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Regulatory Frameworks for Smart Mobility: Current U.S. Regulation of Connected and Automated Vehicles And The Road Ahead

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REGULATORY FRAMEWORKS FOR SMART MOBILITY: CURRENT U.S. REGULATION OF CONNECTED AND AUTOMATED VEHICLES AND THE ROAD AHEAD

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I. Introduction

On June 7, 2023, Senator Gary Peters from Michigan gave an interview about autonomous vehicle technology where he stated that: "From a competitive standpoint, there's no question that it is absolutely essential that this technology get developed here and deployed here in the United States. We're facing significant international competition from other countries that understand that autonomy represents not only the future of mobility, but it drives other technologies in a significant way."[2] Just last year, Senator Peters and eleven of his colleagues had also written a letter to Secretary of Transportation Pete Buttigieg that: "The federal government has the opportunity and responsibility to foster a domestic autonomous vehicle industry that is as safe as it is innovative, and that provides high-quality jobs across the economy, including in transportation."[3] The underlying question, however, is what sort of regulatory framework will allow the industry to flourish.

With increased innovation in and adoption of connected and automated vehicle (CAV) technologies, the U.S. federal government

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[2] *Watch: A conversation on the U.S. autonomous vehicle industry*, Axios, Jun. 7, 2023 (available at https://www.axios.com/2023/05/22/axios-event-autonomous-vehicles).

[3] Peters Highlights Need for Autonomous Vehicle Federal Framework to Support Future of Mobility, Sen. Gary Peters (available at https://www.peters.senate.gov/newsroom/press-releases/peters-highlights-need-for-autonomous-vehicle-federal-framework-to-support-future-of-mobility).

and state governments across the country are grappling with how to responsibly regulate these new technologies. Questions about CAV regulation ranging from uncertainty about how to allocate regulatory authority between federal and state governments (and between regulatory agencies) to debates over which specific safety standards should apply loom for automakers, insurers, technology companies, and other industry actors. States have taken the initiative in crafting their own CAV frameworks, creating a patchwork of requirements for an industry that would benefit from a uniform regulatory framework given the inherently mobile nature of CAVs. This paper surveys current federal and state legislative and regulatory frameworks aimed at advancing the deployment of CAVs to give an overview of the current state of regulatory frameworks and where they may be headed.

II. Background

A. What are CAVs?

The term "CAV" encompasses two types of vehicle technology: connected and automated. Connected vehicles may communicate vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), or to a range of other endpoints that may affect or be affected by the vehicle (e.g., vehicle-to-network, vehicle-to-device, vehicle-to-pedestrian, vehicle-to-grid, vehicle-to-cloud, collectively "vehicle-to-everything" or "V2X").[4] Connected vehicles may communicate information between the vehicle and its owner or manufacturer, such as diagnostic information regarding the car's functioning or status information regarding the vehicle or its functions. Connected vehicle technology enhances driver-operated vehicles and may improve driverless technologies.[5]

As for automated (or "autonomous") vehicle technology, vehicles may be partially or fully automated. SAE International[6] has promulgated a five-stage taxonomy for describing autonomous vehicles, which has been broadly adopted across the industry:[7]

[4] *Fast Facts*, MCITY, https://mcity.umich.edu/our-vision/fast-facts/.
[5] *Id*.
[6] Formerly the Society of Automotive Engineers (SAE).
[7] SAE International, *SAE Levels of Driving Automation Refined for Clarity and International Audience* (May 3, 2021), https://www.sae.org/blog/sae-j3016-update.

- SAE Level 0: warnings and momentary assistance, such as emergency braking, blind spot warnings, or lane departure warnings.

- SAE Level 1: steering or break acceleration to support the driver, such as lane centering or adaptive cruise control.

- SAE Level 2: steering and break acceleration to support the driver, such as lane centering and adaptive cruise control operating concurrently.

- SAE Level 3: the feature can drive the vehicle under limited conditions, but a human must serve as a backup driver.

- SAE Level 4: the feature can drive the vehicle under limited conditions, and will not require a human to take over driving.

- SAE Level 5: the feature can drive the vehicle under all conditions, and will not require a human to take over driving.

Levels 0-2 are considered to be "driver support features" or "Advanced Driver Assistance Systems" (ADAS) and constitute features widely available in vehicles currently offered for sale and operated on public roadways. The focus of much of the current research and accompanying regulatory scheme is on Levels 3-5, which are considered to be "automated driving features" or "Automated Driving Systems."[8] Proposals from federal and state governments have incorporated SAE's taxonomy to describe levels of automation, and the applicability of certain regulations hinges on a vehicle's classification.[9]

B. Overview of Current Landscape and Key Areas of Focus

At the federal level, members of both the U.S. House of Representatives and Senate have proposed bills concerning CAVs going back several years, but as of this writing, no legislative frameworks have been enacted. The National Highway Traffic Safety Administration (NHTSA) of the U.S. Department of Transportation (USDOT), however, has published rules relating to

[8] *See, e.g.,* DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY ii (2017), https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.
[9] *Id.*

CAVs and continues to solicit comments to additional proposed regulations. Additionally, NHTSA provides annual guidance with nonbinding recommendations and its insight into the federal government's policy position and priorities for the future.

In the absence of more robust federal action, states have adopted various approaches to regulating CAVs, using legislation, executive orders, and public-private partnerships. As a reference point for state action, this paper surveys the approaches of five states that have taken steps to regulate CAVs and CAV technologies — Michigan, California, Nevada, Arizona, and Massachusetts — and examines their diverse approaches to crafting a supporting regulatory framework.

This paper first provides a general overview of federal and state roles in regulating CAVs before reviewing the CAV regulatory landscape across six focus areas:

- **Ensuring Safety** – Federal and state regulators are mindful of balancing novel safety concerns presented by CAVs with limiting barriers to innovation in order to harness CAV safety benefits.

- **Supporting Development By Issuing Exemptions and Permits** – Federal agencies evaluate exemptions from safety standards for entities developing CAVs, while state governments issue permits and licenses to allow testing and operation.

- **Revising Regulations** – Federal agencies such as NHTSA are updating regulatory requirements that are inapplicable to CAV technology and may create barriers to innovation.

- **Promoting Disclosure** – Federal and state regulators are exploring requiring CAV manufacturers to disclose safety compliance and vehicle malfunctions.

- **Aligning Infrastructure** – States are leading the way in partnering with private industry to build out CAV-friendly infrastructure, while the federal government focuses on achieving broad accessibility and mobility.

- **Partnering with the Private Sector** – Federal and state governments are partnering with industry leaders, experts, and research consortiums to promote innovation and informed regulation.

III. General Overview of Federal and State Roles in CAV Regulation

Within the federal government, CAV regulation remains primarily the purview of NHTSA, though other divisions of USDOT and other federal agencies are also engaged. Within USDOT, the Federal Highway Administration (FHWA), Federal Motor Carrier Safety Administration (FMCSA), and Federal Transit Administration (FTA) contribute to CAV-related regulation where relevant to their respective spheres of responsibility.[10] Beyond USDOT, other agencies including the Department of Justice, Department of Agriculture, Department of Defense, Department of Energy and Federal Communications Commission (FCC) may seek to address CAV development and regulation where relevant to their agency mission. The FCC, in particular, has jurisdiction over the use of spectrum for CAV communications, such as Cellular Vehicle-to-Everything (C-V2X) technology that will allow vehicles to sense and communicate with each other and with other devices and environmental factors, such as infrastructure, pedestrians, and cyclists.[11]

As the primary federal actor in this space, USDOT envisions a federal-state division of responsibility in which NHTSA regulates "the safety design and performance aspects of motor vehicles and motor vehicle equipment" while states regulate "the human driver and vehicle operations."[12] The Department "strongly urges" states to leave safety design and performance aspects solely to NHTSA.[13] If

[10] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION x (2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf.
[11] *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification, 35 FCC Rcd 13440 (2020), at 1344, ¶ 8.
[12] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY ii (2017), https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.
[13] *Id*. at 18.

states decide to regulate in this space, NHTSA recommends consultation with the agency.[14]

This delineation extends to CAVs the traditional division of regulatory responsibilities in the motor vehicle space: NHTSA would continue to set and enforce Federal Motor Vehicle Safety Standards (FMVSS), monitor and manage noncompliance and safety-related defects, and educate the public about motor safety, and states would retain their traditional responsibility for licensing and registration of both human drivers and vehicles, traffic law enforcement, safety inspections, and regulation of vehicle insurance and liability.[15] To facilitate that role, NHTSA advises on best practices for state legislatures considering CAV regulation.[16]

The federal government also supports CAV development and regulation through partnerships with state and local entities. For example, USDOT initiated a major round of funding in 2016, granting almost $60 million to projects across seven states working to deploy CAVs safely.[17] Recipients included the Ohio Department of Transportation (through DriveOhio), the Pennsylvania Department of Transportation, and the City of Detroit.[18]

Proposed legislation in both the U.S. House and Senate has contained provisions expressly preempting state regulation in the CAV field. The Safely Ensuring Lives Future Deployment and Research In Vehicle Evolution Act—or the "SELF DRIVE Act"—passed in the House in 2017 before stalling in the Senate, and instructed: "No State or political subdivision of a State may maintain, enforce, prescribe, or continue in effect any law or regulation regarding the design, construction, or performance of highly automated vehicles, automated driving systems, or components of automated driving

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[14] *Id*. at 20.
[15] *Id.*
[16] *See id.* at 20-24.
[17] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 14 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf; *U.S. Secretary of Transportation Announces Automated Driving System Demonstration Grant Winners*, DEP'T OF TRANSP. (Sept. 18, 2019), https://www.transportation.gov/briefing-room/us-secretary-transportation-announces-automated-driving-system-demonstration-grant.
[18] *U.S. Secretary of Transportation Announces Automated Driving System Demonstration Grant Winners*, DEP'T OF TRANSP. (Sept. 18, 2019), https://www.transportation.gov/briefing-room/us-secretary-transportation-announces-automated-driving-system-demonstration-grant.

systems."[19] The Senate's American Vision for Safer Transportation through Advancement of Revolutionary Technologies ("AV START Act"), introduced in 2017 without receiving a vote, similarly sought to preempt state and local laws in the areas of "design, construction, or performance" that relate to specified areas of safety evaluation.[20]

In light of the absence of federal legislation to date, states have taken a more active and concrete role in CAV regulation. State regulatory attention has prioritized testing, licensing, and operating these new vehicles—areas traditionally governed by state law. The nature of the regulatory approach by states has varied: In Michigan and other states, governors have signed executive orders encouraging CAV innovation, while California has developed robust frameworks and programs for CAV testing and operation. Many states have partnered with private sector technology and/or automotive companies to enhance CAV infrastructure and innovation. Given the differences in approach between states, there are not yet consistent requirements for testing or operating CAVs across the country, resulting in a patchwork, state-by-state framework.

IV. Areas of Regulatory Focus

A. Ensuring Safety

1. Federal Approach

USDOT views safety as a preeminent agency goal, listing it first among its goals in its mission statement to promote the "*safe*, efficient, sustainable, and equitable movement of people and goods" (emphasis added).[21] The potential for CAVs to mitigate crashes born of human error—which accounted for a substantial share of the more than 45,000 Americans killed in motor vehicle crashes in 2021[22]—animates federal efforts in the space, but the federal government also is considering how to ensure the safety of new technologies.[23] USDOT seeks to strike a balance that identifies and eliminates safety

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[19] SELF DRIVE Act, H.R. 3388, 115th Cong. (2017).
[20] AV START Act, S. 1885, 115th Cong. § 3(a) (2017).
[21] Dep't of Transp., *About DOT* (2022), https://www.transportation.gov/about.
[22] Dep't of Transp., *Early Estimate of Motor Vehicle Traffic Fatalities in 2021* (April 2022), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813283.
[23] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION 1 (2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf.

risks without "delaying or unduly hampering" innovation.[24] To that end, NHTSA has released voluntary guidance documents on CAVs and automated driving systems, including *Automated Driving Systems 2.0: A Vision for Safety* (2017), *Preparing for the Future of Transportation: Automated Vehicles 3.0* (2018), and *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0* (2020).[25] Of particular note, *Automated Driving Systems 2.0: A Vision for Safety* proposes twelve priority safety design elements.[26] The guidance also encourages entities to submit Voluntary Safety Self-Assessments (VSSAs) that evaluate their conformity with each element.[27] While VSSA submission is voluntary, companies in the CAV space have often chosen to submit VSSAs. NHTSA's "cornerstone" guidance continues to steer CAV safety standards, with subsequent annual guidance documents supplementing and evolving standards in light of the latest research.[28]

Formal rulemaking efforts have also begun in the safety space. A December 2020 Advance Notice of Proposed Rulemaking (ANPRM) described the agency's interest in developing a framework for Automated Driving System (ADS) safety that "would use performance-oriented approaches and metrics that would accommodate the design flexibility" needed for CAVs that might look very different from the traditionally-operated motor vehicles NHTSA's current safety standards regulate. The ANPRM identified core elements of current regulations, potential approaches to developing a framework for ADS regulation, as well as administrative mechanisms for implementation and oversight.[29] The ANPRM sought input on the development of the framework and has

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[24] *Id*. at 2.

[25] *See, e.g.*, NHTSA, *Automated Driving Systems*, https://www.nhtsa.gov/vehicle-manufacturers/automated-driving-systems.

[26] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY 1 (2017), https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf. The twelve priority safety design elements are: (1) System Safety, (2) Operational Design Domain, (3) Object and Event Detection and Response, (4) Fallback (Minimal Risk Condition), (5) Validation Methods, (6) Human Machine Interface, (7) Vehicle Cybersecurity, (8) Crashworthiness, (9) Post-Crash ADS behavior, (10) Data Recording, (11) Consumer Education and Training, (12) Federal, State, and Local laws.

[27] *Id*. at 16.

[28] *USDOT Automated Vehicles*, DEP'T OF TRANSP. (Mar. 28, 2022), https://www.transportation.gov/AV.

[29] Framework for Automated Driving System Safety, 85 Fed. Reg. 78,058 (proposed Dec. 3, 2020) (to be codified at 49 C.F.R. 571).

received numerous comments from private sector stakeholders, including Toyota, the National Association of Manufacturers, and the National Safety Council.[30] As of the date of this publication, the agency is still analyzing comments on the ANPRM.

2. State Approach

States often wrap safety requirements into their CAV operation and/or testing requirements. For example, Nevada requires that a fully autonomous vehicle be able to achieve a "minimal risk condition" if its automated driving system malfunctions, which is defined as "a condition in which an autonomous vehicle operating without a human driver, upon experiencing a failure […] achieves a reasonably safe state which may include, without limitation, bringing the autonomous vehicle to a complete stop."[31] Michigan's SAVE project, which allows motor vehicle manufacturers to offer autonomously operated ride sharing services, requires participants to have operated autonomous vehicles on public roads for at least one million miles.[32] Massachusetts' cross-disciplinary Autonomous Vehicles Working Group includes the Secretary of Public Safety and works with experts on motor vehicle safety on planning and oversight of the CAV space within the commonwealth.[33]

In Nevada, individuals testing autonomous vehicles on state highways must take out insurance or provide a deposit to the state Department of Transportation of $5,000,000.[34] If the state's requirements are met and the vehicle is fully autonomous, no human operator needs to be present during testing and operation.[35] Nevada Revenue Statute 428A defines fully autonomous as "capable of achieving a minimal risk condition if a failure of the automated driving system occurs which renders the automated driving system

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[30] Toyota Motor North America, Comment Letter on Framework for Automated Driving System Safety, 85 Fed. Reg. 78,058 (proposed Dec. 3, 2020) (to be codified at 49 C.F.R. 571), https://www.regulations.gov/comment/NHTSA-2020-0106-0714; National Association of Manufacturers, Comment Letter on Framework for Automated Driving System Safety, 85 Fed. Reg. 78,058 (proposed Dec. 3, 2020) (to be codified at 49 C.F.R. 571), https://www.regulations.gov/comment/NHTSA-2020-0106-0731; National Safety Council, Comment Letter on Framework for Automated Driving System Safety, 85 Fed. Reg. 78,058 (proposed Dec. 3, 2020) (to be codified aat49 C.F.R. 571), https://www.regulations.gov/comment/NHTSA-2020-0106-0708.

[31] Nev. Rev. Stat. § 482A.080; 482A.044 (2014).

[32] 2016 Mich. Pub. Acts 146.

[33] No. 572 Mass. Reg. 1325 (Oct. 20, 2016).

[34] Nev. Rev. Stat. § 482A.060 (2014).

[35] Nev. Rev. Stat. § 482A.080(2) (2014).

unable to perform the dynamic driving task relevant to its intended operational design domain."[36] If a vehicle is not fully autonomous, a human operator must be present for testing and operation and able to take "immediate manual control" of the vehicle if the automated system fails or another emergency arises.[37] Partially autonomous vehicles must have an indicator that signals when the autonomous technology has failed and alert the human operator to manually take control of the vehicle during testing and operation.[38]

B. Supporting Development By Issuing Exemptions and Permits

1. Federal Approach

Pursuant to its authority under the Motor Vehicle Safety Act, NHTSA approves exemptions from and waivers of FMVSS when regulations oriented towards human drivers would limit development of CAVs.[39] This strategy, which the agency describes as a "near-term tool"[40], enables entities to pursue safety research, testing, and deployment of CAVs without having to await the promulgation of new regulations. NHTSA granted its first such exemption in 2020 to Nuro, Inc., a company designing autonomous delivery vehicles.[41] The exemption allowed noncompliance with an FMVSS governing safety design features, such as mirrors and rear visibility requirements that would be unnecessary in low-speed driverless vehicles.[42] NHTSA justified the exemption on grounds that it would ease development without impacting safety.[43] Without such an exemption, the FMVSS would have created barriers to the deployment of a Nuro vehicle that was expected to be just as safe as otherwise compliant vehicles.[44]

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[36] Nev. Rev. Stat. § 482A.080(2)(b) (2014).
[37] Nev. Rev. Stat. § 482A.070(1) (2014).
[38] Nev. Rev. Stat. § 482A.080 (2014).
[39] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 10 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf; 49 U.S.C. § 30113(d).
[40] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 10 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf.
[41] Nuro, Inc.; Grant of Temporary Exemption for a Low-Speed Vehicle With an Automated Driving System, 85 Fed. Reg. 7,826 (Feb. 11, 2020).
[42] *Id*.
[43] *Id*.
[44] *Id*.

Efforts are underway to formalize and expand the federal exemption and waiver system. Two NHTSA proposed rules would regulate the process of seeking an exemption and the agency's process for determining whether to grant the request.[45] Moreover, proposed federal legislation has sought to broaden the NHTSA's authority to issue exemptions and increase the maximum exemptions USDOT may issue from the 2,500 allowable under the Motor Vehicle Safety Act to 80,000 per year under the proposed AV START Act, or 100,000 per year under the proposed SELF DRIVE Act.[46]

The federal government also has leveraged the exemption approach to allow for testing of CAVs on public roads, campuses, and tracks.[47] USDOT applies "neutral, objective criteria" to authorize certain locations for testing.[48] This represents a shift from the more restrictive previous policy under which USDOT identified only ten designated testing sites.[49] Furthermore, on public roads, the testing regime serves the additional goal of evaluating the current infrastructure's capability to accommodate CAVs.[50]

The FCC also has taken steps to advance the deployment of CAV technologies in the form of waivers. In November 2020, the FCC issued an order that, among other things, sought comment on how to transition the upper 30 MHz of spectrum of the 5.9 GHz band to C-V2X-based technology.[51] In that same order, the FCC also clarified that existing intelligent transportation system licensees could apply for waivers that will enable licensees to start using C-V2X technology while the FCC finalizes its rulemaking proceeding.[52] Multiple entities, including original equipment manufacturers (OEMs) and state departments of transportation, have applied for

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[45] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 11 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf.
[46] AV START Act, S. 1885, 115th Cong. §6(3)(B) (2017); SELF DRIVE Act, H.R. 3388, 115th Cong. §6 (2017); 49 U.S. Code §30113(d).
[47] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION 17 (2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf.
[48] *Id*. at 14.
[49] *Id*.
[50] *Id*.
[51] *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification, 35 FCC Rcd 13440 (2020), at 13500, ¶ 147.
[52] *Id.* at 13464-65, ¶ 55.

waivers. In April 2023, the FCC approved a joint waiver request that will allow certain entities to start deploying C-V2X technology.[53] Interested stakeholders have overwhelmingly praised the grant of the joint waiver request, stating that they "applaud[] this decision . . . to [advance] the use and deployment of these technologies to further roadway safety in a manner that enhances safety-of-life and public safety services for all users."[54] Many stakeholders have stated that they would accept the same conditions specified in the joint waiver grant.[55]

2. State Approach

California has developed two permit-based programs for testing autonomous vehicles, both administered by the State's Department of Motor Vehicles (DMV). The 2014 Autonomous Vehicle Tester Program applies to autonomous vehicles that require a human present to take control of the vehicle when needed.[56] As of June 2023, the program had 41 permit holders.[57] The 2018 Autonomous Vehicles Tester Driverless Program allows manufacturers to test autonomous vehicles without a human driver present.[58] As of November 2021, the program had seven permit holders.[59] Both programs require test vehicles either to operate under manufacturer

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[53] *See Request for Waiver of 5.9 GHz Band to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, Order, ET Docket No. 19-138, DA 23-343 (Apr. 24, 2023).

[54] *See USDOT Statement on FCC waiver action*, DEP'T OF TRANSP. (Apr. 26, 2023), https://www.transportation.gov/mission/administrations/assistant-secretary-research-and-technology/usdot-statement-fcc-waiver.

[55] *See, e.g.*, DriveOhio Letter, ET Docket No. 19-138 (filed May 09, 2023) ("This letter is to confirm that [DriveOhio] will accept the same waiver grant conditions that were specified in the C-V2X Joint Waiver Grant."); *see also* Georgia Department of Transportation Letter, ET Docket No. 19-138 (filed June 21, 2023) ("This letter is to confirm that GDOT would accept the same waiver grant conditions that were specified in the C-V2X Joint Waiver Grant in a grant of GDOT's waiver request.").

[56] *Autonomous Vehicles Testing with a Driver*, State of Cal. Dep't of Motor Vehicles, https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/testing-autonomous-vehicles-with-a-driver/.

[57] *Id*.

[58] *Autonomous Vehicles Tests Without a Driver*, State of Cal. Dep't of Motor Vehicles, https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/testing-autonomous-vehicles-without-a-driver/.

[59] *Id*.

or distributor plates, or to have a current California registration.[60] To register for either program, applicants must submit a statement of facts that certifies that the vehicle will be operated only for testing purposes and provides a brief description of the vehicle's autonomous technology and functional capabilities.[61]

California has also created a separate testing program for autonomous vehicles used for ride sharing, administered by the California Public Utilities Commission (CPUC), which oversees passenger carriers like traditional taxi services and ride-sharing services like Uber and Lyft. CPUC also has two programs, one for cars that require the presence of a human driver and one for driverless cars. The programs are "designed to work in tandem with the DMV's jurisdiction over regulations addressing the safe operations of AVs themselves by providing for the safety and consumer protections of passengers of commercial operators within the Commission's jurisdiction."[62] Would-be participants in the CPUC programs must first acquire the appropriate corresponding permits from the California DMV.[63] In March 2022, the CPUC issued its first "Drivered Deployment" permits to Cruise LLC and Waymo LLC, allowing for passenger service in AVs with a safety driver present.[64] Since then, the CPUC has authorized both Cruise and Waymo to participate in the "Driverless" pilot as well, which provides driverless AV passenger service to the public.[65]

C. Revising Regulations

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[60] *Id*.; *Autonomous Vehicles Testing with a Driver*, State of Cal. Dep't of Motor Vehicles, https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/testing-autonomous-vehicles-with-a-driver/.

[61] *Id*.

[62] CPUC decision 18-05-043.

[63] *Autonomous Vehicle Passenger Service Programs*, Cal. Pub. Util. Comm'n, *https*://www.cpuc.ca.gov/regulatory-services/licensing/transportation-licensing-and-analysis-branch/autonomous-vehicle-programs.

[64] Johnson and Dworkin, *CPUC Issues First Autonomous Vehicle Drivered Deployment Permits*, Covington Inside Tech Media (Mar. 11, 2022), https://www.insidetechmedia.com/2022/03/11/cpuc-issues-its-first-autonomous-vehicle-drivered-deployment-permits/.

[65] California Public Utilities Commission, *CPUC Approves New Driverless Autonomous Vehicle Service Under Pilot Program Designed To Transform State's Transportation System* (Nov. 18, 2022), https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-approves-new-driverless-autonomous-vehicle-service-under-pilot-program.

1. Federal Approach

If exemptions and waivers are the federal government's "near-term tools," modernizing existing regulatory frameworks is their long-term tool. The initial phase of regulatory modernization focuses on removing "unintended regulatory barriers to innovation."[66] Many of NHTSA's FMVSS assume human occupancy and control of the vehicle, imposing requirements made obsolete by some CAVs. In an effort to harmonize the FMVSS with emerging CAV technologies, NHTSA issued a final rule in March 2022 amending the occupant protection FMVSS to account for vehicles that are equipped with ADS and do not contemplate traditional manual controls associated with human drivers.[67] Amongst other changes, the "Occupant Protection for Vehicles with Automated Driving Systems" final rule adjusts standards for inapplicable or inaccurate terminology—such as the "steering wheel" and "driver's seat"—to resolve any ambiguities stemming from applying the safety standards to non-driver-controlled vehicles.[68] Secretary Buttigieg noted that the new rule is an important step in "establishing robust safety standards for ADS-equipped vehicles."[69] Other proposed rules would update FMVSS for crash avoidance, safety messaging, and passengerless vehicles.[70]

Comments to the Occupant Protection rule indicate support for regulatory revision from the private sector. For example, Nuro's response notes the importance of "updat[ing] requirements by removing those that could degrade safety or offer no relevant safety

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[66] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION 7 (2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf.

[67] Occupant Protection for Vehicles with Automated Driving Systems, 87 Fed. Reg. 18,560 (Mar. 30, 2022) (to be codified at 49 C.F.R. pt. 571).

[68] *Id*.

[69] NHTSA, NHTSA Finalizes First Occupant Protection Safety Standards for Vehicles Without Driving Controls, https://www.nhtsa.gov/press-releases/nhtsa-finalizes-first-occupant-protection-safety-standards-vehicles-without-driving (Mar. 10, 2022).

[70] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 11-12 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf; https://www.federalregister.gov/documents/2019/05/28/2019-11032/removing-regulatory-barriers-for-vehicles-with-automated-driving-systems.

purpose."[71] Many stakeholders, such as Uber, urged NHTSA to continue progressing its regulatory revision across all FMVSS affecting CAVs.[72]

2. State Approach

Nevada leads the movement among states toward modernizing transportation laws to fit the needs of CAV innovation. Its key autonomous vehicle statute contains a provision that "[n]o motor vehicle laws or state traffic laws of this State shall be construed to require a human driver to operate a fully autonomous vehicle which is being operated by an automated driving system. The automated driving system of a fully autonomous vehicle shall, when engaged, be deemed to fulfill any physical acts which would otherwise be required of a human driver except those acts which by their nature can have no application to such a system."[73]

D. Promoting Disclosure

1. Federal Approach

To foster information sharing and transparency, the federal government has issued voluntary and mandatory reporting requirements. *Automated Driving Systems 2.0* encourages entities to disclose their consideration of the NHTSA's twelve priority safety requirements.[74] Its Voluntary Safety Self-Assessments (VSSA) program seeks to show the public that parties are "(1) considering the safety aspects of ADSs; (2) communicating and collaborating with USDOT; (3) encouraging the self-establishment of industry safety norms for ADSs; and (4) building public trust, acceptance, and

[71] Nuro, Inc., Comment Letter on Occupant Protection for Vehicles with Automated Driving Systems, 85 Fed. Reg 17,624 (Mar. 30, 2020) (to be codified at 49 C.F.R. pt. 571), https://www.regulations.gov/comment/NHTSA-2020-0014-0037.

[72] Uber Advanced Technology Group, Comment Letter on Occupant Protection for Vehicles with Automated Driving Systems, 85 Fed. Reg 17,624 (Mar. 30, 2020) (to be codified at 49 C.F.R. pt. 571), https://www.regulations.gov/comment/NHTSA-2020-0014-0022.

[73] Nev. Rev. Stat. § 482A.200 (2014).

[74] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY 16 (2017), https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf; NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., VOLUNTARY SAFETY SELF-ASSESSMENT TEMPLATE, https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/voluntary_safety_self-assessment_for_web_101117_v1.pdf.

confidence through transparent testing and deployment of ADSs."[75] Many leaders in the CAV industry abide by this recommendation, including Apple, GM, Ford, Uber, and Nuro.[76]

In addition to the VSSA initiative, NHTSA also launched the Automated Vehicle Transparency and Engagement for Safe Testing Initiative (the "AV TEST Initiative") in June 2020 with states, local governments, and private-sector stakeholders throughout the driving automation community to "provide the public with direct and easy access to information about testing of ADS-equipped vehicles, information from states regarding activity, legislation, regulations, local involvement in automation on our roadways, and information provided by companies developing and testing ADS."[77] On April 6, 2023, NHTSA published a notice and request for comments on its intention to request approval from the Office of Management and Budget for an extension of its information collection efforts under its AV TEST Initiative for three additional years, beginning from the date of approval.[78] Participation in AV TEST is voluntary.

Movement toward mandatory disclosure has begun at the federal level. The AV START Act would have codified disclosure of many of NHTSA's safety elements as mandatory, while the House's proposed SELF DRIVE Act would have directed CAV developers to

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[75] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 2.0: A VISION FOR SAFETY 16 (2017), https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.

[76] *Voluntary Safety Self-Assessment*, NHTSA, https://www.nhtsa.gov/automated-driving-systems/voluntary-safety-self-assessment; *see e.g.,* APPLE, OUR APPROACH TO AUTOMATED DRIVING SYSTEM SAFETY (2019), https://www.apple.com/ads/ADS-Safety.pdf; GENERAL MOTORS, 2018 SELF-DRIVING SAFETY REPORT (2018), https://www.gm.com/content/dam/company/docs/us/en/gmcom/gmsafetyreport.pdf ; FORD, A MATTER OF TRUST 2.0: FORD'S APPROACH TO DEVELOPING SELF-DRIVING VEHICLES (2021), https://media.ford.com/content/dam/fordmedia/North%20America/US/2021/06/17/ford-safety-report.pdf; UBER ADVANCED TECHNOLOGIES GROUP, A PRINCIPLED APPROACH TO SAFETY (2020), https://uber.app.box.com/v/UberATGSafetyReport; NURO, DELIVERING SAFETY (2021), https://nuro.sfo3.digitaloceanspaces.com/nuro-vssa-2022.pdf?mtime=20220111152245&focal=none.

[77] NHTSA, *AV TEST Initiative*, https://www.nhtsa.gov/automated-vehicle-test-tracking-tool; *see also* Bell et al., *NHTSA Launches Automated Vehicle TEST Initiative to Improve Transparency and Safety of Self-Driving Technology*, COVINGTON ALERT (June 26, 2020), https://www.cov.com/news-and-insights/insights/2020/06/nhtsa-launches-automated-vehicle-test-initiative-to-improve-transparency-and-safety-of-self-driving-technology.

[78] 88 Fed. Reg. 20608 (Apr. 6, 2023).

submit a "safety assessment letter."[79] In 2021, NHTSA adopted mandatory reporting for crashes that occur while engaging technology categorized as SAE automation level two or above.[80] NHTSA claims the oversight will provide data useful for uncovering safety issues and build public confidence.[81]

2. State Approach

Disclosure requirements in most states are less involved than federal standards, but some states do mandate reporting when errors occur. California requires manufacturers of AVs to track and annually report how often their vehicles "disengage" from autonomous mode, whether from a technology failure or a situation where the test driver had to take manual control of the vehicle to operate safely.[82] Nevada requires people responsible for testing autonomous vehicles to report crashes that result in physical injury or property damage exceeding $750.[83]

E. Aligning Infrastructure

1. Federal Approach

Federal agencies have undertaken the task of preparing the transportation system for CAVs, with a focus on advancing accessibility and mobility, particularly for people with disabilities and older Americans.[84] Efforts involve researching the feasibility of CAV integration with current infrastructure and systems, investing in developing public transportation that leverages CAV technology, and modernizing infrastructure standards to equip transportation arteries

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[79] AV START Act, S. 1885, 115th Cong. (2017); SELF DRIVE Act, H.R. 3388, 115th Cong. § 3 (2017).
[80] DEP'T OF TRANSP., STANDING GENERAL ORDER 2021-01 (2021), https://www.nhtsa.gov/press-releases/nhtsa-orders-crash-reporting-vehicles-equipped-advanced-driver-assistance-systems; *see also* Johnson et al., *NHTSA Amends Standing General Order on Automated Vehicle Crash Reporting*, COVINGTON INSIDE TECH MEDIA (Aug. 30, 2021), https://www.insidetechmedia.com/2021/08/30/nhtsa-amends-standing-general-order-on-automated-vehicle-crash-reporting/.
[81] *Id.*
[82] *Autonomous Vehicles Testing with a Driver*, State of Cal. Dep't of Motor Vehicles, https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/testing-autonomous-vehicles-with-a-driver/.
[83] Nev. Rev. Stat. § 482A.095 (2014).
[84] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 14 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf.

for CAV deployment.[85] Specifically, the FHWA is working to update its Manual of Uniform Traffic Control Devices (MUTCD) to align current traffic-control infrastructure with the needs of CAVs.[86] Importantly, the Infrastructure Investment and Jobs Act: (1) provided for grants for "infrastructure installation that can be responsive to technology advancements, such as accommodating autonomous vehicles, vehicle-to-vehicle technology, and future charging methods"[87]; (2) directed the Secretary to establish a pilot program for research and development activities, including testing research regarding the impacts of connected, autonomous, and platooned vehicles on pavement and infrastructure performance[88]; and (3) created "SMART" grants, eligible towards projects demonstrating the use of automated transportation and autonomous vehicles.[89]

2. State Approach

Various states have built corridors or identified specific geographic areas dedicated to CAV testing and operation. The Michigan Department of Transportation has partnered with Cavnue, a company developing "connected road" technology, to create a Connected and Automated Vehicle Corridor from downtown Detroit to Ann Arbor.[90] According to the Michigan DOT, this project "will advance key policy goals, including improving safety, achieving neutrality among vehicle OEMs [original equipment manufacturers] through standards-based approaches, enhancing accessibility, affordability, and equity, and aligning with regional planning, thus encouraging innovation, R&D, economic development, open data access and sharing learnings, cybersecurity, and replicability."[91] Michigan Governor Gretchen Whitmer has positioned the initiative as a continuation of Michigan's leadership in the automotive industry, saying that, with the Cavnue partnership, Michigan is "taking the initial steps to build the infrastructure to help us test and deploy the

[85] DEP'T OF TRANSP., AUTOMATED VEHICLES: COMPREHENSIVE PLAN 14-15 (2021), https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf.
[86] FHWA Propose Rule, https://www.federalregister.gov/documents/2020/12/14/2020-26789/national-standards-for-traffic-control-devices-the-manual-on-uniform-traffic-control-devices-for.
[87] H.R. 3684, Sec. 11401(f)(4)(A)(iv).
[88] H.R. 3684, Sec. 13005(b)(2).
[89] H.R. 3684, Sec. 25005(e)(1)(A)(i).
[90] *Michigan Project*, Cavnue, https://www.cavnue.com/michigan-project.
[91] CAV Corridor, Mich. Dep't of Transp., https://www.michigan.gov/mdot/Travel/Mobility/Initiatives/cav-corridor.

cars of the future."[92] Initial partners included Ford, the University of Michigan, and the American Center for Mobility.[93] The Departments of Transportation for Colorado, Utah, and Georgia have each taken on similar initiatives in partnership with Panasonic to test and develop connected infrastructure.[94]

F. Partnering with the Private Sector

1. Federal Approach

While policy priorities have shifted with each presidential administration, in general, the federal government's approach to CAV policy has sought to promote innovation and collaboration with the private sector. Federal initiatives seek to maximize research impact by leveraging investments in and partnership with private sector actors, including companies, universities, and nonprofit organizations. USDOT views the private sector as primarily responsible for research, investment, and commercialization of CAVs.[95] As such, private sector input heavily informs the federal government's development of a CAV regulatory framework. NHTSA has published many notices in the Federal Register to formally solicit private sector participation in policymaking, while listening sessions, public workshops, and online dialogues seek to more informally harness the expertise and experience of the private sector to drive informed regulatory development.[96]

2. State Approach

Many states have created consortiums spanning the public and private sectors to foster innovation in the CAV space. Michigan's American Center for Mobility is a group of "government, industry and academic organizations . . . focused on accelerating the mobility

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[92] *Michigan, Cavnue Creating Road of Future Between Ann Arbor and Detroit*, Mich. Econ. Dev. Corp., https://www.michiganbusiness.org/press-releases/2020/08/michigan-cavnue-creating-road-of-future-between-ann-arbor-and-detroit/.
[93] *Id*.
[94] *How public-private-philanthropic partnerships are driving transportation technology*, Panasonic, https://na.panasonic.com/us/trends/how-public-private-philanthropic-partnerships-are-driving-transportation-technology.
[95] DEP'T OF TRANSP., AUTOMATED DRIVING SYSTEMS 3.0: PREPARING FOR THE FUTURE OF TRANSPORTATION 5 (2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf.
[96] *Id*. at 27-28.

industry through research, testing, standards development and educational programs."[97] The Center is a partnership between the Michigan Department of Transportation, Michigan Economic Development Corporation, the University of Michigan, Business Leaders for Michigan, and Ann Arbor SPARK.[98] Its 2022 board members included AT&T, Ford, Toyota, Microsoft, and Deloitte.[99] The Center has committees focused on developing and promoting testing, standards, education, and smart parking.[100] The Center also has a testing center, innovation and technology campus, and event and demonstration areas dedicated to CAV development.[101]

In Arizona, Governor Steve Ducey issued an executive order in 2018 creating the Institute of Advanced Mobility, a group where "industry leaders, academics, and policy makers have an open, coordinated effort to safely develop and deploy automated vehicles."[102] Members of the Institute of Advanced Mobility include The University of Arizona, Intel, State Farm, the Arizona Commerce Authority, and other groups across academia and the public and private sectors.[103] The Institute's projects cover CAV safety, functionality, and incident reporting.[104] The Institute also manages a network of testing sites around Arizona.[105]

V. The Road Ahead

Given the economic and safety incentives for CAVs, federal and state governments are likely to continue updating current automotive regulations, or to adopt CAV-specific new regulations, to encourage further development. Federal attention remains on ensuring CAVs increase roadway safety. To achieve this, USDOT is likely to seek to reduce unintended barriers to innovation created by driver-oriented safety standards, issue appropriate exemptions to permit continued

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[97] *About Us*, Am. Ctr. for Mobility, https://www.acmwillowrun.org/about-us/.
[98] *Id*.
[99] *Id*.
[100] *Collaboration & Committees*, Am. Ctr. for Mobility, https://www.acmwillowrun.org/collaborations-committees/.
[101] *About Us*, Am. Ctr. for Mobility, https://www.acmwillowrun.org/about-us/.
[102] *Approach*, Inst. of Automated Mobility, https://www.azcommerce.com/iam/approach.
[103] *Members*, Inst. of Automated Mobility, *https://www.azcommerce.com/iam/members*.
[104] *Projects*, Inst. of Automated Mobility, https://www.azcommerce.com/iam/projects.
[105] *Approach,* Inst. of Automated Mobility, https://www.azcommerce.com/iam/approach.

development, and explore how best to promote information sharing and transparency by CAV developers and manufacturers to maximize learning on safety promotion. In states, the increasing number of public-private partnerships indicates that states will continue looking to the private sector to inform regulations to facilitate CAV development. However, some states may also follow in California and Nevada's footsteps, creating regulations and programs that allow CAV testing and operation, but imposing robust licensing requirements to ensure safe and efficient CAV use. Bottom line, state and federal governments are far from finished in their efforts to create workable frameworks that encourage advancement and deployment of CAVs and CAV technologies, and more activity is bound to occur. Stakeholders seeking to innovate in this space should watch these developments closely, consider how best to implement or take advantage of emerging programs, regulations, guidance, and standards, and look for opportunities to productively engage with regulators and lawmakers and help develop a record that will inform future frameworks to advance the development and deployment of CAVs and CAV technologies.