INFRASTRUCTURE VICTORIA

John Alexander OAM, MP
c/- Secretariat
Standing Committee on Infrastructure, Transport and Cities
PO Box 6021
Parliament House
CANBERRA ACT 2600

Dear Mr Alexander

Inquiry into automated mass transit

Infrastructure Victoria is pleased to provide this submission to the Standing Committee on Infrastructure, Transport and Cities' Inquiry into automated mass transit.

Infrastructure Victoria is an independent advisory body operating under the *Infrastructure Victoria Act 2015*. It was established to take a long-term, evidence-based view of infrastructure planning and raise the level of community debate about infrastructure provision.

Advice on Automated and Zero Emissions Vehicles Infrastructure

In 2017, the Victorian Government asked Infrastructure Victoria to provide advice on what infrastructure might be required to enable both highly automated and zero emissions vehicles in the state. Our advice was delivered to the Government in October 2018, and is available on the Infrastructure Victoria website: www.infrastructurevictoria.com.au/AVadvice .

Our research found that automated and zero emission vehicles could significantly reduce traffic congestion and greenhouse gas emissions, dramatically improve access to services, avoid car accidents caused by human error and add almost $15 billion per year to the economy.

Our advice and 17 key recommendations seek to help navigate through the inherent challenges and uncertainties that new technology brings, while maximising the benefits and minimising the risks associated with its introduction. While Victoria is well placed for the roll out of new vehicles, significant investment will be required to fully maximise their potential. This includes:

- Up to $1.7 billion to upgrade mobile networks
- Around $250 million for improved line markings on roads
- At least $2.2 billion for energy network upgrades

While significant, these investments should be viewed in the context of the potential benefits of automated and zero emissions vehicles.

There are many other recommendations where government can take action right now to get ready for new vehicle technologies. These include integrating on-demand and mobility as a service offerings into the public transport mix, sharing transport data in real time and allowing flexibility in the planning regime to make it easier for people to charge their electric vehicles. All could have an immediate impact and deliver benefits, regardless of how new vehicle technologies roll out.

To inform our advice, Infrastructure Victoria commissioned modelling and analysis across the following ten topic areas:

- Transport modelling

- Land use modelling
- Socioeconomic modelling
- Urban design
- Financial analysis
- International markets
- Transport engineering
- Energy modelling
- ICT infrastructure
- Environment and population health

The advice was guided by seven possible future scenarios that helped us to test some of the uncertainties surrounding automated and zero emissions vehicles, including a future where all vehicles are driverless, zero emissions and shared, right through to a future where driverless and zero emissions vehicles fail to take off and our vehicle mix remains very similar.

The following documents are attached with this submission:

- *Advice on automated and zero emissions vehicles infrastructure* report, including our final advice and recommendations to the Victorian Government.
- The full suite of technical reports and analysis covering the ten topic areas listed above.
- *Future scenarios* report, which describes the seven future scenarios upon which the analysis was based.

With regards to the terms of reference for this Inquiry, our advice and evidence directly examined both road mass transit and point-to-point transport using automated vehicles, as well as touching on state and Commonwealth roles and responsibilities in the development of these technologies. We did not, however, specifically consider the technical requirements to automate trains or trams in our study as the scope of our advice related specifically to the infrastructure required to enable road-based vehicles.

The following aspects of our advice are of particular relevance to this Inquiry and, in some cases, the evidence has been prepared for the first and/or only time in an Australian context.

Transport modelling – showing integration of public and private transport

The transport modelling we commissioned for the advice considered the impacts and potential outcomes of automated vehicles, vehicles on demand and zero emissions vehicles using the Melbourne Activity Based Model. To assess the range of different scenarios we modelled the impacts on road congestion, the size and efficiency of the vehicle fleet, physical activity and access to activities and services.

We also modelled the impacts of new vehicle technologies on the transport network as a whole, considering both public and private transport. Under a future with automated on-demand vehicles, our findings point to a blurring of the traditional distinction between public and private transport as automated vehicles help supplement or fill gaps in the public transport network and improve access to services.

For example, we modelled a 'Fleet Street' future scenario where, in 2046, the entire vehicle fleet would be electric, automated and on-demand, with a cost per trip of approximately 30% of the cost of a current on-demand vehicle trip (such as an Uber). Under this scenario, the total number of vehicles in Victoria is projected to fall by 93% to just 260,000. This is the result of shared vehicles being utilised for 36% of the day (compared with the base case where traditional vehicles are used just 4.8% of the day). Total vehicle kilometres travelled in this scenario are projected to fall by 15% due to a mode shift from cars to public transport as a result of the higher perceived cost of using on-demand vehicles. In total, 72% of trips were made by car versus 28% by public transport.

In contrast, we also modelled a 'Private Drive' future scenario where all vehicles are privately owned, electric and automated. In this scenario, private cars became even more ubiquitous, with 7% more

cars than in the base case. Public transport use across all modes declined, falling from 19% of all trips in the base case to 14%. Buses were forecast to see the most significant fall in use (32%), but tram (28%) and train (22%) use also significantly declined. Despite this, overall public transport trips increased significantly compared to 2015 as a result of population growth, with nearly 3.7 million trips forecast in 2046 versus 1.7 million trips in 2015.

In addition to the seven intentionally extreme future scenarios that were modelled (which are detailed in our attached *Future Scenarios r*eport), we also developed a 'more likely future' in which we considered a mix of vehicle types and ownership models that reflect the differing needs and preferences of users in different places. From modelling this future we found that road congestion could fall considerably (average delays are projected at 90% less than in the base case) and the size of the vehicle fleet could be significantly smaller than the base case (30% less than base case). This future is also forecast to lead to an increase in public transport use across all modes. Public transport use is forecast to account for 22% of all motorised trips, compared to 19% in the base case. Buses and trams in particular are forecast to experience the strongest growth in demand. This is likely due to public transport use becoming more common for more trip types, other than travel to work, and the fact that buses and trams service a more diverse range of destinations.

For more detail on our findings, see the *Advice on automated and zero emissions vehicles infrastructure* and for detailed information on the transport modelling refer to KPMG's *Automated and zero emissions vehicles infrastructure advice – Transport modelling* report.

On-demand and mobility as a service increasingly important for public transport

On-demand public transport and mobility as a service (MaaS) solutions could make significant improvements to how we travel. Through our research we found that on-demand, MaaS and integrated planning and payment for multi-modal trips are likely to supplement existing public transport services and pave the way for introducing on-demand automated vehicles. We recommended incorporating on-demand and MaaS into the public transport mix in preparation for automation, through the following actions:

a. Ensuring new contracts for public transport operators allow for changes to accommodate new market models.
b. Plan for opportunities to develop open payment, ticketing, validation, third-party purchasing platform(s) and open/integrated barrier systems for public transport.
c. Plan for changes to public transport hubs to accommodate pick-up and drop-off facilities, and other mobility options like active transport to encourage multi-modal trips.
d. Review existing contracts and public transport franchise agreements, including fare structure, for opportunities to integrate automated vehicles into service planning.
e. Transport services delivered directly by the government (such as community transport) should plan for potential changes to accommodate new market tools (for example, apps and on-demand services) and automated vehicles.
f. Assess potential for automated vehicles to support demand-responsive transport services.
g. Consider whether there is a role for government to incentivise or procure services from automated fleet operators to operate in regional and rural areas, if the market fails to do so.
h. Consider how automated vehicles could be used to enhance public transport, especially to support people with mobility impairments and those currently on concession arrangements.

Again, our research and recommendations point to a blurring of the distinction between public and private transport. In a future with automated vehicles, having simple and efficient interactions between private operators and public transport will be critical to unlock accessibility and community benefits.

Energy modelling, including generation and hydrogen

The energy modelling we commissioned considered the impacts to the Victorian electricity system resulting from the co-emergence of zero emissions vehicles (either battery electric vehicles and hydrogen fuel cell vehicles) and automated vehicles. The results showed that if zero emissions vehicles replace conventional vehicles, there will be substantial impacts for both Victorian generation capacity and transmission and distribution networks. If all vehicles were battery electric, electricity

consumption would roughly double and generation upgrades could cost at least $2.2 billion. If all vehicles were fuelled by zero emissions hydrogen, electricity consumption would increase by almost 150%. However, it is important to note that this was based on a scenario with 100% hydrogen vehicle take-up, which is unlikely. If hydrogen were used in certain specific applications, such as to fuel heavy vehicles and buses, the impact would be far lower. Buses and other heavy vehicles could lend themselves to a potential model of industrial-scale hydrogen generation and use, as current battery technologies are generally considered too heavy to be a commercially viable solution for some payload-sensitive uses.

The actual demand for electricity generation and distribution will depend upon a wide range of factors, including potential incentives to charge outside of peak times and the composition of the vehicle fleet. For example, under our 'Fleet Street' scenario where all vehicles are electric, on-demand and automated, charging would be likely to occur outside of peak travel (and energy) time periods. However, fleet charging could have a significant localised impact on the electricity distribution network if large numbers of vehicles charge at fleet depots. In contrast, under the 'Private Drive' scenario, where all vehicles are electric, privately-owned and automated, peak energy demand could be worsened if all drivers plug in to charge when they get home from work, unless there are centralised controls, or incentives or other mechanisms to encourage off-peak charging.

For more details, see KPMG's *Automated and zero emission vehicle infrastructure advice – Energy impacts modelling* report.

Driving energy and transport closer together

While the significant increases in electricity use shown through our modelling were largely caused by zero emissions rather than automated vehicle uptake, it has direct implications for automated vehicle planning. Based on current trends and the way both automated and electric vehicle technologies are advancing, it is highly likely that the driverless vehicles of tomorrow will be zero emissions. If these significant increases in electricity consumption eventuate, energy and transport policy and planning will need to be coordinated more than ever before.

Many of our recommendations rely on monitoring trends and closely watching the market for technology developments in automated and zero emissions vehicles. To plan appropriately, energy departments will need clear visibility of transport technology developments and future plans for the transport network. Similarly, transport will need to work closely with energy to understand how our energy supply could impact an electric or hydrogen vehicle fleet.

Role for the Commonwealth in enabling automated vehicles

While our advice was to the Victorian Government, our recommendations touched on some key areas where the Commonwealth Government would need to play a role, particularly in the areas of ICT and automated vehicle standards and regulations.

Our recommendation to 'lead and collaborate' focused on continuing to participation in the development of national principles, standards and regulations for automated vehicles. This includes the ongoing Commonwealth Government work on cyber security, the National Transport Commission's work on regulations for automated driving systems and Austroads' work on line marking and signage to support the introduction of automated vehicles.

In relation to ICT, continuing the Mobile Black Spot Program with a focus on improving cellular data coverage for automated vehicles in rural and regional areas was another area we highlighted where the Commonwealth has a strong role to play.

Greater cooperation between state and Commonwealth governments is also needed to implement the appropriate energy and emissions policies and settings, including vehicle emissions standards, to enable zero emissions vehicles.

Summary

We encourage the Standing Committee on Infrastructure, Transport and Cities to review the work completed in this area to date by Infrastructure Victoria to help inform its understanding of what might be required to enable the introduction of highly automated vehicles. The evidence base we developed, including our transport and energy modelling, now forms the most comprehensive body of evidence in Australia, if not the world. In particular, we have been able to predict the impacts of automated private and shared fleet vehicles on the entire transport network, including public transport. We have demonstrated the importance of energy and transport policy working more closely together to ensure we reap the benefits of automated vehicles.

Thank you for the consideration of this submission. We would be pleased to meet with you to further discuss the submission and our research. If you would like any further information, please contact Dr Allison Stewart, Project Director.

Yours sincerely

Michel Masson
Chief Executive Officer

06 / 12 / 2018