The Future is Here: Connected and Autonomous Vehicles
Part II -*Challenges and Regulatory Framework*

Over the next several months, Travel Times will be featuring a series of short articles with links for further reading on connected and autonomous vehicles. What once may have sounded like science fiction or at least somewhat futuristic is now a reality and only years away from wide-scale deployment. This series will shed light on this emerging technology and look at what it means for the traveling public, consumers, and our region. We hope you find this series informative, and we invite you to share any thoughts or comments on this topic on our [Facebook page](#) where we will be hosting an online conversation related to our Connected and Autonomous Vehicles Series.

What are the Regulatory and Policy Challenges with Connected and Autonomous Vehicles?

Advances in technology have always had a way of disrupting our daily routines, yet they often result in the kinds of positive advances only envisioned in science fiction. This is the case with the introduction of connected and autonomous vehicles (CAVs). A recent finding by the National Highway Traffic Safety Administration (NHTSA) estimates that safety features enabled by connected vehicles could eliminate or lessen the severity of up to 80 percent of non-impaired crashes, including crashes at intersections or while changing lanes. We noted in the last report in our series that connected-vehicle technologies are already in production and that with each year, new features are being added such as driver-assist, alerts of upcoming hazards, and crash-avoidance, such that the driving experience of today resembles nothing like that of the past. Further, this evolution has led to the incremental introduction of small-scale autonomous systems—particularly as taxi or short-range car-services—but the focus is now on the more widespread adoption for all travelers. All indications are that connected and autonomous vehicles will continue to evolve, and according to stated plans, most auto manufacturers are anticipating high-volume production no later than 2021.

In order to meet the safety and operational demands of the travelling public, CAVs must be regulated to ensure that their complex technology and advanced engineering operate smoothly on our roads. Fortunately, the effort by the USDOT to guide CAV standards recognizes a vision of interoperability in the multimodal transportation network, guided by a robust policy and regulatory framework. And recently, the House and Senate have begun to play catch-up with industry as they work on bills that would provide a federal framework for self-driving car regulation.

Personal and public safety, user mobility, and the economy all rely on a safe and efficient transportation system. A hasty and "disruptive" introduction of connected/autonomous capabilities would inevitably present serious problems if issues of incompatibility were not addressed. Uniform standards and guidance will ensure compatibility among driverless cars and the technologies that interface with the roadway infrastructure so that these types of situations are handled consistently and effectively. This point is especially critical for the public sector where local agencies have the legal responsibility for the design and safe operation of the transportation infrastructure and underlying public investment.

Technology and implementation standards ensure interoperability in the application of the traffic management and operation tools (signals, roadway sensors, and other devices) needed to safely and effectively manage congestion. With the introduction of advanced communications, not only are capabilities enhanced, but these systems must comply with federal agencies such as the Federal Communications Commission (FCC) and the National Highway Traffic Safety Administration (NHTSA) under the USDOT. The responsibility is to ensure that adequate licensing and testing be done and any electronic communication be standardized and comprehensive enough to ensure proper operational, safety, and privacy features among dedicated short range communications (DSRC)-equipped vehicles, infrastructure, and smartphones/mobile communications.

Existing and Developing Guidance and Enabling Legislation

Connected vehicles already exist, with their introduction driven primarily by the auto and advanced communications industries and consumers. The adoption of technical standards guiding their use has been initiated by the Society of Automotive Engineers (SAE) and the Institute of Electrical and Electronics Engineers (IEEE) in coordination with the National Highway Traffic Safety Administration (NHTSA) and the Federal Communications Commission (FCC). This is good news for the drivers already relying on connected systems in their vehicles; however, the USDOT, NHTSA, and other regulatory agencies are having to play catch-up in response to subsequent safety and operational issues that have emerged with additional advances and capabilities in driverless cars. For example, currently there are no national "benchmarks" for what it means for self-driving technology to be designed safely. Current federal law simply requires that manufacturers of autonomous vehicles self-certify their vehicles with all applicable Federal Motor Vehicle Safety Standards. However, this lack of a uniform industry standard does not satisfy the crucial safety and operational needs of the general transportation system and the traveling public. A larger national framework is needed.

Early efforts to establish a standardized regulatory framework for driverless cars has involved a collaborative effort among the USDOT, transportation system operators, and communications trade associations. The key areas of this guidance include:

- intersections
- queue warnings
- work zone management
- curve warning systems

These efforts are in support of infrastructure communications with all vehicles, including passenger vehicles, freight, transit, as well as with pedestrians equipped with mobile communications.

Numerous pilot programs have been deployed across the country to evaluate new systems and to help in the development of guidance in a "real world" context. Driverless taxis have been deployed in few urban cores already such as Pittsburgh and Las Vegas. Many states, including Arizona, Iowa, Wisconsin, and Florida, are providing testbed environments. Those states providing such support will likely be first to reap the rewards of autonomous vehicle adoption.

The NHTSA has proposed standards for vehicle to vehicle communications in coordination with the FCC and the automotive and communications industry, and in January of this year the USDOT announced federal guidance on Vehicle to Infrastructure (V2I) technologies in support

of the ability of vehicles to communicate with the roadway infrastructure to ensure adequate information is being exchanged, i.e., correct roadway geometry, signal phasing, weather conditions, presence of pedestrians or other vehicles, and so on. In September 2016, the NHTSA published the Federal Automated Vehicles Policy, which now serves as the principal guidance for both federal and state regulatory responsibilities, as well as industry consistency among manufacturers. It also includes model State Policy guidance for states to use in developing their own regulatory framework.

According to the National Conference of State Legislatures, since 2012 at least 41 states and D.C. have considered legislation related to autonomous vehicles. As of 2017, the following states have enacted autonomous vehicle legislation.

Recently, the state of New Mexico has introduced the idea of developing enabling legislation for CAVs. As reported in the Albuquerque Journal on July 26, 2017, Sen. James White (R-Albuquerque) led a discussion with colleagues at the Capitol to consider enabling legislation in the upcoming session in January 2018. He cited the NHTSA report and model-legislation mentioned above as well as the expected safety

States with Enacted Autonomous Vehicle Legislation

LEGEND
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Executive Order

improvements as a potential benefit to our state. The City of Albuquerque has issued "Executive Instruction 29" to promote self-driving vehicle testing and operations in the City of Albuquerque, thereby directing the Department of Municipal Development and other departments of the City to promote self-driving vehicles in Albuquerque. Capitalizing on the industry momentum associated with CAVs is great news for the region. This emerging billion-dollar industry can promote jobs, and pursuing the enabling legislation ensures New Mexico's participation nationally. It often takes leadership from state and local governments to set forth the policy framework for the adoption of new technologies.
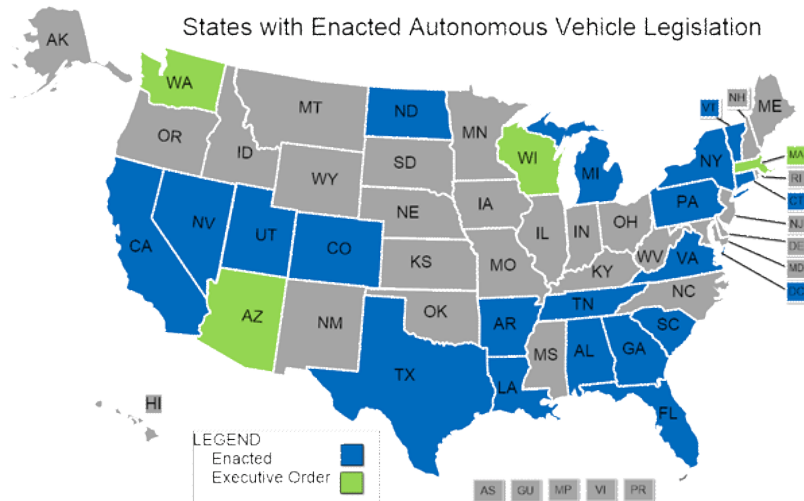
States involved in the 2016 National Connected Vehicle Challenge, peer exchange
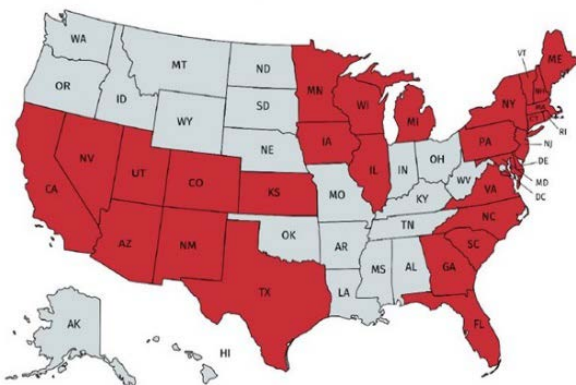
The state of New Mexico is involved in a peer exchange facilitated by the American Association of Highway and Transportation Officials (AASHTO), the Institute of Engineers (ITE), and ITS America in what is being referred to as the National Connected Vehicle Challenge. The effort is geared to public infrastructure owners and operators and the goal of this effort is that by 2020, at least one corridor or network (approximately 20 signalized intersections) in each of the 50 states achieves deployment of advanced

communications with properly–equipped signals to support connected vehicles.

Not only are autonomous passenger vehicles being considered for application of CAV technologies within the regulatory framework and guidance, but freight is also being addressed. New Mexico, with its major freight corridors connecting significant shipping ports (Houston and Long Beach), is participating with adjacent states along I-10 in a test of truck "platooning" using wireless V2V communications. This system will connect pairs of tractor trailers matching speeds and distance (headway) between them to enable safe, aerodynamic, and fuel efficient travel. The communications between the trucks allow the sharing of speed change, braking, following distance, and other rapidly changing information during long haul travel and will be managed by a cloud-based "Network Operations Center" (NOC).

The benefits of self-driving cars are tremendous. The improvements to safety, mobility, and quality of life are poised to affect our cities in ways unimaginable up until recently. However, in order to be fully realized, the roll out of these technologies must be done in a manner that maintains existing laws and integrates new laws that support the operation of the transportation system. States and local entities must work to modify municipal codes and the regulatory framework in support of driverless vehicles, including freight, yet also maintain consistency with a national policy framework. Considering the importance of a smooth rollout and the adoption of driverless vehicles, it is encouraging that national, state, and local policy is in place or in consideration.

Editor's Note: What are your thoughts on connected and autonomous vehicles in general? What benefits and drawbacks do you foresee? We'd love to hear from you. Check out MRMPO's Facebook page and feel free to leave your thoughts on the topic. You can also email the author at npmasek@mrcog-nm.gov with any questions. A related and interesting article ("As Self-Driving Cars Near, Washington Plays Catch-Up") that might be of interest published on July 21, 2017 in the New York Times and can be found here.