ALLIANCE FOR AUTOMOTIVE INNOVATION

April 1, 2021

VIA ELECTRONIC FILING

Dr. Steve Cliff
Acting Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E., West Building
Washington D.C. 20590-0001

RE: NHTSA Advance Notice of Proposed Rulemaking: *Framework for Automated Driving Systems*, NHTSA Docket No. 2020-0106, 85 Fed. Reg. 78058 (December 3, 2020)

Dear Acting Administrator Cliff:

The Alliance for Automotive Innovation ("Auto Innovators") appreciates this opportunity to provide input to the National Highway Traffic Safety Administration's ("NHTSA" or "Agency") on the *NHTSA Framework for Automated Driving System* Advance Notice of Proposed Rulemaking ("ANPRM").

Auto Innovators' members[1] are committed to a safer, cleaner, and smarter transportation future, and automated vehicles ("AVs") have the potential to play a significant role in realizing this vision. By combining advanced sensing technologies with artificial intelligence to avoid crashes, AVs have the potential to reduce the number of fatalities on our nation's roadways. Unlike conventional human drivers, AVs cannot get distracted, drive impaired, or fall asleep at the wheel. In addition, AVs hold promise to provide numerous social and economic benefits, including less congestion, lower fuel consumption, and increased mobility for older adults and people with disabilities.

Auto Innovators and its members share the Department of Transportation's ("DOT" or "Department") interest in promoting the safe testing and deployment of AVs. We support the Agency's current approach of providing guidance, encouraging transparency through voluntary reporting, and updating existing Federal Motor Vehicle Safety Standards ("FMVSS") to remove barriers that inhibit the introduction of this promising technology. We also agree with NHTSA that, based on the current state of development, it is too soon to make any decisions about the

[1] The Alliance for Automotive Innovation represents the manufacturers producing nearly 99 percent of cars and light trucks sold in the U.S. Its members are listed as follows: Aisin Group, Aptiv, Argo AI, BMW Group, Bosch, Byton, Cruise, Denso, Ferrari, Ford, GM, HARMAN, Honda, Hyundai, Intel, Isuzu, Jaguar Land Rover, Karma, Kia, Local Motors, Luminar, Mazda, Mercedes-Benz, Mitsubishi Motors, Nissan, NXP, Panasonic, Porsche, RV Industry Association, Sirius XM, Stellantis, Subaru, Suzuki, Texas Instruments, Toyota, Volkswagen Group of America and Volvo.

extent to which new FMVSS might be needed to address particular aspects of the safety performance of automated driving systems ("ADS"). As NHTSA notes in the ANPRM, since AVs are in the development stages and mature AVs do not yet exist in the market, meaningful data is not yet available about the on-road experience of these systems that can be analyzed to determine whether a safety need exists to justify a new FMVSS rulemaking. As a result, it is not yet clear which aspects of performance may be appropriate for regulation and what would be reasonable, practicable, or appropriate for such regulation. We share NHTSA's concerns about issuing new regulations that would needlessly prevent the deployment of any AV, as this could inhibit the development of a promising technology that has the potential to result in an unprecedented increase in safety.

At the same time, we also believe it is appropriate for NHTSA to begin thinking about the elements of a potential safety framework and to solicit the input of stakeholders to that end. For this reason, we appreciate this ANPRM and the ability to provide comment to NHTSA. We look forward to continuing to work with NHTSA and other stakeholders on this important issue going forward.

To inform and guide our approach to this issue, Auto Innovators developed Principles for a Future ADS Safety Assurance Regulatory Framework ("Principles").[2] These Principles are integrated into and reflected throughout these comments.

At a fundamental level, we agree with NHTSA that any AV safety framework should be performance-based. This is consistent with the Motor Vehicle Safety Act and preserves an approach that ensures that manufacturers can continue to innovate, pursuing novel safety technologies and designs. As stated in the ANPRM, this performance-based approach could incorporate mechanisms ranging from voluntary guidance to regulations.

Since AV technology is still under development, certain administrative mechanisms (e.g., new FMVSS) would not be appropriate now, but may be appropriate in the future if a safety need is demonstrated. Conversely, certain administrative mechanisms (e.g., DOT guidance and FMVSS exemptions) may have a significant role to play in the near-term but may not be necessary in the long-term. For this reason, the AV "safety framework" should not be conceptualized as a stagnant regulatory approach; rather, it should be viewed as one that can advance and progress over time along with the technology. As such, we provide suggestions in our comments regarding the timelines of various mechanisms that would fit within an adaptable safety framework.

While it is important to think about what a longer-term safety framework should look like, at this juncture, deciding upon and implementing the near-term steps that NHTSA can take to facilitate and enable the development of such a framework is critical. The AV Policy Roadmap that Auto Innovators' recently released[3] outlines 14 specific recommendations for federal policymakers to allow for AV deployment at scale. The recommendations contained within Pillar 1, relating to the need to reform existing regulations, and within Pillar 3, focused on laying the foundation to achieve longer term goals, are highly relevant for this ANPRM and are incorporated, as appropriate, into our recommended approach below.

In addition, as many of our member companies are working within a global market, we strongly encourage international harmonization in this space, to the extent possible, within the US self-certification regulatory

[2] See Appendix 2: Auto Innovators' Principles for a Future ADS Safety Assurance Regulatory Framework.
[3] See Appendix 3: Auto Innovators' AV Policy Roadmap.

approach. As such, Auto Innovators is engaged with international AV policy development through the Organisation International Constructors of Automobiles ("OICA") and has provided supplemental information on these efforts.[4]

We propose the following proactive safety framework for the Department's consideration:[5]

POTENTIAL NEAR-TERM ACTION

Safety Self-Assessment and Other Voluntary Disclosure/Reporting: The Voluntary Safety Self-Assessments ("VSSAs") should continue to be used as a tool for ADS developers to present information to NHTSA and to the public on how they are meeting critical safety areas and building safety into the vehicle through robust engineering best practices. These critical safety areas include process measures (e.g., system safety and validation methods) and engineering measures (e.g., object and event detection and response and post-crash ADS behavior).

This voluntary guidance approach has already proven to be highly effective, transparent, and a unique approach to engaging the public upfront in the development of this promising technology. Nearly 30 ADS developers have published VSSAs and the number of industry participants, as well as the utility of the information, in the AV TEST Initiative ("AV TEST") continues to grow. If deemed necessary, additional reporting guidance could be developed to supplement or refine the existing AV Guidance 1.0-4.0 or AV Test Initiative.

Regulatory Barriers: NHTSA has already begun extensive and important work to identify and remove regulatory barriers to AV deployment. As a near-term action, it is imperative that NHTSA continue efforts to ensure that unnecessary conflicts with existing regulations are addressed.

Operational Guidance: DOT should develop and issue operational guidance to provide direction to manufacturers, as appropriate. Potential areas for guidance should be informed through DOT's ongoing efforts to monitor and assess industry-led activities, such as the development of industry standards and best practices and could include matters that are not already being addressed by industry or that are developing in a way that is not aligned with DOT's views. Consistent with long-standing NHTSA practice, operational guidance should provide sufficient detail to guide and inform manufacturers, but not prescribe a specific approach that could stifle innovation.

As an immediate next step, we recommend that NHTSA develop and publish guidance on the FMVSS exemption process for manufacturers seeking temporary exemptions from one or more existing FMVSS for a novel AV design that maintains overall safety equivalence. To provide clarity and predictability to companies seeking exemptions, this guidance should specify what data NHTSA requires as part of the exemption application and establish a predefined timeline under which NHTSA will review exemption petitions.

Part 555 FMVSS Temporary Exemptions: Part 555 FMVSS temporary exemptions should continue to be an important component of an emerging safety framework for AVs. These exemptions enable DOT to determine if a novel vehicle should be introduced into interstate commerce based on the requirement for equivalent safety and, if so, what data or information should be shared with the Agency. This information sharing can provide DOT with the knowledge and data that is required to build out the longer-term components of a safety framework.

[4] See Appendix 4: International Activities Under the UNECE.
[5] See Appendix 1: Auto Innovators' Responses to ANPRM Questions, for detailed information.

Reporting requirements associated with exemptions should be reasonable and consistent for all exemption approvals of similar Operational Design Domains (ODDs) and vehicle category or class. In addition, proprietary or competitive data should have the same confidential business information protections as today.

AV Pilot Program:[6] DOT should create an AV Pilot Program to advance the testing and deployment of AVs and provide NHTSA with data and information that could be used to inform the longer-term components of a safety framework for such vehicles. By using Section 30114[7], coupled with authority provided by Section 30182[8], the program would create an additional pathway to deployment under NHTSA oversight. The AV Pilot Program could make significant strides to engender public trust, as certain nonproprietary information shared with DOT could also be shared with state DOTs and the general public. This program could also fulfill the important goal shared by NHTSA and industry to provide consumers with safety-relevant information on new AVs (see discussion below). For more details on the AV Pilot Program, please see Appendix 5.

Consumer Information: We share NHTSA's goal of empowering consumers by making important AV-related safety information available to them. However, because the New Car Assessment Program ("NCAP") is designed and intended to provide consumers information on vehicles for purchase, it is not suitable for AVs that will likely – at least initially – be operated as part of a ride-share service or fleet. Therefore, incorporating AVs into NCAP as a new vehicle type may create consumer confusion. Moreover, the development and implementation of novel tests for AVs may over-burden the program.

However, Auto Innovators welcomes the opportunity to work with NHTSA on ways to achieve its important goals in this area and to explore ways of effectively sharing relevant information with consumers about the safety of AVs. This could include leveraging a number of existing programs. For example, the scope of the AV TEST could be expanded to include information on vehicle deployments. An expanded AV TEST could provide a flexible way to increase the transparency and consumer awareness of AV-related activities. It could also provide a platform where NHTSA and AV companies share important safety-related information about existing deployments, including relevant information from the VSSA safety categories, in a user-friendly and accessible approach. In addition, NHTSA may want to consider partnering with industry and other stakeholders (through Partners for Automated Vehicle Education (PAVE), perhaps) to bolster and enhance consumer education on AVs and AV-related safety.

In addition to these existing programs, the AV Pilot Program presents a unique opportunity for industry and NHTSA to share key safety information with consumers. This program could provide an additional mechanism for industry and NHTSA to collect and share targeted, real-world data with the public. At the same time, the data collected through the Pilot Program could address the additional goal of generating data to support the development of a safety performance assessment testing method, which the ANPRM identifies in relation to an NCAP test for AVs.

New Vehicle Class for AVs:[9] NHTSA should create a new vehicle class for AVs within the FMVSS. An AV class would enable NHTSA to efficiently identify and categorize existing motor vehicle safety standards that should apply to

---

[6] See Appendix 5: AV Pilot Program.

[7] 49 U.S.C. Section 30114.

[8] 49 U.S.C. Section 30182 confers authority on NHTSA to conduct motor vehicle safety research, "including activities related to new and emerging technologies".

[9] Although this approach would allow for AVs to be incorporated into the existing regulatory framework sooner, if a new vehicle class is not established, DOT should complete its efforts to update existing motor vehicle safety standards as expeditiously as possible.

AVs without impacting the applicability of those standards for conventionally driven vehicles. This would help avoid unintended consequences of changing business processes, interpretations, etc., that have been built over the decades to certify traditional vehicles while furthering NHTSA's existing work to reduce existing FMVSS barriers for AVs.

Within this class, there should likely be subcategories for specific types of AVs. For instance, ADS-Dedicated Vehicles (ADS-DVs) will not have manual driver controls (e.g., steering wheel, foot pedals, gear shifter) while certain ADS-DVs could be designed for only delivery purposes and therefore would not need to accommodate the needs of in-vehicle occupants. These variations have significant implications for vehicle design assumptions, test procedures and applicability of the "make inoperative" prohibition.[10]

POTENTIAL LONG-TERM ACTION

New FMVSS: If there is a demonstrated safety need to develop AV-specific regulations, any new FMVSS should be grounded in research and science and include objective, performance-based test procedures. Any new FMVSS should also be consistent with self-certification and enable continued innovation in a technology neutral approach.

If this approach is taken, new FMVSS requiring scenario-based validation in variable conditions could be considered as a potential testing framework. Certainly, developing representative and meaningful scenarios presents a challenge – the selected scenarios would need to be based on real-world scenarios and prioritized appropriately (i.e., occurrence in field, injury risk). These scenarios could be, when and where appropriate, informed by current FMVSS and international activities under WP.29. In addition, they ~~and~~ should leverage state-of-the-art research and industry-led initiatives, e.g., SAE Automated Vehicle Safety Consortium (AVSC) Best Practices, Safety First for Automated Driving (SaFAD), Advanced Vehicle Technology Consortium (AVT), IEEE standards, ISO 34502 Road vehicles – Engineering framework and process of scenario-based safety evaluation, etc. It would also be necessary to design the tests to be flexible enough to accommodate a variety of ODDs and to determine pass/fail test criteria that can accommodate and allow for a variety of acceptable outcomes.[11] Innovative regulatory approaches, such as virtual testing with validated simulators or surrogate vehicle testing, should be considered in this approach.[12] It may also be worth considering whether it would be appropriate and meaningful to include common traffic laws (such as responses to traffic lights or stop signs) in a testing scenario as a means to support states and localities in overseeing and enforcing compliance with traffic laws.

For reasons NHTSA states in the ANPRM, any future AV-specific FMVSS should be drafted in a data-driven, performance-oriented manner at the vehicle level, but not the vehicle subsystem level. For example, it would be challenging to create component-level standards that address each unique ADS component, which will likely vary by manufacturer. Such an approach would require successive rulemaking proceedings to amend or remove aspects of the standards as they become outdated by new technologies and engineering solutions. Instead, a focus on the vehicle level would help ensure that the regulatory framework is technology neutral and would eliminate the need for an excessive number of regulations to capture every variant of ADS technology.

---

[10] See Principle 4 in Appendix 2: Auto Innovators' Principles for a Future Safety Assurance Regulatory Framework.
[11] See Principle 4c in Appendix 2: Auto Innovators' Principles for a Future Safety Assurance Regulatory Framework.
[12] See Recommendation 6, "Embrace Innovative Regulatory Approaches", in Appendix 3: Auto Innovators' AV Policy Roadmap.

If a new FMVSS vehicle class is created for AVs in the near-term (as suggested above), it could potentially be used in the long-term to incorporate *new* AV-specific FMVSS if a safety need justifies such regulation. A new vehicle class with the appropriate subcategories of AVs (e.g., ADS-Dedicated Vehicles, etc.) would clarify the applicability of any such potential future rulemakings and enable a more efficient process overall.

Auto Innovators looks forward to discussing this recommended safety framework with DOT and the broader vehicle safety community. We believe that our suggested approach is pragmatic and forward thinking while maintaining consistency with the Motor Vehicle Safety Act. It creates a phased pathway that would support data-driven policies and facilitate regulatory harmonization with the international community. We look forward to collaborating on a safety framework that supports our collective goals of realizing AV deployments at scale, providing appropriate Federal oversight, and realizing safety and societal benefits.

Sincerely,

John Bozzella
President & CEO
Alliance for Automotive Innovation

APPENDIX 1: Response to ANPRM Safety Framework Questions

Question 1. Describe your conception of a Federal safety framework for ADS that encompasses the process and engineering measures described in this notice and explain your rationale for its design.

PROPOSED SAFETY FRAMEWORK

We agree with NHTSA that a performance-oriented approach to an AV safety framework is appropriate. This is consistent with the Motor Vehicle Safety Act and ensures that manufacturers can pursue safety innovations and novel designs in AVs. As laid out in the ANPRM, this approach could incorporate mechanisms ranging from voluntary guidance to regulations. Auto Innovators agrees that, over time, there is likely a role for many of the administrative mechanisms discussed in the ANPRM.

Our proposed approach includes critical near-term action items and long-term action items, including the potential for new regulations if a safety need is clearly demonstrated. The near-term items are designed to provide DOT with the ability to maintain effective oversight of motor vehicle safety and simultaneously generate the data and information that are required to inform future safety framework mechanisms.

Near-Term Approaches

We recommend that DOT establish an **AV Pilot Program** as a complement to the current exemption process. Data generated through the AV Pilot Program could guide the development of a longer-term AV safety framework and satisfy important consumer information goals.

In addition, a number of existing programs could be leveraged to fulfill NHTSA's goal of providing safety-relevant **information to consumers** regarding AVs. AV TEST could be expanded and provide a flexible way to increase the transparency and consumer awareness of AV-related activities. Government-industry collaborations could also be developed or leveraged to enhance consumer education on AVs and AV safety.

In the near term, DOT should continue to utilize the **Part 555 FMVSS temporary exemption process** for AVs. The information shared with DOT as part of this process will also provide DOT with the knowledge and data that is required to build out the longer-term components of a safety framework.

NHTSA should continue to **remove regulatory barriers** to AV deployment by amending existing FMVSS and their associated test procedures. To assist in this work, we recommend that the DOT create a **separate vehicle class for AVs**. Within this class, there could be subcategories for specific types of AVs, e.g., ADS-Dedicated Vehicles (ADS-DVs). This construct could enable a more efficient organization and categorization of existing standards that should apply to certain AVs without impacting the applicability of those standards to conventionally driven vehicles.

We further propose that **safety self-assessments** continue to be used as a voluntary tool for ADS developers to present information and educate the public on how they are meeting critical safety areas. If deemed necessary, additional reporting guidance could be developed to supplement or refine these submissions.

Finally, we urge that additional **operational guidance** be developed and issued as needs are identified. As an immediate next step, we recommend that NHTSA develop and publish guidance on the FMVSS exemption process for manufacturers seeking one or more temporary exemptions for novel AV designs. This guidance should specify what data is required as part of the exemption application and include a timeline for NHTSA to review and make a determination on AV exemption requests. Such guidance would inform companies of NHTSA's expectations as they develop interim milestones to meet AV deployment goals.

Longer-Term Approaches

Since AV technology is still under development, certain administrative mechanisms (e.g., new, AV-specific FMVSS) are not currently appropriate. However, in the future, if there is a demonstrated safety need to develop AV-specific regulations, FMVSS requirements and test procedures should be objective, focused, relevant and able to accommodate a variety of operational design domains and a range of acceptable outcomes. For instance, if **new FMVSS requiring scenario-based validation in variable conditions** are considered, the selected validation scenarios and conditions at that time would need to meet these criteria and be based on established research and science. They would need to be founded on real-world scenarios and prioritized appropriately (i.e., occurrence in field, injury risk). These scenarios could be, when and where appropriate, informed by current FMVSS and international activities under WP.29. In addition, they should leverage research and industry-led initiatives, e.g., SAE Automated Vehicle Safety Consortium ("AVSC") Best Practices, Safety First for Automated Driving (SaFAD), Advanced Vehicle Technology Consortium (AVT), IEEE standards, ISO 34502 Road vehicles – Engineering framework and process of scenario-based safety evaluation, etc. The development of any new requirements must remain consistent with the US self-certification regulatory approach.

Innovative regulatory approaches, such as virtual testing with validated simulators or surrogate vehicle testing, should be considered. It may also be worth considering the inclusion of common traffic laws (such as responses to traffic lights or stop signs) into the testing scenario to support states and localities in overseeing and enforcing compliance with traffic laws.

Any future, new AV-specific FMVSS should be drafted in a performance-oriented manner at the vehicle level, but not the vehicle subsystem level. A focus on the vehicle level would help ensure that the regulatory framework is technology neutral and would eliminate the need for an excessive number of regulations to capture every variant of ADS technology.

Finally, the **new vehicle class for AVs**, created as one of the near-term action items, could potentially be used to incorporate new AV-specific FMVSS. A new vehicle class with the appropriate subcategories of AVs (e.g., ADS-Dedicate Vehicles, etc.) would clarify the applicability of potential future rulemakings and enable a more efficient process overall.

APPENDIX 1: Response to ANPRM Safety Framework Questions

Process and Engineering Measures (Near- and Long-Term)

Both process[1] and engineering[2] measures could be incorporated, as appropriate, into the **voluntary mechanisms** within our proposed safety framework. These include voluntary disclosures (including safety self-assessments), operational guidance and sharing relevant AV safety information with consumers.

Engineering measures related to "control", as defined in the ANPRM, could be incorporated into the regulatory mechanisms contained within our proposed safety framework. These include the **traditional regulatory mechanisms**, such as FMVSS, and **novel regulatory mechanisms**, such as the AV pilot program and use of Part 555 temporary exemptions for AVs.

Process measures could include the items discussed in the ANPRM (e.g., ISO 26262, ISO 21448 Safety of the Intended Functionality (SOTIF) or UL 4600), but ADS developers should have flexibility to use the process measures that are best suited to their unique development methods. For instance, other options could include ISO/TR 4804 (Safety and cybersecurity for automated driving systems — Design, verification, and validation) or the SAE AVSC Best Practices.

The voluntary and regulatory mechanisms in our proposed safety framework should be performance-oriented at the vehicle level and, thus, only include control-based engineering measures. Sensing, perception, and planning all pertain to vehicle subsystems, e.g., LIDAR/radar/cameras/etc. and vehicle software, that would require independent subsystem performance requirements and associated test procedures. As mentioned in the ANPRM[3], regulating at the subsystem level would be limiting with regards to the technologies that could be included and would likely lead to "successive rulemaking proceedings to amend or remove regulatory provisions as they are obsoleted by technological change." Instead, if new regulatory mechanisms are deemed necessary, they should focus on vehicle-level performance requirements and test procedures consistent with the existing regulatory framework for conventional vehicles.

We note that vehicle-level performance requirements and test procedures could indirectly evaluate sensing, perception, and planning functionalities. For instance, if a hypothetical new FMVSS required the vehicle to navigate a route, the vehicle would certainly be required to have a sensing capability to "see" the surroundings, a perception capability to identify other road users or obstacles, a planning capability to make well-informed decisions about the driving task, and a control capability to execute the driving task. While testing at the vehicle level, the control capability (i.e., execution of the driving task) is the variable that is directly being tested while sensing, perception and planning are indirectly tested. In addition, "control" could include certain items that are noted as "Other Safety Functions" in the ANPRM, such as transitioning to a failsafe or limp home mode, as appropriate.

[1] As stated in the ANPRM, "Unlike engineering measures, process measures address safety issues that cannot be efficiently or thoroughly addressed through the FMVSS approach to testing, since process standards help to ensure reliability and robustness of designs over the life of the vehicle, and in "edge" cases – both of which are difficult or impossible to verify through one-time testing a finished vehicle."

[2] As stated in the ANPRM, "Engineering measures are those aspects that can be readily determined through the testing of a finished motor vehicle or system and establish the level of safety performance."

[3] Framework for Automated Driving Systems ANPRM, NHTSA Docket No. 2020-0106, Section IV(5)(c): FMVSS Drafted in a Highly Performance-Oriented Manner.

APPENDIX 1: Response to ANPRM Safety Framework Questions

Question 2. In consideration of optimum use of NHTSA's resources, on which aspects of a manufacturer's comprehensive demonstration of the safety of its ADS should the Agency place a priority and focus its monitoring and safety oversight efforts and why?

NHTSA should prioritize near-term actions that are needed to inform the continued development of a longer-term safety framework. For instance, NHTSA should prioritize efforts on demonstrated vehicle-level performance within the context of exemption grants or participation in the AV Pilot Program. As it stands today, there are numerous aspects of automated driving that need to be studied and understood to inform and guide any future NHTSA rulemaking activities. The data collection from vehicles deployed operating under Part 555 exemptions or an AV Pilot Program could help NHTSA achieve this goal.

Ultimately, if a safety need is demonstrated, a future self-certification regulatory framework should be objective and able to accommodate a variety of operational design domains and a range of acceptable outcomes. For example, if NHTSA determines that this is possible to achieve with a core set of common driving scenarios, NHTSA should identify the scenarios with a method that is harmonized with the UNECE WP.29 efforts to the extent possible but tailored for US roadways and state/local traffic rules and driving norms.

Question 3. How would your conception of such a framework ensure that manufacturers assess and assure each core element of safety effectively?

As compared to the current safety framework for conventional vehicles, the inclusion of process and vehicle design measures in our potential safety framework through the safety self-assessment and corresponding DOT guidance provides targeted direction to manufacturers on the aspects of core safety that must be assessed. By providing guidance and creating opportunities to share core safety information with the general public and NHTSA, manufacturers are incentivized to articulate how they are designing safety into the vehicle from every stage in the development process. NHTSA should continue to engage with industry and stay informed of industry-led activities, such as the development of industry standards or best practices, to identify areas where additional DOT guidance would be helpful.

In addition, required reporting associated with FMVSS exemption grants or a potential DOT AV Pilot Program will provide DOT with real-world performance data that can, and likely will, capture core safety elements.

Of course, any future AV safety framework must allow innovation to continue while ensuring that NHTSA has the ability to provide the appropriate safety oversight. Our proposed safety framework satisfies this goal by:

- Urging NHTSA to develop guidance regarding FMVSS exemptions to clarify the process and evaluation criteria for AVs. This would encourage use of the Part 555 exemption pathway while simultaneously allowing NHTSA to engage with ADS development and collect safety relevant information during the lifetime of the exemptions, if granted;

- Recommending that NHTSA monitor and assess industry-led activities, such as the development of industry standards and best practices, and issue guidance on matters that are not already being

addressed by industry or that are developing in a way that is not aligned with DOT's policies.

- Creating an AV Pilot program to establish a voluntary near-term additional pathway to AV deployment. Similar to current Part 555 exemptions, this would enable NHTSA to review and approve/deny applications to deployment. Applicants would be required to share safety-related information with NHTSA that would further the Agency's research goals and provide information that could ultimately be used to inform a future regulatory framework, if a safety need is demonstrated consistent with the Motor Vehicle Safety Act.

- Focusing on performance requirements and testing at the vehicle level, if future regulations are deemed appropriate. Vehicle level performance requirements and testing will allow NHTSA to provide safety oversight while remaining technology agnostic and allowing innovation to occur. The method will also enable NHTSA to provide oversight in the most efficient and effective way possible.

- Incorporating vehicle design process measures via voluntary mechanisms, consistent with the US self-certification approach. This allows for NHTSA to receive information pertaining to the ADS and vehicle design process, while ensuring flexibility for manufacturers to design unique solutions to ensure AV safety.

Question 5. How could the Agency best assess whether each manufacturer had adequately demonstrated the extent of its ADS' ability to meet each prioritized element of safety?

At the outset, it must be noted that NHTSA maintains the authority to investigate vehicle safety concerns and identify defects for AVs. As is the case for conventional vehicles today, where appropriate, this may lead to vehicle recalls.

As discussed in our response to Question 1, the AV safety framework should be performance-oriented at the vehicle level. Currently, many companies are providing detailed descriptions of their system safety engineering and test verification processes in their VSSAs. In the near-term, NHTSA should also leverage the existing FMVSS exemption program and create an AV Pilot Program to demonstrate this promising technology and collect relevant data and information regarding AV operation. The AV Pilot Program would enable NHTSA to tailor requirements based on the type of AV, intended use case, and ODD.

In the long-term, if there is a demonstrated safety need, NHTSA may consider establishing new FMVSS that address AV performance.

It is important to recognize, however, that AV developers are already focusing on increasing vehicle and roadway safety throughout the design process. This includes leveraging the industry's engineering expertise through various consensus standards and best practices, and by voluntarily reporting their safety processes through the VSSAs and other outreach to the public and state and local governments.

APPENDIX 1: Response to ANPRM Safety Framework Questions

Question 6. Do you agree or disagree with the core elements (i.e., "sensing," "perception," "planning" and "control") described in this notice? Please explain why.

The core elements of sensing, perception, planning, and control are certainly key elements of ADS design. However, for vehicle-level testing, "control" is the only element that NHTSA should consider incorporating into the mechanisms laid out in our potential safety framework. Sensing, perception, and planning could be incorporated indirectly, but these elements should not be included for vehicle-level performance testing. We note that "control" could include communication or interaction with other road users and certain items that are noted as "Other Safety Functions" in the ANPRM, such as transitioning to a failsafe or "limp home" mode, as appropriate.

Question 7. Can you suggest any other core element(s) that NHTSA should consider in developing a safety framework for ADS? Please provide the basis of your suggestion.

NHTSA should focus on vehicle-level performance that meets a demonstrated safety need, consistent with the Motor Vehicle Safety Act and NHTSA's long-standing approach. This may include some items that are noted as "Other Safety Functions" in the ANPRM, such as transitioning to a failsafe or limp home mode, as appropriate.

Question 8. At this early point in the development of ADS, how should NHTSA determine whether regulation is actually needed versus theoretically desirable? Can it be done effectively at this early stage and would it yield a safety outcome outweighing the associated risk of delaying or distorting paths of technological development in ways that might result in forgone safety benefits and/or increased costs?

The Motor Vehicle Safety Act, 49 U.S.C. Section 30111(a) states in part:

> *Each such Federal motor vehicle safety standard shall be practicable, meet the need for motor vehicle safety, and be stated in objective terms.*

Thus, any new FMVSS must be predicated on a need for motor vehicle safety. At this juncture, AVs are being tested but have not yet been deployed. It is not yet known if there are regulatory safety needs for AVs that are not addressed by the existing regulatory framework. In the future, if a safety need is demonstrated, a new regulation would need to be based on significant engineering research and real-world data that informs the development of an objective metric and the standard based on that metric.

As stated in the ANPRM, premature creation of a new regulation could have unintended consequences, such as erroneously converging on a specific technology or placing constraints on the wrong performance factors, while missing other critical safety factors. The rulemaking process to enact a new FMVSS takes many years, so NHTSA should conduct appropriate research before determining whether new FMVSS are appropriate and helpful towards the Agency's mission to uphold motor vehicle safety. If an FMVSS is created too hastily and without sufficient grounds, it could significantly delay the AV deployments and the corresponding safety and societal benefits to the public.

However, this does not mean that NHTSA should not take an active role in the deployment of AVs. There

are important steps that NHTSA can take to oversee and participate in the deployment of AVs, including creating an AV Pilot Program, evaluating and – when appropriate – approving Part 555 exemption petitions, establishing a new AV class, and addressing regulatory barriers. This work will lay a foundation to achieve longer-term goals, including the development of a longer-term safety framework.

Question 9. If NHTSA were to develop standards before an ADS-equipped vehicle or an ADS that the Agency could test is widely available, how could NHTSA validate the appropriateness of its standards? How would such a standard impact future ADS development and design? How would such standards be consistent with NHTSA's legal obligations?

It would be very difficult, if not impossible, for NHTSA to develop new performance standards for AVs before such vehicles are widely available. As indicated in the ANPRM, there should be meaningful data about the on-road experience of these systems that can be analyzed to determine the safety need (e.g., which aspects of performance are in need of regulation and, if so, what the regulation should entail). In the interim, manufacturers can share information with the Agency regarding AV performance via voluntary disclosures or as part of the Part 555 exemption process or an AV Pilot Program.

If a safety need is identified once AVs are widely available, consistent with the Section 30111 of the Safety Act, any new performance standards would need to be created with the same general methodology that the Agency has used for conventional vehicles – significant engineering research and the development of an objective metric and standard based on that metric.[4] It would be very difficult for NHTSA to complete this process without first having the ability to evaluate the performance of widely available ADS-equipped vehicles.

Question 10. Which safety standards would be considered the most effective at improving safety and consumer confidence and should therefore be given priority over other possible standards? What about other administrative mechanisms available to NHTSA?

Per the response to Question 9, it is too early to determine specific safety standards. In these early stages of AV development and deployment, meaningful data is not yet available about the on-road experience of these systems that could inform potential new safety standards. However, in the interim, manufacturers can share information with the Agency regarding AV performance via voluntary disclosures or as part of the Part 555 exemption process or an AV Pilot Program.

Question 11. What rule-based and statistical methodologies are best suited for assessing the extent to which an ADS meets the core functions of ADS safety performance? Please explain the basis for your answers. Rule-based assessment involves the definition of a comprehensive set of rules that define precisely what it means to function safely, and which vehicles can be empirically tested against. Statistical approaches track the performance of vehicles over millions of miles of real-world operation and calculate their probability of safe operation as an extrapolation of their observed frequency of safety violations. If there are other types of methodologies that would be suitable, please identify and discuss them. Please explain the basis for your answers.

[4] Framework for Automated Driving Systems ANPRM, NHTSA Docket No. 2020-0106, Section I: Executive Summary.

Statistical methods could be useful as part of a multi-faceted approach to evaluating ADS safety performance, but further research and verification with real-world data would be required to make an accurate assessment about the efficacy of such an approach.

Question 12. What types and quanta of evidence would be necessary for reliable demonstrations of the level of performance achieved for the core elements of ADS safety performance?

The most valuable evidence regarding ADS safety performance will include many of the data elements reported and analyzed on conventional vehicles, such as information about vehicle crashes involving ADS-equipped vehicles and crashes involving human driven vehicles. However, it will be important to differentiate between crashes that were caused by the ADS-equipped vehicle and those that were not for an analysis to be meaningful. In addition, input from the AVSC Best Practice for Metrics and Methods for Assessing Safety Performance of ADS, which provides suggestions on ADS safety performance metrics and outlines a framework for how to select such metrics, could be considered. Finally, NHTSA research focused on establishing meaningful and appropriate human driver baseline data for crashes of various severities that can be segmented or scaled appropriately according to ODD could be helpful.

Question 13. What types and amount of argumentation would be necessary for reliable and persuasive demonstrations of the level of performance achieved for the core functions of ADS safety performance?

ADS safety performance should be assessed via vehicle-level performance. Further research and real-world testing, including that which could be facilitated through the AV Pilot Program, would be useful in determining the types and amount of argumentation that would be necessary.

B. Question About NHTSA Research

Question 14. What additional research would best support the creation of a safety framework? In what sequence should the additional research be conducted and why? What tools are necessary to perform such research?

The AV Pilot Program could assist with NHTSA's research goals by providing real-world data from various types of AVs across the country. This would provide operational and performance data in diverse geographic regions under various traffic, time of day, weather, and other relevant conditions.

C. Questions About Administrative Mechanisms

Question 15. Discuss the administrative mechanisms described in this notice in terms of how well they meet the selection criteria in this notice.

Voluntary Mechanisms:

Safety Self-Assessment and Other Disclosure/Reporting has the benefit of providing transparency to build public trust and acceptance in the technology. The safety self-assessments and AV TEST are great examples of this. In addition, voluntary disclosure/reporting enables the Agency to be efficient and meet

resource requirements. Establishing a non-regulatory mechanism by which the Agency can collect ADS related data and information is a low cost, high reward endeavor. In addition, this mechanism allows consistency with market-based innovation, technology neutrality and equity for all manufacturers.

Operational Guidance has the potential to be a very useful administrative mechanism in the near-term. If done well, DOT Guidance could meet each one of the selection criteria provided in the ANPRM. For instance, guidance pertaining to Part 555 exemptions would provide consistent and reliable assurance of safety and provide equity. Like voluntary disclosure/reporting, guidance can be set forth much faster than regulatory mechanisms, so it would have a high efficiency and return on investment (resource requirements). Beyond Part 555 exemption guidance, the Agency could issue guidance to preview technology neutral/performance-based metrics and provide predictability to ADS developers regarding expected performance outcomes they will need to demonstrate. Guidance should be set forth in a manner that is consistent with market-based innovation and should not restrict new technologies that meet or exceed safety goals. Lastly, guidance would help build public confidence and acceptance by providing transparency to notional safety performance metrics and information that is of interest to the Agency.

Consumer Information opportunities should be prioritized to increase the transparency and consumer awareness of AV operation and performance. Initiatives such as AV TEST could be expanded to include information on vehicle deployments and, in doing so, would provide an equitable and technology neutral approach while accommodating different types of AVs designed with a variety of operational design domains. Leveraging existing programs, like AV TEST or the VSSAs would be efficient and meet resource requirements. This approach would also be consistent with market-based innovation, as it would provide AV safety information to the public and incentivize vehicle manufacturers to continue to enhance the safety performance of their vehicles.

Regulatory Mechanisms:

Mandatory Reporting and/or Disclosure in the context of an FMVSS exemption grant or the AV Pilot Program has similar qualities to the voluntary disclosure/reporting mechanism. Outside of this context, mandatory reporting and/or disclosure is not consistent with the existing self-certification regulatory framework and should therefore be avoided.

At this point, it is premature to enact new FMVSS – such action would not be consistent with market-based innovation. **In the future, if a safety need is demonstrated consistent with the Motor Vehicle Safety Act, new AV-specific FMVSS** could help provide assurance of safety, technology neutrality/performance-based standards, and predictability. However, care should be taken that the standards are technology neutral, truly performance-based, objective and equitable for different manufactures, ODDs and various types of ADS-equipped vehicles. Due to the long lead-time of creating new FMVSS, this is not the most efficient method to provide safety oversight as there are high resource requirements associated with their development.

APPENDIX 1: Response to ANPRM Safety Framework Questions

Question 16. Of the administrative mechanisms described in this notice, which single mechanism or combination of mechanisms would best enable the Agency to carry out its safety mission, and why? If you believe that any of the mechanisms described in this notice should not be considered, please explain why.

As detailed in our response to Question 1, in the near-term, NHTSA should set forth operational guidance and encourage manufacturers and ADS developers to participate in voluntary disclosure/reporting regarding their ADS development and testing results. NHTSA should also create an AV Pilot Program and utilize FMVSS exemptions to generate the information and data required for potential future rulemaking, in addition to continuing to remove existing barriers to AV deployment in the current FMVSS.

New FMVSS should be considered only if a safety need is justified. In that instance, FMVSS requirements and test procedures would need to be objective, tied to relevant scenarios, and flexible enough to accommodate a variety of operational design domains and range of acceptable outcomes. Innovative regulatory approaches, such as virtual testing with validated simulators or surrogate vehicle testing, should also be considered in a manner consistent with the U.S. self-certification regulatory approach. FMVSS based on risk-minimizing behavior should not be considered at this time, as further research and a more mature understanding of the concept would need to be developed.

While we share NHTSA's goal of empowering consumers with relevant vehicle safety information, the New Car Assessment Program ("NCAP") is not a suitable approach for AVs. Instead, we recommend identifying ways to leverage existing programs, like AV TEST or the VSSAs, and enhancing educational efforts, including through industry and NHTSA collaborations, to provide consumers relevant AV information in a transparent and easily accessible manner. Since NCAP is designed and intended to provide consumers information on vehicles for purchase, it is not suitable for AVs that will likely – at least initially – be operated as part of a ride-share service or fleet. Incorporating an entirely new type of vehicle into NCAP not only frustrates the purpose of the program, but may create consumer confusion. Moreover, the development and implementation of novel tests for AVs may over-burden the program.

Mandatory reporting and/or disclosure is not consistent with the existing self-certification regulatory framework, unless it is required as part of a NHTSA defect or compliance investigation, and should therefore be avoided as a standard aspect of an AV safety framework.

Question 17. Which mechanisms could be implemented in the near term or are the easiest and quickest to implement, and why?

The easiest and quickest items to implement include operational guidance and voluntary disclosure/reporting. However, creating the AV Pilot Program and facilitating FMVSS exemptions would provide the most near-term benefit by allowing the collection of real-world data from AV deployments. In addition, creation of a new AV Class would facilitate a streamlined review of existing regulatory barriers to deployment and lay the foundation for the implementation of new FMVSS, if a safety need is demonstrated and justified.

Question 18. Which mechanisms might not be implementable until the mid or long term but might be a logical next step to those mechanisms that could be implemented in the near term, and why?

While the AV Pilot Program should be created and utilized in the near-term, there could be continued improvements to the program in the mid and long term. As AV technology advances and more companies enter the space, the program would likely need to evolve and apply the learnings from its initial years in operation. For instance, as more data is generated by the program participants, NHTSA and AV developers may refine their understanding of what data is the most relevant to advance NHTSA's research objectives and contribute to a future safety framework. Since the program will enable each applicant to provide data that is tailored for its use case and NHTSA's research objectives, the data shared with the Agency might look different for program participants, for example, in year five versus year one.

Question 19. What additional mechanisms should be considered, and why?

Please see our response to Question 1.

Question 20. What are the pros and cons of incorporating the elements of the framework in new FMVSS or alternative compliance pathways?

We agree with DOT that the FMVSS framework can be used for AVs with no change to the Motor Vehicle Safety Act, including the creation of a new vehicle class for AVs. This is a benefit because it would not require the creation of a new regulatory mechanism, which could delay the widescale deployment of AVs.

However, near-term compliance pathways are possible by leveraging voluntary mechanisms, such as public disclosures regarding the ADS design and performance and compliance with existing or future DOT guidance.

Question 21. Should NHTSA consider an alternative regulatory path, with a parallel path for compliance verification testing, that could allow for flexible demonstrations of competence with respect to the core functions of ADS safety performance? If so, what are the pros and cons of such alternative regulatory path? What are the pros and cons of an alternative pathway that would allow a vehicle to comply with either applicable FMVSS or with novel demonstrations, or a combination of both, as is appropriate for the vehicle design and its intended operation? Under what authority could such an approach be developed?

More information about such an "alternative regulatory path" would be helpful to provide a complete and accurate assessment of this potential approach. That said, Auto Innovators supports an AV safety framework that is consistent with the self-certification approach and allows for continued innovations in advanced vehicle technologies.

D. Questions About Statutory Authority

Question 22. Discuss how each element of the framework would interact with NHTSA's rulemaking, enforcement, and other authority under the Vehicle Safety Act.

A key part of the framework requires that the Agency apply the existing rulemaking process to remove FMVSS compliance barriers by addressing issues and requirements that may not apply to AV designs. We

recognize that the Agency has begun this process and we encourage their efforts in this important near-term element.

We also note that a statutory increase to the duration and number of vehicles allowed per manufacturer as part of the Part 555 exemption program would be beneficial. Due to the existing statutory cap, the existing Part 555 exemption program is somewhat limited in its ability to generate real-world data.

Longer-term, if a safety need is justified, we concur with NHTSA that considering all-new potential AV-specific FMVSS, focused on vehicle-level performance, would be consistent with the existing Motor Vehicle Safety Act. The safety framework supported in these comments would not require any modifications to existing NHTSA rulemaking, enforcement, and other authority provided under the Motor Vehicle Safety Act.

Question 23. Discuss how each element of the framework would interact with Department of Transportation Rules concerning rulemaking, enforcement, and guidance.

The safety framework supported in these comments would not require any modifications to existing DOT Rules.

Question 25. If you believe that any of the administrative mechanisms described in this Notice falls outside the Agency's existing rulemaking or enforcement authority under the Vehicle Safety Act or Department of Transportation regulations, please explain the reasons for that belief.

The administrative mechanisms described in this Notice would fall within the Agency's existing rulemaking or enforcement authority under the Motor Vehicle Safety Act or DOT regulations. However, mandatory reporting outside of the context of an FMVSS exemption grant, the AV Pilot Program, or as part of a NHTSA defect or compliance investigation, would not be within NHTSA's authority and should therefore be avoided. In addition, if a new AV-specific FMVSS is justified and a scenario-based validation approach is considered, the selected validation scenarios and conditions would need to be objective, focused, founded on real-world scenarios, and prioritized appropriately. Any such FMVSS would need to remain consistent with the agency's long-standing regulatory approach including self-certification and 49 U.S.C. 30111; therefore, it would not be appropriate to include scenarios at random within a vehicle's ODD.

Question 26. If your comment supports the Agency taking actions that you believe may fall outside its existing rulemaking or enforcement authority, please explain your reasons for that belief and describe what additional authority might be needed.

The Agency does not need to take any actions that fall outside its existing rulemaking or enforcement authority. However, as stated in our response to Question 22, we support Congressional action to increase the volume and duration of Part 555 FMVSS exemptions.

APPENDIX 2: Auto Innovators' Principles for a Future ADS Safety Assurance Regulatory Framework

1. No change to the current framework of self-certification by the manufacturer.
2. Any future safety regulations should be based on a demonstrated clearly defined safety need.
3. If so demonstrated, future safety regulations should be performance based (e.g., evaluation of the vehicle's *response* to an object or event, but not the *detection* of such) and could include the performance of the Dynamic Driving Task (DDT) within the vehicle's Operational Design Domain (ODD), as defined by the manufacturer.
4. Any future safety regulations, including the test procedures and performance criteria, should take into consideration the key fundamental differences between ADS-equipped vehicles and non-ADS-equipped vehicles:
    a. Certain ADS-equipped vehicles (i.e., ADS-Dedicated Vehicles) do not require manual driver controls (i.e., steering wheel, gear shifter, pedals). This has implications for vehicle design assumptions and test procedures.
    b. Certain ADS-equipped vehicles (i.e., Dual Use Vehicles) will require control by the ADS or human driver, depending on the circumstance. This has implications for vehicle design assumptions, test procedures and the current "make inoperative" prohibition.
    c. ADS-equipped vehicles use non-deterministic control algorithms. This has implications on test criteria. For instance, it would be more appropriate to define a set of acceptable test outcomes versus limiting performance criteria to only one acceptable outcome.
5. Vehicle manufacturers may use one, or any combination of, the following tools to demonstrate conformance with interim and future safety test procedures and/or performance criteria and/or guidelines:
    a. Technical documentation
    b. Simulation
    c. Closed-course testing
    d. On-road testing
6. Consistent with DOT's principles, any future safety regulations should be technology agnostic.
7. Any future safety regulations should be harmonized internationally to the extent possible.

ALLIANCE FOR AUTOMOTIVE INNOVATION

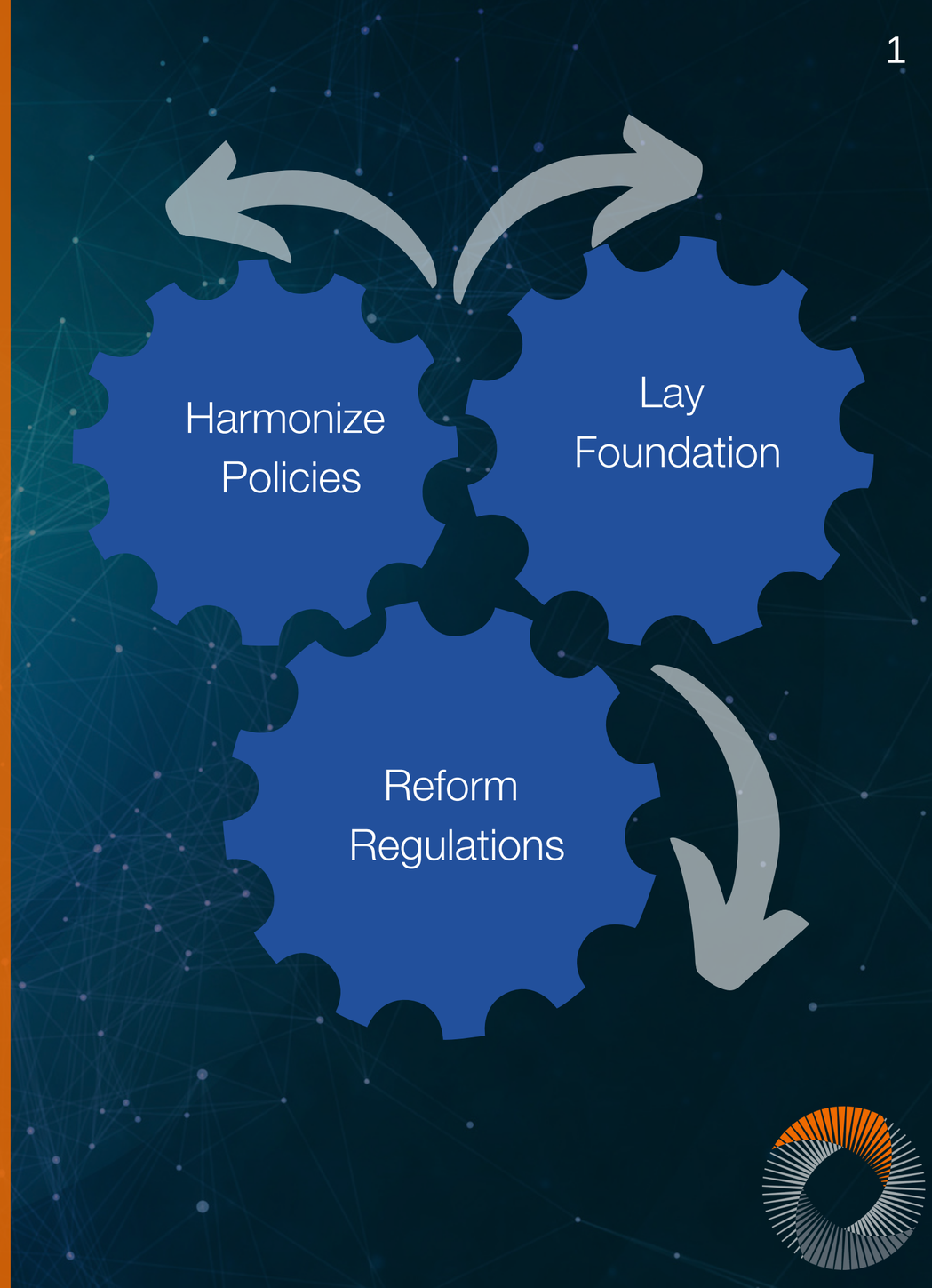
POLICY ROADMAP TO ADVANCE AUTOMATED VEHICLE INNOVATION

A Four-Year Plan to Revolutionize Transportation

We are at a pivotal time on the pathway to a cleaner, safer, and smarter transportation future. There is no doubt that Level 3-5 automated vehicles (AVs) are an important component of this future.

Focused and sustained leadership from policymakers is required to ensure this technology and the benefits it can deliver are realized. To that end, the Alliance for Automotive Innovation puts forward this FOUR-YEAR ACTION PLAN for federal policymakers to significantly advance the testing and deployment of AV technologies in the United States.

The 14 specific recommendations contained within this plan fall within the following pillars: (1) Reform Regulations to Allow for AV Deployment at Scale; (2) Harmonize Federal, State, and International Policies; and (3) Lay the Foundation to Achieve Longer-Term Objectives.



PILLAR 1
REFORM REGULATIONS TO ALLOW FOR AV DEPLOYMENT AT SCALE

RECOMMENDATION 1
CREATE A NEW VEHICLE CLASS FOR AVs

The U.S. Department of Transportation (DOT) should create a new vehicle class within the Federal Motor Vehicle Safety Standards for AVs. Since the current regulations were not written with AVs in mind, a number of existing standards assume the presence of a human driver and therefore present a barrier to the deployment of AVs without conventional driver controls. An AV class would enable the DOT to efficiently identify and categorize existing motor vehicle safety standards that should apply to AVs without impacting the applicability of those standards for conventionally driven vehicles. Although this approach would allow for AVs to be incorporated into the existing regulatory framework sooner, if a new vehicle class is not established, DOT should complete its efforts to update existing motor vehicle safety standards as expeditiously as possible.

RECOMMENDATION 2
CLARIFY APPLICABILITY OF “MAKE INOPERATIVE” PROHIBITION

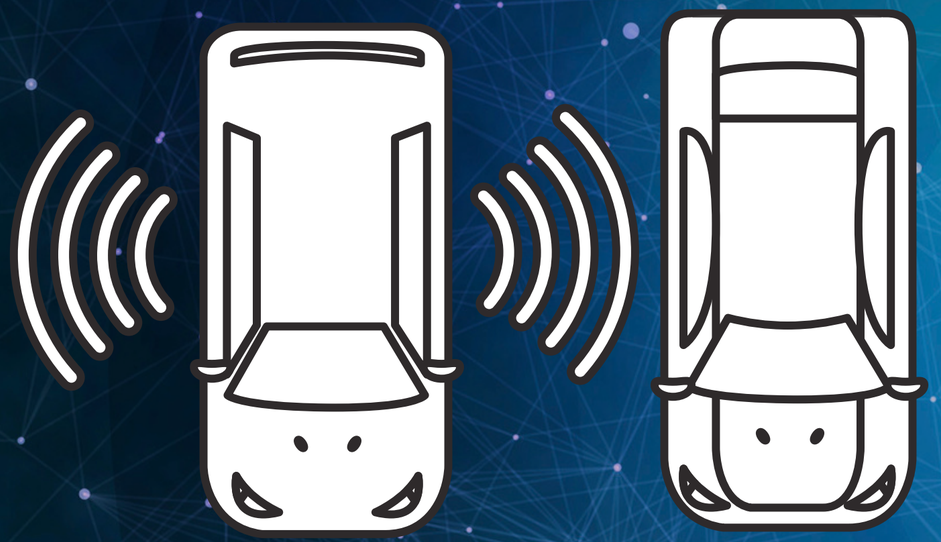
Existing DOT regulations prohibit manufacturers from knowingly making inoperative any feature or system installed on or in a motor vehicle in compliance with an applicable motor vehicle safety standard. This prohibition could have unintended implications for “dual mode” vehicles that are equipped with selectable AV features that temporarily deactivate conventional driver controls while the vehicle is operating safely in “autonomous mode.” To address this, DOT should confirm that the deactivation of conventional driver controls in “dual mode” vehicles, when the vehicle is in AV mode, does not fall under the “make inoperative” prohibition if the vehicle is compliant with all applicable motor vehicle safety standards while in manual driving mode.

RECOMMENDATION 3
ESTABLISH A NATIONAL AV PILOT PROGRAM

DOT should establish a robust national pilot program for AV testing and deployment. Such a program would not only provide a venue to advance DOT research objectives relating to AVs, but also provide AV developers that choose to participate with an alternative pathway to AV testing and deployment. A focused pilot program carried out under DOT's oversight could increase public exposure to the technology and provide the DOT with the data that it will need to create new safety regulations for AVs.

RECOMMENDATION 4
IMPROVE THE EXEMPTION PETITION PROCESS

Current law authorizes DOT to grant manufacturers exemptions from existing safety standards provided that vehicle safety is upheld. As the safety standards are being updated in line with RECOMMENDATION 1, DOT should simplify and streamline the existing exemption process for AVs to provide greater clarity to manufacturers. As part of this effort, DOT should issue guidance that specifies what data is required as part of the exemption application.



RECOMMENDATION 5
RAISE THE CAP ON EXEMPTIONS FOR AVs

To provide for meaningful AV deployments, the U.S. Congress should enact legislation to increase the existing cap on temporary exemptions that can be granted to AVs. Under existing law, exemptions are limited to 2,500 vehicles per manufacturer annually and valid for a two-year duration. Increasing this limit will promote continued development of this technology in the United States by providing certainty to AV developers that there is a near-term path to deploy AV technologies. Raising the cap will also lead to the generation of more real-world data to support any efforts by DOT to enact new AV-specific regulations.

RECOMMENDATION 6
EMBRACE INNOVATIVE REGULATORY APPROACHES

DOT should embrace innovative regulatory approaches that are appropriately matched to the current pace of technological advancement. As part of the federal motor vehicle safety regulatory compliance and the exemption petition process, DOT should permit manufacturers to submit vehicle-specific technical design and/or build documentation. This “technical documentation” approach would accommodate unique design solutions and would empower manufacturers to use innovative safety assurance techniques, such as virtual testing with validated simulators. In addition, DOT should allow for the use of a surrogate vehicle (i.e., a vehicle that shares the same platform as the AV but has conventional driver controls) to perform certain regulatory compliance tests.

PILLAR 2
HARMONIZE FEDERAL, STATE, AND INTERNATIONAL POLICIES

RECOMMENDATION 7
MAINTAIN TRADITIONAL FEDERAL AND STATE ROLES

The U.S. Congress should enact legislation to clarify federal and state roles related to AVs. The federal government should maintain responsibility for the design, construction, and performance of motor vehicles, while states should continue to oversee licensing of human drivers, registration, insurance, and traffic laws.

RECOMMENDATION 8
COORDINATE STATE AV POLICIES

The current patchwork of AV laws and regulations at the state level presents challenges for manufacturers seeking to test and deploy AVs in multiple states. AV testing and deployment across state lines could be significantly improved if states coordinated with each other and sought to ensure consistency of AV laws and regulations. A federal grant program could be established to provide funding to states that agree to work together to harmonize policies that govern the testing and deployment of AVs. In addition, a unified approach to AV licensing and registration should be encouraged.

RECOMMENDATION 9
ALIGN STATE TRAFFIC LAWS

Variation in state traffic laws creates additional challenges for AV developers. AV developers must translate each state's traffic laws into the system's programming and capture even the slightest differences, and then continuously monitor state laws for any updates or changes. To the extent possible, states should be encouraged to harmonize traffic laws and regulations, particularly those that apply to the operation of AVs on public roads. Uniformity of state traffic laws and regulations would provide benefits not only to AV developers, but also to any road user who crosses state lines. At a minimum, a single resource of state traffic laws and real-time updates to those laws that is accessible to AV developers should be created. In addition, states should review their existing laws and identify any provisions that would prevent the deployment of AVs.

RECOMMENDATION 10
LEAD IN INTERNATIONAL FORUMS

Many AV companies, including those developing this technology in the United States, may deploy in global markets. For this reason, international alignment on AV testing and deployment regulations is helpful. DOT should actively participate in international forums, like the United Nations Economic Commission for Europe, where AV policy is being developed. DOT should also strive to implement a national AV policy framework that is reasonably aligned with international rules within the bounds of the U.S. self-certification regulatory regime.

PILLAR 3
LAY THE FOUNDATION TO ACHIEVE LONGER TERM GOALS

RECOMMENDATION 11
PROMOTE INDUSTRY STANDARDS

Industry consensus standards play an important role in the deployment of new vehicle technologies. Standards Developing Organizations (such as ISO, IEEE, and SAE) provide a neutral forum for technical experts to reach consensus on foundational elements of AV design. This alignment around effective practices helps to advance safety and increase public trust in the technology. To that end, policymakers should support and appropriately leverage the development of these industry standards.

RECOMMENDATION 12
BUILD KNOWLEDGE FOR A SAFETY ASSURANCE FRAMEWORK

DOT should encourage research and seek input from industry stakeholders to inform the development of a national AV safety assurance framework. Above all, to provide the necessary leadership and to facilitate meaningful progress on the testing and deployment of AV technology in the United States, it is important that DOT stay abreast of the latest advancements in AV technology.

RECOMMENDATION 13
PREPARE ROADWAY INFRASTRUCTURE FOR AVs

Roadway infrastructure can help facilitate the deployment of AV technology. For example, AV performance will benefit from consistent and well-maintained lane markings, signage, and traffic control devices. DOT should revise the Manual on Uniform Traffic Control Devices (MUTCD) to include items that will support and facilitate AV deployment. States should be encouraged and even incentivized to update their infrastructure consistent with any AV-related MUTCD update.

RECOMMENDATION 14
SUPPORT U.S. LEADERSHIP ON AVs

In addition to creating a regulatory environment that allows for AV deployment in the United States (as described in the above recommendations), policymakers should explore additional policies to ensure that the United States maintains a leadership role in the development of AV technologies. This could include specific tax or other incentives that support the research, development, manufacturing, and deployment of AVs in the United States. In addition, policymakers should adopt policies that strengthen the AV workforce pipeline and create a pathway for qualified AV developers to safely test their vehicles on public roads with NHTSA oversight. Finally, restrictions on the ability of developers to commercialize AV technologies should be avoided or eliminated.

BENEFITS OF THIS FOUR-YEAR ACTION PLAN

Includes two pathways to AV deployment, both with DOT oversight

Since the current exemption process might not make sense for some AV developers, a new pilot program would create a second option, designed specifically for AVs and created with existing DOT authorities.

Defines federal and state roles

With a clear alignment of state and federal roles, each are empowered to take actions that strengthen - rather than confuse - the policy landscape.

Paves the way for long-term national success

The steps policymakers take today will have implications for years to come. If we work together to get it right, we will reap the benefits of a safer, cleaner, and smarter transportation system.

Appendix 4: International Activities Under the UNECE

Many automated vehicle ("AV") companies are developing vehicles that will be deployed in a global market. For this reason, it is important to increase the harmonization or "compatibility" of motor vehicle regulations and associated performance requirements across international markets. Furthermore, it is a critical time in AV policy development – countries around the globe are in the beginning stages of defining their national AV policy frameworks. If harmonization does not occur at this early stage in the process, it will be even harder to align international policy in the years to come.

As such, Auto Innovators regularly participates in international harmonization activities in the United National Economic Commission for Europe ("UNECE") World Forum for Harmonization of Vehicle Regulations ("WP.29") through its membership in the Organisation International Constructors of Automobiles ("OICA"). We appreciate NHTSA's leadership as chair and vice-chair of important WP.29 AV subgroups and look forward to continued coordination on these efforts. In particular, it is imperative that NHTSA and industry continue to work together to ensure that the performance specifications and regulatory certification processes being developed at the UNECE are technology neutral and can be efficiently applied to both self and type-approval certification systems.

The UNECE's approach to AV policy is based on a 2018 OICA proposal known as the "multi-pillar" approach. This proposal recognized that characterizing AV performance and safety would require a variety of assessment methods and tools that had not been previously used in conventional vehicle regulation. The initial OICA proposal contained three pillars: track testing, on-road testing, and an audit. The WP.29 has recently expanded this framework to also include pillars for simulation and virtual testing.[1]

While Auto Innovators generally supports this "multi-pillar" approach, certain aspects (e.g., an audit) are unique to type-approval and would not be appropriate to replicate in the United States' self-certification regulatory framework. However, it is possible that these aspects that are unique to type-approval could be implemented by NHTSA as guidance or as part of technical documentation. Other aspects of the "multi-pillar" approach (e.g., track testing, on-road testing and simulation) are more readily acceptable in a self-certification framework. In the United States, these elements could potentially be incorporated in a new Federal Motor Vehicle Safety Standards ("FMVSS") for AVs, if a safety need for such an FMVSS is demonstrated and justified. As the WP.29 continues to develop and refine this approach, it is important for industry and NHTSA to work together to provide input on behalf of the United States.

In addition to the development of the "multi-pillar" approach, the WP.29 has a workstream devoted to developing the functional performance requirements for AVs.[2] Given the fact that AVs will likely be composed of unique combinations of automated driving system ("ADS") "features", each with their unique functionality and operating design domain, the WP.29 has determined that it is not feasible to develop specific performance requirements for each unique set of ADS features. Instead, the WP.29 is developing high-level requirements that can be further defined at an appropriate level of detail, depending on each individual AV configuration. Auto Innovators supports the current approach to develop high-level performance requirements at the vehicle level.

[1] This work is occurring the WP.29 Informal Working Group titled: Validation Method for Automated Driving (VMAD).

[2] This work is occurring the WP.29 Informal Working Group titled: Functional Requirements for Automated and Autonomous Vehicles (FRAV).

Appendix 4: International Activities Under the UNECE

Lastly, it is important to note that the WP.29 developed a framework document[3] to serve as guidance for each of the AV subgroups and detail key principles for the safety and security of AVs. These principles are closely aligned with the safety elements identified in the US Department of Transportation's ADS 2.0 Guidance. In addition, the framework specifies that an AV safety assurance framework needs to be performance based, technology neutral, based on the state of the art technology, and allow for future innovation. Auto Innovators supports this general direction provided in the framework and believes these key principles also apply to NHTSA's approach to developing an AV safety assurance framework.

[3] https://undocs.org/ECE/TRANS/WP.29/2019/34/REV.2

Appendix 5: AV Pilot Program

An AV Pilot Program ("Program") will advance AV testing and deployment and provide the National Highway Traffic Safety Administration ("NHTSA") with data and information that could be used to inform a future AV safety assurance framework. The establishment of such a Program presents a unique leadership opportunity for DOT in the testing and deployment of AVs in coordination with state departments of transportation and other key stakeholders. In addition, the Program would provide a platform whereby NHTSA could engage with and educate the public regarding the AV technology being tested and deployed under the Program.

Such a Program would create a streamlined approach for AV developers to deploy their vehicles in the near-term, predicated on the requirement to share agreed-upon information with NHTSA that advances its safety mission. The information shared with NHTSA could be used to inform the development of a safety assurance mechanism including the vehicle performance criteria that would be appropriate. In other words, the Program would enable NHTSA to create data-driven decisions based on vehicles deployed on public roads. At the same time, the Program would provide AV manufacturers and suppliers a pathway to deployment of these vehicles at scale.

To reap the benefits of the Program, it should be established under Section 30114 of the U.S. Code[1] as a second pathway for AV deployments, in addition to the existing Section 30113 exemption program.[2] Section 30114 would provide flexibility to the Secretary in determining the best way to structure the program. Unlike Section 30113, which is currently the only pathway for automakers to deploy AVs that require FMVSS exemptions, Section 30114 is not constrained by a statutory vehicle volume (2,500) or duration (2 years). In addition, a Program under Section 30114 can be designed specifically for AVs and avoid some of the procedural challenges that currently exist for AV exemption petitions under the Section 30113 process.

Auto Innovators provides the following recommendations regarding the structure of the Program.

APPLICATION PROCESS: The application process should provide NHTSA with information necessary to meet NHTSA's research objectives in order to inform future rulemaking, while providing flexibility for participants who may have unique testing or deployment goals and strategies. Auto Innovators recommends that applicants:

- submit a safety report to NHTSA that addresses the 12 areas included in the Department of Transportation's voluntary safety self-assessment ("VSSA"). This includes information about the automated driving system ("ADS") technology, system safety, validation methods, crashworthiness, data recording and cybersecurity protections. Consumer education and training, including training of test drivers, would also be addressed in the application, particularly as it relates to the location where the vehicle may be operated under the Program. Applicants would also address their plans to abide by applicable federal and state vehicle regulations, and to design

[1] Section 30114 provides NHTSA with the authority to expand the coverage of exemptions beyond imported vehicles. Further, when coupled with the authority providedby Section 30182, which confers authority on NHTSA to conduct motor vehicle safety research, "including activities related to new and emerging technologies," Section 30114 authorizes NHTSA to create and execute a Pilot Program for AVs.

[2] Auto Innovators finds both Section 30113 and 30114 exemptions to be valuable. We look forward to working with the Agency to suggest improvements to the existing Section 30113 process for AVs, including in the anticipated Notice of Proposed Rulemaking titled "Updating the Process for Temporary Exemptions."

their ADS technology to comply with state and local traffic laws for the areas in which they are applying to test/deploy.

- include the number of vehicles and duration of participation that is required to further NHTSA's research needs under the Program. Under the Section 30114 exemption process, NHTSA may determine the number of allowable vehicles and duration of their participation on a case-by-case basis. In order to generate statistically significant vehicle data that can inform NHTSA for potential future rulemaking, it is likely that some applicants would require significantly higher vehicle volumes and durations than are currently permitted under Section 30113.

DATA SHARING WITH NHTSA: Participants in the Program should share information with NHTSA that advances its safety mission.

- Program participants should share information with NHTSA that supports NHTSA research objectives and is appropriately tailored for the specific ADS technology and use case. During the application process, applicants and NHTSA should coordinate to determine what types of ADS-operated vehicle data or information should be shared and at what frequency such sharing should occur. For example, this could include information about a crash, traffic citation, or interaction with law enforcement involving an AV that is covered under the Program. It could also include statistical information, such as the number of miles the vehicle has traveled with the ADS engaged over a certain timeframe. Once accepted into the Program, participants would be required to report such information accordingly to remain in good standing in the Program.
- If proprietary data or information is required as part of the Program reporting requirements, NHTSA should be prepared to receive information that is considered confidential under Part 512, similar to the method used for the Transportation Recall Enhancement Accountability and Documentation (TREAD) program.

DATA SHARING WITH STATES: Program participants should share information with the states in which testing or deployment is planned under the Pilot Program to advance the state's mission to oversee the safety on their roadways.

- When a Program application is approved by NHTSA, the accepted applicant should notify the state(s) in which they will be operating under the Program before such operation begins for which the application was approved and provide information regarding the following:
    - Participant (name and business address);
    - ADS-operated vehicle technology (SAE level of automation, operational design domain (ODD) and other VSSA elements); and
    - Plans for testing or deployment (estimated number of vehicles and duration of their operation) on the state's public roads under the Program.
- During their participation in the Program, participants should notify the state of any material update to the parameters of their involvement in the Program or material changes to the participant's application.

- Additionally, based on the ADS capabilities and use case, participants may be able to share information with state departments of transportation or departments of motor vehicles to assist in their mission, such as providing recommendations for infrastructure improvements or traffic flow optimization.
- Any crashes involving an ADS-operated vehicle participating in the Program should be reported to the state consistent with applicable laws.

PUBLIC ENGAGEMENT: NHTSA and Program participants should engage with states and key stakeholders throughout the duration of the Program.

- Program participants should coordinate with states and localities in areas where ADS-operated vehicle testing occurs under the Program.
- NHTSA should share key metrics from the Program with states and AV stakeholders at various points throughout the duration of the Program.