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Dearborn, MI 48124

April 1, 2021

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 System Safety,
Docket No. NHTSA-2020-0106

Dear Acting Administrator Cliff:

Ford Motor Company (Ford), a domestic manufacturer and importer of motor vehicles with offices at One American Road, Dearborn, Michigan 48126-2798, submits the following response to the National Highway Traffic Safety Administration's ("NHTSA") *Framework for Automated Driving System Safety* advance notice of proposed rulemaking ("ANPRM")¹.

Ford is a member of the Alliance for Automotive Innovation ("Innovators") and participated in the development of their response to this ANPRM. The responses herein supplement those provided by the Innovators.

Ford Mobility Vision and potential for autonomous vehicles (AVs): Ford Motor Company was built on the belief that freedom of movement drives human progress, and it is that belief that has always fueled our passion to create great cars and trucks. It continues to drive our commitment to become the world's most trusted mobility company, designing smart vehicles for a smart world, to help people move safely, confidently, and freely.

Ford is investing in an autonomous future and working to provide mobility solutions for transportation challenges affecting communities across the country and around the world. The possible benefits of autonomous technology are substantial, including the potential to save lives, expand mobility, and make

¹ Framework for Automated Driving Systems ANPRM, Docket No. NHTSA-2020-0106

transportation more efficient. We have announced our intent to deploy an SAE Level 4²-capable Automated Driving System (ADS) equipped vehicle for commercial application in mobility services in 2022.

Ford appreciates NHTSA's and the U.S. Department of Transportation's ("USDOT") continued leadership and efforts to promote the safe testing and deployment of AVs. We share NHTSA's belief that it is too early to make decisions on how ADS-operated vehicles should be regulated. We believe NHTSA's concerns about issuing regulations without meaningful data and a demonstrated safety need are valid, as premature regulation could inhibit the development of promising ADS technology that has great potential to increase safety.

As NHTSA states within the ANPRM, mature ADS-equipped vehicles do not yet exist in the mass market, and many are still in the development stages. Considering the current state of ADS implementation, we believe NHTSA's efforts to begin assessing the elements of a safety assurance framework and seek feedback from potential stakeholders is appropriate at this time. NHTSA's efforts to address a safety framework should improve safety, mitigate risk, and enable development of this new safety innovation. Ideally, the resulting framework will maintain federal authority over performance standards and help to avoid a patchwork of state regulations.

AV Developer perspective of ADS framework: Although it may be premature to regulate the technology based on the lack of available data and limited exposure, the public needs to trust the technology and be confident that appropriate safety measures are in place to govern the platform's development and testing procedures before it can have any meaningful impact on safety and the society at large. To inform and guide our approach to this issue, Ford published a Voluntary Safety Self-Assessment (VSSA), which includes specifics on the safety standards and methods applied to the platform, and the policies in place to govern training of our safety test drivers. Since the publication of our VSSA two years ago, we have learned a lot and are in the process of publishing a revised version of the VSSA.

Ford is actively testing ADS-equipped vehicles with Argo AI in multiple pilot cities with safety drivers, in part to begin building trust by making the public more familiar with ADS-equipped vehicles. We are providing test locations and other details through our partner Argo AI on the AV TEST platform launched by the agency. Creating a level playing field for domestic developers of AVs, in addition to importers and established manufacturers through rulemaking for AV testing, can further accelerate the growth and maturity of the technology, while at the same time encouraging the new technology companies to share information about their test vehicles.

Additionally, we have shared our learnings through the development of Best Practices published by the Automated Vehicle Safety Consortium (AVSC) which Ford co-founded. The Best Practices are freely available from the SAE ITC website and provide insight into the state-of-the-art practices for AV development. The latest Best Practice, *Metrics and Methods for Assessing Safety Performance of Automated Driving Systems (ADS)*³, was published on March 25, 2021 and shares metrics that may help determine safety outcomes for an ADS. Ford is also an active contributor to the AV related policy discussions and whitepapers developed by the Alliance for Auto Innovators and the Self-Driving Coalition for Safer Streets.

² Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles J3016_201806: https://www.sae.org/standards/content/j3016_201806/

³ AVSC Best Practice for Metrics and Methods for Assessing Safety Performance of Automated driving Systems (ADS): <https://avsc.sae-itc.org/principle-6-5471WV-45893QD.html?respondentID=28553252#Read-More>

We believe the first implementation of the technology will be AVs employed to transport passengers and goods through a Transportation-as-a-Service (TaaS) model. The ADS will be capable of completing the entire driving task without the need for controls and displays that are normally required for a human driver. NHTSA has long recognized that vehicles with non-conventional designs (e.g., lack of operator controls) may need exemptions from Federal Motor Vehicle Safety Standards (FMVSS) to enable vehicle deployment. NHTSA's *Notice Regarding the Applicability of NHTSA FMVSS Test Procedures to Certifying Manufacturers* (Google reinterpretation)⁴ and recent rulemaking efforts for ADS-equipped vehicles have provided some clarity. A streamlined and efficient process for approving exemption petitions is one tool NHTSA could use to speed up access to real-world data.

However, the full potential of AVs can only be realized through larger-scale deployment. To do so, we believe NHTSA needs to continue the work initiated with the *Removing Regulatory Barriers for Automated Driving Systems* ANPRM⁵ and the *Occupant Protection for Automated Driving Systems* NPRM⁶ to remove the regulatory barriers for ADS-equipped vehicles without manual controls. We further encourage NHTSA to continue progress on other AV-related rulemaking, such as the pre-rule efforts on the *Considerations for Telltales, Indicators and Warnings in ADS Vehicles*⁷.

As these vehicles are deployed in larger numbers, and as the technology matures and converges to a robust platform, NHTSA can use this mature data when reviewing the potential need for creating regulations around objective performance requirements that are supported by real world data.

NHTSA has consistently used its recall authority to ensure the performance and reliability of new safety-related technologies, before FMVSS are established. Under Section 30118(c) of the Motor Vehicle Safety Act⁸, manufacturers are obligated to monitor performance, investigate potential safety defects, and recall vehicles in a timely manner. Manufacturers who fail to meet these obligations are subject to enforcement actions. NHTSA can also order safety recalls with evidence of a safety defect. Emerging ADS technologies are subject to these requirements that obligate manufacturers to correct safety defects and stop the sale of unremedied vehicles to consumers. NHTSA can use this authority to effectively ensure the safety of new ADS technologies before FMVSS are established^{9 10}.

Ford has provided inputs to the Innovators regarding an AV policy that could support AV developers and extend US leadership in AV development. We believe NHTSA should continue to use the self-certification

⁴ Notice Regarding the Applicability of NHTSA FMVSS Test Procedures to Certifying Manufacturers: <https://www.federalregister.gov/documents/2020/12/21/2020-28107/notice-regarding-the-applicability-of-nhtsa-fmvss-test-procedures-to-certifying-manufacturers>

⁵ Removing Regulatory Barriers for Vehicles With Automated Driving Systems: <https://www.federalregister.gov/documents/2019/05/28/2019-11032/removing-regulatory-barriers-for-vehicles-with-automated-driving-systems>

⁶ Occupant Protection for Automated Driving Systems: <https://www.federalregister.gov/documents/2020/03/30/2020-05886/occupant-protection-for-automated-driving-systems>

⁷ <https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201904&RIN=2127-AM07>

⁸ 49 U.S.C. Section 30118

⁹ NHTSA directs driverless shuttle to stop transporting school children in Florida: <https://www.nhtsa.gov/press-releases/nhtsa-directs-driverless-shuttle-stop-transporting-school-children-florida>

¹⁰ EasyMile Low Speed Emergency Stop for Safety Triggers Partial US Suspension: <https://easymile.com/news/low-speed-emergency-stop-for-safety-triggers-partial-us-suspension>

approach and bolster the nation's AV leadership by adopting a safety framework that includes the considerations summarized below:

- Now: AV testing and exemptions
 - We support the agency's plans to continue providing guidance on emerging safety areas for ADS-equipped vehicles, and encourage voluntary participation in AV TEST. Additionally, NHTSA should continue to emphasize and encourage the publication of VSSAs as a means to communicate the safety standards and protocols developers are applying to test platforms and ensuring safety is the paramount objective.
 - We believe NHTSA should utilize Part 555 exemption approvals and use them as a means to gather data about the performance of ADS-DVs.
 - Manufacturers are currently obligated under the Safety Act to monitor the performance of vehicles in the field and remedy any safety defect. NHTSA could further address potential safety concerns with approved deployments by using its recall authority.
- Near: Multiple self-driving deployments in the field
 - We ask that NHTSA continue efforts to remove regulatory barriers for AVs without controls, including the pending efforts on a Telltales and Indicators ANPRM. This will provide certainty for AV developers and separate AV-related regulations from conventional motor vehicles, as NHTSA contemplated in the Crashworthiness ANPRM. The approach has the potential of making the rulemaking process more responsive to developments in AV technology.
- Far: Large scale deployment of AVs with significant market penetration
 - We believe NHTSA could contemplate ADS specific performance requirements in the form of Best Practices and consolidate ADS safety metrics as envisioned by AVSC.
 - As more data becomes available over time, NHTSA will be able to determine if there is a need for new FMVSS addressing the minimum performance expectations of ADS-equipped vehicle platforms.
- NHTSA Research
 - Simulation
 - Utilizing the Virtual Open Innovation Collaborative Environment for Safety (VOICES) project, as funded by the USDOT, NHTSA may help research, develop, and assess transportation solutions in a distributed virtual environment that produces a high-fidelity representation of the transportation system.
 - Real world data
 - AV TEST involvement may enable an understanding of testing and deployment performance during real world operation.
 - AV Pilot rulemaking efforts¹¹ introduced another measure that may enable greater deployment efforts and collaboration with NHTSA to generate real world data.
 - Part 555 AV Exemptions and any associated data reporting can provide NHTSA an additional resource for collecting real world performance data.

¹¹ Pilot Program for Collaborative Research on Motor Vehicles With High or Full Driving Automation: <https://www.federalregister.gov/documents/2018/10/10/2018-21919/pilot-program-for-collaborative-research-on-motor-vehicles-with-high-or-full-driving-automation>

At Ford, the safety of our customers and the quality of our products are the primary focus. NHTSA's ANPRM is an important step towards potential future regulation of ADS-equipped vehicles, that provides certainty for manufacturers and developers, and more importantly, enhances safety for all Americans.

We thank NHTSA for the opportunity to provide input and look forward to discussing this recommended safety framework with USDOT and the broader vehicle safety community. We will seek to collaborate on a framework that supports our collective goals of providing appropriate Federal oversight, enabling AV deployments at scale, and realizing the safety and societal benefits of the technology. If you have questions regarding these comments, please contact Anthony Smith (email: asmit685@ford.com or phone: 313-845-2408).

Sincerely,

A handwritten signature in blue ink, appearing to read 'Desi Ujkashevic', with a long horizontal flourish extending to the right.

Desi Ujkashevic

Attachments:

1. Appendix 1 - Ford's Response to the Questions and Requests Within the *Framework for Automated Driving System Safety* ANPRM

Appendix 1 – Ford’s Response to the Questions and Requests Within the Framework for Automated Driving System Safety ANPRM

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.

We believe NHTSA should rely on existing mechanisms and authorities – rulemaking, exemptions and recall authority – to enable the safe deployment of AVs. Based on the data obtained over time from these deployments and the evolving best practices from organizations such as AVSC, NHTSA can pursue FMVSS or additional measures as required to meet the safety needs. The determination as to whether additional FMVSS or regulations are required should be based upon real world measures of societal outcomes as defined within the AVSC Best Practice for *Metrics and Methods for Assessing Safety Performance of Automated Driving Systems (ADS)*¹².

Guidance, in this situation, is allowing NHTSA time to collect data that will inform whether rulemaking is required. By issuing guidance, NHTSA has been able to proactively establish safety expectations, and has given industry an understanding of where NHTSA is potentially headed with rulemaking. Industry VSSAs provide a feedback mechanism through which NHTSA can review the response of industry to the safety needs established by guidance.

Real world data is essential to any rulemaking on automated vehicles and NHTSA’s existing exemption and recall and defect authorities enable the generation of this data while ensuring roadway safety. NHTSA should grant exemptions for vehicle designs that, based on rationale presented in the exemption request, maintain equivalent or better vehicle safety. In approving the exemption, NHTSA should request sufficient information about the operations of exempted vehicles to ensure that the safety of the vehicles as deployed conforms to the analysis outlined in the exemption request. NHTSA has already demonstrated the feasibility of this approach by approving the Nuro exemption¹³. This process encourages innovation while enabling NHTSA to quickly deploy the powerful mechanism of recall authority to remove vehicles from the road when real world operations raise concerns about an unreasonable risk to safety.

As NHTSA has noted in the ANPRM, developing a new FMVSS requires significant time and research be devoted to setting requirements and designing appropriate compliance demonstration methods. With the rapid pace of AV development, it is simply not possible or necessary to develop FMVSS to regulate these new technologies in advance of their introduction. This is not unique to AVs and has been true of systems like ESC and AEB. Certain FMVSS already block the deployment of novel approaches that differ from conventional vehicle design and creating FMVSS for ADS hastily without real world data can inhibit the technology and risk creating a further barrier to automated vehicle deployment. NHTSA should consider future FMVSS for AVs based on a solid safety need, sufficient real-world data of AV operations, and consideration of industry best practices.

¹² AVSC Best Practice for Metrics and Methods for Assessing Safety Performance of Automated Driving Systems (ADS): <https://avsc.sae-itc.org/principle-6-5471WV-45893QD.html?respondentID=28553252#Started>

¹³ Nuro, Inc.; Grant of Temporary Exemption for a Low-Speed Vehicle With an Automated Driving System: <https://www.federalregister.gov/documents/2020/02/11/2020-02668/nuro-inc-grant-of-temporary-exemption-for-a-low-speed-vehicle-with-an-automated-driving-system>

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?

Adequate exposure to the ODD will remain a challenge in the near-term and NHTSA should look to guidance from the *AVSC Best Practice for Metrics and Methods for Assessing Safety Performance of Automated Driving Systems (ADS)* for additional metrics that may require less exposure and may provide insight into the potential trending of societal outcomes.

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

While NHTSA should rely on rulemaking, exemptions and recall authority to ensure safe deployment of AV technology, we propose manufacturers use a two-part approach to ADS safety assurance, which treat the core elements holistically. The first aspect includes self-certification to applicable FMVSS requirements, and execution of internal quality process requirements and validation assessments. These should be based on established failure mode avoidance practices and interpretations of existing standards, such as Functional Safety (ISO 26262), Safety of the Intended Function (ISO 21448), cybersecurity (ISO/SAE 21434) and the AVSC best practices¹⁴. These requirements may be validated through a combination of simulation, closed course and public road testing with trained safety drivers.

The second aspect, which is the decision point to remove safety drivers and subsequently deploy, should be based on high confidence of adequate test coverage in the first aspect. This may be gained through the aggregation of fleet metrics on key societal outcomes on the developers test fleet, such as frequency of road rule violations and collisions. This part of the proposed framework is designed to expose potential gaps in the first aspect and create a feedback loop to remedy missing or deficient requirements. NHTSA can monitor the first aspect of the process through VSSAs and the second aspect of the process through AV TEST reporting and the data requirements outlined within exemption approvals.

Per the response to Question 2 above, adequate exposure to the ODD will remain a challenge in the near-term.

Question 4. How would your framework assist NHTSA in engaging with ADS development in a manner that helps address safety, but without unnecessarily hampering innovation?

In the proposed framework, NHTSA's focus should be on vehicle-level performance as measured by the ADS's competency executing the dynamic driving task. This provides for a technology neutral approach

¹⁴ AVSC Best Practices and Safety Principles: <https://avsc.sae-itc.org/welcome-5471WV-45872ML.html?respondentID=28553252#roadmap>

applicable to all developers, which allows diversity in the execution of the core elements so all as the sum of the core elements meets an acceptable standard of performance.

NHTSA has also played a key role in setting safety needs for the industry through guidance. By establishing guidance, NHTSA has given industry an understanding of where NHTSA is potentially headed with rulemaking, and frames the conversation for the entire industry, from research and development, to standards generation and vehicle deployment. As data from deployments becomes available, NHTSA can monitor to ensure any rulemaking efforts are sufficient to meet the safety needs.

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 described is one of several ways to break an ADS into logical layers. For example, another separation of logical layers may call out a “decision making” layer, or may include sensing as a subset of the perception layer. We do not believe it is in the interest of the public or developers to impose criteria on individual core elements. We believe that the performance of the ADS DV should be evaluated at the system, or vehicle, level. This allows for maximum innovation in the development of each of the core elements.

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

There are several standards in use and under development that provide useful insight into developing safe vehicles, these include Functional safety ISO 26262, SOTIF ISO 21448, and Cybersecurity ISO/SAE 21434. Furthermore, the Automated Vehicle Safety Consortium (AVSC), which is an industry led group of AV developers has been systematically publishing best practices on various aspects of AV deployment. This group leverages lessons learned from existing development fleets that address test driver selection and training, data collection, First Responders Considerations, and most recently metrics and methods for safety assurance.

All of these standards and best practices are written to be broadly applicable for their target audiences and therefore require interpretation by developers. NHTSA should consider their existing mechanisms and authorities for ensuring safe vehicle operation as outlined in question 1, as recourse for safety concerns in the field.

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?

We believe NHTSA should include the following when considering ADS research:

- Simulation
 - Utilizing the Virtual Open Innovation Collaborative Environment for Safety (VOICES) project, as funded by the USDOT, NHTSA may help research, develop, and assess transportation solutions in a distributed virtual environment that produces a high-fidelity representation of the transportation system.
- Real world data
 - AV Test involvement may enable an understanding of testing and deployment performance during real world operation.
 - AV Pilot rulemaking efforts introduced another measure that may enable greater deployment efforts and collaboration with NHTSA to generate real world data.
 - AV Exemptions and any associated mandatory data reporting can provide NHTSA an additional resource for collecting real world performance data.

Within their efforts, we recommend NHTSA conduct research on how to gather data on key societal outcomes at the scale of current developer ODDs. One threshold to gate AV deployment may be informed by the what is considered reasonably safe human performance in a particular ODD, and this performance expectation may be highly variable depending on the ODD elements (geographical, weather, etc.).

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.

At this time, the best mechanisms are the voluntary ones, perhaps supported by mandatory reporting when exemptions are required to help facilitate NHTSA's research efforts. Through self-certification, the obligation is on industry to ensure vehicles on the road are safe, as well as the responsibility of addressing any defects and noncompliance, while NHTSA can ensure real world safety through its recall authority. Additionally, rulemaking efforts for AV testing can provide a level field for importers, established OEMs, and domestic tech companies to test vehicles and share data to accelerate the technology.

The current NCAP structure is not preferred, as the use/business cases for these vehicles are different from traditional vehicles, and the variety of ODDs that they may operate within can lead to skewed ratings. Customers may need or want to know more about the vehicle AND service to understand the safety offerings of the AV service provider. This is better done through a VSSA-like format, or requires a significant rework of the NCAP structure to support AVs.

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

The ANPRM mentions some of the principles that NHTSA has in mind with regards to automated vehicles including encouraging innovation and remaining technology neutral. In addition to these, NHTSA should ensure that the safety rules apply equally to all companies and do not advantage foreign manufacturers

or technology companies that modify vehicles relative to domestic automotive manufacturers. There should be no loopholes or shortcuts around the safety process.

Voluntary safety mechanisms like the VSSA, AV Test, and Operational Guidance are great avenues for OEMs and developers alike. The exemption process is key to addressing the regulatory barriers that have not yet been addressed, and the mandatory reporting and conditions (i.e. Nuro) allows NHTSA to react quickly in the event of a safety concern. Continuing to remove regulatory barriers and expediting the exemption approval process is still needed to assist the rollout of the AV vehicle fleets, which will help generate more industry AV data for NHTSA to consider and monitor.

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?

FMVSS authority, implemented in either existing FMVSS or new FMVSS, are likely to be mid-long term for the ADS-specific elements. The safety need is not yet defined to establish these requirements at this time, and significant data will be needed to gather the appropriate insights for requirement development.

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

The key benefit is the ability to provide certainty for the AV developers by crafting a unique, ADS-specific FMVSS that may allow for the most flexible approach to addressing the future safety needs, if and when they are determined.

A concern with the approach is the time needed to make this shift. There are a significant number of FMVSS that need to be updated to address the lack of applicability to ADS-driven vehicles and/or how an ADS-driven vehicle's compliance pathway can be done differently, while still maintaining the intent of the regulation.