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December 10, 2018

Ms. Heidi R. King
Deputy Administrator,
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Dear Ms. King:

RE: Pilot Program for Collaborative Research on Motor Vehicles with High or Full Driving
Automation
Docket No. NHTSA–2018–0092

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") request for comments (RFC) to provide feedback on the proposed pilot program for collaborative research on vehicles with High or Full Driving Automation.

Ford also provided input to the comments submitted to NHTSA by the Alliance of Automobile Manufacturers (Alliance) and is aligned with the response.

The benefits of autonomous technology are substantial, including the potential to save lives, expand mobility, and make transportation more efficient.

Ford Motor Company was built on the belief that freedom of movement drives human progress. It is a belief that has always fueled our passion to create great cars and trucks and drives our commitment today as well, to become the world's most trusted mobility company, designing smart vehicles for a smart world that help people move more safely, confidently, and freely.

Ford is investing in an autonomous future and is working to provide mobility solutions for transportation challenges affecting communities across the country and around the world.

We have announced our intent to deploy an SAE Level 4¹-capable Automated Driving System (ADS)-equipped vehicle for commercial application for ride hailing and package delivery early in the next decade.

Ford shares NHTSA's goal of bringing ADS-equipped vehicles to the market in a timely manner to improve the lives of our customers. At the same time, we want to do this in a thoughtful and safe manner. Hence, Ford appreciates NHTSA's leadership and efforts in identifying opportunities to improve learning through real world testing envisioned in the AV pilot program.

Factors to be considered for the AV pilot program

The AV pilot program provides NHTSA the opportunity to learn about the capabilities and limitations of different AV designs from traditional manufacturers, suppliers, technology companies, research institutes and other developers. It also allows the agency to collect data to inform future rulemaking. Ford recommends the agency to consider the following factors for the AV pilot program:

- **Enable regulatory exemptions for AVs without controls:** ADS-equipped vehicles represent a new paradigm in mobility that was not envisioned when FMVSS requirements were first developed. In the absence of updated regulations or exceptions for ADS-equipped vehicles without manual controls, there is no clear regulatory pathway for realizing the potential societal benefits of ADS-equipped vehicles.
- **Support innovative mobility solutions:** ADS technologies are advancing rapidly and companies have invested heavily to innovate on new designs and business models to enhance mobility. NHTSA's proposed AV pilot offers a valuable opportunity for developers of self-driving vehicles to gain required on-road testing experience and to share their learning to develop common solutions that can enhance the safety of the ADS technologies. In order to foster participation in the pilot program, Ford suggests NHTSA balance the participation requirements with the need to protect intellectual property (IP) for individual participants, as well as provide flexibility for business opportunities to justify their investments in the program.
- **AV pilot program volumes:** The pilot should provide a pathway to support the introduction of ADS-equipped vehicles at high enough volumes to study the impact on road safety. Legislators have already been discussing an increase in exemption limits for highly automated vehicles and have developed proposals through the House of Representatives (SELF DRIVE ACT – H.R. 3388) and Senate (AV START Act - S. 1885). Consistent with pending federal legislation, Ford recommends that the volume of the vehicles allowed through the pilot program be increased over time after the developer has established credibility and demonstrated the capability of the ADS through a phased testing approach described below.
- **Gaining public trust through phased testing:** At present, there is work needed to win public trust in the capability of new technologies associated with ADS-equipped vehicles. In order to further develop public and stakeholder trust in the technology, Ford recommends that the agency consider a phased approach for a developer of ADS technology to participate in the AV pilot program.

¹ Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles J3016_201609 (https://www.sae.org/standards/content/j3016_201609/)

- **Phase 1: Testing with safety operators.** Developers of ADS-equipped vehicles that have traditional controls are already testing on public roads. One or more safety operators monitor the driving task and ADS equipment and are trained to take over control if the vehicle does not operate as expected. This would be similar to operating the vehicle at SAE L2 capability. This stage will allow the developers to explore the capabilities of the sensing, perception and planning functions within the operating design domain (ODD). It also provides AV developers the confidence that the ADS is capable of reliably operating within the ODD without human intervention and that it can achieve a minimal risk condition (MRC) in the event of a failure.
- **Phase 2: Testing self-driving operation without safety operators.** As part of developing trust in the system prior to the developer should be encouraged to share a Voluntary Safety Self-Assessment detailing the approach for the safe testing on public roads. In addition, developers may choose to demonstrate publicly how the ADS-equipped vehicle performs in scenarios applicable to the design-specific ODD, under controlled test conditions through third party, capability assessments. They are also encouraged to work with local public safety officials to develop an engagement plan.
- **Phase 3: Engaging public in self-driving vehicles at scale.** An AV developer should have a history of safe operation on public roads within the selected ODD and an established consumer education plan before involving the public. A support infrastructure for customer-facing activities and proposed business opportunities should also be in place. Privacy concerns should be addressed to protect customers' personally identifiable information. For vehicles that are produced at scale, the data storage capacity is expected to be smaller than for test vehicles, so the data recorded and stored should be restricted to crash incidents detected by the restraints control module (RCM). Ford is participating in industry efforts to standardize the data to be collected.

While Ford recommends that new developers start at Phase 1, the agency could encourage participation from experienced developers by allowing them to move quickly through the phases or start at a higher level if a developer has demonstrated safe testing outcomes outside of the AV pilot.

Safety Principles and analysis of petitions

As an initial step, Ford recommends agreement by pilot participants on safety principles each participant vehicle will adhere to during the pilot. These safety principles are intended to address foreseeable hazards associated with operating on public roads. Sharing of high level safety principles could be included as a data element in future revisions of the Voluntary Safety Self-Assessment (VSSA).

Data sharing is a key enabler for the agency in learning about the capability of ADS technologies. Incremental data sharing beyond crash incidents needs to be determined through conversations with industry and standards creation groups to ensure that the data supports future rulemaking by the agency and at the same time does not create an undue burden on the industry. NHTSA should also protect the intellectual property of participants by allowing them an opportunity to submit information

confidentially to allow for more robust exchanges with the agency. The documentation and data that can be shared during the phases described in the earlier sections are summarized in Table 1.

Table 1: Assessment Considerations for AV Pilot Participants

Assessment Topics	Phase 1: AV testing with safety operator	Phase 2: AV testing without safety operator	Phase 3: Engaging public in self-driving vehicles at scale
Summary information	Police-reported crashes resulting in damage, injuries or fatalities	In addition to Phase 1 data, reporting statistics on duration of operation	Same as phase 2
Scenario recreation	High level data to recreate scenarios that resulted in a crash	Same as phase 1	Same as phase 2, but subject to privacy principles.
ODD detection, Object and Event Detection and Response(OEDR), and MRC capability demonstration	Safety operator responsible	Ability to detect ODD limits and reach fallback position per design intent. Developers may choose to partner with universities or other test facilities to demonstrate capability	Same as phase 2
Voluntary reports	Share safety operator training principles individually or as part of a VSSA if available	Share VSSA with public and stakeholders to build trust. Develop engagement plan with public safety personnel	Same as phase 2 and a customer education plan
Other			Customer feedback and trip completion rates

Assessing the driving characteristics of the Automated Driving System: In addition to collecting data to establish a safe driving record, the agency may also want to assess how the ADS-equipped vehicle behaves in a mixed-fleet environment of automated and human-driven vehicles. These assessments may include the following but are not limited to:

- Identifying driving scenarios that are applicable to the ODD for the ADS design under consideration and develop metrics to assess acceptable driving performance.
- Assessing the ability to detect the ODD limitation or other software or hardware failure and also whether an MRC is achieved for the detected failure.

- Evaluating how the AV navigates in the environment relative to human drivers (e.g., whether the AV displays overly cautious behavior that causes a disruption in traffic flow within the ODD).

Use of existing statutory provisions and regulations for Highly Automated Vehicles (HAV)

In conjunction with discussions with the Alliance, Ford has identified the following options for testing and deploying HAVs as part of the AV pilot program, especially when they are not equipped with manual controls.

- **Testing:** Section 30112 of title 49, United States Code (U.S.C.), was amended by the FAST Act² to exempt traditional manufacturers (that sold FMVSS-compliant vehicles prior to the passage of the Act in December 2015) from operating non-FMVSS-compliant vehicles solely for purposes of testing or evaluation provided the manufacturer agrees not to sell or offer for sale the motor vehicle at the conclusion of the testing or evaluation. Since that revision of law does not cover non-traditional AV developers, they may need to avail of the special exemptions in section 30114(a) of title 49, U.S.C., that addresses vehicles used for particular purposes³. As part of the AV pilot program, the Secretary of Transportation could use the authority provided under this section to exempt a motor vehicle for the purposes of research.
- **Deployment:** Manufacturers can request for an exemption to FMVSS provisions under Part 555⁴, which currently limits the volume to no more than 2,500 units per year for each manufacturer for up to two years. For the long term, individual test procedures and FMVSS provisions need to be updated to allow for the compliance of ADS-equipped vehicles without manual controls for high volume deployment. Alternatively, under the AV pilot program the Secretary of Transportation could use the authority provided under section 30114 of title 49, U.S.C., to provide approval for the introduction of AVs at scale for developers with well-established safety records. The Alliance has provided additional analysis for the legal standing for this approach as part of its comments.
- **Make Inoperative Exemption:** Some designs for HAVs may include manual controls to allow dual use, but developers may choose to make the driving controls (e.g., steering, brake and throttle) inoperative for non-authorized users. We agree with NHTSA that such a design will conflict with the “make inoperative” prohibition under Section 30122 of the Safety Act. Since Section 30122 also authorizes the agency to prescribe rulemaking to provide exemptions from the “make inoperative” prohibition, Ford encourages NHTSA to initiate an accelerated rulemaking to update Part 595⁵ to exempt ADS-equipped vehicles from the “make inoperative” prohibition if they comply with all applicable FMVSS requirements in manual operation.

² Fixing America's Surface Transportation (FAST) ACT, Public Law 114-94- Dec, 4, 2015 (<https://www.gpo.gov/fdsys/pkg/PLAW-114publ94/pdf/PLAW-114publ94.pdf>)

³ Section 30114(a) Vehicles Used for Particular Purposes. The Secretary of Transportation may exempt a motor vehicle or item of motor vehicle equipment from section 30112(a) of this title on terms the Secretary decides are necessary for research, investigations, demonstrations, training, competitive racing events, show, or display

⁴ 49 CFR Part 555—Temporary Exemption From Motor Vehicle Safety And Bumper Standards

⁵ 49 CFR Part 595—Make Inoperative Exemptions

NHTSA's request for comments is an important step in establishing a pathway to aid in the safe and efficient deployment of ADS equipped vehicles and related services, provide certainty for manufacturers, and more importantly enhance safety for all Americans.

At Ford, the safety of our customers and the integrity of our products is a primary focus. We thank the agency for this opportunity to provide these comments and look forward to continued collaboration with NHTSA as it plans to address the safe testing and deployment of AVs to realize their potential societal benefits. If you have questions regarding these comments, please contact Gurunath Vemulakonda (email: gvemulak@ford.com or phone: 313-323-9582).

Sincerely,

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

Desi Ujkashevic