Public Submission

Select Committee on Electric Vehicles

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Introduction

I am the owner of a Tesla Model X 90kWh fully electric vehicle (EV) and am an inaugural committee member of the Tesla Owners Club of Western Australia (TOCWA) and a member of the Australian Electric Vehicle Association (AEVA). In the 17 months since purchasing my vehicle, I have travelled over 58,000km in both country and urban areas and as such have gained much experience of the benefits and current pitfalls of EV ownership. I am a small business owner and a professional engineer. I make this submission on my own behalf but am doing so with the benefit of the shared experiences and opinions of many other EV owners I have been acquainted with at TOCWA and AEVA.

Electric vehicle charging infrastructure

Figure 1 Current total EV charging infrastructure (PlugShare 2018)

Figure 1 shows data from a crowd sourced website PlugShare which displays all publicly known EV charging locations (PlugShare 2018). Initial impressions upon seeing this map would understandably lead one to conclude that Australia is well served with electric vehicle charging infrastructure. This, however, is not the case. The green markers in Figure 1 represent slow AC charging stations which vary from 32 amp 3 phase sockets, which at best can charge some EVs at a rate of 100km of added range per hour of charge, down to 10 amp single phase wall outlets that can charge the same cars at a rate of 10km of added range for every hour of charge. These chargers are akin to using a pipette to dribble petrol or diesel into a conventional vehicle's fuel tank.

If a road trip was undertaken between Perth to Carnarvon in Western Australia in my EV, which is a total distance of 890km, it would take approximately 17 hours. This includes a cumulative charging time of over 8 hours using the best AC charging stops along the journey. Such a trip highlights the arduous nature of electric vehicles when they are deprived of the benefit of effective charging infrastructure and represents a significant barrier to the uptake of electric vehicles.

Figure 2 Current total fast DC charging infrastructure (PlugShare 2018)

Figure 2 shows the total extent of fast DC charging infrastructure presently installed in mainland Australia. (There are no DC chargers in Tasmania).

If a road trip was undertaken between Melbourne and Sydney in my EV, which is a total distance of 881km, it would only take approximately 11 hours (Tesla 2018). This includes approximately 90 minutes of fast charging which can conveniently be undertaken during regular rest stops along the journey. Such a trip highlights the fact that EVs represent a compelling and uncompromised alternative to internal combustion powered vehicles when they are driven in regions with appropriate charging infrastructure. This is in stark contrast to the Perth to Carnarvon route before mentioned.

Figure 2, however, includes proprietary Supercharger DC charging locations that have been installed by Tesla Australia and which are compatible only with their vehicles. A proper overview of the current situation pertaining to electric vehicles in general can only be gained when Tesla Superchargers are removed from the map as illustrated in Figure 3 below.

Figure 3 Current generic fast DC charging infrastructure (PlugShare 2018)

Figure 3 shows there are 48 generic fast DC charging locations presently installed in Australia. With the exception of much of the east Queensland coast and a small portion of the south west region of Western Australia, the remainder of Australia is effectively bereft of fast DC charging infrastructure. This is in stark contrast to New Zealand which presently has approximately 150 generic fast DC charging locations as shown in Figure 4.

Figure 4 Current generic fast DC charging infrastructure in New Zealand (PlugShare 2018)

For electric vehicles to gain broad public acceptance, it is essential that they can be driven on long country trips without having to wait inordinate times to charge at slow AC charging stations.

In 2017 the Queensland state government completed a 2,000km fast charging network comprising 18 locations at a total budgeted cost of $3 million (Charlwood 2017). These stations have an average separation of approximately 100km and represent gold standard geographical coverage.

Since the average range of modern EVs is approximately 300km (NimbleFins 2018), the spacing between DC charging stations can be extended to approximately 250km at a maximum and more ideally, 200km. If this was done, then the remaining approximately 18,000km of Australia's national highway system not presently served by fast DC chargers could be upgraded with the addition of approximately 100 charging locations. If the Queensland example were used, it would cost less than $20 million to construct a comprehensive fast DC charging network that would interconnect all major Australian cities and regional centres.

I recommend the Federal Government immediately provide tied funding to all states and the Northern Territory to install a minimum of 111 charging stations at approximately 200km intervals along all major highways in Australia at locations listed in Appendix 1.

If the above proposal was implemented in full, Australia's fast DC charging network would be that as shown in Figure 5, with new locations coloured blue and existing locations coloured orange.

Figure 5 Proposed fast DC charging network including existing locations (Murphy 2018)

Electric cars and the power grid

A significant advantage of EVs charged during the day at workplaces or at home overnight is the fact they can be charged at varying power rates and at multiple short or long durations over an extended period without affecting the ultimate aim, which is for them to be fully charged at the end of the day or night. This means that cars being charged can be treated as nearly instantly sheddable loads. The same can apply in reverse where these vehicles can also be used as nearly instantly connectible loads for the purpose of absorbing excess short term volatile power generation which can occur with some renewable energy sources such as wind or solar generation. This presents an excellent opportunity for EVs to contribute to overall grid stability rather than degrade it as has often been claimed previously (Packham 2018).

An example of how this can operate is via workplace (and home) installed demand response enabled chargers. Employees, for example, connect their EVs to workplace chargers which may not actually commence charging the cars until the Power Utility commands them to do so when there is, say, a surplus of solar generation between 10am and 2pm. Should a large cloud bank, however, significantly reduce solar generation at, say, 12:30pm for 15 minutes while these cars were charging, the Power Utility could easily and quickly shed them until increased generation resumed. All of this would occur without any motorists noticing or being inconvenienced.

Such control can easily be implemented with industry standard Demand Response Enabling Devices (DREDs) which are routinely used by Power Utilities to control optionally sheddable loads such as air conditioners. While the temporary load shedding of air conditioners has been found to be counterproductive and often leads to greater nett power consumption (Wall and Matthews 2014), EVs charged in this manner do not suffer this disadvantage.

There is a draft Australian Standard DR AS/NZS 4755.3.4 which stipulates how EV charging equipment ought to respond to demand response signals from Power Utilities (Standards Australia 2013). Unfortunately, this standard has not progressed since the closing date for public comment related to this draft standard closed on 19 September 2013. This standard ought to be finalized so that businesses manufacturing electric vehicle charging equipment can properly implement this extremely useful feature where the need arises.

I recommend Standards Australia be directed to commence a new public consultation period for draft Australian Standard DR AS/NZS 4755.3.4 and that its finalization be expedited thereafter.

Luxury Car Depreciation Anomaly

EVs are currently more expensive to produce and purchase than conventional vehicles. The Federal Government has appropriately increased the Luxury Car Tax (LCT) threshold for economical vehicles (including EVs) to $75,526 (Australian Taxation Office 2018b). Unfortunately, it has left the business depreciation ceiling for these cars at a prior LCT threshold of $57,581 (Australian Taxation Office 2018a). This policy has directly affected my business and no doubt many similar businesses and is an unnecessary barrier to greater EV adoption.

I recommend this anomaly be resolved by setting the business depreciation threshold for EVs equal to the modified EV LCT threshold.

The elephant in the room

The elephant in the room is the fact that electric vehicles are not currently contributing to federally funded road maintenance and construction since they do not suffer fuel excise (Crowe 2016). While this loss in revenue is currently relatively insignificant due to the small number of EVs in Australia, this will change over time as EVs are adopted in increasing numbers into the future. It is obviously impossible to apply a fuel excise on EVs since there is no effective method to demarcate electricity that is consumed in the course of charging vehicles as opposed to that ordinarily consumed in houses and businesses in general. In fact, in many instances, EVs can be charged for free in the privacy of people's houses from solar panels behind the utility meter.

Fortunately, modern cars in general and EVs in particular, are increasingly equipped with advanced telemetry technology that means it is simple to accurately determine any vehicle's total road use during any time interval. In this case, the Federal Government could apply a cost per kilometre levy which could be payable, say, in monthly or quarterly instalments. Australian Design Rules could be amended to mandate that car manufacturers facilitate such a reporting mechanism so as to facilitate such a levy.

While it is obviously appropriate for EVs to contribute to the federal fuel excise regime, I suggest that this contribution ought to be made on an equitable basis with internal combustion vehicles after all externalities have been considered. A significant factor that ought to be considered is the reduction in harm that EVs cause in urban environments due to the fact they emit no harmful gaseous or particulate emissions.

Every time I collect my children from school I am starkly reminded that they are often being marinated in noxious gases and harmful particulate emissions from dozens of idling SUVs waiting to collect them, whereas my EV emits absolutely nothing at all. On a population wide basis, such emissions cause significant harm (Marshall et al. 2005; Krzyżanowski, Kuna-Dibbert and Schneider 2005). This should be accounted for when comparing the total human and environmental costs of conventional vehicles versus the benefits of EVs. This accounting ought to be used to discount the effective per kilometre cost applied to EVs compared to that levied to conventional vehicles paying fuel excise.

I recommend further investigation be undertaken into the equitable collection of road taxes from the users of EVs and suggest that the Productivity Commission would be ideally suited to undertake this task.

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Appendix 1: Suggested new DC charging locations

The following is a list of proposed fast DC charging locations. An online map of these locations is available at:

https://drive.google.com/open?id=1vr3vAq-ZNmCRnYCrWdfNyvJCJkU3Vg2s&usp=sharing

Western Australia

Jurien Bay, Geraldton, Billabong Roadhouse, Carnarvon, Minilya Roadhouse, Nanutarra Roadhouse, Karratha, Port Headland, Pardoo Roadhouse, Sandfire Roadhouse, Bidyadanga, Broome, Willare Bridge Roadhouse, Fitzroy Crossing, Halls Creek, Warmun, Kununurra, Eucla, Madura, Caiguna Roadhouse, Balladonia Roadhouse, Norseman, Coolgardie, Southern Cross, Kellerberrin, Esperance, Ravensthorpe, Jerramungup, Albany, Manjimup, Kojonup, Williams, Dalwallinu, Paynes Find, Mount Magnet, Meekatharra, Kumarina, Newman, Auski Tourist Village

The Northern Territory

Timber Creek, Katherine, Adelaide River, Darwin, Larrimah, Elliott, Tennant Creek, Barrow Creek, Alice Springs, Kulgera, Barkly Homestead

South Australia

Marla, Coober Pedy, Glendambo, Port Augusta, Port Wakefield, Keith, Kyancutta, Ceduna, Nundroo, Nullabor, Renmark, Mt Gambier

Queensland

Camooweal, Mt Isa, Cloncurry, Kynuna, Winton, Longreach, Alpha, Emerald, Duaringa, Goondawindi, Maxwelton, Hughenden, Charters Towers, Warwick

Victoria

Horsham, Ballarat, Euroa, Wodonga, Geelong, Warrnambool, Mildura, Sale, Orbost, Bendigo, Sea Lake

New South Wales

Gundagai, Goulburn, Port Macquarie, Coffs Harbour, Balranald, Darlington Point, Chatsworth, Narrabri, Gilgandra, Parkes, Wyalong, Jerilderie, Bathurst, Wallendbeen, Batemans Bay, Boydtown, Tamworth, Glen Inns

Tasmania

Hobart, Launceston, Crayfish Creek, Tullah, Derwent Bridge

Figure 6 Proposed new fast DC charging locations (Murphy 2018)

Figure 7 Proposed new fast DC charging locations including existing sites (Murphy 2018)