MUNICIPAL ASSOCIATION OF VICTORIA

Infrastructure Victoria – Advice on Automated And Zero Emissions Vehicle Infrastructure

Contents

Background

Infrastructure Victoria (IV) published its *Advice on Automated and Zero Emissions Vehicles Infrastructure* for the State Government in October 2018.

The report builds on earlier reports, including the Evidence Base Report (August 2018) to which the MAV developed a submission and circulated a member briefing.

In total, IV has made 17 recommendations which it has tested against seven possible scenarios for the future, as outlined in their Evidence Base Report. The advice suggests the investment required to fully maximise the potential of automated (AV) and zero emissions (EV) vehicles is significant, but should be viewed within the context of the potential benefits of these vehicles. The advice report also states that while many of the benefits of AV and EV may be realised without government intervention, there are important actions that Victorian State and local governments should take now, and in the future to enable their deployment.

While some actions are related to investing in or building new infrastructure, other considerations such as regulatory settings, standards, incentives and information provision are all levers available to government to steer the emergence of these vehicles technologies toward the best possible outcome. Keeping in mind the potential benefits, risks and uncertainties about the future, IV ultimate advice to the State Government recommends some tangible actions that government should take to prepare for AV and EV in Victoria.

IV Recommendations

The recommendations made by IV fall into the six broad thematic categories of transport, ICT infrastructure and data, energy, planning, waste and monitoring and coordination:

Transport

1. ***Update Victoria's roads* – update road maintenance and monitoring to take into account the needs of AV, including changes to lines and signs, roadworks, and road maintenance throughout Victoria, and provision of reliable and timely data to connected and AV.** If Victoria wishes to enable AV, standardised approaches to lines, signs and roadworks would assist. Any changes should be suitable for both AV and non-AV for the foreseeable future. Even with the current significant uncertainties in AV requirements, **do now actions** include:

   - survey or audit road infrastructure to evaluate suitability for AV e.g. identify road quality challenges or ensure pedestrian right of way is clear for vehicles and pedestrians;
   - If significant changes are required to lines, signage, or road quality to enable AV, review funding arrangements for road maintenance and upgrades by local authorities;
   - evaluate the impact of upgrading/changing road network features e.g. sign consistency, machine readability and placement, line quality on the basis of recommendations expected from Austroads as part of its Connected and AV projects in 2018 and 2019.

   When there is more certainly around AV requirements, a **further set of actions** should be delivered including:

- develop clear guidance on road maintenance approaches, integrating needs of AV and conventionally-driven vehicles, especially where changes would benefit both, such as avoiding competing lane markings;
- establish a single source of trusted Victorian Government transport data to advise of planned or unplanned maintenance and road changes;
- explore physical and digital tech solutions to communicate both planned and unplanned maintenance to connected vehicles.

Key considerations – based on a conservative assumption of 100% of Victoria's non-declared roads (suitable for general traffic) requiring new or improved single, line marking, the one-off cost of this is likely to be **$250 million**, excluding additional costs such as traffic management.

2. ***<u>Rethink road space</u> – incorporate AV and EV vehicles into a transparent road space allocation framework in Victoria, building on existing transport system and place-based planning principles.*** IV's 30-year infrastructure strategy and Five-year focus report have previously highlighted the opportunities to review and accelerate road space allocation changes. However, AV and EV are likely to have implications that have not previously been incorporated in transport system and place-based planning. AV could change the way people access transport hubs, reshape long-term parking to pick-up and drop-off areas, and allow for a reallocation of road space for walking, cycling, urban greening and place-making to an even greater extent.

   Do now actions include a review of current legislation and traffic management guidelines to identify and remove barriers to future vehicle technologies e.g. legislation that does not currently allow private vehicles in drop-off zones should be amended. Proactively increase pick-up and drop-off areas in and around public transport stations, activity centres and destinations.

   Once connected AV are ready for optimisation, a **further set of actions** should be delivered including:

   - publish an updated road space allocation framework that includes AV and EV. This should include consideration of place-making optimal traffic flow, variable traffic prioritisation, flexible road space, allocation of sufficient space for pedestrians, trees and roadside amenity, parking versus pick-up and drop-off areas, and principles for AV to interact with vulnerable road users;

   - consider the longer-term potential for changes to physical or virtual traffic calming, including potential truncation or closures of streets to through traffic;

   - health agencies should monitor health benefits and risks arising from the increased or reduced use of active transport under different AV uptake scenarios.

   Key considerations – evidence suggests there is significant opportunity to replan streetscapes with the emergence of AV and EV. In urban areas, adopting lane widths that are closer to actual vehicle widths could be possible with areas that have complete adoption of AV. This could deliver substantial place benefits through reduced road space allocation to vehicles, reducing the space requirement for roads overall. The need for parking space is likely to reduce significantly, which will have an impact on council revenue. Pick-up and drop-off requirements and kerbside access are likely to increase, possibly requiring kerbside management and practices to be introduced where private passenger vehicles, service vehicles and road-based public transport compete. There is opportunity to define pick-up and drop-off areas at precinct or sub-precinct levels instead of disaggregated levels.

3. ***<u>Future-proof projects</u> – develop specific guidance for business cases for transport projects to account for the risks, opportunities and uncertainties posed by AV and EV.*** While there is some uncertainty around the potential risks and benefits of AV and EV, there is sufficient evidence to suggest they will have a significant impact on the transport system in future. Current and future infrastructure projects would benefit from clear guidance on how to plan for these potential changes.

   Do now actions include incorporating real options to defer, stage, modify or cancel projects due to technology change explicitly into project contracting and delivery arrangements, where appropriate. Also consider low marginal cost investments to allow for future flexibility. All major transport projects that are planned for but not yet in construction should be reviewed to ensure the strategic fit and options analysis address the uncertainty posed by AV. Once the potential impacts of AV and EV is clearer, a **further set of actions** should be delivered including:

   - review and update approach to transport modelling underpinning project development and evaluation;
   - assess strategic investment need, appraisal periods and range of project benefits to identify how different futures could change these outcomes.

4. ***<u>Plan for transport</u> - develop a transport plan that includes potential impacts of AV and EV, to enable priority transport investments and reforms to be identified and to support the development of business cases that address transport needs.*** A transport plan should include scenarios testing and support adaptive planning in the face of the potential for significant change due to new technologies and business models.

5. ***<u>Manage before you build</u> – ensure Victoria's transport planning considers how non-infrastructure solutions, including transport network pricing, can provide a policy response to address the potential impacts of AV and EV.*** This should include consideration of both benefits (such as network performance) and risks (such as empty running) posed by the advent of AV, as well as the potential for induced trips due to reduced cost of vehicle running.

   Key considerations – there are significant uncertainties related to AV and EV that need to be closely monitored to understand the ways in which benefits can be best realised, and risks can be best mitigated. Some of the most important uncertainties highlighted in IV's work include:

   - in AV scenarios, empty running vehicles (unoccupied vehicles travelling between trips or returning home after dropping an occupant at their destination) generates additional congestion on the network. The congestion dampening effects of parking fees are lost;
   - in the private drive scenario, the addition of empty running generates an additional 46,000 hours of delay in the inner urban areas of Melbourne, compared to IV's test of the same scenario with empty running disabled;
   - IV has previously highlighted the importance of transport network pricing to manage congestion in the 30-year infrastructure strategy. IV is continuing work to identify a transport network pricing approach in Victoria.

6. ***<u>Integrate new transport options</u> – incorporate new services like on-demand and mobility as services into the public transport mix, in preparation for AV.*** On-demand, mobility as a service, and integrated planning and payment for multi-modal trips are likely to supplement existing public transport services. Many of these functions are also considered to be necessary precursors to introducing shared automated fleets into new markets.

Do now actions include planning 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.

ICT Infrastructure and Data

7. ***<u>Boost ICT Infrastructure</u> - promote investment in ICT infrastructure where there is a safety and/or optimisation requirement for AV that the market is unable to satisfy commercially.***

   Do now actions include the identification of priority corridors for cellular data coverage requirements, based on need and demand, and monitor the market's delivery of coverage in these areas as AV is adopted. Leverage the Victorian Government's existing communication infrastructure base and purchasing power to influence the Australian Government's activity – such as the mobile black spot programme to improve cellular data coverage in rural and regional areas. Monitor the need for investment in roadside ICT infrastructure as technology develops.

8. ***<u>Share more data</u> – expand the availability of open, real-time information on government-owned transport system data and establish principles for data sharing between government and commercial transport service providers.*** Agreement on data sharing between government and companies operating AV will help to promote transport system efficiency, fair market competition, integration, consistency, and user privacy.

9. ***<u>Integrate transport management</u> – develop integrated transport management to enable better real-time coordination of the system across all transport modes, including network management of connected AV.*** Existing road and public transport network management systems will need to be supported in the short to medium term. A progressive approach to upgrades as and when existing separate management centres become due for major renewal is likely to be feasible. Integration with the State emergency management centre and relevant operational management centres in other sectors should also be considered.

   Achieving the potential performance benefits of AV will almost certainly require vehicles to be connected to each other and/or to certain types of infrastructure, with full benefits likely to depend on an integrated approach to transport management to optimise traffic flow in busy areas.

   Do now actions include expanding the availability of open, real-time information on government-owned transport data and establish principles for data sharing from AV driving systems manufacturers.

Energy

10. ***<u>Transition to zero emissions</u> – establish a supportive environment for the Victorian fleet to transition to zero emissions technologies.*** There are significant health, amenity and emissions benefits associated with zero emission vehicles (with or without automation). The transition of the Victorian fleet to EV technologies needs to be balanced with adequate planning for charging and source energy generation.

    Do now actions include the development of design standards to govern the design and placement of EV charging infrastructure in public areas and establishing principles for smart charging and integrated payment systems in all charging infrastructure in Victoria to ensure interoperability between various charging infrastructure providers.

    Once the proportion of AV/EV vehicles in fleet is increasing significantly, a **further set of actions** should be delivered including:

    - only allocate public land to charging infrastructure that meets the Federal Chamber of Automotive Industries standards on harmonising charging equipment;
    - invest in public charging infrastructure only in areas where there is evidence of market failure and a compelling reason for government to intervene and/or where interoperability is a concern.

    Key considerations – IV state that EV, including hydrogen fuel cell vehicles, are also likely to generate much less noise than traditional petrol or diesel vehicles, particularly at lower speeds. This provides opportunities for increased freight services in urban areas. This could also be important to ensure the ongoing social licence and capacity of the Port of Melbourne.

11. ***<u>Plan for energy changes</u> – enable the energy sector to respond to the emergence of zero emissions vehicles.*** Rapid and widespread uptake of EV may put significant pressure on the energy system. Measures intended to promote the effectiveness and stability of the energy market generally will become even more important in such a scenario. Action may need to be taken to ensure that the energy market can optimally respond to substantial additional demand while continuing to meet reliability and affordability requirements and emissions reductions targets in the face of the withdrawal of coal-fired energy generation.

    If the market is not equipped to effectively absorb increased demand from zero emission vehicles, the stability of the system as a whole may be threatened, potentially resulting in steeply rising prices, falling reliability and failure to meet emissions reduction targets.

    Do now actions include the Australian Government implement stricter vehicle emissions targets in line with advice from the Climate Change Authority and enable further investment in transmission networks associated with the development of renewable energy sources. Ensure that the regulatory frameworks governing network investment are reviewed to review they will facilitate investment in the distribution network to support the uptake of EV.

12. ***<u>Encourage demand management</u> – allow for incentives or other mechanisms to shift energy demand from peak periods.*** Strategies to reduce electricity demand peaks can reduce the additional energy infrastructure required in Victoria. **Do now actions** include review state-based regulatory settings to allow electricity providers to set demand-variable rates and demand management strategies.

Planning

13. ***<u>Rethink planning values</u> – re-examine planning values, assumptions and opportunities related to where people may want to live and work in a future with AV and how government should constrain or support these preferences.*** AV may change much of the current thinking about the costs and benefits of vehicle use in a variety of planning settings. Without re-evaluating some of these underlying assumptions, we may not achieve the full benefits of AV, and may in some cases create restrictions that limit their usefulness.

    Do now actions include consider changes to minimum car parking requirements in the planning scheme within the broader context of policy objectives for the transport system, with AV and EV. This could build on recent amendments to the Victorian Planning Provisions that reduce car parking requirements for new uses of existing builders in commercial areas and for land within walking distance of public transport.

    Once connected, AV are ready for optimisation, a **further set of actions** should be delivered including:

    - using the evidence available on potential impacts of AV/EV, re-evaluate the costs and benefits associated with car use in different planning settings to develop new guidance for strategic planning for urban and regional areas of Victoria.

14. ***<u>Create planning flexibility</u> – for property owners and local authorities to adapt to future changes due to AV and EV.***

    Do now actions include allowing flexibility in statutory planning for car parking infrastructure and design to allow for retrofits, including electricity, gas, water and other services to ensure infrastructure can adapt as needs change. And the introduction of flexible kerb space in high density areas, driven by real-time date to intelligently adjust permitted kerbside uses at different times, including the potential to apply pricing to kerbside use, to ensure that space both meets demand and achieves **local transport and land use goals**.

    Once there has been the identification of potential impacts of AV/EV in Victoria, a **further set of actions** should be delivered including:

    - amend policy settings for establishing private charging infrastructure on private and public land, such as allowing metered electricity to be installed outside of titled property (for example, a charging point on a nature strip) to enable easy and equitable access to charging infrastructure.

    Key considerations – there is already a significant underutilisation of car parking spaces which, when combined with the ongoing trend of parking added to newly built apartments, may result in large amounts of redundant land. IV found this would be especially relevant with the emergence of on-demand vehicle use and declining personal car ownership.

    Busy urban streets and metropolitan and regional CBDs could benefit from new approaches to flexible kerbside management that preserve accessibility for AV while maintaining and enhancing neighbourhood character and delivering improvements for pedestrians and other road users.

Waste

15. ***<u>Prepare for new waste</u> – implement changes to the Statewide waste and resource recovery infrastructure plan and Recycling industry strategic plan to incorporate impacts of the emergence of AV and EV.*** AV/EV are forecast to introduce new forms of waste into the waste management system and dramatically increase the amount of e-waste being disposed of.

    Once there is an actual need to dispose of significant numbers of AV/EV, **do now actions** include analysing the current and future capacity of waste infrastructure to accommodate new waste streams and develop a specific waste management plan for AV/EV; support effective recycling of EV waste streams and develop effective methods for remanufacturing, re-use and recycling to reduce environmental impacts.

Monitoring and Coordination

16. ***<u>Keep track of trends</u> - Initiate monitoring and annual reporting of AV and EV developments, benefits and risks, focusing on uptake, performance, safety, vehicle connectivity, road water, road structures and public transport usage changes.*** Once preparations are underway for manufacturers to bring high automated vehicles to Victoria, **do now actions** include TfV monitoring accident statistics in local, national and international areas.

    VicRoads will:
    - monitor the efficiency of AV fleets, in real-world applications and on different road types, including what connectivity and/or centralised routing control is required to achieve efficiencies;
    - survey or audit road infrastructure to evaluate suitability for AV e.g. identify road quality challenges and ensure pedestrian right of way is clear for vehicles and pedestrians;
    - monitor evidence of uneven road wear or other pavement impacts;
    - EPA will expand its air quality monitoring network to monitor the impact of EV as part of developing the Victorian Air Quality Strategy;
    - DELWP will monitor the deployment of charging infrastructure by the private sector to determine whether demand is being met.

    Key considerations – AV travelling more uniformly on roads, or with more concentrated loads allowing less time for pavements to recover between vehicles, may increase road wear.

17. ***<u>Lead and collaborate</u> – continue to participate in the development of national and international principles, standards and regulations for AV.*** Examples include the ongoing Australian Government work on cyber security requirements, the NTC work on regulations for AV driving systems, and Austroads work on lines and signage to support the introduction of AV/EV.

Key Considerations for Councils

The advice given to the State Government by Infrastructure Victoria has potential implications for council's roles and responsibilities, and a number of the recommendations have funding implications.

The recommendations within the **transport theme** are particularly relevant to councils considering the headline cost of recommendation one is that it will cost $250 million (just for line markings) to bring Victorian roads up to an acceptable standard for AV to safely operate.

The MAV submission to the IV Evidence Base consultation in August 2018 highlighted the fact that many of the potential infrastructure implications of AV will fall to local councils to respond to, in particular road maintenance, upgrades to road lines and signage. IV research found that clear line markings and road signs are likely to be a key enabler of AV. The task of marking and maintaining lines to the required standard on all local roads would be unattainable for local authorities in the current fiscal environment.

Councils are individually responsible for the inspection, maintenance and upgrading of roads that are not State or privately owned. Section 40(20) of Victoria's Road Management Act specifically provides that there is no duty on road authorities to upgrade a road, or to maintain a road to a higher standard than the standard to which the road is constructed. There is good reason for this provision, given the limited resources of councils in comparison to the extensive size of the road network. However, the increased need to maintain road signs and line markings will have a significant cost implication, and require more intensive road asset management. This potential cost burden will need to be factored into council's future Road Asset Management Plans and similar policies.

It was positive to see IV advice recognise the challenge for local government by referencing *"funding for councils is mostly derived from local rates, charges and grants from the Victorian and Australian Governments. Each council's proportion of funding from different sources varies, with rural councils relying more heavily on government grants and metropolitan councils relying more on local rates and charges. Rural councils also tend to have significant road networks and low revenues, while urban councils have much fewer roads to maintain, with a much higher revenue base".*

The MAV submission to IV's Evidence Base consultation highlighted that the level of service required to upgrade rural country roads would be particularly significant. The MAV also noted that sealed roads can be narrow in width with gravel shoulders. Issues including temporary changes in local road conditions, or whether AV will recognise kangaroos and other wildlife crossing roads are yet to be worked through satisfactorily.

Simultaneously, as referred to in Recommendation 2 – rethink road space – the emergence of AV may lead to reductions in the amount of parking revenue collected by local government. Some councils in Victoria are already considering the drop-off and pick-up implications of AV and EV along with the potential conversion of on-street parking and taxi zones. The *do now actions* suggested by IV in their advice around reviewing current legislation and traffic management guidelines should include consultation with local government. This will help to ensure conflicts with parking, priority bike networks or public transport routes are minimised, and that overall the variability of local streets is appreciated.

The MAV supports the audit and review outlined in Recommendation 1: that the State survey or audit road infrastructure to evaluate suitability for AV, and if significant changes are required to lines, signage, or road quality to enable AV, review funding arrangements for road maintenance and upgrades by local authorities.

Freight Vehicles

A specific consideration within the transport recommendations is freight vehicles. Heavy goods vehicles have the potential to impose some additional pressure on road surfaces and structure design in future, through uniform routing or reduced following distances. IV advice suggests that the most significant challenges could be addressed through digital non-build solutions, such as implementing coordinated traffic management systems. IV found that in a fully automated and zero emissions future, the way heavy vehicles operate is not likely to change significantly, and that things like dedicated or designated lanes or increased road strengths are not likely to be required directly as a result of automation. However, this is not as yet a proven theory, and is an issue for councils to keep a watchful eye on.

The transition to full automation could happen faster in the freight sector than in passenger vehicles, and before zero emissions technologies evolve, due to the commercial incentives to do so. If this happens, freight operators may seek to implement platooning of freight vehicles – where vehicles closely follow a lead vehicle in a 'road train' style – to reduce labour costs and use fuel more efficiently. If this were to be the case, changes to road space allocation and road design may be needed in the medium-term.

An overall key consideration highlighted by IV within their advice to the State Government is the additional congestion on the network that empty running vehicles would create, and a potential network pricing approach for Victoria. Increased congestion presents a potential tension for many councils within the context of their transport objectives which include a shift away from car use towards sustainable transport modes.

The importance of identifying a transport network pricing approach in Victoria (highlighted within IV's 30-year Infrastructure Strategy) is an issue which will also require consultation with councils. As IV state in their advice *"in designing a transport network pricing scheme that applies to zero emissions vehicles, consideration will need to be given to the effect this may have on their uptake and the realisation of potential benefits"*.

Recommendations within the **ICT Infrastructure and Data theme** included consideration of cellular data coverage - an important part of optimising the performance and safety of AV, with the potential to *"provide an additional layer of information, navigation and communication to vehicles, making it more likely they will be able to operate at full effectiveness in more areas"*. IV have estimated the cost of providing cellular date coverage to support AV on main roads in Victoria will need 134 new cell towers, at a cost of $76-$109 million in 2046. To cover all sealed roads in Victoria this increases to 2098 cell towers at a cost of between $1.1 and $1.7 billion. This raises a question around the potential likely equity for regional and rural areas receiving improved cellular coverage from telecommunications companies, to be able to support AV, and gain from the safety and economic benefits.

The recommendations made by IV, particularly the integration of transport management referred to in recommendation 9, will require councils to fund additional responsibilities as their road infrastructure managers have to plan and manage roads with more complex infrastructure needs. In some scenarios outlined by IV in their evidence base (e.g. electric avenue and private drive), additional traffic. Councils may be required to deliver additional planning considerations as the use of public and private transport changes.

Within the **energy theme**, the transition to zero emissions outlined within recommendation 10 includes several specific considerations for councils. The IV Evidence Base report did not envisage range being an issue for EV considering the length of the average journey. However, the MAV highlighted that some councils believe range anxiety is in actual fact higher, and needs to be recognised more as a current barrier to the use and adoption of EV across Victoria. Local councils play a key advocacy role within their local communities, and

could act as a key conduit to help mitigate public concern and influence public attitude towards the introduction of EV and AV.

Recommendation 10 suggests immediate development of design standards to govern the placement of EV charging infrastructure in public areas. The MAV also recommends awareness raising and communication literature should be produced in consultation with councils, to help mitigate the range anxiety issue. The location of EV charging infrastructure within public places is another important consideration.

It is crucial to the successful introduction of EV and AV that local councils are closely consulted and involved in the delivery across all recommendations made by IV within the **planning theme**. Councils will be instrumental in contributing their expertise to a rethinking of planning values and creating more planning flexibility by helping to develop new guidance and achieves local transport and land use goals. Councils face potential complications with planning where population movements and their implications are concerned across several of IV's evidence base scenarios.

There will need to be clarity and consideration around the role that land use planning and building will play in facilitating a transition to a new transport system and its supporting infrastructure. Further consideration of the key role councils will play to support the design, support and enforcement of new standards in the future will be required. Consideration of this should also include other technology enabled transport modes which are starting now such as bike and car share, electric scooters, and how they will utilise road, pavement and parking space.

Councils will also play a key role in delivering the **waste theme** outlined, in particular the statewide waste and resource recovery infrastructure plan to prepare for the new waste EV and AV would produce.

Local level data and intelligence councils have across their local road networks will also contribute significantly to the **monitoring and coordination theme** recommendations, and help TfV and VicRoads keep track of trends relating to issues such as safety and road structures, including road wear.

Next steps

The MAV is meeting with IV in December to discuss their advice to the Victorian Government, and its intersection with the MAV. The MAV and IV will explore opportunities to work more closely together on further progressing the implementation of the 17 recommendations with councils.

Councils will need support, funding and clarity in taking forward IV advice on how the significant road infrastructure implications of the transport theme recommendations will be managed into the future. Consideration will also have to be given to councils facing potential revenue loss from electric charging replacing parking fees. The MAV will advocate that these actions should be a priority in the near future, and that a consistent approach is taken to roll out across the State. There would need to be an agreement with councils around how any revenue generation from the transport system would contribute to council income to invest in the maintenance and renewal of roads to accommodate emerging vehicle technologies.

Considering the increase of freight vehicles within some council areas, particularly metropolitan councils close to the Port of Melbourne (e.g. Maribyrnong), this is also an important issue for further consideration.

Future design changes will also need to reflect the needs of other road users, such as cyclists and pedestrians, a particularly important consideration for councils and their communities. Councils may seek to encourage EV charging infrastructure to be off street, with footpaths, bike lanes and trees prioritised for the street area.

Lastly, councils will play a key advocacy role in developing community acceptance of this technology as well as mitigating public concern which is going to be a crucial factor in the uptake of AV and EV. Councils will be a key partner for State and Commonwealth Governments to develop guidelines for consistent and clear communications.