



LEGISLATIVE ASSEMBLY
FOR THE AUSTRALIAN CAPITAL TERRITORY

STANDING COMMITTEE ON PLANNING, TRANSPORT, AND CITY SERVICES
Ms Jo Clay MLA (Chair), Ms Suzanne Orr MLA (Deputy Chair),
Mr Mark Parton MLA

Submission Cover Sheet

Inquiry into electric vehicle (EV) Adoption in the ACT

Submission Number: 39

Date Authorised for Publication: 8 September 2022

The Power To Recharge An Electric Vehicle

Rod Pitcher

Submission to the Inquiry into electric vehicle (EV) adoption in the ACT,
Standing Committee on Planning, Transport, and City Services.

.

Rod Pitcher

[REDACTED],
[REDACTED]

[REDACTED]

I am unable to use a telephone

I request publication of my paper, including my full name, on the Committee's and any other website as required.

The Power To Recharge An Electric Vehicle

Rod Pitcher

Abstract

This paper discusses the problems that may be associated with the power supply to an Electric Vehicle (EV). It describes these problems from the points of view of the mains power provider and the owner of the vehicle.

Introduction

One of the biggest concerns with Electric Vehicles is the power supply to keep the batteries charged. The concerns cover the source of the mains power and the personal problems in actually connecting the mains supply to the car by the installation of suitable charging facilities.

Concerns with the mains supply involve environmental aspects of the power production. Personal concerns include having a connection available at one's home or elsewhere.

Neither of these concerns is trivial and most certainly both will be major factors in a person's decision to buy an EV or not.

The Power Supply Problem

Putrus, *et al* (2009) suggest that distributing power to more sources, such as charging points for EVs, can cause reverse power flow in the network. This in turn effects the quality of the power supply. It may lead to disturbances in the network, such as fault currents, phase imbalances and malfunctions in the network protection systems.

It is important that these effects be understood and planned for appropriately, BEFORE the situations occur. That is before EVs are introduced into the ACT in increasingly large numbers.

A further factor discussed by Putrus *et al* (2009) is the damaging effects that might follow from the charging schedules adopted by owners. It may become necessary for some regulations to control the timing of charging a large number of EVs to equalise, to some extent, the load on the power mains which might otherwise exceed the capabilities of the power generators or cause problems with them. In particular, this problem would almost certainly occur if all EV owners wished to recharge their batteries overnight.

Kapustin and Grushevenko (2020) further discuss problems with the power supply that may be caused by a large increase in EVs, and the large growth in demand from the power supply system. They warn that the result of the increased demand may be an increase in the consumption of fossil fuels to provide the extra power required.

They also suggest possible damage to the power system similar to that described by Putrus *et al* above, causing potentially severe power grid instabilities.

They go on to say

The expansion of the [number of EVs] will entail a fairly significant growth of electricity demand. The main issue, however, is not the net increase in demand for electricity *per se*, but rather meeting this demand on a day-to-day basis. The increased peak loads, produced by EV charging, are a challenge for grid stability in and of itself.

Irregularity on top of instability is a recipe for disruptions. While this issue does not seem apparent or pressing now, it is only due to the current modest [number of EVs in use]. Governments pushing for their expansion should already formulate adaptation strategies, to prevent serious consequences in the future.

Kapustin and Grushevenko, (2020), p8.

There is also the question as to whether the current or future developments of power provided from environmentally-friendly sources will be adequate to provide the increased power requirements. If the introduction of EVs results in more use of fossil fuels to generate the extra power needed, then their advantage is highly questionable.

As Stephen Corby (2022) writes:

EVs, with their delightful zero-emission tailpipes, are almost certainly better for the environment, but that doesn't mean they're 100 per cent carbon neutral.

Unless you're charging your car with renewable energy generated by wind or solar, you're likely using electricity that's been generated in a power plant emitting CO₂, and the production of EVs also involves the releasing of carbon emissions. Corby (2022)

The problems discussed above need to be investigated and considered in detail when exploring the factors involved in the introduction of a large number of EVs to the ACT. Precautions or procedures for dealing with them should be established before they happen, and before the number of EVs reaches the point of causing the problems.

Connecting The Batteries To The Charging Point

Of major concern to actual and potential EV owners, is how they are going to recharge their vehicle's batteries and keep them up to full capacity.

There are three basic options for charging an EV at home.

The EV can be charged from a normal household socket, but the charging rate will be very slow and fully charging a battery could take up to 24 hours for some EVs. There is also some danger if a normal socket is used for long periods and at a high load due to charging the EV.

Having a dedicated charger installed will reduce the charging time considerably to about 8 hours, depending on the EV.

A 3-phase connection is fastest and possibly the best choice for home use according to most reviews, although it will be much more costly.

Any installation may incur further expenses in upgrading the current wiring, meter, or other parts of the household mains electrical system.

Corby (2022) suggests that what he calls 'range anxiety' is one of the major worries for most EV owner-drivers. This is the fear that they are going to run out of power before finding the next charging point. It is certain to be a constant worry for most if not all EV drivers.

From this, it follows that access to a fast charging point is a high priority for EV owners and drivers, particularly when the vehicle has a heavy regular daily usage or is a long way from home where the location of charging points is an unknown factor and time is pressing. A further problem when away from the vehicle's usual parking-charging point is that there is no standardised charging connection for EVs. Thus any available charging point must match the requirements of the vehicle.

More About Providing Charging Points

There are many questions requiring answers about providing charging points in particular situations for EVs that must be settled by the Committee to provide guidelines for the public, and what is likely to happen in particular circumstances.

Some of these questions include:

How much will it cost to have a special charging point fitted, and what are the conditions, regulations and other factors which will apply to its installation and usage?

In the case of a rented home, who will bear the cost of installing any special charging point, the owner or tenant? Who will have the final decision regarding the installation, the owner or tenant? Will the owner have the option of vetoing the installation?

In a complex of privately owned flats or units, who will be responsible for decisions regarding the installation of charging points, the resident-owners or the Body Corporate? Who will bear the costs, individual resident-owners or the Body Corporate?

In a complex of rented flats or units, who will be responsible for decisions regarding the installation of charging points, the residents, the owners or the Body Corporate? Who will bear the costs, individual residents, the owners or the Body Corporate?

In a Government housing complex of flats or units, who will make the decisions regarding the installation of charging points, the residents or Housing ACT or someone else in the Government? Who will bear the costs, individual residents or Housing ACT?

If the owner should move residence, will a charging point be transferable to a new home or will the homeowner once again have the problem of installing a connection point, under one of the above conditions?

Will employers provide charging points for their employee's use while at work?

Will people staying in hotels, motels and other away-from-home accommodation have access to charging facilities? What will this access cost?

Although public charging stations will undoubtedly become more available, will charging points be available in public places such as open car parks and parking stations, shopping centres and streets?

Will there be publicly available charging points available for travellers at such locations as highway service stations and rest stops?

This last question will become of most importance to ACT residents travelling outside the Territory where EVs and charging stations may not be so prevalent or established. If they are unsure of the provision of charging points in other states, it will severely limit their options for travelling. Although the provision of charging points outside the ACT is not a matter for the ACT Government, it may require some arrangement, or at least discussion, with the other states.

And, probably the most important question, particularly to people on low incomes: How much will it cost me to keep the batteries charged so that my car is always available for use, and doesn't spend much of its life standing in the garage with flat batteries? And who will set that cost?

Will the Government regulate these situations, preferably before they arise, or allow the situation to develop *ad hoc*, uncontrolled and in a disorganised manner?

What are the legal implications and possible ethical, social or other complications which will arise under any of the above situations?

Where there is disagreement over decisions related to any of the above matters will some public arbitration process be available, preferably without recourse to the courts?

These questions, and possibly many more, need to be answered to the satisfaction of any current or potential owner of an EV by the Committee. The answers, or lack of them, will undoubtedly be a major factor in any decision to buy an EV in the future.

Conclusions

The power supply issues discussed above are very important, and it is vital that they are addressed before there is any very large increase in EVs in the ACT.

Procedures must be planned and put in place to deal with the situations before they occur and cause damage to the power supply service or problems and ill feelings from the general public. More importantly, if these problems should occur later, there would certainly be a very large negative backlash from current and potential future owners of EVs and from the general public.

Further, the Government must establish just how much they want people to use EVs by becoming involved in the private and public problems discussed which effect the provision of charging facilities for EVs. Being able to recharge one's batteries quickly at will is a necessary requirement of having an EV, and not one that the majority of owners will lightly give up.

Leaving these problems unresolved and without corrective procedures already planned and in progress at the present time would certainly jeopardise any further plans to promote EVs and encourage their use in the ACT.

Since the ACT Government is actively encouraging a rapid change over to EVs, these matters require urgent attention.

References

- Corby, S. (2022) 'The top five biggest problems with electric cars' CarsGuide. <https://www.carsguide.com.au/ev/advice/the-top-five-biggest-problems-with-electric-cars-85673>. Retrieved 13 August 2022.
- Kapustin, NO. Grushevenko, DA. (2020) 'Long-term electric vehicles outlook and their potential impact on the electric grid'. *Energy Policy 2020*
- Putrus GA. Suwanapingkarl P. Johnston D. Bentley EC. Narayana M. (2009) 'Impact of Electric Vehicles on Power Distribution Networks'. Paper delivered at the 5th IEEE Vehicle Power and Propulsion Conference, University of Michigan, September 2009.