Identification of Policy to Support Tech-enabled Transport

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1 PROJECT INTRODUCTION

The recent acceleration in the development of technologies for both vehicles and transport infrastructure is intended to provide safer, cheaper, cleaner and faster personal mobility and freight services. However, given the rapid rate of change in this area, it stands to pose both opportunities and risks for transport agencies globally. SBEnrc Project P1.52 '*Tech-Enabled Transport: Informing the Transition to Technology Enabled Transport Vehicles and Infrastructure'*[1] seeks to provide guidance as to how to navigate the transition to technology-enabled vehicles and transportation infrastructure in a manner that maximises the utility of investments and best prepares for the future of mobility. The project focussed firstly on identifying current assumptions in partner agencies around the scale and pace of technology enablement of vehicles and infrastructure across all modes. This work then informed consideration, with partners, of how the deployment of integrated technologies into transportation infrastructure is likely to unfold to support passenger, freight, and mass transit vehicles of the future.

In particular, the shift to technology-enabled vehicles and transport infrastructure to allow vehicle-to-vehicle (V2V) and vehicle-to-infrastructure data transfer presents significant opportunities that will require a change in the assumptions around transport planning, design, and network operation. Hence, the previous relative certainty around vehicle use and the growth in number of vehicles is being challenged. There are growing risks that transport infrastructure may not keep pace with growing levels of technology enablement of vehicles, across all modes nor account for a mix of vehicles with differing levels of technology enablement; from those with little to no technology, to vehicles that can communicate with other vehicles and the transport infrastructure itself, to vehicles that do not require drivers or operators. Regulations will play an important role in the emergence and development of technology-enabled vehicles and infrastructure. Authorities around the world are now adapting and rethinking their approaches to regulation and policy around the use of technology in transportation in order to avoid conflicts without stifling the innovative uses of these technologies. This report provides an overview of such efforts to demonstrate that much has been achieved that can inform similar efforts in Australia.

[1] SBEnrc Project P1.52: http://sbenrc.com.au/research-programs/1-52/

2 BACKGROUND

The transport sector is rapidly evolving after a prolonged period of innovation focused around driver-operated internal combustion vehicles. This has in part been due to a shift away from fossil fuels due to the concerns around greenhouse gas pollution, evident from a number of countries including Britain, India, France and Germany moving to phase out Diesel Fuel. This, together with innovations in electric vehicles in recent years has spurred a new wave of innovation in the transport sector that has seen not only the rapid uptake of electric vehicles but also the race to deliver a fully driverless vehicle. Given that government legislation around the world has been based on driver operated vehicles there is a need for amendments to support a greater level of technology enablement of vehicles, ranging from driver assist technologies right through to fully driverless without the need for a driver. For instance, until May 2016 the 1968 'Vienna Convention on Road Traffic' that has 75 signatory countries stipulated that a vehicle is able to be operated by a driver.

The response by the general public has been mixed, with a 2018 study by the American Automotive Association of 1000 adults finding that 63 percent of respondents were fearful of riding in a completely self-driven car, down from 78 percent in 2017. The study also found that 46 percent of respondents indicated that they would feel less safe sharing the road with a driverless vehicle, with just 13 percent indicating that they would feel safer.[2] A study by KPMG found that 67 percent of insurance companies surveyed believe that a significant adoption of autonomous vehicles will not occur until after 2035, the remaining 33 percent believing this adoption will occur in the next by 2027.[3]

For the purpose of this report, the Society of Automotive Engineers International (SAE) International Standard J3016 levels of driver automation have been adopted as listed below:[4]

- *Level 0: No Driving Automation (100% Human driven)* - The Human driver monitors the driving environment and the vehicle is operated by a human driver at all times.
- *Level 1: Driver Assistance (Automated steering or acceleration control)* - The Human driver monitors the driving environment and is assisted by either automated steering or acceleration/deceleration.
- *Level 2: Partial Driving Automation (Automated steering and acceleration control)* - The Human driver monitors the driving environment and is assisted by both automated steering and acceleration/deceleration.
- *Level 3: Conditional Driving Automation (Some driving with human driver on call)* - The vehicle monitors the driving environment and undertakes all aspects of driving with the expectation that a human driver will respond to a request to intervene.
- *Level 4: High Driving Automation (Most driving with infrequent human driver intervention)* - The vehicle monitors the driving environment and undertakes all aspects of driving under

[2] AAA (2018) Vehicle Technology Survey – Phase 3, American Automotive Association.
[3] KPMG, 2016, *The Autonomous Vehicle Insurer: Driving change in UK insurance* https://assets.kpmg.com/content/dam/kpmg/pdf/2016/07/Autonomous-Vehicles-report-v3.pdf
[4] SAE International (2016) *Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicle Automated Driving Systems,* SAE International, J3016.

specific conditions and/or in pre-determined areas with the expectation that a human driver will be needed from time to time.

- *Level 5: Full Driving Automation (All driving with no human intervention possible)* - The vehicle monitors the driving environment and undertakes all aspects of driving in all conditions with no opportunity for a human to intervene; i.e. no steering wheel or controls.

3 OVERVIEW OF CURRENT LEGISLATION AND POLICY APPROACHES

There are many jurisdictions around the world currently updating legislation to allow for the testing and use of automated vehicles; some examples are presented below.

3.1 Europe

In April 2016, the 'Declaration of Amsterdam - Cooperation in the Field of Connected and Automated Driving' signed by all 28 EU Member State Transport Ministers acknowledged that '*connected and automated vehicle technologies offer great potential to improve road safety, traffic flows and the overall efficiency and environmental performance of the transport system*'. The Declaration called for the European Commission '*to develop a shared European strategy on connected and automated driving*'.

Although many European Countries are enacting amendments to related policies and legislation, countries such as Belgium require (under the Belgian Highway Code) that all vehicles must have a driver and that driver is responsible for any acts or damages caused by the vehicle. In the case that it is deemed that a car manufacturer provided the public with a driverless vehicle that was unsafe, it may be prosecuted along with its directors. However, there have been some trials on Belgian roads with the approval of the Ministry of Mobility, which has also created a 'Code of Good Practice' with recommendations to car manufactures. Italy also requires a human driver under the Italian Highway Code, ruling out SAE Level 4 and 5 vehicles for the time being.[5]

Countries taking a proactive approach to the transition to technology-enabled vehicles include:

- *Germany*: Germany passed amendments to the German Road Traffic Act as of 21 June 2017 that allow for the operation of driverless vehicles (referred to as having automated driving functions) subject to a *driver being able to immediately take control of the vehicle*. Further, the Act requires that the vehicle is *fitted with a device capable of collecting data* such as for monitoring when the vehicle is driver-operated.[6]
- *France:* France has recently allowed for large-scale experimentation of autonomous vehicles from 2018, under decree by the French Parliament. Autonomous vehicles *must only use selected roadways,* which currently sit at over 10,000 kms, and must *display an autonomous vehicle registration plate*. Legislation on requirements for autonomous vehicles is being continuously updated as progress is being made with the technology and safety. Currently, *vehicles require supervision*, but legislation plans to allow fleets without supervision by 2019.[7]
- *Sweden:* Sweden has introduced *trial permits for autonomous vehicles* on the roads since 2013. Criminal acts when driving these cars are borne on the permit holder, which is often the manufacturer of the vehicle. In 2017, Gothenburg Council partnered with Volvo in a long-term trial where families are given autonomous vehicles to use in everyday circumstances on roads used by other drivers. Crucially, the driving of the autonomous

[5] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.
[6] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.
[7] Sencerin, J. (2017) Autonomous Driving French National Plan, Workshop Presentation, Renault.

vehicles is the sole responsibility of Volvo, even when the vehicle is being controlled by the person inside. This may expose some difficulties in further trials, where it may be hard to distinguish if the driver or the autonomous vehicle is in control in the case of an accident or criminal act, and hence whether the driver or vehicle is liable.[8]

- *Denmark:* In May 2017, the Danish Parliament passed changes to the Danish Road Traffic Act to allow pilot projects with autonomous vehicles up to SAE Level 4 to be undertaken on *specific roads within a specific timeframe*. The pilot projects need to be granted a licence that requires the *vehicle is approved, a certified assessor* is used to ensure safety and *pre-approval from the Ministry of Transport.* The licensee is responsible for insurance requirements and damages, while both the driver and licensee are liable for any criminal offence or violations.[9]
- *Finland*: Testing permits for driverless vehicles have been issued in Finland and vehicles are required to *follow a set route* and demonstrate that they *can avoid sudden obstacles* without driver involvement. Early trials are finding that the snow conditions make line marking recognition difficult.[10]
- *Poland*: On 26 April 2017, the Polish Government enacted a Bill on 'Electro-mobility and Alternative Fuels' that defines an 'autonomous vehicle', as '*an electric vehicle which is equipped with technology and systems which control the vehicle's movement and allow the vehicle to drive without any driver interaction*'. In order to test such vehicles, approval must be granted by the appropriate road authority where: the organiser is required to cooperate with local police to ensure safety; the vehicle contains a licenced driver; and the *public is informed of the trial with associated road signage* for the duration of the trial.[11]
- *United Kingdom*: On 19 June 2018, the UK Parliament enacted the 'Automated and Electric Vehicles Bill' to underpin the development of technology-enabled vehicles; with the Queen stating that the Act intends to support the UK to become '*a world leader in new industries, including electric cars'*.[12] Under the Bill, the UK Government can require that electric vehicle charge points are installed at service stations and along highways, with all types of electric vehicle *chargers subject to a common set of requirements to ensure interoperability*.[13]

[8] Amanuel, M. (2016) 'Sweden proposes a progressive legislation for autonomous vehicle trials', Drive Sweden, 11 April 2016.
[9] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.
[10] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.
[11] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.
[12] UK Government (2017) Queens Speech 2017, Prime Ministers Office, 21 June 2017.
[13] Bird&Bird (2017) At a Glance: Autonomous Vehicles, Bird&Bird, 25 July 2017.

3.2 Asia-Pacific

- *Australia*: Austroads and the National Transport Commission have developed *'Guidelines for Trials of Automated Vehicles in Australia'*.[14] The guidelines recommend that an application for such trials should include a number of items including the location of the trial, a safety management plan and provision of insurance. South Australia has amended the Motor Vehicles 1959 (SA) Act and the Motor Vehicles (Trials of Automotive Technologies) Amendment Act 2016[15] to allow for the trialling of automotive technologies.
- *China*: On the 6th of April 2017, the Chinese Ministry of Industry and Information Technology released the 'Mid to Long Term Development Plan of the Automotive Industry' that calls for more than 50 percent of vehicles in China be SAE Level 1, 2 or 3 by 2020, 80 percent by 2025 and post-2025 that SAE Level 4 and 5 vehicles enter the market. A sub-committee of the Automotive Standardisation Committee has been formed, the Connected Smart Automotive Subcommittee, to *develop national standards* around technology-enabled vehicles.
- *Singapore*: In February 2018, the Singapore Parliament amended the Road Traffic Act to include standards for automated vehicles. The amendments include provision for trials to be undertaken on public roads and changes to the responsibility of the safe use of vehicles. Singapore made amendments to their Road Safety Act in 2017, which mandates liability insurance to be held while trialling autonomous vehicles and recognises that human drivers do not need to be in control of the car.[16] The Singapore Land Transport Authority in collaboration with Nanyang Technical University has created a *1.8-hectare facility for testing automated vehicles* that will mock conditions on public roads.

3.3 United States of America

The United States Department of Transportation and the National Highway Traffic Safety Administration released their Federal Automated Vehicle Policy in 2016, paving the way for 'Accelerating the Next Revolution in Roadway Safety'.[17] California's Department of Motor Vehicles announced that technology companies, and others, are no longer required to have drivers in the autonomous vehicle for trials from April 2018. However, vehicles without a driver present must have a communications channel from the vehicle to a remote operator, with ability to take over if required.[18] New York previously had regulations that require a driver to keep one hand on the wheel at all times, but new legislation included in the State's 2018 budget allows for testing autonomous technology through a year-long pilot program in which Audi has begun testing automated vehicles.

In 2017, 33 US states introduced legislation surrounding automated vehicles (as shown in Table 1), up from 20 in 2016.[19]

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[14] NTC (2017) Guidelines for trials of automated vehicles in Australia, National Transport Commission, Melbourne, Australia.
[15] SA Government (2016) Motor Vehicles (Trials of Automotive Technologies) Amendment Act 2016—No 10 of 2016, South Australian Government.
[16] The Strats Times, Singapore (2017), "New rules for autonomous vehicles".
[17] http://digitalcommons.law.scu.edu/lawreview/vol52/iss4/9/
[18] http://www.thedrive.com/tech/18834/california-approves-testing-of-self-driving-cars-without-human-backup-drivers
[19] http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx

Table 1: Enacted Autonomous Vehicles Legislation in the US

State	Bill Number	Relevant Provisions	Effective Date
Alabama	SJR 81 (2016)	Established the Joint Legislative Committee to study self-driving vehicles.	Enacted and chaptered on May 10, 2016.
Arkansas	HB 1754 (2017)	Regulates the testing of vehicles with autonomous technology, relates to vehicles equipped with driver-assistive truck platooning systems.	Enacted and chaptered on April 1, 2017.
California	SB 1298 (2012)	Requires the Department of the California Highway Patrol to adopt safety standards and performance requirements to ensure the safe operation and testing of autonomous vehicles, as defined, on the public roads in this state. Permits autonomous vehicles to be operated or tested on the public roads in this state pending the adoption of safety standards and performance requirements that would be adopted under this bill.	Enacted and chaptered on Sept. 25, 2012.
California	AB 1592 (2016)	Authorizes the Contra Costa Transportation Authority to conduct a pilot project for the testing of autonomous vehicles that are not equipped with a steering wheel, a brake pedal, an accelerator, or an operator inside the vehicle, if the testing is conducted only at specified locations and the autonomous vehicle operates at specified speeds.	Enacted and chaptered on Sept. 29, 2016.
California	AB 669 (2017)	Extends the sunset date of the law allowing the testing of vehicle platooning with less than 100 feet between each vehicle from January 2018 to January 2020. Prohibits someone from participating in the testing unless they hold a valid driver's license for the class of vehicle.	Effective Jan. 1, 2018.
California	AB 1444 (2017)	Authorizes the Livermore Amador Valley Transit Authority to conduct a shared autonomous vehicle demonstration project for the testing of autonomous vehicles that do not have a driver seat in the driver's seat and are not equipped with a steering wheel, a brake pedal, or an accelerator.	Effective Jan. 1, 2018.
California	SB 145 (2017)	Repeals a requirement that the Department of Motor Vehicles notify the Legislature of receipt of an application seeking approval to operate an autonomous vehicle capable of operating without the presence of a driver inside the vehicle on public roads. Repeals the requirement that the approval of such an application not be effective any sooner that a specified number of days after the date of the application.	Effective Oct. 12, 2017.
California	AB-3106 (2018)	An autonomous vehicle may be operated on public roads for testing purposes by a driver who possesses the proper class of license for the type of vehicle being operated if all of the following requirements are met: (1) The autonomous vehicle is being operated on roads in this state solely by employees, contractors, or other persons designated by the manufacturer of the autonomous technology. (2) The driver operator shall be seated in the driver's seat, monitoring the safe operation of the autonomous vehicle, and capable of taking over immediate manual control of the autonomous vehicle in the event of an autonomous technology failure or other emergency. (3) Prior to the start of testing in this state, the manufacturer performing the testing shall obtain an instrument of insurance, surety bond, or proof of self-insurance in the amount of five million dollars ($5,000,000), and shall provide evidence of the insurance, surety bond, or self-insurance to the department in the form and manner required by the department pursuant to the regulations adopted pursuant to subdivision (d).	Effective February 16, 2018
California	A 87 (2018)	Requires the Department of Motor Vehicles to adopt application requirements for the testing of autonomous vehicles on public roads without the presence of a driver inside. Requires that the manufacturer certify that the local authorities within the jurisdiction where the autonomous vehicle will be tested have been provided with a written notification. Requires that the manufacturer provide certain law enforcement agencies with a copy of a law enforcement interaction plan.	Enacted January 05, 2017
Colorado	SB 213 (2017)	Defines automated driving system, dynamic driving task and human operator. Allows a person to use an automated driving system to drive or control a function of a motor vehicle if the system is capable of complying with every state and federal law that applies to the function that the system is operating. Requires approval for vehicle testing if the	Effective Aug. 9, 2017.

		vehicle cannot comply with every relevant state and federal law. Requires the department of transportation to submit a report on the testing of automated driving systems.	
Connecticut	SB 260 (2017)	Defines terms including "fully autonomous vehicle," "automated driving system," and "operator." Requires the development of a pilot program for up to four municipalities for the testing of fully autonomous vehicles on public roads in those municipalities. Specifies the requirements for testing, including having an operator seated in the driver's seat and providing proof of insurance of at least $5 million. Establishes a task force to study fully autonomous vehicles. The study must include an evaluation of NHTSA's standards regarding state responsibility for regulating AVs, an evaluation of laws, legislation and regulations in other states, recommendations on how Connecticut should legislate and regulate AVs, and an evaluation of the pilot program.	Enacted and chaptered on June 27, 2017.
Florida	HB 1207 (2012)	Defines "autonomous vehicle" and "autonomous technology." Declares legislative intent to encourage the safe development, testing and operation of motor vehicles with autonomous technology on public roads of the state and finds that the state does not prohibit or specifically regulate the testing or operation of autonomous technology in motor vehicles on public roads. Authorizes a person who possesses a valid driver's license to operate an autonomous vehicle, specifying that the person who causes the vehicle's autonomous technology to engage is the operator. Authorizes the operation of autonomous vehicles by certain persons for testing purposes under certain conditions and requires an instrument of insurance, surety bond or self-insurance prior to the testing of a vehicle. Directs the Department of Highway Safety and Motor Vehicles to prepare a report recommending additional legislative or regulatory action that may be required for the safe testing and operation of vehicles equipped with autonomous technology, to be submitted no later than Feb. 12, 2014.	Enacted and chaptered on April 16, 2012.
Florida	HB 599 (2012)	The relevant portions of this bill are identical to the substitute version of HB 1207.	Enacted and chaptered on April 29, 2012.
Florida	HB 7027 (2016)	Permits operation of autonomous vehicles on public roads by individuals with a valid driver license. This bill eliminates the requirement that the vehicle operation is being done for testing purposes and removes a number of provisions related to vehicle operation for testing purposes. Eliminates the requirement that a driver be present in the vehicle. Requires autonomous vehicles meet applicable federal safety standards and regulations.	Enacted and chaptered on April 4, 2016.
Florida	HB 7061 (2016)	Defines autonomous technology and driver-assistive truck platooning technology. Requires a study on the use and safe operation of driver-assistive truck platooning technology and allows for a pilot project upon conclusion of the study.	Enacted and chaptered on Apr. 14, 2016.
Georgia	HB 472 (2017)	Specifies that the law prohibiting following too closely does not to apply to the non-leading vehicle in a coordinated platoon. Defines coordinated platoon as a group of motor vehicles traveling in the same lane utilizing vehicle-to-vehicle communication technology to automatically coordinate the movement of the vehicles.	Effective July 1, 2017.
Georgia	SB 219 (2017)	Defines automated driving system, dynamic driving task, fully autonomous vehicle, minimal risk condition and operational design domain. Exempts a person operating an automated motor vehicle with the automated driving system engaged from the requirement to hold a driver's license. Specifies conditions that must be met for a vehicle to operate without a human driver present in the vehicle, including insurance and registration requirements.	Effective July 1, 2017.
Georgia	S 54 (2017)	Relates to motor vehicles and traffic, so as to create a new class of motor vehicles to be known as autonomous vehicles, provides for definitions, provides for requirements to operate an autonomous vehicle, provides for the operation of autonomous vehicles on public highways for testing purposes, provides for indemnity to vehicle manufacturers in certain instances, provides for the regulation of autonomous vehicles, provides for a penalty, provides for related matters, repeals conflicting laws.	Pending January 24th, 2017.

Georgia	S 219 (2018)	Relates to motor vehicles, exempts persons operating an automated motor vehicle with the automated driving system engaged from the requirement to hold a driver's license, provides for satisfaction of requirement to notify law enforcement in certain instances of collisions by automated motor vehicles, provides for certain equipment and insurance requirements, provides for registration requirements, provides for exclusive jurisdiction governing such vehicles.	Enacted August 5th, 2017
Hawaii	H 1596 (2017)	Authorizes for testing purposes the operation of autonomous vehicles in the State of Hawaii, requires Department of Transportation to establish an application and approval process and report annually to the Legislature, makes an appropriation.	Pending January 25th, 2017
Hawaii	H 2253 (2018)	Authorizes and regulates the testing of autonomous vehicles in the State of Hawaii, establishes approval process and annual reporting, defines autonomous vehicles, regulations, and financial liabilities, makes an appropriation.	Pending January 22nd, 2018
Illinois	HB 791 (2017)	Pre-empts local authorities from enacting or enforcing ordinances that prohibit the use of vehicles equipped with Automated Driving Systems. Defines "automated driving system equipped vehicle."	Effective June 1, 2018.
Indiana	H 1341 (2018)	Establishes regulation relating to autonomous vehicles, provides that a political subdivision may not prohibit the authorized use of an automated driving system, automated vehicle, or an on demand automated vehicle network, provides criteria for the authorization and operation of automated driving systems and vehicles, provides criteria for the registration of automated vehicles and proof of financial responsibility, provides for required equipment and prerequisites, provides for certain liabilities.	Pending March 5th, 2018
Louisiana	HB 1143 (2016)	Defines "autonomous technology" for purposes of the Highway Regulatory Act.	Enacted and chaptered on June 2, 2016.
Massachusetts	H 1822 (2017)	Authorizes the operation of autonomous vehicles without active control or monitoring by a human operator.	Pending January 23rd 2017
Massachusetts	H 1829 (2017)	Promotes the safe integration of autonomous vehicles into the transportation system of the Commonwealth.	Pending February 24th 2017
Massachusetts	H 1897 (2017)	Relates to autonomous vehicles.	Pending January 23rd 2017
Massachusetts	S 1938 (2017)	Relates to the safety of autonomous vehicles.	Pending January 23rd 2017
Massachusetts	S 1945 (2017)	Promotes the safe integration of autonomous vehicles into the transportation system of the Commonwealth.	Pending January 23rd 2017
Massachusetts	H 3422 (2017)	Relates to the safety of autonomous vehicles.	Pending March 20th 2017
Michigan	SB 995 (2016)	Allows for autonomous vehicles under certain conditions. Allows operation without a person in the autonomous vehicle. Specifies that the requirement that commercial vehicles maintain a minimum following distance of 500 feet does not apply to vehicles in a platoon.	Enacted and chaptered on Dec. 9, 2016.
Michigan	SB 996 (2016)	Allows for autonomous vehicles under certain conditions. Allows operation without a person in the autonomous vehicle.	Enacted and chaptered on Dec. 9, 2016.
Michigan	SB 997 (2016)	Defines automated driving system. Allows for the creation of mobility research centers where automated technology can be tested. Provides immunity for automated technology manufacturers when modifications are made without the manufacturer's consent.	Enacted and chaptered on Dec. 9, 2016.
Michigan	SB 998 (2016)	Exempts mechanics and repair shops from liability on fixing automated vehicles.	Enacted and chaptered on Dec. 9, 2016.
Michigan	SB 169 (2013)	Defines "automated technology," "automated vehicle," "automated mode," expressly permits testing of automated vehicles by certain parties under certain conditions, defines operator, addresses liability of the original manufacturer of a vehicle on which a third party has installed an automated system, directs state DOT with Secretary of State to submit report by Feb. 1, 2016.	Enacted and chaptered on Dec. 20, 2013.

Michigan	SB 663 (2013)	Limits liability of vehicle manufacturer or upfitter for damages in a product liability suit resulting from modifications made by a third party to an automated vehicle or automated vehicle technology under certain circumstances; relates to automated mode conversions.	Enacted and chaptered on Dec. 26, 2013.
Missouri	H 1871 (2018)	Allows testing of driverless motor vehicles until August 28, 2021.	Pending March 1st 2018
Nebraska	L 1122 (2018)	Authorizes testing of automated motor vehicles as prescribed.	Pending January 18th 2018
Nevada	AB 511 (2011)	Authorizes operation of autonomous vehicles and a driver's license endorsement for operators of autonomous vehicles. Defines "autonomous vehicle" and directs state Department of Motor Vehicles (DMV) to adopt rules for license endorsement and for operation, including insurance, safety standards and testing.	Enacted and chaptered on June 17, 2011.
Nevada	SB 140 (2011)	Prohibits the use of cell phones or other handheld wireless communications devices while driving in certain circumstances, and makes it a crime to text or read data on a cellular phone while driving. Permits use of such devices for persons in a legally operating autonomous vehicle. These persons are deemed not to be operating a motor vehicle for the purposes of this law.	Enacted and chaptered on June 17, 2011.
Nevada	SB 313 (2013)	Relates to autonomous vehicles. Requires an autonomous vehicle that is being tested on a highway to meet certain conditions relating to a human operator. Requires proof of insurance. Prohibits an autonomous vehicle from being registered in the state, or tested or operated on a highway within the state, unless it meets certain conditions. Provides that the manufacturer of a vehicle that has been converted to be an autonomous vehicle by a third party is immune from liability for certain injuries.	Enacted and chaptered on June 2, 2013.
Nevada	AB 69 (2017)	Defines terms including "driver-assistive platooning technology," "fully autonomous vehicle" and "automated driving system." Allows the use of driver-assistive platooning technology on highways in the state. Preempts local regulation. Requires the reporting of any crashes to the department of motor vehicles within 10 days if the crash results in personal injury or property damage greater than $750. Allows a fine of up to $2,500 to be imposed for violations of laws and regulations relating to autonomous vehicles. Permits the operation of fully autonomous vehicles in the state without a human operator in the vehicle. Specifies that the original manufacturer is not liable for damages if a vehicle has been modified by an unauthorized third party. Allows the DMV to adopt certain regulations relating to autonomous vehicles. Defines "driver," for purposes of an autonomous vehicle, to be the person who causes the automated driving system to engage. Specifies that the following distance requirement does not apply to a vehicle using platooning technology. Imposes an excise tax on the connection of a passenger to a fully autonomous vehicle for the purpose of providing transportation services. Specifies requirements for autonomous vehicle network companies, including a permitting requirement, prohibitions on discrimination, and addressing accessibility. Permits the use of autonomous vehicles by motor carriers and taxi companies if certain requirements are met.	Enacted and chaptered on June 16, 2017.
New York	SB 2005 (2017)	Allows the commissioner of motor vehicles to approve autonomous vehicle tests and demonstrations. Requires supervision from the state police for testing. Specifies requirements for operation, including insurance of five million dollars. Defines autonomous vehicle technology and dynamic driving task. Requires a report on testing and demonstration.	Enacted and chaptered on April 20, 2017.
New York	A 1037 (2017)	Provides for and regulates the operation and testing of motor vehicles with autonomous technology.	Pending 1/10/2017
New York	S 2005 (2017)	Provides for budget implementation, relates to corrections candidates, police officers, prisoner furloughs, correctional facilities, inmate work release, certain departments, detention and incarceration alternatives, certain taxes, the ignition interlock device program, family violence, military funds, vulnerable adults and various other matters.	Enacted April 20th 2017
New York	A 3005 (2017)	Enacts into law major components of legislation necessary to implement the state public protection and general government budget for the state fiscal year, relates to extending various criminal justice and public safety programs that would otherwise sunset, relates to criminal possession of marihuana in the fifth degree, relates to cybercrimes.	Pending April 4th 2017

New York	S 7508 (2018)	Amends the generally, enacts into law major components of legislation necessary to implement the state transportation, economic development and environmental conservation budget for the 2018-2019 state fiscal year, enhances the state's ability to enforce state and federal law relating to motor carriers, commercial drivers and bus operators and increases penalties for violations of state law relating thereto (Part A), allows for commercial facilities at roadside rest areas (Part B).	Pending February 16th 2018
New York	A 9508 (2018)	Amends the generally, enacts into law major components of legislation necessary to implement the state transportation, economic development and environmental conservation budget for the 2018-2019 state fiscal year, enhances the state's ability to enforce state and federal law relating to motor carriers, commercial drivers and bus operators and increases penalties for violations of state law relating thereto, allows for commercial facilities at roadside rest areas.	Pending February 16th 2018
New Jersey	S 3225 (2017)	Permits testing and use of autonomous vehicles on state roadways under certain circumstances.	Failed May 18th 2017
New Jersey	A 3745 (2016)	Permits testing and use of autonomous vehicles on state roadways under certain circumstances, provides that an operator is a person seated in the driver's seat or has the ability to cause the autonomous technology to engage.	Failed December 12th 2016
North Carolina	HB 469 (2017)	Establishes regulations for the operation of fully autonomous motor vehicles on public highways of this state. Defines terms. Specifies that a driver's license is not required for an AV operator. Requires an adult be in the vehicle if a person under 12 is in the vehicle. Preempts local regulation. Establishes the Fully Autonomous Vehicle Committee.	Effective Dec. 1, 2017.
North Carolina	HB 716 (2017)	Modifies the follow-too-closely law to allow platooning.	Effective Aug. 1, 2017.
North Dakota	HB 1065 (2015)	Provides for a study of autonomous vehicles. Includes research into the degree that automated motor vehicles could reduce traffic fatalities and crashes by reducing or eliminating driver error and the degree that automated motor vehicles could reduce congestion and improve fuel economy.	Enacted and chaptered on March 20, 2015.
North Dakota	HB 1202 (2017)	Requires the department of transportation to study the use of vehicles equipped with automated driving systems on the highways in this state and the data or information stored or gathered by the use of those vehicles. Also requires that the study include a review of current laws dealing with licensing, registration, insurance, data ownership and use, and inspection and how they should apply to vehicles equipped with automated driving systems.	Effective Aug. 1, 2017.
Oklahoma	S 202 (2017)	Relates to autonomous vehicles, defines term, establishes certain regulations for the operation of autonomous vehicles, provides for codification.	Pending 2/6/2017
Pennsylvania	SB 1267 (2016)	Allows the use of allocated funds, up to $40,000,000, for intelligent transportation system applications, such as autonomous and connected vehicle-related technology, in addition to other specified uses.	Effective Sept. 19, 2016.
Pennsylvania	S 427 (2017)	Amends Vehicles of the Pennsylvania Consolidated Statutes, in operation of vehicles, provides for highly automated vehicles and platooning testing.	Pending 2/24/2017
South Carolina	HB 3289 (2017)	Specifies that minimum following distance laws for vehicles traveling along a highway do not apply to the operator of any non-leading vehicle traveling in a platoon.	Effective May 19, 2017.
Tennessee	SB 598 (2015)	Relates to motor vehicles. Prohibits local governments from banning the use of motor vehicles equipped with autonomous technology.	Enacted and chaptered on April 24, 2015.
Tennessee	SB 2333 (2016)	Allows a motor vehicle to be operated, or to be equipped with, an integrated electronic display visible to the operator while the motor vehicle's autonomous technology is engaged.	Enacted and chaptered on March 22, 2016.
Tennessee	SB 1561 (2016)	Redefines "autonomous technology" for purposes of preemption. Defines "driving mode" and "dynamic driving task."	Enacted and chaptered on April 27, 2016.

Tennessee	SB 676 (2017)	Permits the operation of a platoon on streets and highways in the state after the person provides notification to the department of transportation and the department of safety.	Enacted and chaptered on April 24, 2017.
Tennessee	SB 151 (2017)	Creates the "Automated Vehicles Act." Defines a number of terms. Modifies laws related to unattended motor vehicles, child passenger restraint systems, seat belts, and crash reporting in order to address ADS-operated vehicles. Specifies that ADS-operated vehicles are exempt from licensing requirements. Permits ADS-operated vehicles on streets and highways in the state without a driver in the vehicle if it meets certain conditions. Preempts local regulation of ADS-operated vehicles. Specifies that the ADS shall be considered a driver for liability purposes when it is fully engaged and operated properly. Makes it a class A misdemeanor to operate a motor vehicle on public roads in the states without a human driver in the driver's seat without meeting the requirements of this Act. Specifies that this Act only applies to vehicles in high or full automation mode.	Enacted and chaptered on June 6, 2017.
Tennessee	H 381 (2017)	Relates to motor vehicles, authorizes the operation of autonomous vehicles on the public roads of this state.	Pending 2/1/2017
Texas	HB 1791 (2017)	Allows the use of a connected braking system in order to maintain the appropriate distance between vehicles. Specifies that "connected braking system" means a system by which the braking of one vehicle is electronically coordinated with the braking system of a following vehicle.	Enacted and chaptered on May 18, 2017.
Texas	SB 2205 (2017)	Defines a number of terms, including "automated driving system," "automated motor vehicle," "entire dynamic driving task" and "human operator." Preempts local regulation of automated motor vehicles and automated driving systems. Specifies that the owner of an automated driving system is the operator of the vehicle when the system is engaged and the system is considered licensed to operate the vehicle. Allows an automated motor vehicle to operate in the state regardless of whether a human operator is present in the vehicle, as long as certain requirements are met.	Effective Sept. 1, 2017.
Utah	HB 373 (2015)	Authorizes the Department of Transportation to conduct a connected vehicle technology testing program.	Enacted and chaptered on April 22, 2015.
Utah	HB 280 (2016)	Requires a study related to autonomous vehicles, including evaluating NHTSA and AAMVA standards and best practices, evaluating appropriate safety features and regulatory strategies and developing recommendations.	Enacted and chaptered on March 23, 2016.
Virginia	HB 454 (2016)	Allows the viewing of a visual display while a vehicle is being operated autonomously.	Enacted and chaptered on April 6, 2016.
Vermont	HB 494 (2017)	Requires the department of transportation convene a meeting of stakeholders with expertise on a range of topics related to automated vehicles. The secretary of transportation must report to the House and Senate committees on transportation regarding the meetings and any recommendations related automated vehicles, including proposed legislation.	Enacted and chaptered on May 17, 2017.
Washington, D.C.	2012 DC B 19-0931	Defines "autonomous vehicle" as "a vehicle capable of navigating District roadways and interpreting traffic-control devices without a driver actively operating any of the vehicle's control systems." Requires a human driver "prepared to take control of the autonomous vehicle at any moment." Restricts conversion to recent vehicles, and addresses liability of the original manufacturer of a converted vehicle.	Enacted and effective from April 23, 2013.
Washington State	H 2131 (2017)	Regulates autonomous vehicles.	Pending 2/23/2017

Source: NCSL (2018)[20]

[20] NCSL (2018) Autonomous Vehicles – Self-Driving Vehicles enacted legislation, National Conference of State Legislatures, NCSL, 21 May 2018.

4 CONCLUSION

Innovation in the transport sector is now rapidly evolving after a prolonged focus on driver-operated internal combustion vehicles, to create the potential for self-driving electric vehicles, both private and public. However, in many cases such innovations have been in advance of underlying policies and legislation, calling for revisions and the development of new policy mechanisms to support the incorporation of such innovation into the transport system. Likewise, innovation in transport vehicle technology has been in advance of social acceptance, with many fearful of riding in a self-driving vehicle. The combination of technology innovation timeframes, updates to policy and legislation and social acceptance suggests that significant adoption of self-driving vehicles will not occur until around 2035.

When considering policy responses, there are examples of both leaders and laggards. Leaders include EU Member State Transport Ministries calling for the European Commission '*to develop a shared European strategy on connected and automated driving*', and laggards include Belgium that requires that all vehicles must have a driver and that driver is responsible for any acts or damages caused by the vehicle. It is the conclusion of this investigation that precedent exists to inform policy and legislative changes in Australian State Governments to underpin the trialling and adoption of self-driving technologies.