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Dear Mr Flindell

RAC's Response to the Issues Paper on Proposed Revisions to the Western Power Network Access Arrangement

RAC thanks the Economic Regulation Authority for the opportunity to respond to the *Issues Paper on Proposed Revisions to the Western Power Network Access Arrangement*. RAC represents over 995,000 Western Australians. As part of RAC's mobility agenda, RAC is committed to safe, accessible and sustainable mobility. A safe mobility system is measured through a reduction in the number of people killed and seriously injured on our roads, an accessible system through a reduction in the cost of both congestion and motoring and a sustainable system principally through a reduction in carbon dioxide (CO_2) emitted from cars.
In Australia, approximately 3,000 deaths are caused by air pollution each year and 0.6 per cent of all injury and disease, particularly coronary heart disease and stroke, can be attributed to air pollution[1]. The Australian Government has committed to reducing Australia's greenhouse gas emissions by 26 to 28 per cent below 2005 levels by 2030[2]. Transport is responsible for 18 per cent of Australia's total greenhouse gas emissions and over 23 per cent of total CO_2 emissions[3]. On a per capita basis, Australia's emissions are 50 per cent above the OECD average[4]. Transport emissions are also the fastest growing and are expected to increase by 20 per cent by 2030.
According to the Australian Government, even with the current trend in vehicle efficiency improvement, the growth in the light vehicle fleet will add an estimated eight million tonnes of greenhouse gas emissions, to the current 43 million tonnes of greenhouse gas caused by

[1] AIHW (Australian institute of Health and Welfare), (2007). *Australian burden of disease study: impact and causes of illness and death in Australia 2003,* AIHW, Canberra. https://www.aihw.gov.au/getmedia/f81b92b3-18a2-4669-aad3-653aa3a9f0f2/bodaiia03.pdf.aspx?inline=true
[2] Department of Environment, (2015), *Australia's 2030 climate change target*. Available online at: http://www.environment.gov.au/climate-change/publications/factsheet-australias-2030-climate-change-target
[3] Department of Climate Change, (2017), *National Greenhouse Gas Inventory 2015*. Available online at: http://ageis.climatechange.gov.au/NGGI.aspx#
[4] Climate Council (2016), *"What's the deal with transport emissions?",* https://www.climatecouncil.org.au/transport-emissions-and-climate-solutions

vehicles each year[5]. The continued growth would also add an additional $5 billion in energy costs to the economy per year by 2030[6].

In addition to CO_2, vehicles are responsible for oxides of nitrogen (NOx), hydrocarbons (including methane, benzo[a]pyrene, toluene and xylene), carbon monoxide (CO), oxides of sulphur (SOx), ozone (O_3) and particulate matter (PM). All of these emissions impact negatively on human health and/or the environment. NOx effects the respiratory system, and can form smog and acid rain; hydrocarbons include known carcinogens and hydrocarbons such as methane has 21 times the global warming impact of CO_2; carbon monoxide deprives the blood of oxygen and contributes to greenhouse gases; SOx impacts on the respiratory system and creates sulphuric acid creating acid rain; ozone can be both good and bad for human health, naturally occurring ozone occurs in the upper atmosphere, while tropospheric or ground level ozone is caused by chemical reactions from pollutants and is toxic to human health, ozone impacts negatively on the respiratory system and is a main contributor to smog; and PM can be inhaled, causing serious health problems.

Trends

Globally, governments are implementing vehicle emissions standards – which limit the amount of CO_2 vehicles, are able to emit without accruing a monetary penalty, and often in conjunction with electric vehicle sales targets, as a proportion of overall new vehicle sales. In Australia, the Federal Government is considering implementing vehicle emissions standards for all passenger and light commercial vehicles in Australia, with incentives for manufacturers to sell low and ultra-low emissions vehicles including electric vehicles and plug-in hybrid vehicles. Both pure electric vehicles and plug-in hybrids require connection to an external power source to charge the batteries of the vehicle; and the energy stored in the batteries is then used to drive. Manufacturers will need to sell a certain number of electric vehicles and plug-in hybrids in order to meet the proposed standard.

Currently, Tesla is the only mainstream manufacturer to exclusively produce pure electric vehicles. With Volvo announcing that from 2019, every vehicle it produces will have a form of battery electric drive, producing hybrid and electric vehicles, rather than vehicles powered solely by internal combustion engines. Other major automakers including BMW, Volkswagen, Daimler, Renault-Nissan and Ford have all also announced plans to ramp up their electric vehicle production. Across Europe a number of countries have announced they will be banning the sale of new petrol or diesel combustion engine vehicles, including Norway in 2025, the Netherlands in 2030, Scotland in 2032, and the UK and France in 2040. India and China have also indicated they will be banning combustion engine sales along the same timeline.

The forecasts for electric vehicle uptake in Western Australia range from 20 (low) to 34 per cent (high) of all vehicles in 2036, which could be up to approximately 700,000 electric vehicles on the road[7], and this forecast is broadly in line with global electric vehicle forecasts[8].

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[5] Department of Infrastructure and Regional Development, (2016), *"Improving the efficiency of new light vehicles Draft Regulation Impact Statement Ministerial Forum on Vehicle Emissions"* https://infrastructure.gov.au/roads/environment/forum/files/Vehicle_Fuel_Efficiency_RIS.pdf

[6] Ibid.

[7] Australian Energy Market Operator, (2016), Electric Vehicles, pg. 43. https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/AEMO-insights_EV_24-Aug.pdf

[8] Bloomberg New Energy Finance, (2017), *Electric Vehicle Outlook 2017*, https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf

There are three 'levels' of charging currently available for electric vehicles. Level 1 or 'trickle' charging, is slow AC charging and is usually through a standard household 10 amp (120 volt) outlet, Level 1 charging provides approximately six kilometres of battery range per hour of charging. Level 2 charging requires installation of charging equipment and provides a faster charge than Level 1; a 15-20 amp (180-240 volt) power source will fully recharge most vehicles overnight and can provide, on average, 30 kilometres of charge but can range up to 110 kilometres of charge in an hour. Level 3, DC, Fast or Superfast chargers are commercially installed and include the Tesla Supercharger, CHAdeMO and SAE (Mennekes) Combo. Level 3 is currently the fastest charging level available and requires a 55 amp (660 volt) power outlet. Approximately 80 per cent of battery capacity can be charged within 30 minutes. When in use, fast chargers require more power than that consumed by an average house for short periods of time and are usually only for public fast charging[9,10]. These levels of charge are current-day charging options; although it may be assumed as the technology is further refined and improved, different or greater electricity may be required by electric vehicle chargers.

We are also seeing the first stages of induction charging occur at Level 2 charging, however it seems likely that future induction charging will be Level 3 or above and that wireless and induction charging will become the main source of electric vehicle charging in the future.

Having introduced Australia's first electric vehicle charging station highway in 2015, RAC is well placed to participate in this review. The *RAC Electric Highway* consists of 11 fast chargers between Perth and Augusta. Along with Level 3 charging facilities, there are Level 2 AC chargers. RAC has made the following observations regarding its publically available charging stations. Approximately 70 per cent of all charges and 90 per cent of all electricity used, are sourced by the Level 3 fast chargers. The average length of time for a Level 3 fast charge is 42 minutes, compared to an average of over 1.02 hours for an AC charge. An average 30 minute charge on a Level 3 charger draws approximately 12 kwh, although this can range from 6 kwh up to 22 kwh in 30 minutes. An average 30 minute Level 2 AC charge draws approximately 3 kwh[11].

Internationally, public charging infrastructure availability ranges from a ratio of approximately two electric vehicles per publically available charging station in some European cities, to over 30 electric vehicles per public charging station in some US cities. Overall the international trend appears to be in the range of 7 – 27 electric vehicles per public charging station. In Norway, which has the highest share of new electric vehicle sales compared to traditional combustion engine vehicles, the average number of publically accessible charging stations is between 10 and 20 electric vehicles to one public charge point. Publically available charging infrastructure is either Level 2 or Level 3. Internationally, Level 3 charging infrastructure makes up approximately 10 to 20 per cent of all publically available charging infrastructure. In the UK and Finland over 40 per cent of public charging infrastructure is Level 3[12].

Currently, in WA there are just over 300 Electric Vehicles on the road. In the Perth Metro area there are 50 publically available charging stations, with three of those being Level 3 fast

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[9] Electric Vehicle Council, (2017), *"Types of EV chargers".* Accessed online at: http://electricvehiclecouncil.com.au/charger-guide/

[10] Plug In America, (2011), "*Understanding Electric Vehicle Charging*". Accessed online at: https://pluginamerica.org/understanding-electric-vehicle-charging/

[11] RAC Electric Highway Usage Data – not publically available

[12] ICCT, (2017), *"Emerging best practices for electric vehicle charging infrastructure"* . Accessed online at: http://www.theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf

chargers[13]. Publically available electric vehicle charging infrastructure in Perth has an approximate ratio of six electric vehicles to one charging station, and six per cent of publically available charging stations are Level 3. As electric vehicle demand and uptake grows, so will demand for publically available charging infrastructure and due to Perth and WA's vast land mass and sprawl, the demand for publically available charging infrastructure, particularly Level 3 will grow.

Looking ahead

In terms of installing Level 3 electric vehicle chargers, the requirements are unique from most other power supply arrangements. Level 3 charging stations often require a transformer to be installed/upgraded or an upgrade to the existing power supply. Large-scale electricity is required for relatively short periods of time, in very small and localised areas. As Level 3 charging infrastructure demand increases, so will the requirements for 'bursts' of electricity.

'Standard' or 'BAU' electricity supply and access-demands include business and residential users, and demand that is assumed to be reasonably consistent and forecastable. The locations, for the most part, would be on land that is already fit for purpose, or within close proximity to appropriate power supply, and given the 'standard' nature of most requirements, without large, additional or costly works required. However, the installation and overall cost of an electric vehicle charging station, particularly in light of electricity investigation and redirection/upgrade costs, will for the most part mean electric vehicle charging infrastructure is at risk of remaining unviable, either for commercial providers or the community.

Determining an appropriate place to access a sufficient and cost effective power supply, coupled with convenience, is of the highest importance particularly for Level 3 installations in WA. Accessibility and the knowledge requirements to determine a suitable location is complex and an appropriate and standardised mechanism needs to be in place to allow for a cooperative approach to accessing appropriate supply. Such a mechanism or indicators should ensure it is viable for private enterprise, in addition to or instead of Government, to enter into a large-scale roll out of Level 3 infrastructure. California utility provider Pacific Gas and Electric, for example, has created an interactive map which identifies specific locations across California suitable for fast charging infrastructure, as well identifying priority need areas[14].

There is also a need to ensure increasing electric vehicle numbers do not impact on the State's electricity supply during peak demand periods and this may be alleviated or avoided by investigating the introduction of smart metering and monitoring. This would enable and encourage electric vehicle owners charging at home, to do so during non-peak times and in the long term may assist in smoothing peak electricity demand periods for all users.

Further, to the extent electricity can be an enabler or blocker to innovation, it is necessary to consider future electricity access requirements that may currently only be ideations or viewed as 'future' technologies. Electricity 'sharing', peer-to-peer electricity provision, a lesser reliance on personal vehicle ownership and a subsequent reduction of at-home garaging, a greater uptake of electric vehicles, impacts of automated vehicles on electricity provision, a possible transition to greener public transport including electric and/or hydrogen powered vehicles,

[13] Plugshare, (2017), https://www.plugshare.com/location/131133
[14] Pacific gas and Electric, Interactive DC Fast Charger Siting Map, https://www.pge.com/b2b/energysupply/wholesaleelectricsuppliersolicitation/PVRFO/ev.html?WT.mc_id=Vanity_epic-project-dcfastcharging

among other potential advances and impacts, may all impact in some way on the State's electricity demand.

We trust RAC's response, which recognises the need for industry and regulators to work together to prepare for and support the inevitable growth of electric vehicles, while ensuring a sufficient and appropriate rollout of public and private electric vehicle charging infrastructure, adequately highlights the unique electricity access requirements and complexities surrounding electric vehicle charging infrastructure in WA.
Should you require further information please do not hesitate to contact Anne Still, General Manager Public Policy, on (08) 9436 4412.

Yours sincerely,

Patrick Walker
EXECUTIVE GENERAL MANAGER
ADVOCACY AND MEMBERS
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