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Economy and Infrastructure Committee

Victorian Parliament

Parliament House, Spring Street

East Melbourne VIC 3002

By email: electricvehicles@parliament.vic.gov.au

11 December 2017

Dear Committee,

Victorian Parliamentary Inquiry into Electric Vehicles, 2017

AGL Energy (**AGL**) welcomes the opportunity to respond to the Victorian Parliamentary Inquiry into Electric Vehicles (**Inquiry**), 2017.

AGL is one of Australia's largest integrated energy companies and the largest ASX-listed owner, operator and developer of renewable generation. AGL is also a significant retailer of energy, providing energy solutions to over 3.5 million customer accounts throughout eastern Australia. In addition, AGL is continually innovating our suite of distributed energy services and solutions for customers of all sizes (residential, business and networks). These 'behind the meter' energy solutions involve new and emerging technologies, including electric vehicles (**EVs**).

We believe that innovative technologies will play a crucial role in improving the efficient use of infrastructure, reducing greenhouse gas emissions, and delivering value for Australian homes and businesses. EVs have the potential to deliver on these objectives based on their use of cost-efficient and clean electricity and will play a pivotal role in Australia's transportation and energy future. Accordingly, AGL wants to improve access to EVs in the Australian market, by removing the obstacles to ownership and enhancing the ownership experience.

AGL recognises the wide range of societal benefits that vehicle electrification can deliver to Victoria and the broader Australian economy, including the following:

- Increased EVs uptake will stimulate investment in the local economy and provide important opportunities for job creation.
- In the electricity system context, EVs are a flexible resource that have the potential to deliver benefits that will increase with scale.
- A faster shift towards vehicle electrification will increase the benefits from decarbonisation of our electricity system.
- The wider societal benefits resulting from advanced mobility systems will be brought forward through policies that support vehicle electrification.



AGL is invested in the development of the Australian EV market through our Electric Car Plan, which allows customers to charge their electric car, whenever they like and as often as they like for \$1 per day. As part of our Electric Car Plan, we also offset emissions associated with our customers' EVs at home through our Future Forests Program. AGL is a member of the Electric Vehicle Council, that was launched in May this year. We have also committed to transitioning 10 per cent of AGL's business vehicle fleet to EVs by mid-2018.

AGL consider that public policy settings at both the State and Federal levels can also play a crucial role in accelerating the uptake of EVs in Australia. AGL urges the Victorian Government to consider implementing the following policy measures in particular:

1. A State EV target;
2. A Government fleet EV target;
3. Stamp duty and registration concessions;
4. High Occupancy Vehicle (**HOV**) lane access; and
5. Charging infrastructure planning and support.

We have given careful consideration to the Inquiry's terms of reference, which we elaborate further in the attachment to this submission.

Should you have any questions in relation to this submission, please contact Kristian Handberg, Electric Vehicle Lead, on 0402 955 013, or Kurt Winter, Manager, Policy and Research, on 03 8633 7204.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Stephanie Bashir'.

Stephanie Bashir

Senior Director, Public Policy



ATTACHMENT

The potential benefits of widespread uptake of electric vehicles in Victoria to the environment, including greenhouse gas emissions, air quality, noise and amenity, whereby electric vehicles are defined as vehicles that both:

- a) use one or more electric motors as their sole means of propulsion; and
- b) require recharge from an off-board electricity source

The widespread uptake of electric vehicles, when coupled with the decarbonisation of the electricity grid, presents a substantial opportunity to deliver emissions reductions consistent with Australia's long-term commitments under the Paris Agreement. The increased uptake of electric vehicles also has the potential to contribute towards improved air quality, delivering significant health benefits to communities, particularly in metropolitan areas of Victoria. These benefits stem from the fact that electric vehicles emit zero tailpipe emissions.

Whilst Australia has a range of current climate policies in place which address the electricity sector, there is currently a complete absence of policy to address emissions from the transport sector, underlining the urgent need for policy reform.

We refer the Committee to the ClimateWorks Australia 2016 report, 'The path forward for electric vehicles in Australia',¹ of which AGL was a project partner (**Path Forward Report**). As the Path Forward Report underscores, whilst the transport sector is one of the fastest growing sources of emissions in Australia, it also represents the most financially attractive emissions reduction opportunity across the Australian economy. A breakdown of sectoral emissions are set out in Table 1 below.

Table 1. National Greenhouse Gas Inventory, 'unadjusted' emissions by sector, year to Dec 2016, sectoral change since 1990²

Sector	Emissions (Mt)	% of Australian total	% change since 1990
Electricity	191.5	35.6%	48.4%
Non-electricity stationary energy	92.5	17.2%	44.0%
Transport	95.4	17.7%	55.4%
Fugitive emissions	44.1	8.2%	19.8%

¹ ClimateWorks, 'The path forward for electric vehicles in Australia' (April 2016), Available at https://climateworksaustralia.org/sites/default/files/documents/publications/the_path_forward_for_electric_vehicles_in_australia_-_submission_to_the_federal_government_vehicle_emissions_discussion_paper_1.pdf

² Australian Government Department of Environment and Energy, *Quarterly Update of Australia's National Greenhouse Gas Inventory: December 2016*, May 2017.



Industrial processes	32.8	6.1%	27.0%
Agriculture	70.0	13.0%	-12.5%
Waste	11.4	2.1%	-42.0%

In AGL's view, all sectors of the Australian economy have an important role to play in meeting Australia's emission reduction targets and its long-term commitments under the Paris Agreement.

AGL accepts the Intergovernmental Panel on Climate Change (**IPCC**) conclusion that the risks associated with climate change are reduced substantially if warming is limited to less than 2 degrees Celsius above pre-industrial levels. Achieving this outcome would require complete decarbonisation of the world economy by 2100 and emission reductions of up to 70 percent by 2050.

As our Greenhouse Gas Policy³ elaborates, it is important that governments set both binding and aspirational medium and long-term emission reduction targets. AGL supports the use of both regulatory and market-based policy mechanisms to deliver the required emission reductions. Importantly, a range of policies are likely to be needed.

AGL believes that the costs of decarbonisation should be shared equitably across the Australian economy. Indeed, any failure to address emissions from the transport sector will increase the burden for other sectors, including the energy sector which has already committed to a significant transition program.

The research undertaken by the Victorian Government for its Electric Vehicle Trial in 2012 remains illustrative of the interrelationship between EV energy economy and electricity grid emissions. We refer the Committee to the report, Victorian Electric Vehicle Trial: Environmental Impacts of Electric Vehicles in Victoria (**EV Trial Report**). Key findings in the EV Trial Report included that:

- the impacts from vehicle operation far outweigh those from vehicle production. That is true even where modelling allows for an EV battery replacement over the vehicle life. Vehicle disposal impacts, including those of the EV battery, were found to be negligible due to the expected high rate of material recycling;
- the dominant influence of vehicle operation during the EV lifecycle highlights the importance of the way in which electricity is made, how efficient energy conversion is, and the way a vehicle is used; and
- the source of the electricity used to power electric vehicles is a key issue in Victoria. Although the breakeven point in terms of carbon emissions from vehicle operation is some years away for vehicles operating on Victoria's current electricity grid, an electric vehicle operating on renewable energy may provide a net benefit in terms of lifecycle carbon emissions within three years of operation.

Figure 1 of the EV Trial Report (below) depicts the interrelationship between EV energy economy and electricity grid emissions intensity, which in combination determine the vehicle's full fuel cycle greenhouse gas emissions. Using the first-generation Nissan LEAF as a case study, the EV Trial Report modelled how

³ See AGL, Greenhouse Gas Policy, Available at http://agl2016.sustainability-report.com.au/files/agl_greenhouse_gas_policy.pdf.

the vehicle's full fuel cycle emissions (horizontal dashed line) trend away from high emissions (signified by the blue shaded area) towards low emissions (signified by the green shaded area) as the grid decarbonises.

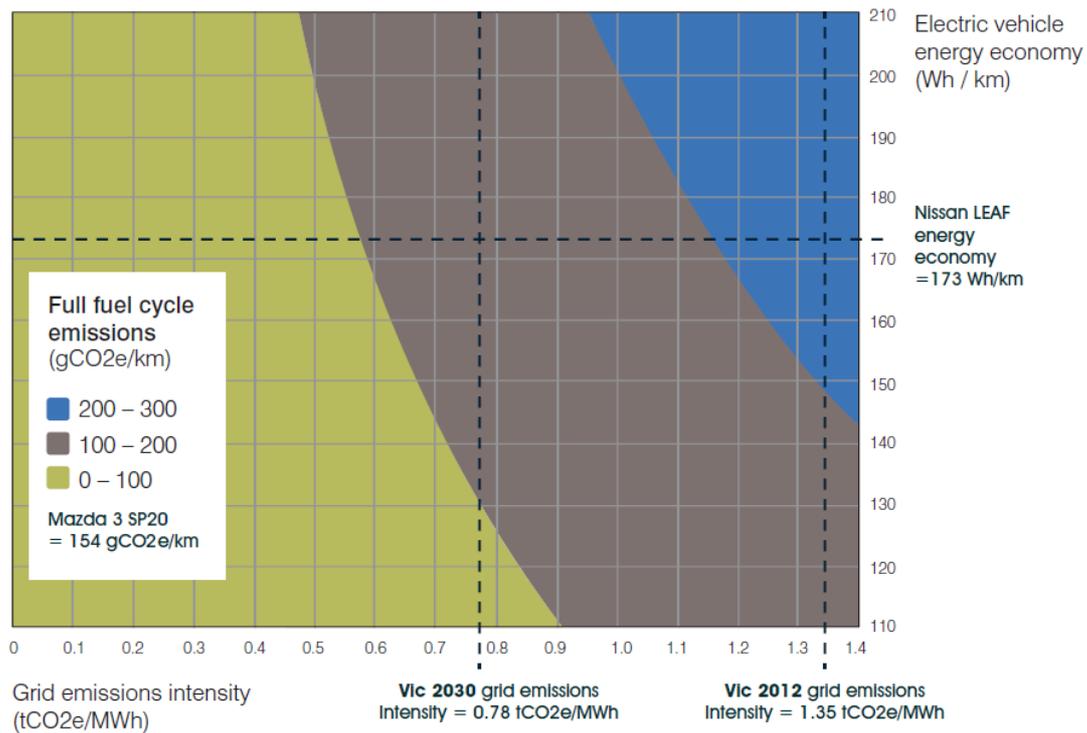


Figure 1. Chart depicting the interrelationship between EV energy economy and electricity grid emissions intensity

Figure 2 of the EV Trial Report (below) depicts the cumulative greenhouse gas emissions calculated over an average vehicle lifetime for an Internal Combustion Engine Vehicle (**ICEV**) and a comparable EV operating on both the Victorian electricity grid mix and renewable energy. The step change in both EV calculations reflects impacts arising from a single battery replacement forecast, however more recent data suggests this may not be required. We also consider that grid emissions impacts will decrease over time, meaning that a vehicle purchased later than 2012 will have lower overall emissions.

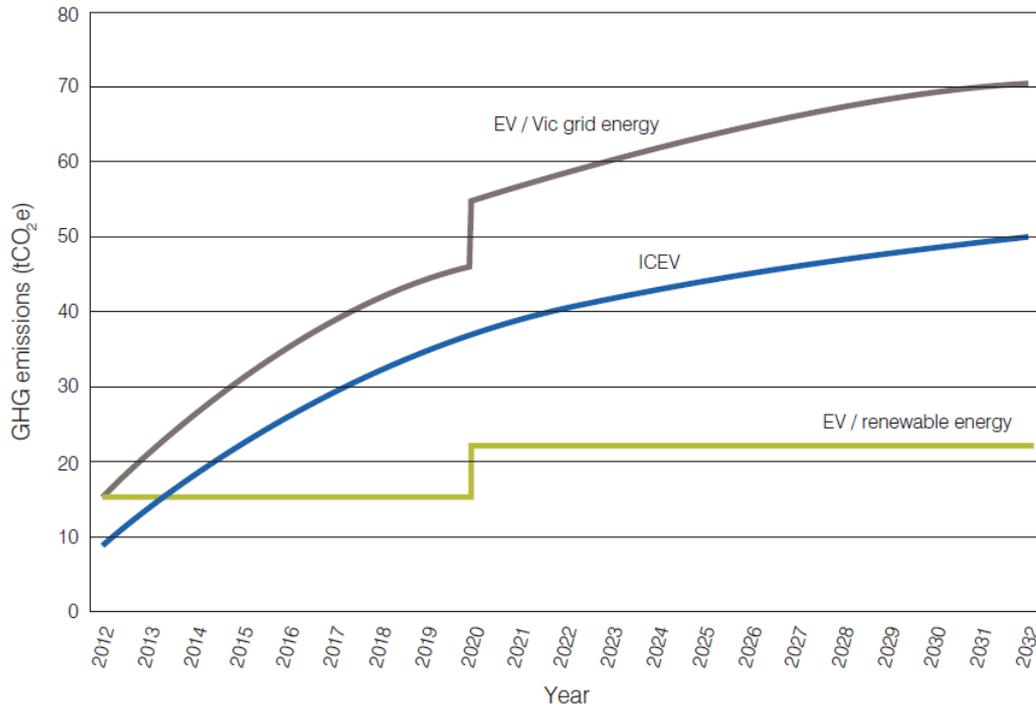


Figure 2. Cumulative GhG emissions calculated over an average vehicle lifetime for an ICEV and a comparable EV operating on both the Victorian electricity grid mix and renewable energy

AGL is acutely aware of the potential for electricity generation to facilitate emissions reductions in the transportation sector, through electrification powered by renewable energy as is illustrated by these figures.

AGL is committed to playing a leading role in developing a pathway to a modern, decarbonised generation sector. As our Greenhouse Gas Policy elaborates, we have made a strong commitment to a range of measures that will drive the decarbonisation of the energy sector, including the closure of all of our existing coal-fired power stations by 2050 and continued investment in new renewable and near-zero emissions technologies. A clear example of the impact of this strategy and as a result of the policy is to place clear time limits on the operation of our fossil fuel plants, providing certainty to communities and the market as to our decarbonisation pathway.

We developed our Electric Car Plan with a strategic focus on its environmental impacts, as the energy grid transitions towards full decarbonisation. AGL’s Electric Car Plan for EV charging at home is 100 per cent carbon offset through our Future Forest Program, effectively delivering zero emission charging to our EV customers. Our Future Forests Program enables customers to offset the carbon emissions associated with their electricity usage through Australian forestry carbon credits certified against the Gold Standard. This program is underpinned by robust accounting to ensure its integrity. Whilst retailers currently offer a number of alternative carbon offset programs, in our view, the Gold Standard provides the most robust certification standard globally, ensuring that energy efficiency and renewable energy projects actually reduce carbon dioxide emissions, and provide benefits to the local population.



AGL is also committed to ensuring robust product stewardship and recycling of batteries, as their use becomes more widespread in both the electricity and transport sectors. In particular, AGL is a member of the Australian Battery Recycling Initiative (**ABRI**), a not-for-profit association established in 2008 to promote responsible environmental management of batteries at end of life. AGL has been working closely with ABRI and other stakeholders to develop robust product stewardship and recycling processes and standards for the Australian market.

The regulatory, infrastructure, economic, employment and incentive options for supporting the uptake of privately owned electric vehicles

In AGL's view, increasing the uptake of privately owned EVs requires concerted efforts towards easing consumer access to EVs. Indeed, as the recent consumer survey undertaken by the Royal Automotive Club of Victoria (**RACV**) revealed⁴, while many people are willing to consider purchasing an electric vehicle, purchase cost and access to charging infrastructure remain key barriers to uptake. In the development of our own Electric Car Plan, AGL has sought to make access to EVs easy for our customers by removing the obstacles to ownership and enhancing the ownership experience.

We consider that public policy settings at both the State and Federal levels can play a crucial role in supporting and accelerating the uptake of electric vehicles in the Australian market. In particular, AGL recommends that the Victorian Government consider implementing the following policy measures:

1. A State EV target

Establishing a target for EV uptake is the centrepiece of most international government policy support frameworks for EVs, with other policies and their relative settings crafted to achieve that target. Given that transport infrastructure is substantially a matter for State jurisdictions, we consider that planning and deployment of EV charging infrastructure should be designed around a State EV target. Just as the Victorian Government has recently legislated its Renewable Energy Target, we consider that a State EV target would act as the complementary driver for the transport sector's necessary transition towards a lower-carbon economy. Indeed, a State EV target would provide a powerful platform to drive coordinated whole-of-government policy initiatives across the Victorian Government. It would also establish a clear benchmark against which to measure ambition and progress.

We would also welcome coordinated cross-government leadership through the COAG Energy Council to develop a robust EV roadmap that establishes a nationally agreed target and supporting policy initiatives. In our view, this would provide the optimal policy platform to support businesses operating across the Australian economy.

2. A Government fleet EV target

We also consider that the Victorian Government can play an important leadership role in the uptake of EVs through the establishment of a Government fleet EV target. Around 4% of new cars sold each year are purchased for Government fleets, equating to around 40,000 vehicles per year. By mandating that new fleet purchases include EVs, the Victorian Government could substantially stimulate EV uptake in Australia. As well as socialising consumer appetite towards EVs, it would also create a second-hand market for

⁴ Cited in ClimateWorks Australia and Electric Vehicle Council, The State of Electric Vehicles in Australia (June 2017), Available at <http://electricvehiclecouncil.com.au/wp-content/uploads/2015/05/State-of-EVs-in-Australia-2017.compressed.pdf>.



depreciated EVs that would provide an additional avenue for private ownership. In the ACT, which has the highest EV market share of any State or Territory, the ACT Government requires government fleet managers to consider the environmental impact of a car in addition to functionality and cost. Nevertheless, the need for substantial infrastructure planning and deployment to support EV uptake necessitates a deviation from a pure environmental performance target, based on the fleet's CO₂ tailpipe emissions. Accordingly, we consider that a government fleet target should be a quantitative target over a specified time period.

3. Stamp duty and registration concessions

AGL would urge the Victorian Government to consider additional discounts on registration and stamp duty in recognition of the broader societal benefits and 'first-mover' costs for buyers of EVs. Such concession arrangements could build upon the \$100 Hybrid Vehicle Registration discount currently offered by the Victorian Government. We consider the ACT Government's provision of the largest stamp duty and registration discount to be a substantial contributor to its high rates of EV take up. The concessions could be intelligently designed to ensure that their revenue impact is contained. For example, a sunset provision could be built into any concession framework as the EV market transitions to the mainstream and battery cost reduction brings the purchase price of EV closer to parity with ICEVs.

4. High Occupancy Vehicle (HOV) lane access

We consider that this non-financial incentive has the potential to strongly influence EV adoption based on the overlap between the Eastern Freeway and CSIRO analysis that highlights the increased propensity for EV adoption in regions surrounding this commuter corridor. HOV lane access presents a low-cost solution to Government. As in the case of concessions, a sunset provision could also be applied to HOV lane access for EV, potentially aligned to the scaling of Automated Vehicle (AV) technology. At such a time, these lanes could be reallocated to AV functions such as vehicle platooning.

5. Charging infrastructure planning and support

Finally, the Victorian Government could play an integral role in addressing charging options outside of the home through the planning and deployment of charging infrastructure. We note that the Federal Chamber of Automotive Industries has recently clarified the choice of EV plug standards and committed to harmonised EV charging standards.⁵ Moreover, the anticipated introduction of longer-range EVs over the next 18 months makes planning and deployment a timely focus for the Victorian Government.

Concerted State policy on EV infrastructure planning and deployment would greatly assist in addressing (perceived) EV range limitations and extended 'zero emissions' vehicle operation. Although Victoria has the highest number of charging stations in Australia, we note that these stations are currently concentrated in metropolitan areas. We consider that there is scope for the Victorian Government to develop more robust planning frameworks than extend EV range across the entire State. We note with interest initiatives such as the Queensland Government's work with Energy Queensland to roll out a network of fast chargers that will allow EVs to travel 1800 km between Cairns and the Gold Coast.⁶

We would also urge the Victorian Government to implement a coordinated cross-government approach to charging infrastructure planning that also includes consideration of vehicle automation. In our view, the

⁵ See Federal Chamber of Automotive Industries, 'FCAI Technical Statement on EV Charging Standards for Public Recharging Infrastructure' (18 September 2017), Available at <https://www.fcai.com.au/news/publication/index/year/all/month/all/publication/99>

⁶ See Queensland Government, 'Queensland Electric Super Highway', Available at <https://www.qld.gov.au/transport/projects/electricvehicles/super-highway>



uptake of EVs and vehicle automation are inextricably linked. The wider societal benefits resulting from advanced mobility systems will be brought forward through the adoption of policies that supports vehicle electrification. Autonomous vehicle technologies are advancing at a rapid rate. By acting as an enabler for improved asset utilisation, they favour lower operating cost vehicle powertrains. Australian cities, characterised by high household incomes and suburban sprawl, are forecast to adopt autonomous vehicles ahead of global averages⁷. Measures which promote EV adoption will have a synergistic effect for the adoption of autonomous vehicles, improving road safety and reducing transport costs for households. AGL recognises this relationship through its involvement in the Australian Driverless Vehicle Initiative⁸, and is working with a variety of stakeholders to advance connected electric autonomous vehicle adoption.

The applicability of electric vehicles in public transport bus fleets and public sector fleets

In our view, the economic profile of EVs in public transport fleets continues to improve and will be optimised when deployed at network scale based on the 'opportunity charging' model. In early 2017, AGL's Electric Vehicle Lead supervised a Master of Energy Systems student project which compared electric and diesel buses in the Australian context. The findings of that study revealed that the extra cost of an electric bus would be paid back within 3 years (based on current price points and forecasts). Moreover, as battery prices continue to fall, the electric bus advantage will continue to grow.

Further analysis and consultation with tech vendors and bus operators suggests that the electric bus advantage will be greatest when deployed at the network scale based on the "opportunity charging" model. Opportunity charging nominally uses battery-buffered high-powered fast-charging stations to regularly charge the vehicles along their service route during passenger on/off-boarding. The advantages of the opportunity charging model include that it:

- allows downsizing of the bus batteries and conservation of the bus payload for passengers;
- enables more efficient asset utilisation by avoiding over-capitalizing on the bus battery, shifting investment to better utilized charging infrastructure; and
- provides a distributed network of batteries that could potentially be used to support the grid.

Indeed, the uptake of EVs in public transport fleets would provide benefits not only to the transport sector but also to the electricity sector as transport system asset owners are empowered to participate in the electricity distribution market.

The electricity grid is undergoing a rapid transformation, driven in part by customers' increasing desire to exert more control over their energy supply arrangements. Smart appliances, smart inverters and intelligent control systems are also entering the market. In combination with solar PV and battery systems, these technologies enable the creation of small-scale electricity ecosystems 'behind-the-meter' - that is, on the customer side of the meter, with a single connection to the grid. These systems and their interaction with the electricity distribution network can be closely monitored and intelligently controlled. They can be dispatched individually or as a fleet to respond to changing network conditions or conditions in the wholesale market.

⁷ Bloomberg New Energy Finance and McKinsey & Company, *An Integrated Perspective on the Future of Mobility*, October 2016, Available at https://www.bbhub.io/bnef/sites/4/2016/10/BNEF_McKinsey_The-Future-of-Mobility_11-10-16.pdf .

⁸ Australian Driverless Vehicle Initiative, *About the Australian Driverless Vehicle Initiative*, Available at <http://advi.org.au/australia/> .



These developments mean that utilisation of the grid is changing dramatically. Customers increasingly see the grid as much as a means to export, as well as import, electricity. Customers are also becoming interested in understanding how they can share energy locally (for example, through a peer-to-peer trading program) or participate in wholesale or network services markets. Thus, the grid is increasingly becoming the gateway to a range of other markets and additional value streams for customers. At the same time, these developments are presenting new challenges for the safe and reliable management of distribution networks. Distribution networks were originally designed for one-way flows and expenditure may be required to accommodate the increasingly bi-directional nature of energy flows. If not managed, reverse flows can cause voltage, protection and thermal network problems.

AGL considers that EV charging has the potential to help protect and enhance the reliability and affordability of Australia's electricity. For example, a car with a 20 kWh battery stores as much electricity as the average Australian home consumes in a day.⁹ Considered as a pooled resource, the growing number of EV batteries could provide valuable grid services, from demand response and voltage regulation to distribution-level services, without compromising driving experience or capability.¹⁰ BMW recently demonstrated this capability in partnership with a Californian electricity utility.¹¹

AGL envisages significant potential in an electrified public transport asset base that could be drawn to augment the electricity distribution market. Indeed, this development would also present substantial commercial benefit to assets owners who would be empowered to participate in the wholesale or network services markets. AGL's New Energy business is developing new products and services with a view to competing in this emerging market, where the economics improve as EV adoption scales.

Whilst some analysis has raised concern that additional cycling to discharge EV batteries to the power grid could detrimentally impact upon battery performance, more recent research from Uddin, Dubarry and Glick¹² suggests that a smart grid, established through two-way controllers and smart meters could overcome this issue, by intelligently setting limits on the amount of energy traded, based on prognostics. As Uddin, Dubarry and Glick conclude, the potential growth of vehicle-to-grid will therefore largely depend upon installing appropriate grid improvements and platforms and establishing a market for the aggregation and trading in grid services.

Options for supporting the manufacture and assembly of electric vehicles in Victoria, including transition of workers and suppliers affected by the closure of vehicle manufacturing in Victoria

In AGL's view, the widespread uptake of EVs present the best opportunities for job creation in Australia, predominantly in the energy sector. Whilst Australia is currently on a trajectory towards complete oil import

⁹ Australian Bureau of Statistics, Household Energy Consumption Survey, Australia: Summary of Results, 2012, 24 September 2013, Available at <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4670.0main+features100052012>

¹⁰ Rocky Mountain Institute Electric Vehicles as Distributed Energy Resources, June 2016, Available at https://www.rmi.org/wpcontent/uploads/2017/04/RMI_Electric_Vehicles_as_DERs_Final_V2.pdf

¹¹ BMW & PG&E, BMW i ChargeForward: PG&E's Electric Vehicle Smart Charging Pilot, June 2017, Available at <http://www.pgecurrents.com/wp-content/uploads/2017/06/PGE-BMW-iChargeForward-Final-Report.pdf>

¹² Kotub Uddin, Matthieu Dubarry and Mark B Glick, 'The viability of vehicle-to-grid operations from a battery technology and policy perspective' (2018) 113 *Energy Policy* 342.



dependency,¹³ the entire electricity supply-chain in Australia is domestic.¹⁴ In 2015-16, 11,150 people were directly employed in renewable energy activities in Australia.¹⁵ The local economy of regions such as the Latrobe Valley in Victoria is inextricably linked to the electricity sector. Supporting the shift toward vehicle electrification will increase demand for electricity, greatly enhancing employment opportunities for Australians.

As AGL's own experience illustrates, the emerging EV market continues to provide new opportunities for business development and job creation. Our New Energy division that is focused on the EV market includes staff with previous experience in the automotive industry. We continue to partner with a range of businesses in Victoria to develop innovative projects that provide new solutions for the EV market.¹⁶ Moreover, direct investment in related products and services include electrical subcontracting, renewable energy generation, carbon offsetting and management consulting.

¹³ ABC News, Defence White Paper 2016: Dependency on fuel imports 'a risk' amid South China Sea tensions, 24 February 2016, Available at <http://www.abc.net.au/news/2016-02-24/fuel-imports-a-risk-amid-south-china-sea-tensions-nrma-advisor/7149648>.

¹⁴ Australian Energy Regulator, State of the Energy Market, May 2017, Available at <https://www.aer.gov.au/system/files/AER%20State%20of%20the%20energy%20market%202017%20-%20A4.pdf>.

¹⁵ Australian Bureau of Statistics, Employment in Renewable Energy Activities, Australia, 2015-16, 17 March, 2017, Available at <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4631.0>.

¹⁶ Our business partners include EV market participants such as Jetcharge/ Chargefox, ChargePoint, Lumen, Delta, Reelectrify, Automotive OEMs including BMW, Renault, Ford, Toyota, Holden as well as distribution network businesses including CitiPower-Powercor, Ausnet Services, United Energy and Jemena.