehicles to cover electricity costs, operational costs, and repaying the remaining \$1.5M capital cost within ten years.)*
- Tasks officers to continually monitor charger usage, electric vehicle uptake, and revise the charging specification and funding sought accordingly.

3. The Case for Change

3.1. Case for Change Outline

3.2. Background/ context

The Council's *Te Atakura First to Zero* blueprint and the Government's 2019 "*Zero Carbon Act*" cite globally accepted climate science and set out ambitions to reach zero carbon emissions by 2050 at a Wellington City and on a nationwide basis respectively.

36% of Wellington's emissions are from road transport. Increasing adoption of walking, cycling, and (zero emission) public transport offer the greatest means to reduce transport emissions. To the extent that private vehicles remain necessary, electric vehicles have no tailpipe emissions and provide a compelling alternative to fossil fuel vehicles.

Most electric vehicle owners will be satisfied by or able to charge up overnight at home. However international research and local evidence shows that almost all electric vehicle owners use a *public charger* at least once a month, usually to enable longer distance travel. In Wellington, residents of over 20,000 households cannot park their car on the property, meaning they are reliant on public charging facilities, and more so than is the case in Auckland, Christchurch, and other areas of New Zealand. Council therefore has a role in seeing the charging station network develop.

A residential charger trial is currently underway and is gathering data. Late 2020, once the results of that trial are ready, a decision and potential funding case can be put forward to expand that initiative. That trial currently has chargers installed in 14 residential streets. Its purpose is to support streets where multiple residents lack off-street parking. This has an important but different focus to than what is possible through the installation of faster chargers at our key public destinations and facilities.

We have some early insights of usage of our existing public chargers to show there is demand for their use. Noting there were 2700 electric vehicles in the Wellington region as at February 2020 (i.e. pre covid lockdown), usage has been as follows for the prior four months:

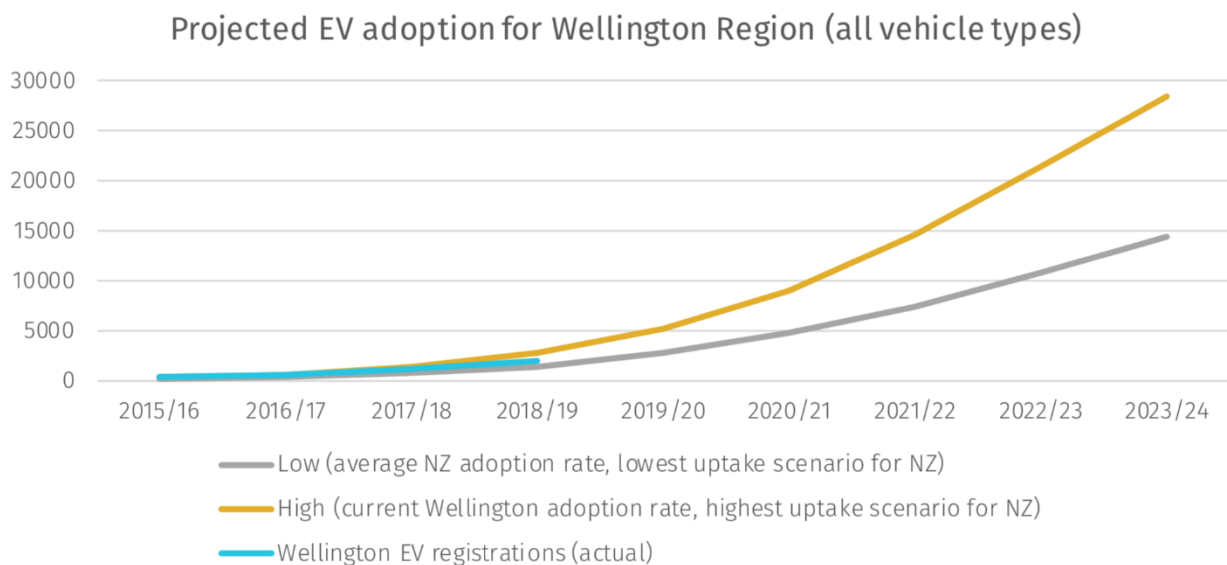
- Wellington Zoo (two fast chargers): 80 to 120 times per month between the two machines
- Inglewood Place CBD (one fast charger): 95 to 125 uses per month
- Barnett St (near Te Papa) (one fast charger): 183 to 223 uses per month
- Grey St (CBD; one fast charger): 186 to 217 uses per month.
- Bond Street (CBD; one slow charger): 95 to 205 times per month (*note, currently no cost for electricity, only cost for parking, so unclear whether this would reduce when electricity has to be paid for. A software limitation is being resolved that will allow electricity costs to be charged for.*)

As electric vehicle numbers grow, they will exceed the capability of Wellington’s nascent charging station network.

3.3. Problem statement

Electric vehicle adoption will shift from obscure to mainstream over this decade.

Public electric vehicle charging equipment needs to keep up otherwise it will constrain uptake and frustrate electric vehicle owners.



Source: Advisory Report - Supporting Electric Vehicles in the Wellington Region (September 2019).

Explanation of figures:

There are approximately 350,000 vehicles in the Wellington region (as at 2018). This figure rapidly grew by more than 40,000 in the preceding four years. This compares to earlier years during an economic lull (2009-2012) where the number of vehicles grew merely by approximately 1000. The impact of Covid19 makes it difficult to predict how much the regional fleet will grow out to 2024. A conservative estimate would suggest slight contraction (i.e. that in 2024 we revert down to the same number vehicles as we did in 2018) and an optimistic pathway would suggest vehicle growth continues unabated consistent with the previous few years. The above graph should cover this range and suggests somewhere between 4% and 8% of vehicles being electric in four years’ time. That equates to around 15,000 and 28,000 vehicles regionally. The upper bound assumes better economic health and lower vehicle purchase prices (either from manufacturers or due to new and effective government policy).

As at February 2020 there are 1300 electric vehicles in the Wellington City, approximately 50% of the 2700 electric vehicles regionally. This business case assumes we retain a 50% proportion going forward, i.e. a minimum of 7,500 electric vehicles city-wide and 15,000 region-wide at the end of 2024.

3.4. Benefits of proposed solution

This business case has been assessed against the criteria in the Te Atakura climate action measurement framework. (Appendix 1) The project-specific assessment is detailed in the table below:

Criteria	Score	Comments
Greenhouse gas reduction potential per annum at 2030	Moderate GHG reduction potential per annum – estimated at 1,531 TCO _{2e}	<p>Emission savings calculated on the basis that charging stations “unlock” the ability for people to sell their petrol cars and buy electric cars, which on average saves almost two tonnes of CO_{2e} per year per vehicle. Without these charging stations, substantially fewer electric vehicles can be supported and purchased, but with the stations, many additional electric vehicles will moreover follow.</p> <p>Furthermore this initiative would contribute to city and national carbon reduction commitments by:-</p> <ul style="list-style-type: none"> • Accelerating electric vehicle uptake (by making it easier to recharge in Wellington), • Encouraging electric vehicles to the region • Increasing awareness and credibility of electric vehicles through a high profile project. • Enhancing opportunities for electric car share.
Co-benefits		
<i>Equity & wellbeing</i>	Minor potential benefit	Over 20,000 Wellington households cannot park their car on the property, meaning they are reliant on public charging facilities. Installing public chargers gives these residents access to and the option to buy an electric vehicle.
<i>Resilience</i>	Minor potential benefit	Improves the resilience of the transportation by geographically spreading the chargers and helps reduce the reliance on fossil fuel vehicles in the City.
<i>Economy & jobs</i>	No potential benefit	
<i>Environment</i>	Minor potential benefit	Helps reduce emissions from road transport which helps improve air quality.
Investment by Council	Low - moderate investment	As detailed in section 6 below
Investment by Others	Low investment	As detailed in section 6 below.
Ease of implementing	Moderate	<p>Some public engagement needed and technical feasibility site to site needed.</p> <p>Charging stations to date have been owned and operated by a private company; Council offers such</p>

		<p>companies a licence to occupy that acts in lieu of an encroachment licence but with additional terms around end-user pricing, and the safety and electrical regulations that equipment must meet and the health and risk obligations that the external company agrees to take up. This approach remains relevant going forward.</p>
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4. Options Analysis

4.1. Options Summary

Options Summary

- Option 1: Ad hoc reactive funding.** This our current state, where for example we received central government and private sector funding to install chargers at Wellington Zoo and Waitohi Hub, but, are not consistently incorporating EV charging into the construction and refurbishment programmes of our buildings, nor are we being targeted and systematic about what and where to install our chargers, nor have we agreed *any* level of funding being contributed by Council, central government, or the private sector going forward. This risks missing opportunities, spending more money (digging up a car park twice), and over- or under-provisioning chargers geographically. It also risks not giving effect to our new draft parking policy, which establishes that we offer EV charging at our destinations, but cannot itself offer funding or implementation.
- Option 2: Systematic funding.** This is our ideal future state, where we thoughtfully select and install chargers where needed, ensuring all areas of Wellington have a minimum level of provision, and look to take advantage of incorporating EV chargers when in the midst of other works. This delivers best value for money and the best chance of supporting electric vehicle uptake and therefore carbon reductions. That said, it won't be straightforward, as predicting exact electric vehicle uptake and behaviour can't be perfect; this approach will need monitoring and refinement as it progresses. This approach aligns to our new draft parking policy, which sets a priority level for EV charging at our facilities and streets. To be clear, this option sees Council fund some or all of the installation, looking to share upfront costs where we can, but importantly, on the expectation that any upfront contribution by Council is repaid by operational revenue within 10 years.
- Other considerations and recommendations are also included in Appendix 3

4.2. Preferred Option

Preferred option:

Option 2 – a systematic approach to funding EV chargers across our network of public facilities, with funding, and aligned to our new draft parking policy.

This replaces the adhoc and reactive approach taken to date.

5. Procurement Approach

5.1. Procurement Options

Procurement options

- Option 1:** Nominate a charging provider/s.
- Option 2:** Run an RFP to gather different commercial models.

5.2. Contractual Approach

Charging stations to date have been owned and operated by a private company; Council offers such companies a licence to occupy that acts in lieu of an encroachment licence but with additional terms around end-user pricing, and the safety and electrical regulations that equipment must meet and the health and risk obligations that the external company agrees to take up. This approach remains relevant going forward. Council could alternatively choose to own equipment but it is expected the electrical and physical maintenance and customer support would remain outsourced.

6. Funding Approach

6.1. Funding Arrangement

Estimated capital costs are as follows:

Description	Cost per Location	Locations	Total
Electrical conduit and cabling to car park, and concrete foundations to enable a charger to be readily bolted into place. <i>(Conservative estimate, allowing for complexity or obstacles at various locations when retrofitted at an existing building. This figure will be much lower if performed during the construction of a new building)</i>	\$40,000	30	\$1,200,000
Set of two 25kW DC chargers	\$30,000	30	\$900,000
Contracted advice and project management <i>(2 day/week; 48 weeks/year; 4 years @\$80/hr)</i>			\$240,000
Contingency	35%	30	\$765,000
			\$3,105,000

Potential halving of capital costs:

The Low Emissions Vehicle Contestable Fund, administered by EECA, offers up to \$500,000 on a dollar for dollar co-funding basis towards public-good projects that support and accelerate electric vehicle adoption. Funding is available every 6 months on a competitive application basis; multiple bids could be made over time. The future of the funding initiative is not certain over the long term; ideally the first bid would be made late 2020 or by mid 2021.

Council would have reasonable probability in securing one or two bids given our organisation's size and track record and the impact of this project. If successful, the additional funding would be used to halve the capital costs, making a return on our investment more feasible.

Decision on whether to outsource chargers to private sector

The work to bring power out to the carpark is naturally within in the usual scope of Council activities, given underground conduit, cabling, and the like are core infrastructure. The cost for this therefore is reasonable to sit with Council, so long as (a) it ends up being inexpensive, such as when done at the time of a new build or (b) in the case of retrofitting, there is a confidence to recover some or all of that spend over time through operational revenue from the chargers.

The cost of the chargers themselves may end up being less than the other preparation work. It therefore is not necessary to hand this off to the private sector as we have tended to do to date, especially where we receive adequate co-funding from EECA and/or revenue from usage fees. A decision to pay for the chargers does not necessarily mean we operate, own, or perform customer service; we could outsource those

elements. However, any decision to pay for the equipment should be met with an expectation that we could recover this within 10 years.

To date, Council has offered other parties the opportunity to invest the majority of capital costs, and has asked for no revenue in return, in part to stimulate and encourage the electric vehicle market. Going forward, however, given the expected rise and maturity of the market, moving to a commercial model makes sense.

6.2. Funding Contingencies

The figures previous already contain a reasonable buffer for installation.

Should dramatically higher installation costs be determined, Council will install at fewer locations. The number of charging equipment across the city may still be retained because that does not dramatically increase installation cost.

6.3. Operational/Post Project Funding

To date, Council has enabled other commercial operators to install EV chargers, who at the present time, collect all revenue from their operation.

Going forward, Council has the opportunity to collect revenue from the machines, in order to repay the capital spent on their installation and maintenance. Drivers would necessarily have to pay a fee sufficient to cover the electrical costs.

There is a possibility this could be revenue positive, in which case it could support the Council's operating income, in a fashion similar to how Council earns revenue through car parking fees, but to a lesser degree.

One option would be use PayMyPark app and charge for parking per hour at a rate that covers all necessary costs (electricity, capital cost repayment, etc); this could provide an efficient form of revenue collection than uses existing Council systems that the public are used to using. Interoperation with the 'ChargeNetNZ' payment system used nationwide is desirable but only if this can be negotiated at a fair price that does not compromise Council's ability to recover its capital investment.

7. Project Management Approach

7.1. Implementation Plan

Implementation plan

The project will utilise the project management expertise and resource of PSR, and other teams where they oversee public property where EV chargers are being installed, as part of building refurbishments and constructions. The Energy Manager and the Sustainability team will provide hands-on subject matter advice and support throughout.

7.2. Change Management Approach

n/a

7.3. Benefits Management Approach

Usage of machines will be recorded on a monthly basis.

Expectation is that during peak car parking periods where rest of the car park is full, that for the majority of time, the EV charger car parks should likewise be in use (charging). Otherwise the facility is too great an intrusion on other users of the facility.

7.4. Next Steps

Following the approval of the Business Case:

1. Work with affected business units to define and document the charger specification so that is incorporated into future projects.
2. Confirm funding and capital and operational financial model with Procurement, and as appropriate, make investment case to EECA and private sector parties.
3. Formulate a detailed and ordered list of locations to install chargers, and perform assessments around electrical supply, car parking layout, and other necessary characteristic.
4. Work with PSR and other teams to implement the chargers over the coming years.
5. Monitor usage patterns and update methodology as appropriate.

8. Recommendations

It is recommended that ELT approve this Business Case and the recommended preferred option presented above.

Approve:

Name	Title	Date

Appendix Two: Greenhouse gas emissions reduction potential modelling

An estimate of carbon savings attributed to charging stations is possible. At the conservative end we can measure the direct carbon reduction of energy provided by our charging stations compared to that energy being dispensed at a petrol station.

Example: The Wellington Zoo site currently on average supplies about 720 kWh of electricity to cars per month, or, if multiplied, about 8640kWh per year. Assuming an average that a car can drive 6km per kWh, this results in an estimate that this station is delivering approximately 51,840km of driving range per year. The average vehicle brought into the New Zealand emits 180 grams of CO₂e per km¹ and EECA cites that the average electric vehicle offers an 80% reduction in CO₂e. Multiplying this together means the Wellington Zoo site is responsible for 6.2 tonnes of CO₂e reduction per annum.

If the station were fully occupied (i.e. charging two vehicles at once) for 6 hours of the day (i.e. 25% utilisation), every day of the year, that would add to 109,500 kWh or 657,000 km of driving or 95 tonnes of CO₂e reduction versus petrol, per year.

Using these two examples as a low and high range, multiplied by 30 (the number of locations proposed by this business case) this offers a range of between 224 and 2838 tonnes of CO₂e saved per year. For context that relates to 0.06% and 0.77% of Wellington City's overall road emissions.

However the electric vehicles using our stations continue to run on electricity wherever they charge throughout their year, such as at home, and the above model ignores these much larger carbon savings.

An alternative approach to calculating emission savings is on basis that charging stations “unlock” the ability for people to sell their petrol cars and buy electric cars, which on average saves almost two tonnes of CO₂e per year per vehicle. The challenge being how to estimate the number of vehicles purchased as a result of an individual charging station being installed. It however does serve as a ‘sanity check’ for the earlier calculation.

Example: It is predicted that in 2024 there will be at least 7,500 electric vehicles in the Wellington City. This equates to approximately 12,500 tonnes of CO₂e savings and a 3.4% reduction to the city's overall road transport emissions.

In the 2018/19FY, Wellington City road transportation (i.e. not bus, rail, air, marine) generated approximately 369,028 tonnes of CO₂e per year. Such emissions are still rising given population growth and a current rise in the ratio of cars to people in our region.

Therefore the CO₂e savings are minor, at 0.06% to 3.4%, depending on how narrow or broad one chooses to be as to the benefits of the proposal.

However, the value of this proposal is also in enabling so many electric vehicles to be on our roads, even if they are only periodically (e.g. once per month) visiting them. This is because 15,000 electric vehicles do offer a genuine reduction to our city transport emissions. The argument is that, without these charging stations, substantially fewer electric vehicles can be supported and purchased, but with the stations, many additional electric vehicles will moreover follow. This in turn allows us to make real progress towards a Wellington where *all* vehicles are electric.

¹ transport.govt.nz/assets/Import/Uploads/Our-Work/Documents/c50c25f19c/Clean-car-standard-preliminary-SIA-July-2019.pdf

Appendix 3 Other considerations and recommendations.

Coverage.

How many of our facilities and parks should gain chargers? How many car parks at our facilities should offer charging?

Recommendation:

Most of our facilities should be included, and they should offer two car parks. By doing so, a wide spectrum of locations that Wellingtonians visit become equipped to charge an electric car.

If only a single charger were to be installed this lacks redundancy and value for money so is not recommended. If more than two chargers are installed at a site, this presents an opportunity cost meaning we cannot as readily achieve geographical diversity, and, in the short term, will remove too much car parking from other users, given the majority of our facilities have limited car parking as it stands. Where possible, we should future proof our installations to make it cost effective to expand to four chargers (or more where deemed appropriate), which we would only do when usage statistics demonstrate the need.

Parking Restrictions.

What restrictions of time length, vehicles, and use, should apply to the car parks?

Recommendation:

- A time restriction **must** be imposed in order to ensure vehicle turnover. The length **should** be **P120**, which is familiar for people as is consistent to many other parts of the city, and, provides a reasonable amount of time for users to enjoy the attraction they are visiting (pool, library, etc), whilst providing an encouragement to free up the car park for other users. This time limit will enable most vehicles to have charged up fully, or where not, they will still be able to drive multiple hundred kilometres from the charging session. On a case by case basis officers **may** elect to reduce or increase the time limit where there is an overriding reason (e.g. P60 where there is insufficient car parking *and* the location naturally does not provide any reason to stay longer than an hour, noting that this may reduce a car's ability to charge sufficiently).
- The car parks **should** be for 'electric vehicles only while charging'. Where this creates significant hurdles with public consultation, resource consents, and the like, this can be relaxed. In any case, there **must** be signage on the charger and/or poles, and on the ground stating that the parks are for 'electric vehicles only' or 'priority given to electric vehicles'.
- Any time limit and electric-vehicles only restrictions **must** be signed posted (and as necessary, formally agreed in bylaws) as being for 'At All Times'. Otherwise evening and weekend users can rightfully 'ignore' the rules.
- The car parks and chargers **should** be restricted to the users of the adjacent facility (pool, library, park/beach, etc). This is unenforceable but nevertheless helpful to encourage the expected behaviour. Promotional signage can support this. The purpose is to enhance the experience of visiting our popular destinations and facilities, i.e. to charge their vehicle whilst enjoying a walk, swim, or taking out library books.
- Note that the car parks **should** remain open on a 24/7 basis in order to maximise the convenience and incentive to Wellingtonians adopting electric vehicles, and to enable the machines to operate on a financially sustainable basis. In most cases this will go beyond the opening hours of the facilities they are outside, such as a pool or library, but this is not expected to provide any materially negative consequence. Out of 'business' hours, drivers will instead be visiting primarily for the sake of their vehicle, which would likely be an urgent need.

Speed of equipment (electrical power level of chargers).

Unlike petrol stations, electric vehicle chargers can operate at wildly different speeds, or more specifically: kilowatts of electrical power. The result is that recharging can take anywhere from minutes to over a day. What speed is relevant to our initiative?

Overview of options:

The main types are:

2 kW AC	<p>Regular 3 pin plug – no capital cost; 12 to 24+ hours to recharge fully.</p> <p>This is not a safe or practical approach for this business case, and is relevant only to how vehicles might recharge at overnight at home or indoors within fleet car parks.</p>
7 kW AC	<p>Cheap to install; 4-10 hours to recharge fully.</p> <p>Does not align to the typical 60-120 minute stay at our facilities. Hard to commercially operate because users will not perceive much value within 1-2 hours so may be less willing to pay for recharging. Only a small quantity of cars can be served during a 24 hour period with this approach.</p>
25 kW DC	<p>Moderately priced; 1-3 hours to recharge.</p> <p>Aligns to a 60-90 minute stay. Users will notice a lot of value (100 to 200km worth of driving range in an hour) and be willing to pay for that. Still “slow” enough that batteries are not detrimentally heated when charging. Ideally suited to our use case and budget.</p>
50 kW DC	<p>More expensive; 0.5 - 2 hours.</p> <p>In some cases will charge vehicle faster than driver is ready. Will warm older style EV batteries which is not ideal if used excessively; this problem does not occur with large battery vehicles that have automatic cooling features.</p> <p>Ideal if purchase price improves, as it offers a high benefit to visitors, without being so quick as to assertively push cars away before people have finished their recreational visit.</p>
100 kW+ DC	<p>Too quick to suit our types of destinations. We don’t want to invite cars to our pools and parks only for them to be finished charging within 15 minutes; it will diminish the likelihood they actively use the recreational facilities they are visiting. Likely that the commercial sector will focus on this power level when replacing petrol stations; we do not need to compete with this.</p>

Recommendation:

Install 25kW (or 50kW facilities if capital costs become affordable). Keep watching brief over technology and pricing changes and revise recommendation as needed

Exceptions to recommendation:

- Where a typical vehicle dwells for much longer than two hours, or, where no perpendicular parking is available, different types of equipment will need to be installed. The Sustainability team can give advice in this case.
- Locations that are expected to attract very high volumes of vehicles seeking recharging may benefit from greater amounts of future proofing (bigger transformer sizes or greater quantities of chargers installed now).

Whose power connection? Future proofing energy decisions.

During implementation, the Council energy manager will investigate and make decisions on a case by case basis on whether the charging stations are powered by either a: 1. An existing Council electricity account (e.g. taking power from a switchboard at a library or pool), 2. A new Council electricity account (taking power

from the street but Council paying), or 3. A new power account owned and paid for by another organisation, such as a charging station provider.

Running the chargers from a Council account has various benefits and complexities. Benefits include:

1. A likely lower cost for ongoing electrical supply. Council's large electricity spend provides us with cheaper electricity costs than what most businesses receive. This can offer a cheaper price to drivers and/or better operational margin in order to recovery upfront capital costs.
2. A greater feasibility in the future to install solar panels at the facility and have the chargers run partially off them. This in turn would lower the carbon emissions and reduce the cost of electricity, plus provide a visually compelling narrative that zero carbon 'clean' sunshine is charging your car.
3. In some situations would reduce the installation cost and timeframe by taking power from the facility rather than off the street supply.
4. If the chargers are connected to a building's electrical supply this leaves the installation future-proofed also for Vehicle-To-Home technology. Under a scenario where the building was temporary faced with a power outage, this enables one or more electric vehicles to discharge into a building to power it electrically. This technology is commercially available today and has been used in a widespread fashion in Japan following major disruption to power due to recent earthquakes, tsunami and the shut-down of nuclear power stations. It complements solar panels, which reduce the electrical supply needed from discharging vehicles. The chargers installed now do not require to provide this capability as the equipment could swapped out as technology evolves and becomes cheaper and more capable; the important element is having the cabling in place between the building and chargers. Presently diesel generators have only sufficient fuel to run a building for a day or two; the conversion to electric alternatives would be expected to be no worse.

Irrespective of this decision, drivers pay for the user of the machine plus a margin, which will recover both direct operational costs (such as electricity volumetric and daily charges) plus over time repay the upfront capital costs paid in.