

Transport Cluster Submission

National Transport Commission Issues Paper on Regulatory Barriers to more automated road and rail vehicles

March 2016

Introduction

TfNSW welcomes this opportunity to contribute to the NTC's national review of regulatory arrangements for automated road and rail vehicles. Transport for NSW (TfNSW) has coordinated this submission from NSW Transport agencies, including Roads and Maritime Services. The following table and notes respond in some detail to the questions raised in the Issues Paper, and provide other commentary on the text. These brief introductory points provide some context for the more specific comments that follow.

The advent of connected and automated vehicles (CAVs) is both an opportunity to improve transport services and a challenge for transport agencies, infrastructure operators and regulators. CAVs and other innovations in intelligent transport systems (ITS) have the potential to improve outcomes in a number of areas including safety, customer service, productivity, congestion management, accessibility and environmental performance. On the other hand, the introduction of CAVs has thrown up a number of challenges that will need to be managed effectively if their potential benefits are to be realised and their potential risks minimised.

TfNSW's approach to CAVs is firmly focussed on the potential mobility benefits that these new technologies can bring to current and potential transport customers. Governments and their agencies should carefully consider the potential costs, benefits and value CAVs offer our customers, by understanding customers' perspectives. Our customers include every category of current or potential road users including bus passengers, drivers of light and heavy commercial vehicles, pedestrians, cyclists, rail passengers, and transport industries.

We need to consider the customer value that CAVs potentially offer, and tailor our policy responses in a way that maximises that value. This should also involve monitoring and measuring the benefits to ensure that they are delivering value that exceeds the program investment.

It is important to identify and understand customer perceptions and readiness for and responsiveness to CAV technology. Work in this area has been undertaken in other jurisdictions. For example, recent research from the USA and UK indicates that over half of the total respondents engaged were comfortable with the concept of CAVs, and would be more likely to use the technology if they could take back control if needed (Accenture, 2011). Additional data from Power and Associates (2012) indicated that 37% of 17,400 vehicle owners surveyed would be interested in purchasing a fully autonomous vehicle at some time in the future.

While TfNSW is keen to encourage innovation, it endorses the need for a nationally consistent set of regulatory arrangements for CAVs, noting that Australia is a single vehicle market and it would be undesirable to erect legal or technical barriers between States. While it is not appropriate for governments to pick winners in a competitive technology market, governments have an important role in addressing areas where markets are unlikely to operate effectively. For example, government

agencies have an important role to play in the evaluation of standards for vehicle to vehicle and vehicle to infrastructure communications that will be essential to the widespread adoption of highly automated vehicles.

CAVs should be viewed in the context of the wider spectrum of technologies described as Intelligent Transport Systems (ITS). These technologies (including smart motorways, customer information applications, integrated ticketing, electronic payment systems and big data) have a significant collective role to play in improving transport services and extending mobility options to more people.

Vehicle automation is a continuum of technologies and not just about “driverless” or “autonomous” vehicles. All of the levels of automation offer potential safety and other benefits, and partial and conditional automation systems have the potential to improve the outcomes listed above by improving the capacity of human drivers to driver safely.

At this stage in the development of CAVs, it is difficult to envisage that fully automated vehicles will be able to operate safely in all situations without some support from connected infrastructure. Therefore we need to recognise that automated vehicle systems, particularly those involving higher levels of automation, are likely to be a combination of vehicle and infrastructure technologies.

General Feedback

National Heavy Vehicle Regulation

- The Paper makes reference to the implicit requirement in road laws that a driver is human. The Heavy Vehicle National Law also makes this assumption. In the event that highly automated heavy vehicles were given approval for access to the public road network, there could be a need to make consequential amendments to the definition of a driver in the Heavy Vehicle National Law. Consideration would also need to be given to the following matters:
 - the relevance of driver fatigue issues such as maximum driving hours to more automated or completely automated heavy vehicles; and
 - who would have responsibility for non-driving obligations which are currently held by the driver of a heavy vehicle, such as the requirement to carry heavy vehicle accreditation documents?

Rail Policy

- The National Rail Safety Regulator was established in 2013 by a Rail Safety National Law which delivers greater consistency in rail safety regulation across jurisdictions.
- Outside of legislated rail safety requirements, there is an opportunity to improve operational interoperability across network interfaces to improve safety. For example, greater interoperability may remove complexities resulting from differing operational safety requirements. Fewer complexities may reduce risk resulting from human error.
- NSW has developed a National Rail Vision which supports increased interoperability and a Work Program is currently being developed by the Commonwealth for Senior Executive endorsement.

- The introduction of new technology presents an opportunity to harmonise the adoption of equipment and infrastructure across Australia, which could lead to safety and risk management improvements, cost reductions for operators and Rail Infrastructure Managers (RIMs) through economies of scale, and a reduction in red tape for manufacturers wishing to access to the market.
- The paper notes that other bodies are doing research in this space. TfNSW is a participant of the Australasian Centre for Rail Innovation (ACRI). ACRI has previously done research that may be relevant to automated rail and the NTC could consider liaising with ACRI about its research.

Road Safety

- The paper frequently mentions the possible safety benefits of increased use of CAVs as a key rationale for removing regulatory barriers. However, there is little discussion of the road safety evidence. It is suggested that the discussion paper should include greater analysis of the safety case for AVs, including discussion about the possible safety impacts of a 'mixed fleet' of automated and non-automated vehicles.
- The safety case should also include:
 - risk assessment including possible risk controls
 - more research and study on CAV interaction with other road users
 - defining the regulation conditions, environments and locations which are suitable for CAVs.
- The paper currently does not provide specific comment about the possible safety risks introduced by CAVs – particularly the safety risks presented in a road environment where there is a mix of both automated and non-automated vehicles, as will occur in the short and medium-term. These new safety risks may require a review of existing regulatory measures, or the introduction of new measures. The paper should acknowledge that these measures must be tested and confirmed to ensure that they appropriately address safety risks before significant changes to the regulatory framework are made to accommodate CAVs.
- It may also be appropriate to develop a section of the discussion paper that identifies the key features of the regulatory environment that would promote increased use of CAVs without introducing significant road safety risks to road users. This would help develop a positive framework in addition to identifying possible red tape reductions.

Policy and regulation

- Individual states and territories (e.g. SA, ACT) have already, or are looking to, introduce legislation to support CAV trials and demonstrations. The NTC review should encourage the development of a consistent national regulatory framework for trials. In the absence of a national framework there is a risk that states and territories will progress isolated legislative amendments that could impede the widespread introduction of CAVs.
- Appendix C is stated to be about road manager liability legislation. However its contents are about exemptions powers of road agencies. The reference to section (s) 158 of the *Road Transport Act* (the Act) in NSW is incorrect. S. 158 of the Act relates to exemptions to the requirements of monitoring of heavy vehicles and vehicles carrying dangerous goods. The

correct reference should be section 21 – ‘Statutory rules may exclude vehicles, animals and persons’.

- Infrastructure Australia’s report *Australian Infrastructure Plan: Priorities and reforms for our nation’s future* released in February 2016 raises road user charging for further investigation and consideration. If this were to eventuate, it would be essential to have a consistent national approach to CAVs that records road usage. This could potentially complement a nationwide approach to both the management of autonomous vehicles and the calculation and collection of road user charges.

Additional comments outside of the question subject areas, by chapter

1. Context

- Item 3, page 8: Some current autonomous features, such as automatic parking, require the driver to take their hands off the steering wheel.
- Item 10, page 9: Some HVNL provisions and heavy vehicle standards assume a human driver: The suggestion to consider amending HVNL to operate effectively without the assumption of a human driver could be risky. For example, legislative requirements in relation to load restraint, mass and dimensions all currently have human interventions throughout the chain of responsibility provisions. In particular, drivers (or HV occupants) may still be required to be responsible for load restraint and mass and dimension items.
- Page 11: Summary of issues relating to automated road vehicles:
 - All the changes identified may create complexity, particularly when considering the different level of CAVs that may be in use. Regulatory amendments will need to stipulate what conditions apply in a range of situations.
 - An additional issue that should be addressed is the need for significant changes to the road environment (and digital infrastructure) to allow greater use of CAVs on the roads and the impact for road managers.
 - Another issue to be included is the impact a mixed fleet will have on the regulatory framework. There should be discussion of whether a parallel set of rules for CAVs may need to be considered, including discussion concerning the impact of the integration of these types of vehicles.

3. What are automated road vehicles?

- Page 16: the Paper asserts that “flexible and performance-based” should be key features of regulations regarding CAVs. Safety should be an explicit key performance outcome.
- Item 3.2, page 19: Consider selecting an appropriate weather example for Australian conditions, rather than a blizzard.

4. Role of government

- Page 22: a statement is made that “it is important that regulations do not create artificial barriers between conditional, highly and fully AVs”. The discussion paper should provide more information to support this statement, including defining what is meant by “artificial barriers” and what impacts these may have. As shown in the table on page 17, there are clear distinctions in the role of human drivers in each of these types of vehicles and there may be different safety implications for each. The regulatory impacts applying to each of these types of vehicles may need to be considered individually.
- Third dot-point, page 23: From a road safety perspective, after the fact liability is a more risky approach.

- Page 24: the discussion makes reference to a “mixed fleet of automated and non-AVs”. This concept should be further explored as the regulation of different types of vehicles within the “mixed fleet” will be a key policy challenge for governments in the short to medium term. In particular, the extent to which regulation applies to interactions between automated and non-AVs should be considered.

5. Issues with regulating the driver

- Figure 4, page 27: Definitions of ‘driver’ should only be amended when CAVs have been demonstrated to be capable of performing these functions safely, in all weather conditions, road environments and traffic conditions. Changing definitions of ‘driver’ will also need to consider responsibility and impacts in situations where road infrastructure is faulty (e.g. traffic lights do not work, blackouts, road works or in situations when there has been an accident).
- Issue 2, page 28: This should include consideration of systems failing, including computer malfunctions or the effects of hacking.
- Issue 3, page 28: states that “there is no express requirement in the Australian Road Rules for a human driver to control the vehicle in a particular way”. While this may be true for drivers of a car, this may not be accurate for the riding of a motor bike (which is a type of motor vehicle).

6. Issues with regulating light vehicles

- Second paragraph, page 32: Consider highlighting that the *Motor Vehicles Standards Act 1989* is currently under review.
- Fifth paragraph, page 32: A vehicle recall is not only concerned with non-compliance with ADRs; a recall can be initiated for other reasons, usually safety related, and could relate to specific batches of vehicles rather than the model as a whole.
- Thirteenth paragraph, page 35: Manufacturers do not recognise modifications outside their specifications.

8. Liability

- Chapter 8: There is little discussion in this section concerning interactions with vulnerable road users – such as cyclists and pedestrians.
- Issue 14, page 43: It should be stressed that there is not an unlimited budget to make all roads suitable for CAVs. This section should take costs for Government into consideration. Consideration should also be given to industry’s potential responsibility in contributing to costs to upgrade roads in relation to CAVs.

12. Other issues

- Second paragraph, page 54: Inappropriate actions by pedestrians when crossing roads can cause significant congestion by affecting the free flow of traffic in urban areas.
- Page 54: the discussion on vulnerable road users should include reference to our ageing population; in NSW, older pedestrians are rising in fatality and serious injury data.

Responses to questions

Chapter	Question	Proposed transport position
What are automated vehicles?	Question 1 – Do you support the use of the Society of Automotive Engineers (SAE) International Standard to classify automated road vehicle functions? Do you have any issues with using the SAE International Standard?	<ul style="list-style-type: none"> • The SAE is an internationally recognised standard. • Using agreed terms to differentiate between different types of vehicle automation will be useful when it comes to developing any regulatory or legislative solutions to overcome issues identified. • While the Transport cluster generally supports the use of the SAE classification, two areas of contention were raised: <ul style="list-style-type: none"> ○ This subject could be progressed by a more suitable forum, such as UNECE World Forum for Harmonization of Vehicle Regulations (WP.29); ○ There are blurred boundaries between the levels of classification and this may lead to difficulty in categorising initiatives into these groups – for example, in some deployments; there is little distinction between the ‘Highway Driving Assist’ and ‘Automated Highway Driving’ examples given in the paper.
Role of government	Question 2 – What do you think the regulatory role of governments should be to support the introduction of automated vehicles (AVs) in Australia?	<ul style="list-style-type: none"> • The Transport cluster agrees a balance should be achieved between promoted innovation and advancement, road network efficiency and ensuring safety standards are maintained. Examples include: <ul style="list-style-type: none"> ○ Establishing trials and undertaking research to promote safety outcomes, and promoting and encouraging mobility improvements for people with disabilities, elderly and vulnerable road users ○ Identifying safety risks for all road users, and those who may interact with AVs ○ Ensuring the road network continues to meet objectives of efficient movement of goods ○ Ensuring that a framework is implemented that allows for questions of liability to be determined ○ Determining whether the eventual introduction of fully AVs means road rules should be more consistent across Australia or whether they need to be programmed by manufacturers to account for regional variations (for example hook turns in Melbourne, school zones in NSW). • Government will also need identify potential emerging market failures that may need to be addressed. For example, some vehicle manufacturers may focus on convenience and cost savings benefits with insufficient weight given to safety performance. • The current regulatory framework for road vehicles (illustrated at figure 1, page 6) will likely support the introduction of highly AVs. • Aspects of the framework will need modification to address the paradigm shift arising from the introduction of more highly AVs including basic concepts associated with the driver licensing task, responsible operator

		<p>(insurance/liability), vehicle standards, privacy and road access. There may also be a need to recognise the role of the private sector manufacturer within the framework, in terms of self-regulation/certification.</p> <ul style="list-style-type: none"> • Rule 297 of the Australian Road Rules currently states that a driver must have proper control of a vehicle and a clear view of the road, and traffic ahead, behind and to each side of the driver. This rule (Rule297) is mirrored in NSW Road Rules. • International Law on road traffic may also need to be examined in this process, for examples to help determine best practice. The Transport cluster recommends focusing on case studies that have utilised a national approach.
<p>Issues with regulating the driver</p>	<p>Question 3 – Have we identified the key issues relating to the Australian Road Rules and state and territory road safety and traffic laws? Are there other issues that should be assessed as part of the NTC review?</p>	<ul style="list-style-type: none"> • While the Transport cluster agrees the NTC Paper identifies the key issues in this area, some suggested items for future consideration include: <ul style="list-style-type: none"> ○ A more general definition of a “driver” that incorporates AVs could be used, such as the person responsible for the vehicle (this is based on the premise that there is a purpose for every journey, for a private vehicle, this can be the person who inputs the destination into the vehicle’s database; while for a public vehicle, this would be company responsible for determining the route used and the stopping sequence) ○ Australian Road Rules are not consistently applied across all jurisdictions ○ AVs will either need to be programmed to meet local rules or those rules may need to be amended (such as the one-metre space required when overtaking cyclists) ○ AVs will need to be able to recognise mandatory signs and indicators, including ‘wig-wag’ warning lights on buses ○ The vehicles must be able to respond to local rules (for example when school zones are in force; and buses must be able to apply ‘wig-wags’ as appropriate) • We question the assertion on page 30 that laws relating to human driving behaviour (such as drink driving laws) are not relevant for AVs that do not have a human driver. For the foreseeable future, and until such time vehicle manufacturers and/or infrastructure providers accept liability for all eventualities on a fully automated road network, there must be a person in nominal “control” of a vehicle who is responsible for ensuring it operates safely. • While occupants of CAVs may not have the same level of control as current ‘drivers’, we need to consider appropriate mechanisms to control ‘driver’ fitness and behaviour. • The appropriate level of ‘driver’ fitness will be dependent on the extent to which human intervention is needed at any time during the driving task. • For example, in ‘conditional’ AVs where drivers are required to respond to request for interventions, it may be appropriate for drink driving laws or driver licensing requirements to apply for AVs. However, in fully automated vehicles, this may not be required of all occupants.

		<ul style="list-style-type: none"> • While the proper application of ‘human factor’ laws (e.g. drink driving) may need to be considered, these laws will still be relevant in a CAV context. This is primarily due to the significant safety consequences that could arise from a human who fails to respond to a request to intervene from a CAV. • Consideration may also be given to highlight the need to ensure that any regulatory changes to accommodate CAVs do not lead to unintended consequences or weakening of existing regulatory controls of traditional vehicles with a properly licensed driver.
<p>Issues with regulating the road vehicle</p>	<p>Question 4 – Have we identified the key issues relating to the Australian Design Rules (ADR) and other vehicle standards? Are there other issues that should be assessed as part of the NTC review?</p>	<ul style="list-style-type: none"> • Regarding vehicle standards and modifications: <ul style="list-style-type: none"> ○ There must not be too much reliance on consumer law to ensure vehicles comply with standards and are safe. ○ Relevant fair trading requirements should also be considered when exploring issues relating to the modification of CAVs. ○ The current ADRs need to be reviewed to ensure they do not stifle innovation, and new ADRs should only be developed if there is a real need to do so. • Compliance with ADRs is only one element to consider when modifying a vehicle; the modified vehicle must not increase the risk to its occupants or other road users. • Rectification of defect through recalls and other avenues under consumer law are initiated after a defect has been identified with vehicles already supplied to the market and in the road network. These defects should be identified prior to this – either in the design or manufacturing stages – to limit the risk these vehicles pose to road users. Also, to be effective, vehicle recall initiatives require the owner or registered operator to respond to the recall notice, and there is strong evidence that they meet with limited success. • In NSW, motor vehicle repairs and modifications must also comply with the requirements of the <i>Motor Dealers and Repairers Act 2013</i>. • ADRs can take a considerable amount of time to develop and implement. Frequently, an item covered by an ADR can already be a standard feature in many vehicles by the time the ADR is complete; in some extreme circumstances, the item could even be obsolete by the time the ADR is published. • Other items to consider include: <ul style="list-style-type: none"> ○ Greater harmonisation of road rules would also assist with infrastructure communication and operation of connected vehicles. ○ There may be a need to make specific reference to ADR’s for heavy vehicles if ADRs for AV standards are to capture more of the driving task including compliance with road traffic laws. ○ Issue 7, page 34: The discussion regarding oversight at a time when manufacturer trust is in doubt indicates that a nationally consistent approach would be beneficial, easier to enforce and to implement over time.

		<ul style="list-style-type: none"> ○ Additional information should be included in Chapter 6 specifically in relation to ADRs for heavy vehicles. Table 4, page 32 should also be revised to identify design rules in heavy vehicles that could be impacted by highly AVs.
<p>Issues with regulating heavy vehicles</p>	<p>Question 5 – Have we identified the key issues relating to heavy vehicles? Are there other issues that should be assessed as part of the NTC review?</p>	<ul style="list-style-type: none"> ● The Transport cluster suggest expanding the list of key issues for heavy vehicles to include: <ul style="list-style-type: none"> ○ Issue 12 on page 39 deals with safe distance rules and their impact on the uptake of heavy vehicle platooning ○ The report makes specific mention of Rule 127 of the Road Rules and notes that the requirement to maintain a separation of 200 metres for road trains and 60 metres for other long vehicles when following another long vehicle could prevent heavy vehicle platooning by AVs ○ The Paper notes that platooning can be safely undertaken by AVs allowing them to travel close together because they can react quickly to situations where the vehicle in front stops or slows down. This accounts for only a part-justification for why Rule 127 exists ○ Rule 127 does not apply in built up areas, on multilane roads or when one long vehicle is overtaking another long vehicle. The Rule does apply on country roads where there is only one lane in each direction ○ Allowing platooning on these roads, and especially in road train areas, could see several long vehicles (25/26m B-doubles, or 30m modular B-triples, or 36.5m Type 1 road trains, or 53.5m Type 2 road trains) travelling in a convoy ○ Road trains are limited to a maximum speed of 90 km/h and all other heavy vehicles to 100 km/h and having several of them platooning could present a very significant hazard to a light vehicle (permitted to travel at 110 km/h) which attempts to overtake a convoy that could extend for several hundred metres without a gap which the light vehicle can safely occupy - If platooning is permitted, this issue will need to be addressed. ○ It may be necessary to specify some constraints around the implementation of platoons, such as maximum platoon lengths or maximum numbers of vehicles in platoons. ○ Platoons should not only be considered a heavy vehicle matter. Platooning of light vehicles, or mixed fleets, could also provide significant benefits. ○ “Platooning” of heavy vehicles presents a potential hazard for overtaking vehicles on single lane country roads. ● Beyond this scope, the Transport Cluster recommends that consideration is also given to: <ul style="list-style-type: none"> ○ The impact on current enforcement regimes that use random road intercepts and how this will apply to AVs. ○ The extent to which sanctions apply to AVs and how these can be complied with– such as sanctions that ground vehicles due to a major defect or severe overload/over dimension. ○ Appropriate conditions, locations and standards required for automated heavy vehicles to be travelled on certain lengths of roads.

		<ul style="list-style-type: none"> ○ Highly AVs could play an important role in ensuring compliance with road rules, conditions and permits. ○ Chain of responsibility legislation may provide a regulatory barrier to more AVs particularly if data from the vehicle is unable to be retrieved (privacy issues) to satisfy legislative requirements in terms of the operators responsibility. ○ Cost to install electronic capability to satisfy regulatory requirements (in the absence of a driver) may be prohibitive from both a manufacturer’s and operator’s point of view. ○ Current HVL places obligations on the vehicle driver under the chain of command provisions. Taking the driver out will affect the chain. ● The role of the operator under Chain of Responsibility legislation includes ensuring that: <ul style="list-style-type: none"> ○ rosters and schedules do not require drivers to exceed driving hours regulations or speed limits ○ you keep records of your drivers’ activities, including work and rest times ○ you take all reasonable steps to ensure drivers do not work while impaired by fatigue or drive in breach of their work or rest options ○ vehicles are regularly maintained, and if speed limiters are fitted they are functioning properly ○ vehicles are not loaded in a way which exceeds mass or dimension limits ○ drivers moving freight containers have a valid Container Weight Declaration to ensure loads are appropriately restrained with appropriate restraint equipment.
Liability	Question 6 – Have we identified the key issues relating to the liability of drivers, manufacturers, service providers and road managers? Are there other issues that should be assessed as part of the NTC review?	<p>Further points for consideration include:</p> <ul style="list-style-type: none"> ● Consideration should be given to developing some form of competency based system to ensure people can respond to reasonably foreseeable problems. This may be a variation on the current licensing requirements or induction training by the vehicle manufacturer. ● The paper has not identified current requirements for a driver’s duty of care. ● It may also be useful to include advice from insurers who provide compulsory third party policies regarding perceived risk/barriers arising from the introduction of highly AVs (i.e. identifying the supplier of the data to support insurance claim where vehicle is in auto-pilot/similar). ● Roads and the associated infrastructure will play a major role in facilitating driverless and autonomous vehicles. Preparing the road for them their full integration represents a major and costly challenge. ● Regardless of current licensing requirements, people occupying autonomous vehicles must be capable of dealing with problems that are likely to arise. ● Drivers, particularly of buses, have a range of road safety responsibilities that extend to their passengers, for example ensuring that the vehicle occupants are seated or are wearing seatbelts. ● Several manufacturers already announced that they will accept liability for their vehicles when they are driving in automated mode.

Privacy and access to data	Question 7 – Have we identified the key issues relating to privacy and access to data by government agencies? Are there other issues that should be assessed as part of the NTC review?	<ul style="list-style-type: none"> • Data generated by the vehicle should be available to road agencies to identify shortcomings with the road infrastructure. • Roads and the associated infrastructure will play a major role in facilitating driverless and autonomous vehicles. Vehicle data could identify where this is inadequate, and help prioritise remedial works. • Another issue is whether there is a need to consider Intellectual Property rights and patents that may prohibit government from access to data.
Supporting on-road trials	Question 8 – Have we identified the key issues relating to on-road trials of automated road vehicles? Are there other issues that should be assessed as part of the NTC review?	<ul style="list-style-type: none"> • While key issues have been identified, the NTC’s next report could consider: <ul style="list-style-type: none"> ○ adopting the safety aspects of the UK code of practice National Highway Traffic Safety Administration principles listed - these should also apply as the basis for evidence and risk based approach to new rules and regulations – and trials must facilitate feedback; ○ developing a national Code of Practice to support the testing of AV technologies in Australia. The NTC could lead the development of this code as a supplementary piece of work to UK’s Department of Transport Review <i>Automated vehicle technologies testing: code of practice</i>. • Feedback is essential to ensure efficacy of intended legislation and codes of practice
More automated rail	Question 9 – Have we identified the key issues relating to more automated rail operations? Are there other issues that should be assessed as part of the NTC review?	<ul style="list-style-type: none"> • The next NTC paper could also consider implications of regulations that cover the interactions between road and the rail vehicles, such as railway level crossings and light rail where rail vehicles travel within the road reserve. • The interaction between highly automated transport systems should be considered. • There is scope to consider automated technologies for rail. In particular, crash avoidance technologies and vehicle identification and separation technologies for rail vehicles and rail bound vehicles would be of value. A trial was conducted five years ago, focused on using GPS technology for collision avoidance and Transport for NSW can supply information on this trial. • Importantly the paper highlights the dangers associated with level crossings and the importance of excluding the public from lines where automated trains operate. Managing these risks will be crucial in the success of introducing more automated trains on to the network.
Other issues	Question 10 – Are there additional issues or risks that should be	<ul style="list-style-type: none"> • Consideration of public passenger vehicle legislation should also be considered, particularly in relation to the use of AVs for hire. • The Discussion Paper’s human factors discussion should also include human factors in relation to vulnerable road

	considered in the NTC's assessment of regulatory barriers to more AVs?	users – not just motor vehicle drivers. <ul style="list-style-type: none">• The public passenger scene is experiencing major changes and these needs to be considered. Additionally, how vehicles interact with vulnerable road users need to be considered. These present a complex challenge; in particular, they may not be responsive to the messages generated by the vehicles.• Greater technology and implementation certainty is required to ascertain the societal and economic impacts of fully AVs.
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