



Electrical Trades Union

**ETU Submission to the
Senate Select Committee
on Electric Vehicles**

August 2018

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1 INTRODUCTION

The Electrical Trades Union of Australia (ETU) is the Electrical, energy and Services Division of the Communications, Electrical, Electronic, Energy, Information, Postal, Plumbing and Allied Services Union of Australia (CEPU). The ETU represents approximately 65,000 electrical and electronic workers around the country and the CEPU, as a whole, represents approximately 100,000 workers nationally, making us one of the largest trade unions in Australia.

The ETU welcomes the opportunity to make a submission to the Select Committee on Electric Vehicles. We also note the ACTU submission to the select committee and support the matters contained within that submission and the recommendations put forward.

The focus on the ETU's submission is on the opportunity to maximise Australia's supply chain competitive advantage, the capacity of a local Australian workforce to perform this work and the availability of currently dormant infrastructure that could be readily operationalised.

The submission also raises one of the most significant constraints to the capacity for Australia to ensure appropriate infrastructure is established to allow for charging of electric vehicles.

Australia has the opportunity to establish itself as a world leader in advanced manufacturing activities relating to the entire supply chain processes associated with electric vehicles. All that is needed is a Government with the foresight and courage to make these investment decisions and to ensure the right regulatory environment is created.

2 ECONOMIC BENEFITS

There are many economic benefits of widespread electric vehicle uptake in Australia. These include developing opportunities for electric vehicle (EV) manufacturing and EV supply and value chain services in Australia, as well as the development of jobs through the creation of new industries and infrastructure to support these industries.

Economic benefits would include:

- Regional jobs in mining for resource extraction (particularly Vanadium and Lithium);
- Construction jobs in building supporting infrastructure;
- Creation of new industries such as battery manufacturing and microgrid power generation;
- Improvements to battery technology to benefit other sectors and industries (for e.g. shipbuilding and electrical power industries);
- Providing certainty in the transition from coal-fired power stations to renewable energy;
- Creating a value added, high technology advanced manufacturing industry for electric vehicles and resource processing; and
- Strengthening Australia's energy security.

Australia has some of the highest grade, and largest, deposits of Lithium and Vanadium in the world, particularly in Western Australia. Western Australia is also currently the largest producer of lithium, which is necessary to supply batteries for the emerging EV market.

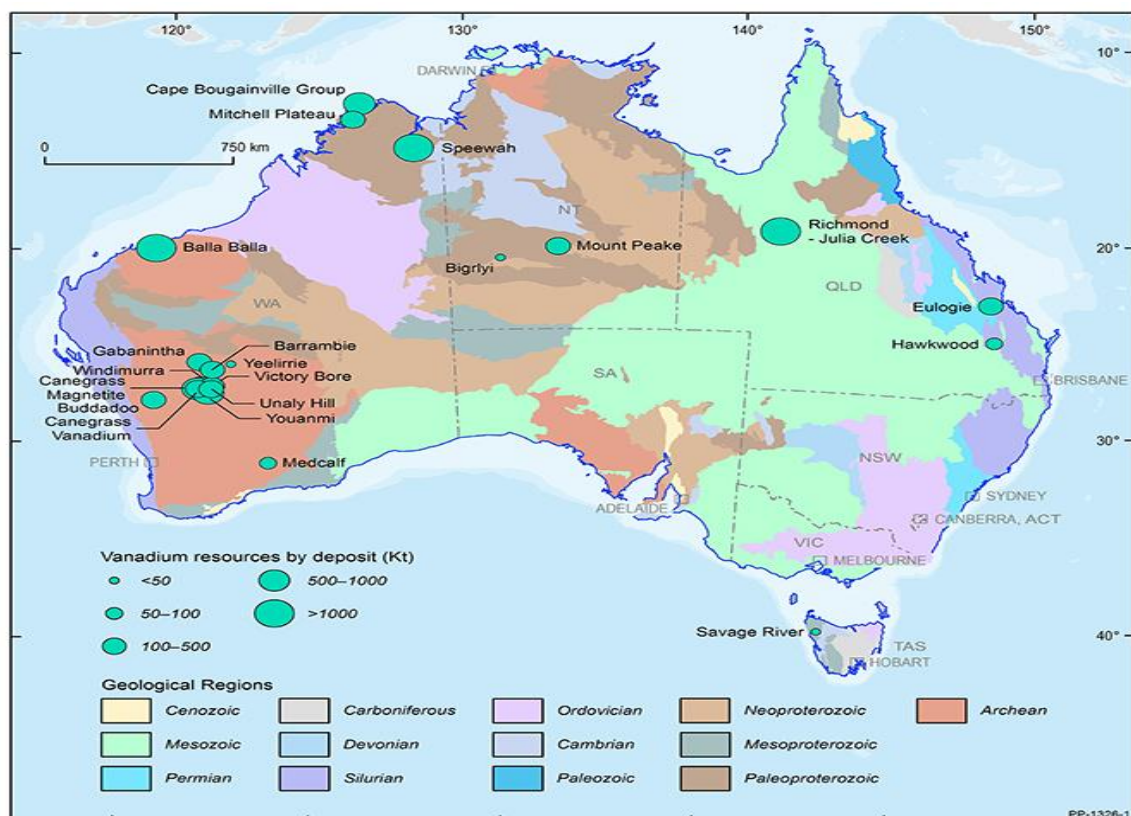


Figure 1. Vanadium-Iron-Titanium deposits with mineral resource estimate as at 31 December 2016. The geological regions defined here are based on Geoscience Australia's Geological Regions Boundaries dataset. Vanadium-iron-titanium deposit location information used in this map is derived from Geoscience Australia's national mineral resources OZMIN database.

Australia's lithium deposits also create opportunities for microgrid technology to revolutionise the power generating sector by removing the need to install new long distance, high voltage power poles and transmission towers and giving local regional communities the opportunity to control their energy supply.

There are many opportunities, in particular for EV manufacturing, vehicle supply and value chain services in Australia. These include:

- Potential to renew Australian vehicle manufacturing and associated spare parts and supply chain industries;
- Creating a vertical supply chain from mining to processing resources, metal production for manufacturing and design, the design and manufacture of EVs and associated parts;
- Battery manufacturing and vehicle sales;
- Increasing Australia's research and development capacity into new technology through research and development partnerships with organisations like the CSIRO;
- Retaining highly skilled/highly paid jobs in knowledge-based product advancement; and
- Creating public sector jobs to develop and apply the appropriate regulatory environment.

Currently in Australia there is a glut of dormant infrastructure that could easily be repurposed to facilitate an electric vehicle manufacturing industry. Since the Federal Government abandoned the car manufacturing industry along with other changes to policy settings which has seen reductions in other manufacturing industries there are many locations around Australia that have unused industrial and commercial premises that would be fit for purpose.

Whether it is the former Mitsubishi, Holden and Ford plants in South Australia and Victoria or the former train building facilities in New South Wales and Queensland, there are multiple locations strategically located nearby to road and rail freight transport corridors, and sea and air transport terminals.

3 ENVIRONMENTAL AND SOCIAL BENEFITS

Environmental Benefits

The electrification of the transportation sector through the diffusion of plug-in EVs, coupled with cleaner electricity generation, is considered a promising pathway to reduce air pollution from on-road vehicles and to strengthen energy security. Other environmental benefits include reducing local air pollution, greenhouse gas emissions and oil dependency to meet our commitment to the Paris Agreement.

Microgrids can help solve regional power generation issues. By using stand-alone dedicated renewable energy systems, the risk caused by environmental factors such as bushfires can be reduced.

Australia's transport industry is the third largest source of emissions and the highest source of emissions growth. Cars alone, make up 46 per cent of all transport emissions.

Analysis by Climate Works Australia¹, a partnership between The Myer Foundation and Monash University, identifies a number of environmental benefits of electric vehicles by reducing emissions from the transport sector, including improving the fuel efficiency of Australia's light vehicle fleet, which can deliver substantial environmental and economic benefits for the nation.

ClimateWorks' research found²:

- Best practice standards for light vehicle CO2 emissions standards could see the fuel efficiency of Australia's new light vehicle fleet improved by over 50% within 10 years
- Improving the fuel efficiency of passenger and light commercial vehicles could reduce greenhouse gas emissions by almost four megatonnes (Mt) of CO2 per year by 2020 and nine Mt CO2 per year by 2025
- By 2025, switching from conventional to electric vehicles could save drivers an average net annual savings of approximately \$350 over a five-year ownership period as well as help produce economy-wide fuel savings of almost \$8 billion per year
- Australia's fuel security can be enhanced through fuel efficiency, with fuel demand reducing under best practice standards by 40-66 million barrels per year in 2024
- Increasing uptake of electric vehicles while decarbonising the electricity grid (or sourcing electricity from low carbon sources) could provide emissions reductions of 9MtCO2 e by 2030 and 27MtCO2 e by 2050

Social Benefits

By embracing EV technology, Australia has the potential to reap many social benefits including:

- Reducing Australia's carbon footprint;
- Reducing the need for transport of dangerous goods (fuel);
- Improving Australia's fuel security;
- Advancing jobs and Australia's standing in eco-tourism initiatives, for e.g.;
 - Building the world's longest non-stop electric vehicle highway from Esperance to Broome;
- Better health outcomes for Australians through reduced exposure to air pollution; and
- Reduction in noise pollution, particularly adjacent to major road corridors.

It is important to note, that to get the full benefit of EV uptake there is a need to align renewable, non-polluting electricity sources with the operations of EVs. Otherwise gains in reduced fossil fuel consumption and greenhouse gas emissions of the vehicle will be negated by increased fuel consumption and emissions at the power source of the electricity grid.

¹ <https://www.climateworksaustralia.org/who-we-are>

² <https://www.climateworksaustralia.org/transport>

4 CONSUMER UPTAKE: INCENTIVES AND BARRIERS

Incentives

There are several measures that could be implemented to support the acceleration of electric vehicle uptake:

- Increase consumer information on range capabilities and begin to build the infrastructure in highly visible areas to increase exposure;
- Increase infrastructure availability through targeted charging station investment;
- Lower upfront purchase cost by exemption of the Luxury Car Tax; and / or
- Targeted discount finance arrangements for purchase of EV's

'Range anxiety' is often seen as one of the major barriers to mainstream EV uptake. There is a common impression that EVs are an impractical option given the driving ranges of most existing models are lower than fossil fuel vehicles. In conjunction with range anxiety, a lack of public charging infrastructure discourages consumers from making the switch to an EV as consumers are wary of limited charging opportunities. The low uptake of EVs in Australia is partly due to the limited range of EV models available and the upfront cost. The cost of purchasing EVs is currently higher than equivalent fossil fuel vehicles, and this difference in upfront costs is a major barrier to consumers.

A comparative indicator of the uptake of electric vehicles is the uptake of solar photovoltaic (PV) installations in Australia. The installed PV capacity in Australia has increased 10-fold between 2009-11 and quadrupled between 2011-16. It was not until 2010 that Australia experienced a 'surge' in the uptake of consumer owned solar PV renewable energy generation systems. At that point in time there was a raft of government driven incentives introduced to encourage consumer confidence in purchasing small generation sized solar PV systems for residential properties. As of 31 March 2018, there are over 1.84 million PV installations in Australia, with a combined capacity of over 7.8 gigawatts.³

With the right federal and state government incentives, multiple jurisdictions have the potential to attract EV manufacturing and EV supply and value chain manufacturing to Australia, the government could explore measures such as:

- Providing tax offsets to companies who support local production.
- Support local and national companies in setting up the EV manufacturing industry
- Supporting whole vertical integration of the EV manufacturing industry i.e. from mining of ore to retail sale of electric vehicles and associated parts
- Proactive and early establishment, which would allow the government to dictate terms of integration unlike other disrupting technologies such as Uber.
- Tax exemptions and rebates for EVs;
- Non-monetary incentives such as High Occupancy Vehicle lane access, toll reduction and free parking;
- Building infrastructure to support an efficient roll out, such as fast charging stations;

³ <http://pv-map.apvi.org.au/analyses>

- Increasing taxes on diesel and petrol vehicles;
- Tightening environmental standards on vehicles, a tax based on vehicle greenhouse gas emissions, is a “powerful instrument that can drive consumer demand towards fuel efficient cars and foster a more sustainable car market;
- Investing in research into renewable energy via the CSIRO;
- Removal of taxes on battery powered vehicles
- Extend the chain of production and expand into manufacturing of batteries adding to the value chain
- Develop highly skilled and highly paid jobs with pathways directly from TAFE and university.

A key focus for all levels of Government would be the need to reach agreement on a plan which would allow acquisition of land from old factory areas and dormant infrastructure which could then be used to establish the manufacturing and supply chain infrastructure needed for new electric vehicles.

Every other country that manufactures vehicles, subsidises this industry due to the return on the dollar on investment. The ETU notes many other submissions already detail this point and would add that there is an opportunity here for Governments in Australia to turn their mind to including a subsidy model designed around reinvigorating dormant infrastructure.

Current research and development grants and discounts in Australia are poorly structured, poorly administered and provided to business based on a company performing its own “self-assessment” on the activities being performed. A better use of research and development incentives would be for the genuine purpose of growing, supporting and expanding Australia’s electric vehicle capacity.

The procurement policy settings of all levels of Government should also play a major incentive to the industry.

Finally, introducing appropriate regulatory settings to ensure infrastructure relating to charging stations needs to be incorporated into rules around new construction particularly relating to rules for developers.

Barriers

The elephant in the room for electric vehicles is the capacity of the grid to support scaling up of electric vehicles with regards to charging without impacting the reliability of supply and network stability.

The capacity of the network, and quality of supply analysis is an area that requires State & Federal cooperation. As is, development of a robust policy position which integrates the objectives and outcomes sought with the Australian Energy Regulator.

Currently the AER is reducing allowed expenditure on electricity networks, on a scantily supported assumption that citizens want less power reliability, in return for very marginally reduced costs (Value of Customer Reliability).⁴

⁴ <https://www.aemc.gov.au/news-centre/media-releases/new-rule-makes-aer-responsible-determining-values-customer-reliability>

This is the position that has been adopted and agreed by COAG, without any genuine public disclosure. Having decided that Australians do not want to pay for reliable power without actually asking them, billions of dollars of maintenance and upgrades of electricity networks, particularly in Victoria, have been ceased or deferred indefinitely.⁵

AER AusNet Services Final Determination 2016-2020

AusNet Services submitted that a lower Value of Customer Reliability (VCR) will result in less monetary value being attributed to the energy associated with supply interruptions that cannot be serviced should parts of its networks fail (energy at risk). Hence, augmentation projects will be implemented later than otherwise. It also stated that the lower VCR will also cause certain station rebuilds (replacement capex) to become economically unjustified.⁶

This is notwithstanding that there are more material ways to reduce the costs to consumers in privatised grids which do not abandon power reliability. In contrast, if the AER required grid owners to spend their maintenance allowance and stopped incentivising them to retain excessive profits through under-expenditure of the allowance provided, the appropriate investment into power reliability and quality could be re-established and maintained.

By way of example, the following excerpts from AusNet Services (one of 5 Victorian Electricity Distribution Grid Owners) 2018 Financial Statements, show that for only their AER *regulated revenue*, AusNet made an operating profit of \$540 million, from revenues of \$833 million. This is a further increase from 2017, where AusNet made \$467 million EBITDA from \$829 million in regulated revenues from their monopolized customers.

AusNet Services Annual Report 2018

	Electricity distribution	
2018	\$M	2017
Regulated revenue	833.0	Regulated revenue 825.9
Excluded transmission revenue	-	Excluded transmission revenue -
Unregulated infrastructure revenue	-	Unregulated infrastructure revenue -
Customer contributions	48.1	Customer contributions 28.8
Service revenue	-	Service revenue -
Other revenue	10.3	Other revenue 13.5
Total segment revenue	891.4	Total segment revenue 868.2
Segment operating expense	(351.2)	Segment operating expense (400.5)
Segment result - EBITDA (i)	540.2	Segment result - EBITDA (i) 467.7

Moreover, under privatized grids, there is limited ability for States under the National Energy Market to set policy objectives for the standards, quality and reliability of supply of network providers. This includes not having any levers to ensure that the power supply capacity, reliability or quality to particular regions or industries can be achieved.

⁵ <https://www.aer.gov.au/news-release/aer-issues-final-decisions-for-victorian-electricity-distributors>

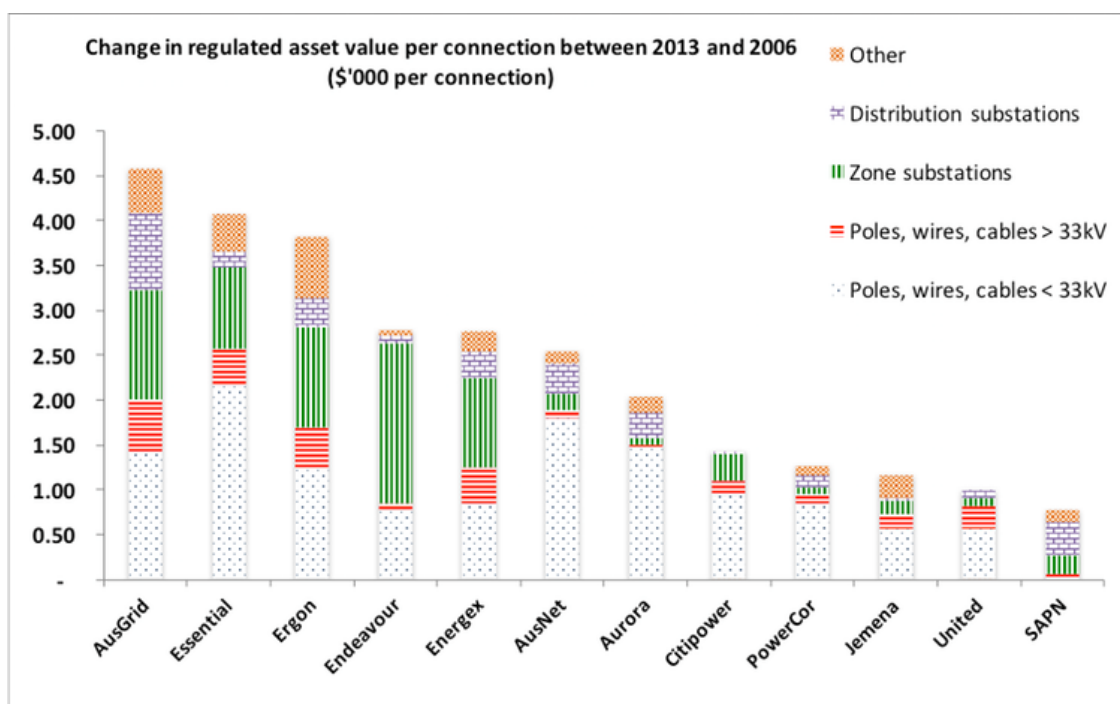
⁶⁶ <https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20AusNet%20distribution%20determination%20-%20Attachment%2011%20-%20Service%20target%20performance%20incentive%20scheme%20-%20May%202016.pdf>

The future of electric vehicles in Australia will depend on rectifying the extreme limitations of the NEM to provide for planning or delivery of electricity grids' capability to support any economic, social or environmental objectives, such as supporting the necessary infrastructure needed to make electric vehicles viable.

This is a critical issue, in particular for Victoria and South Australia, who have not been 'gold plated'. 'Gold plating' is a derogatory term used by privatisation advocates and interests to refer to the relatively higher investment and reliability of publicly owned grids.

Dr. Bruce Mountain, whose analysis is often relied upon to justify the term 'gold plating', concurs his analysis is being used out of context. Simply put, the diagram below shows the relatively greater investment in Zone Substations where a grid is publicly owned (public owned are on the left hand side) versus the privatised states. Each substation is unique and is built and installed to convert the available high voltage power, into lower voltage power to meet the demands of a geographical region. The control and protection equipment installed manages the network demands in an area, including voltage fluctuations, harmonics, load variances and power factor correction to ensure network stability.

Critically, when the load profile in an area exceeds the transformers capacity to deliver that amount of power, or becomes increasingly unstable it causes outages, which are usually associated with transformers & fuses exploding or protection systems operating.



Source: Bruce Mountain, 2016. Note AusGrid, Essential, Ergon, Endeavour and Energex were publicly owned. Note the relatively higher '\$ per connection' in some states primarily reflect the geographically larger network and smaller customer numbers in those States.

An increasing number of EVs will pose a major challenge to the electricity network. The increase in the demand of power required for charging EVs may hamper the smooth performance of the network. To ensure secure and steady performance of the network it is essential to analyse the impact of EV charging stations on the power grid. In the past few years there is extensive research on the effect of EV charging stations on power distribution networks.⁷

The growth in EV's in turn creates a growth in the impact of the EV charging loads on the operating parameters of the power system. The detrimental impact of EV charging station loads on a electricity network that hasn't planned for these kinds of loads cannot be ignored. The high charging loads of the fast charging stations results can increase peak load demand at unplanned times, reduced reserve margins, voltage instability, harmonics and reliability issues.

Significant uncontrolled charging of EVs can have adverse consequences for the electricity system, in terms of peak demand, as well as creating system instability. The degrading performance of the power system, and potential for system wide interruptions, cannot be ignored.

Privatised networks, like Victoria's, are already facing some extreme supply capacity constraints due to chronic, ongoing under-expenditure on the electricity network since privatisation. Like South Australia, Victorian taxpayers are now directly funding generation and grid capacity, because of the failed NEM experiment which encouraged profit gouging in lieu of investment.

Recent outages in Victoria and South Australia along with warnings issued by Australian Energy Market Operator (AEMO) leading up to the 2017/2018 summer have highlighted the existing vulnerability of the distribution networks, which carry electricity to consumers.⁸ According to an AEMO report in late 2017, Victoria is already facing a higher risk of blackouts due to a shortage of reserve power in the national energy market. Victoria experiences power outages during peak periods of demand, such as during hot weather.

It is the privatized states' relative under-investment in transformers and substations to meet supply demand growth, which is a major obstacle to Victoria and South Australia increasing uptake of electric vehicles. This underinvestment is now being driven by the AER in other jurisdictions too.

Recent research studies in Victoria by Dr Julian de Hoog, Honorary Fellow at the University

⁷ Review of impact of electric vehicle charging station on the power grid [https://ieeexplore.ieee.org/document/8397215/2017 International Conference on Technological Advancements in Power and Energy \(TAP Energy\)](https://ieeexplore.ieee.org/document/8397215/2017%20International%20Conference%20on%20Technological%20Advancements%20in%20Power%20and%20Energy%20(TAP%20Energy)) December 2017
[Energy Systems](#) Volume 6, [Issue 1](#), The importance of spatial distribution when analysing the impact of electric vehicles on voltage stability in distribution networks March 2015, pp 63–84
[International Journal of Electrical Power & Energy Systems](#), Impact of electric vehicle fast charging on power system voltage stability [Volume 57](#), May 2014, Pages 241-249

⁸ Adam Carey, 'Rise of blackouts in Victoria on the rise this summer, report warns', *The Age*, 6 September 2017

Adam Carey, 'Sunday blackouts a failure of electricity networks', *The Age*, 6 September 2017

of Melbourne, outlined the common issues which arise in a scenario of greater numbers of electric vehicles charging from the grid. In summary:

1. Extra demand on the network, which in turn means there is extra demand on the transformer and on the cables.
2. As more electricity is drawn through these networks, the voltage is affected at individual houses and affects appliances and other possessions that are also reliant on electricity at a certain voltage.
3. Most networks have three phases - each house connects to one, and if a lot of people on one phase start to buy electric vehicles, you start to unbalance networks and that in turn leads to problems of voltage.

Dr de Hoog explained that in a typical network there are already imbalances due to houses being connected away from transformers. "With the added demand of electric vehicles drawing on a network, the project team had found in their modelling that 'typically the worst problems start to occur at around 10 per cent uptake' or 'every 10th house' when it starts to plug in an electric vehicle, 'that is when you may start to see the worst problems... typically around low voltage'.⁹

This finding is supported by many other studies, including recent reports by New Zealand's biggest electricity distributor warning next-generation electric vehicles with bigger batteries, and preference for faster chargers, could multiply a household's load on the power grid by up to 20 times.

"The perception that networks can absorb the uptake of EV charging is only true for the short term while batteries have a short-range capability, customers are satisfied with long charging times and chargers are evenly distributed across the network," it said.¹⁰

While some advocates, such as Mr Tim Olding, Director of the Sassafras Group, suggest that electric vehicles may represent a potential means to enhance the stability of the grid by acting as a distributed battery and a backup source of energy, due to the constraints of the regulatory model applied to the National Electricity Market, the vested profit interests of privatised networks and lack of coordination between State and Federal Governments this is currently an extreme fantasy.

While the technical capability may be achievable over the next decade, the upgrades to the network are still required to 'balance' the energy provided. The biggest obstacle however, especially for Australia, is that the network and vehicle technologies that would need to be developed and implemented in unison, and total interoperability would need to be agreed, shared and financed. This is a practical and commercial impossibility for multiple, privately

⁹ Dr Julian de Hoog, Honorary Research Fellow, Melbourne School of Engineering - The University of Melbourne, *Transcript of evidence*, 9 November 2017, p. 32

¹⁰ <https://www.stuff.co.nz/business/102240245/power-network-may-struggle-to-deal-with-electric-vehicles>

owned, profit maximizing network owners which lack the economies of scale and scope, and we would argue appetite or regulatory approval, to responsibly transform their networks.

5 WORKFORCE PLANNING

The ETU's experience is that the requisite workforce in the form of available workers and capacity of workers to perform the work is still present in the geographical locations with identified dormant infrastructure. These areas also experience higher than average unemployment rates indicating the potential, with the right investment in training and skills development to ensure a readily available workforce.

Initiatives needed to ensure appropriate workforce planning should include;

- Transition incentives for workers to return to the industry
 - For e.g. a transition centre was set up at Elizabeth SA for workers leaving the industry. There is capacity to turn this initiative around and use it to return workers to the industry.
- Apprenticeships and in particular, mandatory apprentice rations linked to all forms of Government support to the industry;
- Development of an appropriate training package consistent with the historical concept of ensuring skills learnt are transportable.

The Federal Government needs to stop the current devolution of Australian skills, particularly through attacks and defunding of National Skills Councils and TAFE institutions.

6 RECOMMENDATIONS

The ETU Submits the following recommendations to ensure a successful pathway to investing in and supporting the establishment of a highly successful electric vehicle manufacturing and associated industries in Australia.

Recommendation 1

The Australian Government must develop and implement a strategy to re-establish vehicle manufacturing in Australia through the opportunity presented by electric vehicles and their end to end supply chain components.

Recommendation 2

That COAG reverse their decision to abandon the principle of reliability of electricity supply for Australian households and investigate more efficient delivery from optimising grids economies of scale and scope, which would enable them to meet economic, social and environmental policies, including greater uptake of electric vehicles.

Recommendation 3

That the Federal and State Governments reform the AER's excessive returns to privatized electricity grid providers and require that maintenance and upgrades paid for by customers, are delivered. This will make the transition to greater EV uptake substantially more affordable and efficient.

Recommendation 4

That COAG reform the National Energy Market objectives to include that the AEMC & AER investment parameters incorporate the capacity for electricity grids' to enable uptake of electric vehicles in the near to medium term future.

Recommendation 5

All Government incentives associated with EV uptake must be tied to transparent and measurable returns to the community in the form of local jobs, local procurement and local investment in training and apprenticeships.

Recommendation 6

All Government procurement guidelines must support the purchase of Australian made vehicles.

7 CONCLUSION

There is clear evidence that a global transition towards Electric Vehicles has begun. Over the coming years as battery technology evolves, electric vehicle prices fall, and availability of electric vehicle infrastructure expands, the uptake rate will begin to expand rapidly. Given this upcoming change, the Australian Government needs to take steps today to properly prepare the country for the transition to electric vehicles and their associated industries.