



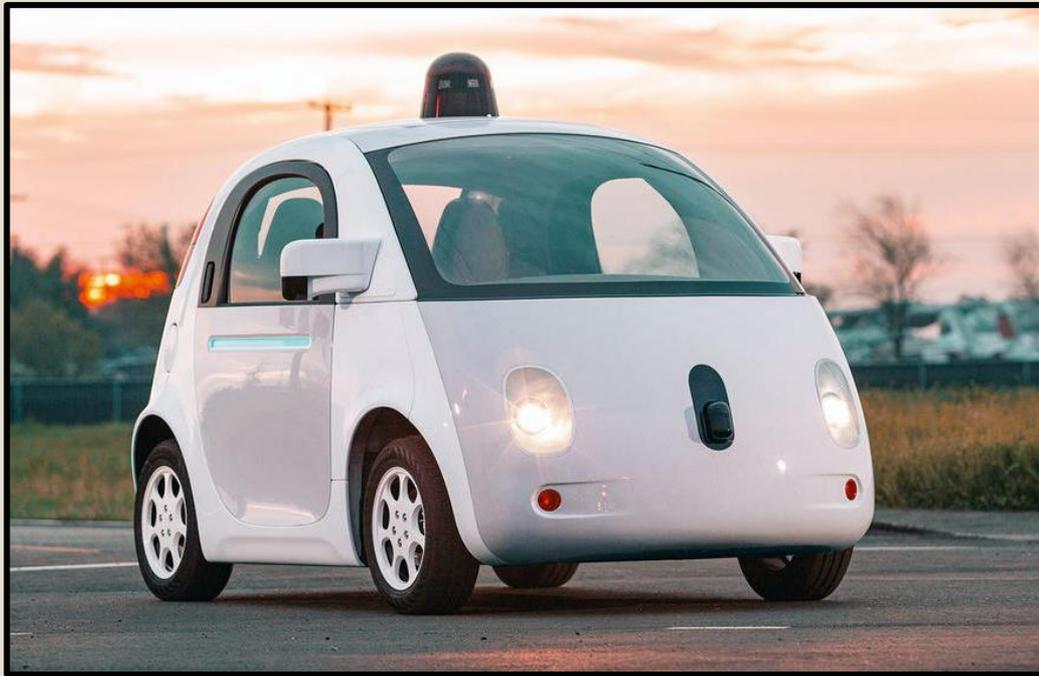
Autonomous Vehicles on New Mexico Roadways

Transportation Infrastructure Revenue Subcommittee

Charles Remkes, P.E., Manager NMDOT
ITS Operations

July 25, 2017

Autonomous Vehicles (AVs) – Vehicles that can sense their environment and navigate (steer, accelerate and brake) without human input.



2009 – Google Self-driving Car Project

<http://blog.americansafetycouncil.com/googles-self-driving-car-hit-a-bus-2/>

Manufacturer Timelines for AV Production*

GM: 2018 – “We expect to be the first high-volume auto manufacturer to build fully autonomous vehicles in a mass-production assembly plant”

General Motors: Self-Driving Cars Being Mass Produced**



Chevrolet Bolt at the GM plant in Lake Orion, Mich. – June 13, 2017

Ford: 2021

Honda: 2020

Toyota: 2020

Renault-Nissan: 2020

Volvo: 2021

Hyundai: 2020

Daimler: 2020

Fiat-Chrysler: 2021

BMW: 2021

Tesla: 2017

* <https://venturebeat.com/2017/06/04/self-driving-car-timeline-for-11-top-automakers/>

** JAMES BENNETT, THE DAILY HERALD, COLUMBIA, TENN. / JULY 13, 2017

Already in Gear



**October 24, 2016 – Uber and Anheuser- Busch delivered 45000 cans of beer
From Fort Collins to Colorado Springs**

(<https://www.wired.com/2016/10/ubers-self-driving-truck-makes-first-delivery-50000-beers/>)

Close to Home



April 2017 – Phoenix residents have access to WAYMO - Google's self-driving car program

<https://www.macrumors.com/2017/04/25/waymo-self-driving-program-phoenix/>

And Most Recently, Friday July 7, 2017

Mayor opens city to self-driving cars

By Rick Nathanson / Journal Staff Writer
Friday, July 7th, 2017 at 11:42pm

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Mayor Richard Berry on Friday sent a strong message to companies developing and testing driverless technology that Albuquerque is opening its arms to them.

Berry issued an “executive instruction” directing the Department of Municipal Development, the city’s Legal Department and “all other agencies of the city” to promote self-driving vehicles in Albuquerque.



Mayor Richard Berry

Executive Instruction 29

Self-Driving Vehicle Testing and Operations in the City of Albuquerque

City shall promote pilot programs on campuses of public and private institutions in cooperation with entities that are developing technology of self-driving vehicles provided that the pilot program:

- Abides by all Albuquerque Ordinances and state and federal traffic laws**
- Does not test or operate AVs on public roads without specific legal authority**
- Does not conflict with the anti-donation clause when using public property**
- Only uses personnel who are authorized by the technology developer to operate their AVs**
- Ensures all AV operators are licensed in the U.S.**
- Monitors AVs during testing and operations**
- Allows the operator to assume AV control**
- Submits proof of financial liability**

AV Enabling Legislation and Executive Orders

2011 - One (1) state introduced legislation – NV passed what was introduced

2012 - Eight (8) states introduced legislation – CA, FL and DC passed

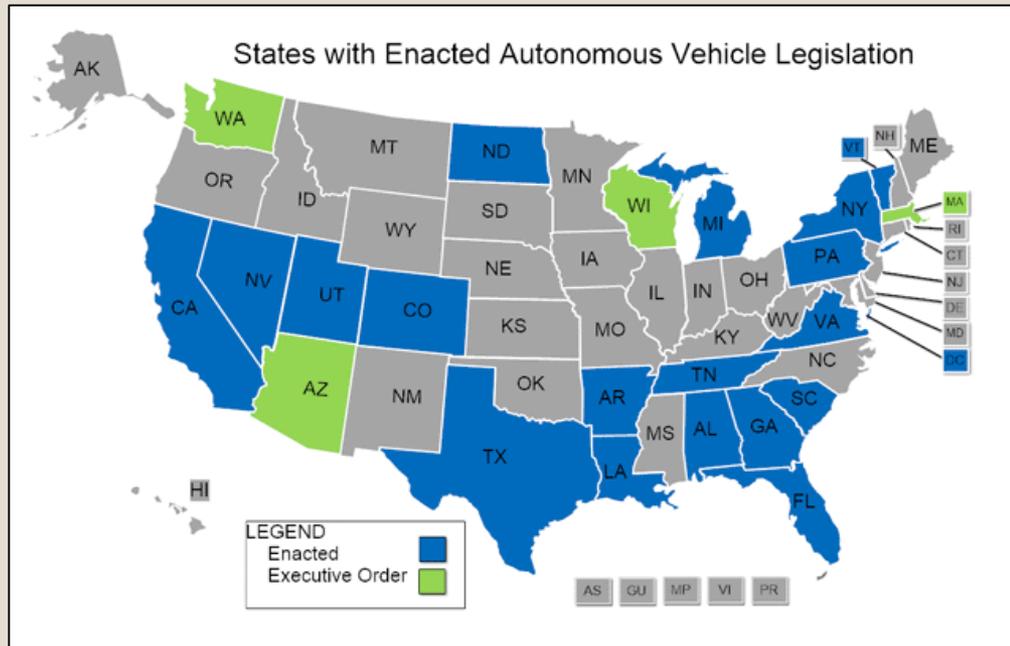
2013- Nine (9) states introduced legislation – MI, NV, DC passed

2014 - Eleven (11) states introduced legislation – None passed

2015 - Fifteen (15) states introduced legislation – ND, UT and TN passed

2016 - Twenty (20) states introduced legislation – AL, CA, FL, MI, LA, PA, UT, VA and TN passed

2017 - Thirty-three (33) states introduced legislation – AR, CO, FL, GA, NV, NY, ND, SC, TN, TX, VT



***18 States and DC have passed AV enabling legislation**

***4 Governors have issued AV enabling Executive Orders**

* Included as a supplement to this presentation – source National Conference of State Legislatures

Currently -

Under current federal law, manufacturers self-certify their vehicles comply with all applicable Federal Motor Vehicle Safety Standards (FMVSS).

If an AV is compliant within the existing FMVSS regulatory framework there is no legal barrier to an AV being offered for sale.

NHTSA maintains authority (defect, recall and enforcement) over manufacturers of AV systems.

USDOT anticipates HAV manufacturers will use industry standards, best practices and federal guidance, to ensure their systems are safe under real-world conditions.

September 2016 – National Highway Traffic Safety Administration (NHTSA) Publishes the Federal Automated Vehicles Policy (FAVP)*



* <https://www.transportation.gov/AV>

FAVP Adopts How the SAE (Society of Automotive Engineers) Defines and Classifies AVs into Different Levels of Automation

- **SAE Level 0, the human driver does everything**
- **SAE Level 1, an automated system on the vehicle can sometimes assist the human driver conduct some parts of the driving task**
- **SAE Level 2, an automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving task**
-
- **SAE Level 3, an automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests**
- **At SAE Level 4, an automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions**
- **SAE Level 5, the automated system can perform all driving tasks, under all conditions that a human driver could perform them**

Highly Autonomous Vehicles (HAVs) are considered to be vehicles that operate at SAE Levels 3, 4 and 5

FAVP Defines Both Federal and State Regulatory Responsibilities

Federal Responsibilities Include:

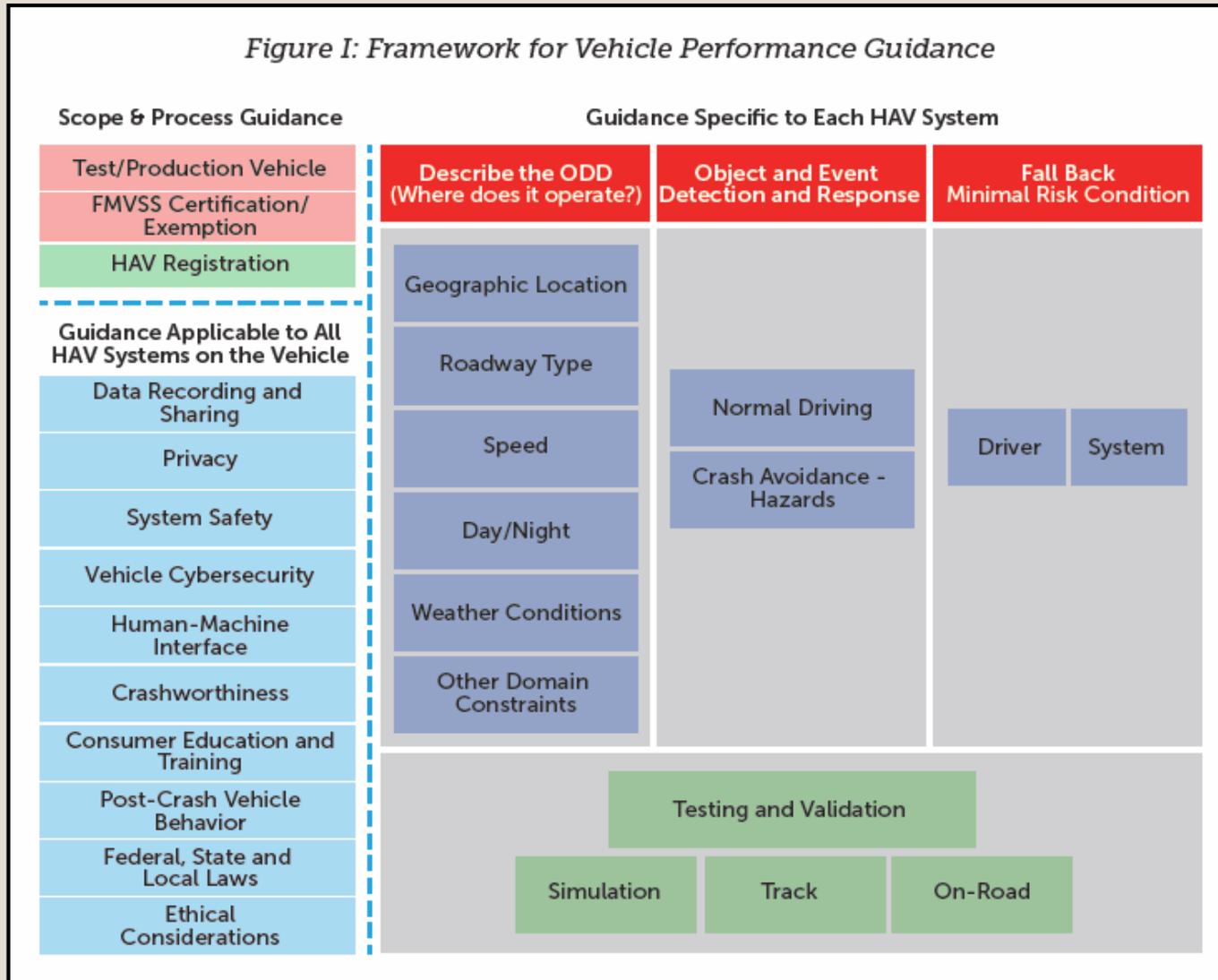
- **Setting FMVSS for new motor vehicles and motor vehicle equipment (to which manufacturers must certify compliance before they sell their vehicles);**
- **Enforcing compliance with the FMVSS;**
- **Investigating and managing the recall and remedy of non-compliances and safety-related motor vehicle defects and recalls on a nationwide basis;**
- **Communicating with and educating the public about motor vehicle safety issues; and**
- **Issuing guidance for vehicle and equipment manufacturers to follow, such as the Vehicle Performance Guidance for HAVs presented in this Policy.**

States' Responsibilities Include other Aspects of Motor Vehicle Regulations:

- **Licensing (human) drivers and registering motor vehicles in their jurisdictions;**
- **Enacting and enforcing traffic laws and regulations;**
- **Conducting safety inspections, where States choose to do so; and**
- **Regulating motor vehicle insurance and liability.**

US DOT's HAV Performance Guidance

Figure I: Framework for Vehicle Performance Guidance



Safety Assessment

NHTSA is requesting HAV manufacturers provide reports regarding how the Guidance in the FAVP has been followed and is satisfied. NHTSA expects the reporting process to soon be required through a future rulemaking.

Assessment Parameters

- Data Recording and Sharing
- Privacy
- System Safety
- Vehicle Cyber-security
- Human Machine Interface
- Crashworthiness
- Consumer Education and Training
- Registration and Certification
- Post Crash Behavior
- Federal, State and Local Laws
- Ethical Considerations
- Operational Design Domain
- Object and Event Detection and Response
- Fall Back (Minimal Risk Condition)
- Validation Methods

FAVP Provides Guidance on 'Model State Policies' for HAVs

The USDOT strongly encourages States to allow US DOT alone to regulate the performance of HAV technology and vehicles.

The Vehicle Safety Act expressly preempts States from issuing any standard that regulates performance if that standard is not identical to an existing FMVSS regulating that same aspect of performance.

States cannot have their own performance standards for HAVs unless identical to NHTSA-issued FMVSS performance requirements on the same aspects of HAV performance.

State laws may be preempted if they stand as an obstacle to the accomplishment and execution of a NHTSA safety standard

THE TAKE AWAY FROM THIS

**STATES SHOULD NOT DEVELOP THEIR OWN HAV SAFETY,
OPERATIONAL, or PERFORMANCE STANDARDS**

FAVP Model State Policy Guidance

Model framework envisions States regulating the procedures and requirements for granting permission to vehicle manufacturers and owners to test and operate HAVs within a state.

Administrative

- Identify a lead agency
- Create an automated safety technology committee
- Identify stakeholders for participation
- Identify other stakeholders for consultation
- Establish an application process for OEMs to test HAVs
- Establish an internal process for to issue testing permits
- Review state statutes to identify impediments and conflicts
 - * New Mexico Statutes Chapter 66. Motor Vehicles
- Document OEM's compliance with NHTSA's FMVSS and Performance Guidance

* Comments on Chapter 66 are included as a supplement to this presentation

Affected Stakeholders for Participation and Consultation

- New Mexico Department of Transportation
- New Mexico State Police of the Department of Public Safety
- Motor Transportation Police
- Motor Vehicles Division (MVD) of the New Mexico Tax and Revenue Department
- Office of Superintendent of Insurance
- Public Regulatory Commission
- Department of Economic Development
- Department of Information Technology
- Department of Aging & Long-Term Services
- Local Jurisdictions
- Transit Agencies
- Research Centers and Universities
- Professional Organizations (ITSA, ITSNM, ITE, ...)
- Public Mobility and Safety Advocacy Groups (Pedestrians, Bicyclists, Consumers, ...)
- Trucking Community (NMTA)
- Federal Transportation Officials (FHWA, NHTSA, FMCSA, FTA, ...)
- OEMs

Anticipated Challenges and Moving Forward

HAV Testing –

- **Locations – controlled environment, public streets**
- **Criteria and Parameters – compliance to NHTSA standards and regulations**
- **Evaluation – Resident expertise within approving agency(ies)**
- **Legislative Actions**
- **Coordinating Agency Resources**

HAV Operations –

- **Public Education and Training**
- **Legislative Actions**
- **Law Enforcement**
- **Process modifications**
 - **Insurance Requirements**
 - **Registration**
 - **Licensing**
 - **Inspections**



Presentation Supplement

Benefits of AVs

Introduced Enabling Legislation

Passed Enabling Legislation

AVs and

New Mexico Statutes Chapter 66. Motor Vehicles

Benefits of AVs

Improves Safety –

- In 2015 35,092 people died on U.S. Roadways* – 383** in New Mexico
- 94%*** of crashes attributed to human choice or error
- 90%**** reduction in fatality rate with full AV deployment
- Using 2015 numbers - 31,500 lives per year saved – 345 of them in New Mexico

Improves Operations –

- Better Traffic Flow
- Reduced congestion
- Increase lane capacity
- Route Optimization

Energy Savings – Less fuel consumption from congestion and delays

Improves Quality of Life -

- More free time
- Less drive time
- More productivity

Improves Personal Mobility –

- Disabilities
- Elderly

* <https://www.nhtsa.gov/press-releases/traffic-fatalities-sharply-2015>

** http://dot.state.nm.us/content/dam/nmdot/Traffic_Safety/AnnualReport.pdf

*** <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115>

**** <https://www.sciencealert.com/driverless-cars-could-reduce-traffic-fatalities-by-up-to-90-says-report>

***Introduced AV Enabling Legislation**

Vary in Scope and Complexity --

- **Focus on Definitions - AV Technology, Operators**
- **Establishes Requirements for Operators**
- **Allows for Testing of AVs**
- **Allows for Operating AVs**
- **Establishes Insurance Requirements**
- **Indemnifies Manufacturers and 3rd Parties from Liability**
- **Establishes Drivers License Requirements**
- **Establishes Safety Standards for OEMs**
- **References Federal Motor Vehicle Safety Standards (FMVSS)**
- **Declares Legislative Intent to Encourage or Endorse AVs Use**
- **Requires an Evaluation of Current and Needed Legislation**
- **Requires a Review of DOT Policies**
- **Identifies Allowances and Restrictions (CVO and Towing Operations)**
- **Relates to AV Guidance and Display System Interfaces**
- **Create a Study Committee**
- **Establish an OEM Certification Process**

***Passed AV Enabling Legislation**

- **Alabama – Establish a Joint Legislative Committee to study self-driving vehicles**
- **Arkansas – Makes allowance for following distances for platooning systems**
- **California – Requires Highway Patrol to adopt safety standards and requirements for AV operations**
- **Colorado – Defines AV systems and operations; allows the use of AV systems for functions that have been demonstrated to comply with associated state and federal laws**
- **Connecticut – Defines AV systems and operations; requires a pilot program to be developed and evaluated; establishes a task force to study AVs, NHTSA standards for state responsibilities, existing laws, legislation/regulations from other states, and make recommendations for CT's approach to AVs**
- **Florida – Defines AV systems and operations; declares legislative intent to support AV testing/operations; establishes insurance requirements; allows for AV use by those with a valid license; eliminates the requirement of a driver in the AV; requires AVs to meet federal safety standards; accommodates truck platooning**
- **Georgia - Makes allowance for following distances for platooning systems; defines AV systems and operations; exempts AV operators from having to have a driver's license; establishes insurance and registration requirements**
- **Louisiana – Defines AV technology**
- **Michigan – Defines AV technology, systems and operations; allows for AV operations under certain conditions; allows for shorter following distances for platooning systems; details liability exemptions and immunities; creation of mobility research center for AV testing**
- **Nevada - Defines AV technology, systems and operations; authorizes AV operations and establishes driver's license endorsement for AV operators; allows the use of cell phones when in autonomous mode; allows for shorter following distances for platooning systems;**
- **New York – Defines AV technology, systems and operations; allows for AV tests and demonstrations; requires it to be supervised by state police**

* <http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>

***Passed AV Enabling Legislation (cont.)**

- **North Dakota – Requires NDDOT to study the use of AVs and a review of current laws for HAV impact**
- **Pennsylvania – Allows the use of \$40 M of allocated funds for AV and connected vehicle technology**
- **South Carolina - Makes allowance for following distances for platooning systems**
- **Tennessee – Defines AV technology, systems and operations; allows for AV operations; allows for shorter following distances for platooning systems; prohibits local entities from banning AV operations**
- **Texas – Defines AV technology, systems and operations; authorizes AV operations without a person present; preempts any local regulations regarding AV operations**
- **Utah – Authorizes UDOT to conduct connected vehicle technology testing; requires a study of AVs that evaluates NHTSA safety standards and regulatory strategies**
- **Virginia – Allows for viewing visual displays during autonomous mode**
- **Vermont – Requires DOT to convene a meeting of AV experts and prepare a report for proposed legislation**
- **Washington D.C. - Defines AV technology, systems and operations; requires a driver to be present and ready to assume control; restricts vehicle conversions and associated OEM liability**

***Executive Orders**

- **Arizona – Directs agencies to undertake any steps needed to support testing and operations of AVs and enables pilot testing program at select universities**
- **Massachusetts – Creates a working group on AVs to work with experts to promote testing and deployment of AVs; work with legislative members to develop legislation**
- **Washington – Establishes an interagency work group to support AV testing and operations via pilot programs**
- **Wisconsin – Creates a Governor’s Steering Committee on Autonomous and Connected Vehicle Testing and Deployment to advise on how to best advance AV and CV testing and deployment**

New Mexico Statutes Chapter 66. Motor Vehicles

The following are existing portions of Article 1 of Chapter 66 that other states have amended in their similar laws:

- **§ 66-1-4.4.K. - “driver” means every person who drives a motor vehicle, including a motorcycle, upon a highway, who is exercising control over or steering a vehicle being towed by a motor vehicle or who operates or is in actual physical control of an off-highway motor vehicle;**
- **§ 66-1-4.4.L. - “driver’s license” means a license or a class of license issued by a state or other jurisdiction to an individual that authorizes the individual to drive a motor vehicle;**
- **§ 66-1-4.13.E - “operator” means driver, as defined in Section 66-1-4.4 NMSA 1978;**

The following are not in Article 1 of our current statute but have been included by other states as amendments their laws:

- **§ 66-1-4.1. – Consider including a definition for ‘autonomous vehicle’ and or ‘autonomous technology’**
- **§ 66-1-4.4.8 – Consider including a definition for ‘highly autonomous vehicle’**
- **§ 66-1-4.11- Consider including a definition for ‘mode-of-operation’ that will differentiate between manual control and autonomous activation**

New Mexico Statutes Chapter 66. Motor Vehicles

Article 2. Motor Vehicle Division of Taxation and Revenue Department

Article 5. Licensing of Operators and Chauffeurs; Financial Responsibility; Uninsured Motorists' Insurance; Identification Cards

Vehicle registrations, the issuance of driver's license and insurance requirements are specific elements identified by the NHTSA in the FAVP that shall remain with the states. It is not readily apparent that the specific language within these Articles would need to be changed with the testing and operations of AVs versus the internal processes (administrative practices, forms, applications, etc. that are used for registration and licensing) within MVD/TRD that would have to be looked at, but that should be addressed by that division within that Department.

This would support the need to have a task force or working group comprised of all affected stakeholder agencies to evaluate their respective administrative and/or operational practices and procedures for impact.

Article 3 – Registration Laws; Security Interests; Anti-Theft Provisions; Bicycles; Equipment; Unsafe Vehicles' Off-Highway Motor Vehicles; Other Vehicles

Part 9 – Equipment - might be appropriate to include language that identifies the hardware and software necessary to have a vehicle operate at SAE Levels 3, 4 and 5 as being integral to that vehicle and cannot be altered or removed by anyone other than the OEM or an authorized agent of the OEM.

New Mexico Statutes Chapter 66. Motor Vehicles

Article 4 – Licensing of Dealers and Wreckers

This Article focuses on the administrative processes that state uses to license dealers not Original Equipment Manufacturers (OEMs); because dealers work as a franchise to OEMs, it is unlikely that there is any need to modify language.

Article 6 – Fees

This Article includes fees associated with vehicle registrations. Registration is in the domain of state's responsibilities. Because currently there is no mention of AVs in the this Article, inclusion of specific language dedicated to the registration of AVs might want to be considered to cover any additional costs incurred by the State toward AV testing and/or operations on NM roadways. This might be just as easily managed within an application process.

New Mexico Statutes Chapter 66. Motor Vehicles

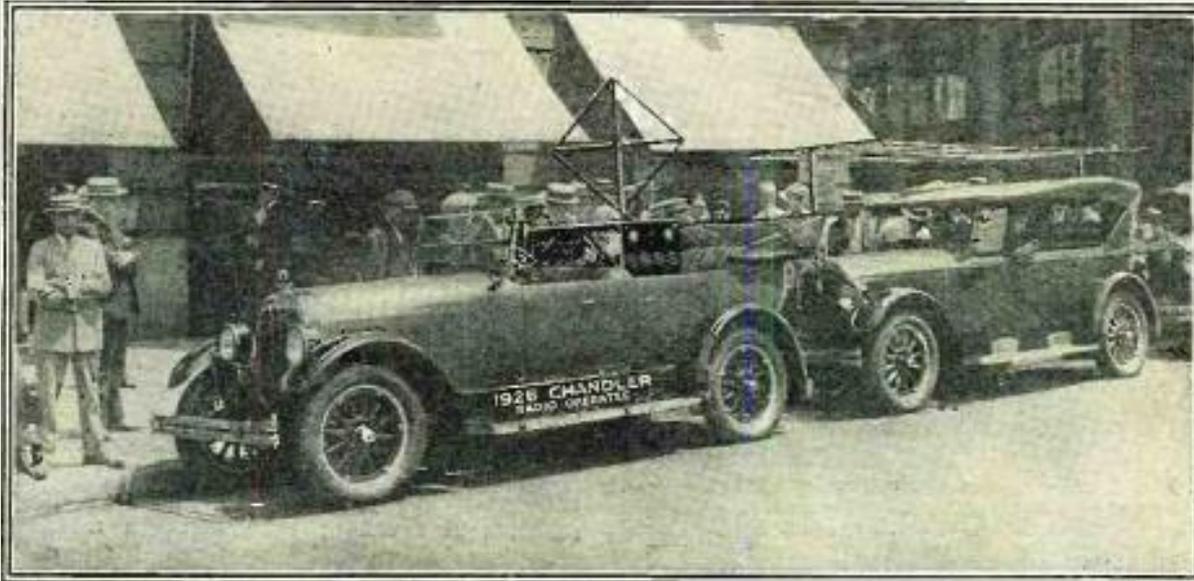
Article 7 – Traffic Laws; Signs, Signals and Markings; Accidents; Weight and Size; Traffic Safety

The various sections of this Article makes multiple references to ‘driver’, ‘drivers’, ‘operator’, ‘operators’, ‘driving a vehicle’, ‘operating a vehicle’ – If the definition is addressed in the General Provisions – that might alleviate the need for clarification on the individual sections associated with this Article.

The following are existing portions of Article 7 of Chapter 66 that other states have amended in their similar laws:

- § 66-7-318 - Following too closely - the language of this should be considered for amendment to accommodate platoons of Commercial Vehicle Operations as well as reducing headway associated with AVs;**
- § 66-7-357 – Obstruction of driver’s view - relevance to AVs questionable;**
- § 66-7-358– Restriction of use of television in motor vehicles – relevance to AVs questionable;**
- § 66-7-374– Texting while driving – relevance to AVs questionable.**

Modern Trend Toward Driverless Cars



1925 – Francis Houdina equipped a Chandler with an antenna by which he operated and controlled the vehicle remotely

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