



DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

[Docket No. NHTSA-2019-0016]

General Motors, LLC – Receipt of Petition for Temporary Exemption from Various Requirements of the Safety Standards for an All-Electric Vehicle with an Automated Driving System

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Notice of receipt of petition for temporary exemption; request for public comment.

SUMMARY: In accordance with the procedures in the Temporary Exemption from Motor Vehicle Safety and Bumper Standards, General Motors, LLC, (GM) has applied for a temporary exemption for its driverless “Zero-Emission Autonomous Vehicle” (ZEAV), an all-electric vehicle with an Automated Driving System (ADS), from part of each of 16 Federal Motor Vehicle Safety Standards (FMVSS). The ZEAVs would not be equipped with a steering wheel, manually-operated gear selection mechanism, or foot pedals for braking and accelerating. If the requested exemption were granted, GM would use the ZEAVs to provide on-demand mobility services in GM-controlled fleets.

GM requests the exemption be granted on either or both of two statutory bases: that it would facilitate the development or field evaluation of a new motor vehicle safety feature providing a level of safety at least equal to those of FMVSS from which exemption is requested, or that it would facilitate the development or field evaluation of a low-emission vehicle without unreasonably lowering the safety performance of the vehicle.

NHTSA seeks comment on the merits of and most appropriate statutory basis for GM's exemption petition and whether the petition satisfies the substantive requirements for an exemption.

NHTSA will assess the merits of the petition after receiving and considering the public comments on this notice, the petition, public responses to the questions in this notice, and any additional information that might be forthcoming from GM.

DATES: Comments must be received on or before **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

FOR FURTHER INFORMATION CONTACT: Stephen Wood or Justine Casselle, Office of the Chief Counsel, National Highway Traffic Safety Administration, 1200 New Jersey Avenue S.E., Washington, D.C. 20590. Telephone: 202-366-2992; Fax: 202-366-3820.

Comments: NHTSA invites you to submit comments on the petition described herein and the questions posed below. You may submit comments identified by docket number in the heading of this notice by any of the following methods:

- *Fax:* 202-493-2251.
- *Mail:* U.S. Department of Transportation, Docket Operations, M-30, Room W12-140, 1200 New Jersey Avenue, S.E., Washington, D.C. 20590.
- *Hand Delivery:* 1200 New Jersey Avenue, S.E., West Building Ground Floor, Room W12-140, Washington, D.C., between 9 a.m. and 5 p.m., Monday through Friday, except Federal Holidays.
- *Federal eRulemaking Portal:* Go to <http://www.regulations.gov>. Follow the online instructions for submitting comments.

- Instructions: All submissions must include the agency name and docket number. Note that all comments received will be posted without change to <http://www.regulations.gov>, including any personal information provided. Please see the Privacy Act discussion below. NHTSA will consider all comments received before the close of business on the comment closing date indicated above. To the extent possible, NHTSA will also consider comments filed after the closing date.

Docket: For access to the docket to read background documents or comments received, go to <http://www.regulations.gov> at any time or to 1200 New Jersey Avenue, S.E., West Building Ground Floor, Room W12-140, Washington, D.C. 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal Holidays. Telephone: 202-366-9826.

Privacy Act: In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, to www.regulations.gov, as described in the system of records notice, DOT/ALL-14 FDMS, accessible through www.dot.gov/privacy. In order to facilitate comment tracking and response, we encourage commenters to provide their name, or the name of their organization; however, submission of names is completely optional. Whether or not commenters identify themselves, all timely comments will be fully considered. If you wish to provide comments containing proprietary or confidential information, please contact the agency for alternate submission instructions.

Confidential Business Information: If you wish to submit any information under a claim of confidentiality, you should submit three copies of your complete submission, including the information you claim to be confidential business information, to the Chief Counsel, NHTSA, at the address given under FOR FURTHER INFORMATION CONTACT. In addition, you should

submit two copies, from which you have deleted the claimed confidential business information, to Docket Management at the address given above. When you send a comment containing information claimed to be confidential business information, you should include a cover letter setting forth the information specified in our confidential business information regulation (49 C.F.R. Part 512).

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I. Background

One of the key tasks of NHTSA, the agency responsible for issuing and enforcing the existing FMVSS, in getting ready for ADS vehicles is to ensure that those standards do not impose unnecessary obstacles to those vehicles. Most existing FMVSS were drafted years ago, based on the assumption that each vehicle would have a human driver who needs controls for manually operating the vehicle, information about the vehicle's operating condition, and a clear view in all directions of the driving environment in all weather and lighting conditions. While many of the existing FMVSS need to be updated so that they are appropriate for vehicles with modern technologies, they do not pose barriers to the manufacturing today of dual mode ADS

vehicles, i.e., ADS vehicles designed to be driven either by an ADS or a human driver. Some of them could, however, pose barriers to ADS vehicles designed to be driven exclusively by an ADS.

NHTSA can address the needs of exclusively ADS vehicles in different ways, depending on the time frame. In the longer term, it can conduct research on how to update the performance requirements and test procedures and then initiate rulemaking proceedings to modernize the FMVSS. In the near term, the agency can, if needed and merited, grant, in whole or in part, petitions from vehicle manufacturers to exempt limited numbers of their vehicles from select FMVSS so that the manufacturers can gain additional on-road experience. While established vehicle manufacturers can conduct on-road tests to evaluate their vehicles without first obtaining an exemption, if they wish to mix such testing with operations involving transporting the public, exemptions may, to that extent, be necessary.

In January 2018, GM submitted such a petition for the ZEAV, a vehicle designed to be driven exclusively by an ADS. GM requested the vehicle's temporary exemption from parts of each of 16 FMVSS.

This notice accomplishes two things. First, it serves as a notice of receipt of GM's petition. Second, it requests (a) comments on the petition and the discussion in this notice and (b) responses to a series of questions related to the petition.

While the analysis of exemption petitions based on rationales other than economic hardship generally involves comparing the relative safety of exempted vehicles and nonexempted vehicles, this is the first petition whose analysis by NHTSA will involve a comparison of (1) a vehicle in which all driving decisions as to when and how it is appropriate to use crash avoidance technologies and take actions to implement those decisions would be made

by an ADS to (2) a vehicle in which almost all of those decisions are made and implemented by a human driver. This difference could affect the amount of safety benefits generated by Federally-mandated safety technologies.

Because this is an important case of first impression and because other petitions for the exemption of other vehicles with ADS are expected in the coming years, NHTSA believes that inclusion of the list of questions is necessary to inform the public about the novel and important issues presented by this petition and to elicit public feedback to aid the agency in determining how to address and resolve those issues. The feedback will also aid the agency, if it partially or fully grants an exemption, in determining how to promote, through the setting of terms and monitoring GM's adherence to them, the safe operation of GM's ZEAVs.

II. Authority and Procedures for Temporary Exemptions

Chapter 301 of title 49, United States Code, authorizes the Secretary of Transportation to exempt, on a temporary basis, under specified circumstances, and on terms the Secretary deems appropriate, motor vehicles from a FMVSS or bumper standard. This authority is set forth at 49 U.S.C. 30113. The Secretary has delegated the authority for implementing this section to NHTSA.¹

The Safety Act authorizes the Secretary to grant, in whole or in part, a temporary exemption to a vehicle manufacturer if the Secretary makes specified findings. The Secretary must look comprehensively at the request for exemption and find that the exemption is consistent with the public interest and with the objectives of the Vehicle Safety Act.² In addition, the Secretary must make one of the following more focused findings:

¹ 49 C.F.R. 1.94.

² 49 U.S.C. 30113(b)(3)(A).

(i) compliance with the standard[s] [from which exemption is sought] would cause substantial economic hardship to a manufacturer that has tried to comply with the standard[s] in good faith;

(ii) the exemption would make easier the development or field evaluation of a new motor vehicle safety feature providing a safety level at least equal to the safety level of the standard;

(iii) the exemption would make the development or field evaluation of a low-emission motor vehicle easier and would not unreasonably lower the safety level of that vehicle; or

(iv) compliance with the standard would prevent the manufacturer from selling a motor vehicle with an overall safety level at least equal to the overall safety level of nonexempt vehicles.³

The second and third of these additional findings are the bases for GM's request for exemption. First, GM requests the Secretary to grant its petition based on finding that an exemption is consistent with the public interest and with the Safety Act, and that the exemption would make easier the development or field evaluation of a new motor vehicle safety feature providing a safety level at least equal to the safety level of the standard.⁴ Second, GM requests the Secretary to grant its petition on finding that the exemption is consistent with the public interest and with the Safety Act, and that the exemption would facilitate the development or field evaluation of a low-emission motor vehicle and would not unreasonably reduce the safety of that vehicle.⁵

NHTSA established 49 C.F.R. Part 555, Temporary Exemption from Motor Vehicle Safety and Bumper Standards, to implement the statutory provisions concerning temporary exemptions. The requirements in 49 C.F.R. 555.5 state that the petitioner must set forth the basis of the petition by providing the information required under 49 C.F.R. 555.6, and the reasons why

³ 49 U.S.C. 30113(b)(3)(B).

⁴ 49 U.S.C. 30113(b)(3)(B)(ii).

⁵ 49 U.S.C. 30113(b)(3)(B)(iii).

the exemption would be in the public interest and consistent with the objectives of the Safety Act.

A petition justified on the basis that an exemption from a FMVSS would facilitate the development or field evaluation of a new motor vehicle safety feature providing a level of safety at least equal to the level of safety required by the standard must include the following information specified in 49 C.F.R. 555.6(b):

- (1) A description of the safety features, and research, development, and testing documentation establishing the innovational nature of such features;
- (2) An analysis establishing that the level of safety of the feature is equivalent to or exceeds the level of safety established in the standard from which exemption is sought;
 - (i) A detailed description of how a vehicle equipped with the safety or impact protection feature differs from one that complies with the standard;
 - (ii) If applicant is presently manufacturing a vehicle conforming to the standard, the results of tests conducted to substantiate certification to the standard; and
 - (iii) The results of tests conducted on the safety or impact protection features that demonstrates performance which meets or exceeds the requirements of the standard.
- (3) Substantiation that a temporary exemption would facilitate the development or field evaluation of the vehicle;
- (4) A statement whether, at the end of the exemption period, the manufacturer intends to conform to the standard, apply for a further exemption, or petition for rulemaking to amend the standard to incorporate the safety features; and
- (5) A statement that not more than 2,500 exempted vehicles will be sold in the United States in any 12-month period for which an exemption may be granted pursuant to this paragraph.

A petition justified on the basis that an exemption would facilitate the development or field evaluation of a low-emission motor vehicle and would not unreasonably lower the safety level of that vehicle must include the following information specified in 49 C.F.R. 555.6(c):

- (1) Substantiation that the vehicle is a low-emission vehicle;

- (2) Research, development, and testing documentation establishing that a temporary exemption would not unreasonably degrade the safety or impact protection of the vehicle;
 - (i) A detailed description of how the motor vehicle equipped with the low-emission engine would, if exempted, differ from one that complies with the standard;
 - (ii) If the applicant is presently manufacturing a vehicle conforming to the standard, the results of tests conducted to substantiate certification to the standard;
 - (iii) The results of any tests conducted on the vehicle that demonstrate its failure to meet the standard, expressed as comparative performance levels; and
 - (iv) Reasons why the failure to meet the standard does not unreasonably degrade the safety or impact protection of the vehicle.
- (3) Substantiation that a temporary exemption would facilitate the development or field evaluation of the vehicle; and
- (4) A statement of whether the petitioner intends to conform to the standard at the end of the exemption period; and
- (5) A statement that not more than 2,500 exempted vehicles will be sold in the U.S. in any 12-month period for which an exemption may be granted.

III. GM's Petition

GM's petition seeks a two-year exemption from parts of each of 16 FMVSS for the production of 2500 or fewer ZEAVs per year.⁶ Citing a report by Nidhi Kalra and David G. Groves,⁷ GM argues "(e)very day of delay in getting autonomous vehicles safely on American Roads is a day in which we are losing lives that could be saved." GM states that, during the exemption period, it would work with NHTSA and industry stakeholders on rulemaking to address autonomous vehicle technology.⁸ GM states that if that rulemaking were not completed during the two-year exemption period, it would likely request a renewal of the exemption.⁹ It also states that (if its petition were granted) it would operate any ZEAVs produced during the

⁶ GM Petition at 3.

⁷ The Enemy of Good, Estimating the Cost of Waiting for Nearly Perfect Automated Vehicles, Rand Corp. (2017), available at https://www.rand.org/pubs/research_reports/RR2150.html.

⁸ GM Petition at 38.

⁹ Id.

exemption period throughout their normal service life¹⁰—i.e., well beyond the two-year exemption period.

GM provides the following explanation of how it organized the arguments in its petition:

GM seeks an “exemption” under two separate statutory provisions, 49 U.S.C. §§ 30113(b)(3)(B)(ii) and (iii). As this Petition makes clear, “exemption” is a term of art that is a misnomer in this context because GM does not seek to be “exempted” from any safety requirements. Rather, through this Petition, GM seeks authorization to satisfy the safety purpose and intent of certain FMVSS requirements and tests through different designs and systems. Because the ZEAV satisfies the requirements of both provisions, NHTSA may grant this Petition under either or both provisions.

First, under 49 U.S.C. § 30113(b)(3), NHTSA may issue an FMVSS exemption “on finding that—(A) an exemption is consistent with the public interest and this chapter or chapter 325 of this title (as applicable); and (B)...the exemption would make the development or field evaluation of a low-emission motor vehicle easier and would not unreasonably lower the safety level of that vehicle.” Thus, in order to justify an exemption, a petition under this provision must support three primary showings: the public interest showing; the low-emission showing; and the safety showing, as set forth in 49 U.S.C. § 30113(b)(3)(B)(iii). These provisions of § 30113(b)(3)(B)(iii) foster the same goals that GM pursues with this application: the development and prompt availability of new low-emission vehicles that improve consumer mobility and meet federal safety objectives embodied in the Safety Act. As demonstrated below, granting this Petition would make easier the development and field evaluation of GM’s zero-emission autonomous vehicle, and GM’s proposed deployment program fully satisfies the three requirements of § 30113(b)(3)(B)(iii).

Second, this Petition also seeks an exemption on the independent basis that it will “make easier the development [and] field evaluation of new motor vehicle safety features.” Under 49 U.S.C. § 30113(b)(3), NHTSA may also issue an exemption “on finding that— (A) an exemption is consistent with the public interest and this chapter or chapter 325 of this title (as applicable); and (B)...the exemption would make easier the development or field evaluation of a new motor vehicle safety feature providing a safety level at least equal to the safety level of the standard.” Thus, under this provision, the Petition must support three primary showings: the public interest showing; the development and evaluation of a new safety feature showing; and the FMVSS safety showing, as set forth in 49 U.S.C. § 30113(b)(3)(B)(ii).

¹⁰ Id.

The discussion below supports findings that GM's proposed ZEAV deployment fully satisfies the three criteria of both §§ 30113(b)(3)(B)(ii) and (iii), and that NHTSA should therefore grant the Petition.

In furtherance of this Petition, the discussion below contains:

- A description of GM's ZEAV program and the vehicle;
- A discussion of how the Petition should be evaluated under the Safety Act and NHTSA's regulations and procedures;
- A Standard-by-Standard description of how GM's ZEAV achieves the safety purposes of the affected human-driver based FMVSS requirements;
- An explanation of how granting this Petition will facilitate the development and field evaluation of a low-emission vehicle;
- A discussion of how granting this Petition will benefit the public interest; and
- A discussion of GM's plans for compliance with applicable FMVSS during and after the effective dates of the proposed exemption.

(Footnotes omitted.)

A. Zero Emission Automated Vehicle

i. Parent vehicle—Chevrolet Bolt

The ZEAV would be built from the architecture of the Chevrolet Bolt EV.¹¹ GM describes its Bolt EV as a zero-emission vehicle, with an Environmental Protection Agency (EPA) estimated all-electric range of 238 miles on a full charge.¹² The company states it created the original prototypes for the ZEAV by retrofitting Bolt EVs with autonomous controls and equipment.¹³

ii. Comparison of Bolt and ZEAV

The Bolt EV and the ZEAV are both all-electric vehicles. GM did not indicate whether the motor and battery pack of the ZEAV would differ in any significant way from those of the

¹¹ *Id.* at 7.

¹² *Id.* at 7 and FN 11.

¹³ *Id.* at 8.

Bolt EV. GM notes that the ZEAV would have electrification innovations incorporated from the Bolt EV, but does not elaborate on the nature, extent or importance of those innovations.¹⁴

As discussed later in this notice, GM notes that the ZEAV's high-performance computer system and array of sensors would draw power from the power supply for the zero-emission propulsion system, potentially affecting the range of the ZEAV. GM states that the all-electric range of the ZEAV has not yet been determined.

There are significant differences between the Bolt EV and the ZEAV with respect to how they are designed to be driven and how safety systems would be activated. The Bolt EV is exclusively driven by a human driver. In contrast, the ZEAV would be exclusively driven by an ADS. More specifically, in relation to the *SAE International Levels of Automation 3-5 – Automated Driving Systems (ADSs) – Conditional, High, and Full Automation*,¹⁵ the Bolt EV's highest driving automation capability would be considered to be at automation Level 0¹⁶ and the ZEAV's capability at driving automation Level 4.¹⁷

The ZEAV's ADS would be a combination of various hardware and software components that function as a system to perform functions traditionally performed by human drivers, i.e., perceive and interpret the driving environment, the objects in that environment, and their likely future movement, make decisions about accelerating, braking and steering so as to select and navigate safe paths through that environment and around those objects, and implement those decisions. While the Bolt EV is equipped with a steering wheel and brake and accelerator

¹⁴ *Id.* at 7.

¹⁵ SAE J3016_201806 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.

¹⁶ No Automation of driving task: While the vehicle may provide warnings (e.g., forward collision warning and blind-spot warning), the human driver must in all conditions and at all times perform all aspects of the driving task like monitoring the driving environment, steering, braking and accelerating.

¹⁷ Full Driving Automation: The vehicle can perform all aspects of the driving task at all times and under all conditions. While the human occupants need to set the trip destination and start the ADS, they need never be involved in any aspects of the driving task.

pedals, among other manual controls, the ZEAV would have none of these components. To emphasize this point, GM notes: “By removing human input from the formula, these changes provide the safety advantages of autonomous transportation while ensuring that passengers cannot interfere, purposefully or inadvertently, with the safe operation of the vehicle.”¹⁸ These differences are further described in Appendix II of the petition. GM suggests that these differences might affect the range of the ZEAV.¹⁹

iii. Planned Usage of the ZEAV

GM states that if it were granted an exemption, it would deploy the ZEAVs in a GM-controlled rideshare program.²⁰ This approach would, GM says, allow it to “closely monitor and address safety in every ZEAV deployed.”²¹ If an incident were to occur, GM states it “could promptly analyze the situation in depth and address it.”²² According to GM, “common factors such as human driver behavior, consumer failure to maintain the vehicle, and consumer failure to repair the vehicle or obtain recall repairs will not be factors for the safety of GM-maintained-and-operated ZEAV fleets.”²³

GM says that the operations of the ZEAVs would be carefully circumscribed, stating:

GM’s ZEAV fleet will operate only within defined geographic boundaries, and limited to predefined speeds and weather conditions. GM’s limitations on the operation of its ZEAV fleet will enhance safety—limited speeds eliminate events due to driving above the speed limit, and weather restrictions reduce occurrences of safety system activations due to weather-related road conditions. GM’s program parameters will reduce the number of miles that the ZEAVs will be driven in higher-risk situations, so the ZEAV is not likely to encounter many of the risk scenarios that other vehicles encounter.²⁴

and:

¹⁸ GM Petition at 12.

¹⁹ *Id.* at 34.

²⁰ *Id.* at 5.

²¹ *Id.* at 21.

²² *Id.*

²³ *Id.* at 22.

²⁴ *Id.* at 13.

The vehicles will drive only in pre-mapped areas for which GM fully understands the infrastructure and conditions that the vehicles will encounter.²⁵

GM notes, however, that while the ZEAVs would have not-to-exceed speeds, GM expects to increase their “not-to-exceed speeds” during the requested two-year exemption period.²⁶ GM further notes that while GM’s ZEAVs would be weather restricted, GM expects to expand its operational design domain (ODD) for rain, snow, and winter driving during the proposed exemption period. GM does not address what additional changes, if any, it might make after that period.

B. Safety Showing

In support of both statutory bases cited in its petition for an exemption, GM asserts that, for each of the 16 FMVSS from which it seeks temporary exemption, in part or in full, the ZEAVs would “effectively meet all FMVSS safety requirements” and would provide a safety level at least equal to the safety level of the affected standard(s) as required by statute.²⁷ In order to deploy the ZEAVs, GM seeks a temporary exemption from the following FMVSS, either in whole or in part: No. 101, Controls and Displays; No. 102, Transmission Shift Position Sequence, Starter Interlock, and Transmission Braking Effect; No. 108, Lamps, Reflective Devices, and Associated Equipment; No. 111, Rearview Mirrors; No. 114, Theft Protection and Rollaway Prevention; No. 124, Accelerator Control Systems; No. 126, Electronic Stability Control Systems; No. 135, Light Vehicle Brake Systems; No. 138, Tire Pressure Monitoring Systems; No. 141, Minimum Sound Requirements for Hybrid and Electric Vehicles; No. 203, Impact Protection for the Driver from the Steering Control System; No. 204, Steering Control

²⁵ GM Petition, Appendix III at 19.

²⁶ GM Petition at 21.

²⁷ *Id.* at 33.

Rearward Displacement; No. 207, Seating Systems; No. 208, Occupant Crash Protection; No. 214, Side Impact Protection; and No. 226, Ejection Mitigation.

The following paragraphs paraphrase how the GM petition discusses each standard from which GM seeks exemption:

i. FMVSS No. 101

The purpose of FMVSS No. 101 is “to ensure the accessibility, visibility and recognition of motor vehicle controls, telltales and indicators, and to facilitate the proper selection of controls...” in order to reduce safety hazards caused by the diversion of the driver’s attention from the driving task and mistakes by the driver in selecting controls.²⁸ Because the ZEAV would not be equipped with human driver controls and would not have a human driver, GM states that the requirements for certain controls, telltales and indicators should not apply²⁹ and requests an exemption from them. GM further states that, instead, its vehicle would be equipped with functionally equivalent ADS interfaces that provide the ADS with access to the information and controls necessary to drive the vehicle and maintain safety.³⁰

ii. FMVSS No. 102

FMVSS No. 102 specifies requirements for transmission shift position sequence, starter interlock, and transmission braking effect. The purpose of these requirements is to reduce the likelihood of shifting errors, to prevent starter engagement by the driver when the transmission is in a drive position, and to provide supplemental braking at speeds below 25 mph. Paragraph S3.1.4 and its subparagraphs require that identification of shift positions and shift position sequence be displayed in view of the driver. GM states that the ZEAV would not have a human

²⁸ 49 C.F.R. 571.101, paragraph S2.

²⁹ GM Petition at 23-24.

³⁰ *Id.* at 24.

driver, the information would be provided electronically to its ADS. GM further states that its vehicle would meet all other requirements of this standard.

iii. FMVSS No. 108

FMVSS No. 108 was established to provide adequate illumination of the roadway and to enhance the conspicuity of motor vehicles so that their presence is perceived by other roadway users and signals understood in daylight, darkness and reduced visibility.³¹ GM explains that the ZEAV would use radar and lidar and would not rely on visible light and, therefore, operation of headlamp switches as required by the standard would be unnecessary.³² GM explains that the vehicle would continue to use ordinary lower beams, but would not use upper beams.³³ GM further explains that the ZEAV would have “interfaces that allow the ADS to receive, monitor, and analyze information otherwise provided by the telltales and indicators related to turn signals and headlamps, and to issue commands to control the headlamps and turn signals.”³⁴

iv. FMVSS No. 111

FMVSS No. 111 pertains to rearview visibility and requires rearview mirrors and images to provide a driver with a clear and reasonably unobstructed view to the rear. GM states that the ZEAV would include “rear-facing cameras, radar sensors, and lidars that continuously provide full rear-field-of-view information to the ADS.”³⁵ GM further states that its vehicle would have sensors that provide overlapping coverage and environmental information to the ADS, allowing it to perceive the vehicle’s surroundings in “significantly more breadth and detail than interior and exterior rearview mirrors provide to human drivers.”³⁶

³¹ 49 C.F.R. 571.108, paragraph S2.

³² GM Petition at 25.

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.* at 26.

³⁶ *Id.*

v. *FMVSS No. 114*

GM asserts although the ZEAV would comply with the performance requirements of FMVSS No. 114, the test procedures in paragraph S6 should not apply and requests an exemption.³⁷ GM explains that its vehicle would not have conventional controls for the parking brake, service brake or transmission gear selection.³⁸ GM further explains that the ZEAV would be designed to enable the ADS to determine and control the brake system status electronically.³⁹

vi. *FMVSS No. 124*

FMVSS No. 124 requires the return of the throttle to the idle position when the driver removes actuating force from the accelerator control (or if the accelerator control system is disconnected). GM states that the ADS would be the driver in the ZEAV, and therefore, the ADS would regulate vehicle propulsion.⁴⁰ As a result, GM suggests that FMVSS No. 124 should not apply and requests as exemption.⁴¹ GM explains that its ADS would include two independent software controls that establish vehicle propulsion and asserts that its system could satisfy the time and temperature requirements of this standard.⁴²

vii. *FMVSS No. 126*

The purpose of FMVSS No. 126 is to prevent driver loss of directional control, including loss of control resulting in vehicle rollover.⁴³ GM states that the ZEAV would have an Electronic Stability Control (ESC) system functionally similar to that of the Bolt EV.⁴⁴ However, the ZEAV would not have a steering wheel, brake or accelerator pedals, and could not be tested pursuant to

³⁷ *Id.* at 26.

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.* at 27.

⁴¹ *Id.*

⁴² *Id.*

⁴³ 49 C.F.R. 571.126, paragraph S2.

⁴⁴ GM Petition at 27.

paragraph S5.2 and paragraphs S7.6 through S7.9.⁴⁵ The ADS would electronically interface with the steering, braking and accelerator control systems.⁴⁶ Because there would be no human driver, GM also states that it would not meet the telltale requirements or related test protocols of paragraphs S5.3, S7.2, S7.3, S7.8 and S7.10.⁴⁷ GM asserts that it would “run tests to ascertain the full functionality of the ESC system” before deployment.⁴⁸ To do so, GM explains that it would use test versions of ZEAVs that differ from the vehicles described in this petition and that would be equipped with standard human driving controls (including steering, accelerator and brake controls).⁴⁹ GM asserts that its vehicle would meet the safety intent of this standard and states that it would certify compliance with the performance requirements of this standard based on the above described tests.⁵⁰

viii. FMVSS No. 135

FMVSS No. 135 was established to ensure safe braking performance under normal and emergency driving conditions.⁵¹ In GM’s ZEAV, the ADS would control braking through commands to the brake control module as the vehicle would not be equipped with an accelerator pedal, a service brake pedal, or manual parking brake controls.⁵² For that reason, GM states that human control requirements of paragraph S5.3.1, the telltale requirements of paragraphs S5.1.2, S5.5, S5.5.5, and the tests in paragraph S7 are not applicable and requests an exemption.⁵³ GM asserts that, because of the ADS, the vehicle would meet the performance requirements of this standard and the vehicle’s braking system would satisfy the stopping distance and grade-holding

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ GM Petition, Appendix II at 15.

⁵⁰ GM Petition at 27 and Appendix II at 15.

⁵¹ 49 C.F.R. 571.135, paragraph S2.

⁵² GM Petition at 28.

⁵³ *Id.*

performance requirements of this standard.⁵⁴ GM further asserts that its vehicle would undergo brake testing to demonstrate it meets the performance requirements before deployment.⁵⁵ To do so, GM would use test versions of ZEAVs that differ from the vehicles described in this petition in that they would be equipped with standard human driving controls (including steering, accelerator and brake controls).⁵⁶ GM states that it intends to certify compliance with the performance requirements of this standard based on those tests.⁵⁷

ix. FMVSS No. 138

FMVSS No. 138 specifies requirements for tire pressure monitoring systems to warn drivers of underinflation of tires and the resulting safety problems. Paragraphs S4.3 and S4.4 require telltales visible to the driver. GM explains that the ZEAV would not have a driver seating position and would not include tire pressure telltales visible to vehicle occupants.⁵⁸ Instead, the vehicle's ADS would monitor the tire pressure electronically, detect low pressure, and recognize malfunctions in the tire pressure monitoring system.⁵⁹ To help in controlling the maintenance and operation of vehicle fleets, the ADS would communicate tire pressure status to GM.⁶⁰

x. FMVSS No. 141

FMVSS No. 141 specifies minimum requirements for hybrid and electric vehicles to reduce injuries resulting from collisions with pedestrians by providing a sound with the loudness and characteristics necessary for the vehicles to be detected and recognized as vehicles by pedestrians. GM asserts that it would test and certify its vehicle to meet this standard, but the ZEAV would not have a human-controlled gear selector to demonstrate compliance with

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ GM Petition, Appendix II at 15.

⁵⁷ GM Petition, Appendix II at 15.

⁵⁸ GM Petition at 29.

⁵⁹ *Id.*

⁶⁰ *Id.*

paragraph S5 of this standard (which requires sounds to be produced when the gear selector is moved to the “drive” position or other forward gear).⁶¹ GM explains that the ZEAV’s ADS would communicate with the gear selector control actuators, and in response, trigger the sound emission performance required by this standard.⁶²

xi. FMVSS Nos. 203, 204 and 207

FMVSS Nos. 203 and 204 relate to impact protection for the driver from a vehicle’s steering control system (steering wheel and steering column) in the event of a crash. GM states that the ZEAV would not be equipped with a steering wheel or steering column; therefore, there is no risk of chest, neck or facial injury being caused by either.⁶³ GM asserts that computer simulation crash tests and subsequent physical crash tests would validate occupant protection for all seating positions.⁶⁴ Additionally, GM asserts that these tests would verify that “the left front seating position safety protection provides occupant protection comparable to that provided to the right front seat passenger.”⁶⁵ For these same reasons, and because there would not be a human driver, GM asserts that the FMVSS No. 207 requirement to have a seat for the driver also should not apply and requests an exemption.⁶⁶

xii. FMVSS No. 208

GM makes the same assertion for certain paragraphs of FMVSS No. 208, which specifies test procedures and requirements for the driver’s seating position. The purpose of this standard is to reduce the number of deaths and the severity of injuries by specifying vehicle crashworthiness and equipment requirements. Some paragraphs within this standard refer to positioning an

⁶¹ GM Petition at 29.

⁶² *Id.*

⁶³ *Id.* at 29-30.

⁶⁴ *Id.* at 30.

⁶⁵ *Id.*

⁶⁶ *Id.* FMVSS No. 207 establishes requirements for seats, attachment assemblies and their installation to minimize the possibility of failure resulting from vehicle impact in a crash.

anthropomorphic test device (“dummy”) in the driver position.⁶⁷ Because GM’s ZEAV would not have a steering control system or a human driver, GM states that it is precluded from using the specified test procedures in this standard.⁶⁸ Instead, GM states that it would “mirror the dummy-positioning provisions of the right front passenger seating position in the left front seating position.”⁶⁹ Paragraph S7.3 specifies requirements for an audible and visual warning system for the driver seating position’s seat belt assembly. Again, GM explains that because its vehicle would not have a driver, the vehicle’s ADS would electronically receive the status of passengers’ seat belt utilization.⁷⁰ GM stated that the vehicle’s ADS would also provide seat belt reminders and warnings to all vehicle occupants before initiating a ride.⁷¹ Finally, paragraph S4.5.2 requires that an air bag readiness indicator be visible from the driver’s seating position to alert the driver that the vehicle’s air bags may not function properly and may require service. GM states that this information would be provided to the ADS, instead of a human driver.⁷² Because GM would control the operation of its vehicles, the company explains that it would receive diagnostics from the vehicles and thus would be able to determine whether further evaluation or repair is necessary.⁷³

xiii. FMVSS No. 214

Paragraph S12 of FMVSS No. 214 also provides test procedures involving a dummy positioned in the driver seating position. The purpose of FMVSS No. 214 is to reduce the risk of injuries to vehicle occupants in side impact crashes. GM again asserts that it would “mirror the

⁶⁷ See, e.g., 49 C.F.R. 571.208 at S10.3.1.

⁶⁸ GM Petition at 31.

⁶⁹ *Id.*

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² *Id.*

⁷³ *Id.*

right front test dummy positioning in the left front seating position” and would utilize computer simulation crash tests and subsequent physical crash tests to validate occupant protection.⁷⁴

xiv.FMVSS No. 226

FMVSS No. 226 relates to ejection mitigation in the event of a rollover. The purpose of this standard is to reduce the likelihood of ejections of vehicle occupants through side windows during rollovers or side impact crashes. Paragraph S4.2.2 of that standard requires a readiness indicator to be visible from the driver’s seating position to alert the driver that the vehicle’s curtain air bags may not function properly and may require service. Like the information provided by other indicators, GM states that this information would be provided to the ADS rather than a human driver.⁷⁵ Because GM would control the operation of its vehicles, the company again explains that it would receive diagnostics from the vehicles and thus would be able to determine whether further evaluation or repair is necessary.⁷⁶

C. Low-Emission Showing

To be eligible for a temporary exemption on the grounds that the exemption would make development or field evaluation of a low-emission vehicle easier without unreasonably lowering the safety performance of the vehicle, the applicant must substantiate that the vehicle is a low-emission vehicle. To qualify as a low-emission vehicle under 49 U.S.C. 30113(a), the vehicle must meet the applicable standards for new motor vehicles under the Clean Air Act, 42 U.S.C. 7521, *et seq.* The EPA’s regulations issued pursuant to the Clean Air Act establish exhaust emission thresholds for light-duty low-emission vehicles and zero-emission vehicles. To qualify as a zero-emission vehicle, a vehicle must meet the applicable standards specified at 40 C.F.R. 88.104-94.

⁷⁴ *Id.* at 32.

⁷⁵ *Id.*

⁷⁶ *Id.*

GM asserts that its vehicle would be “an all-electric, zero-emission vehicle that does not utilize any form of combustion or emit any of the pollutants covered by Section 202 of the Clean Air Act.”⁷⁷ According to GM, although this vehicle would share a platform with the Bolt EV, the vehicle’s zero-emission propulsion system would perform differently because (1) the vehicle’s computer system and sensors would draw power from the power supply for the propulsion system, and (2) the vehicle would be driven by the ADS.⁷⁸ GM believes that the real world field evaluation of this vehicle would “generate valuable data about advantages and disadvantages of incorporating the sophisticated computer and sensors of an ADS in a zero-emission platform.”⁷⁹ GM believes this data would allow it to evaluate the impact of a fully autonomous on-demand service on the performance of the zero-emission propulsion system.⁸⁰ GM states that granting this exemption would encourage the development and introduction of zero-emission autonomous vehicles by GM and other manufacturers.⁸¹

D. Public Interest Argument

GM asserts that granting this exemption would be beneficial to the public. GM states that the safety advances resulting from this exemption would have the potential to save lives and reduce motor vehicle crashes and injuries.⁸² According to GM, granting the exemption would “support thousands of jobs, increase urban mobility options, foster public acceptance of both low-emission and autonomous vehicles, generate important real-world data, and inform future NHTSA action.”⁸³

E. Appendices

⁷⁷ *Id.* at 34.

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² *Id.* at 35.

⁸³ *Id.*

In further support of its request for temporary exemption, GM's petition includes three appendices.

Appendix I provides additional information to support the petition on the basis of facilitating the development or field evaluation of a low-emission vehicle (49 C.F.R. 555.6(c)).

Appendix II provides supplemental technical information, including an overview of the vehicle's ADS and external sensor system; how the vehicle processes and translates information to control vehicle movement; the vehicle's connectivity, redundancy and fail-safe functionality; GM's approach to testing the vehicle's ESC and brake systems; information on how the vehicle would interact with passengers in a ride-share scheme; and some test data.⁸⁴

Appendix III details GM's approach to demonstrating how its safety assurance, comprehensive risk management and deep integration processes for its vehicle and ADS meet the Safety Act requirements.⁸⁵ Appendix III also provides additional information on cybersecurity,⁸⁶ passenger and other road-user interactions,⁸⁷ and fleet management.⁸⁸

F. Clarification

In the section of its petition titled "Evaluating Safety in a Petition for Exemption Under the Safety Act," GM speaks of the "approach to safety regulation crafted by Congress in the Safety Act" and states "(t)hroughout its history, NHTSA has never created a new Standard (or a de facto Standard) before a new technology has entered commerce." A reader might incorrectly conclude from this statement that the agency could not and never has set requirements for or mandated a major technology prior to its entry into commerce. It is correct that NHTSA has chosen, as a matter of policy, not to do this in the last several decades, preferring instead to allow

⁸⁴ GM Petition, Appendix II at 1.

⁸⁵ GM Petition, Appendix III at 1-2.

⁸⁶ *Id.* at 10.

⁸⁷ *Id.* at 18-19.

⁸⁸ *Id.* 19-21.

new technology to mature first. However, in November 1970, NHTSA issued a final rule establishing performance requirements for passive restraints.⁸⁹ The first passive restraints did not appear in on-road test fleets until 1971, and the first ones in vehicles available to the public did not arrive until 1973.⁹⁰

IV. Agency's Review of GM's Petition

The agency has not yet made any judgment on the merits of the petition or on the adequacy of the information submitted. NHTSA will assess the merits of GM's petition after receiving and considering the public comments on this notice and the petition and responses to the questions in this notice, and any additional information that may be forthcoming from GM.

We note that GM identifies several tests that would be performed to demonstrate safety equivalence, which GM did not include in its petition, and which we presume had not been performed as of the submission of the petition. NHTSA is placing a non-confidential copy of the petition in the docket in accordance with statutory and administrative provisions. The agency will update the docket with any additional information it receives from GM and will reopen or extend the comment period for this petition as needed.

V. Potential Types of Terms

Once a manufacturer receives an exemption from the prohibitions of 49 U.S.C. 30112(a)(1), NHTSA can affect the use of those vehicles produced pursuant to the exemption only to the extent that NHTSA either sets terms when partially or fully granting the exemption or exercises its enforcement authority (e.g., its safety defect authority). The agency's authority to set terms is broad. Since the terms would be the primary means of monitoring and affecting the

⁸⁹ 35 Fed. Reg. 16927, November 3, 1970. The full early history of the notices issued on passive restraints is set out in *Chrysler v. Department of Transportation*, 472 F.2d 659, 664-666 (6th Cir. 1972).

⁹⁰ *Automotive News*, October 31, 2011. Available at <http://www.autonews.com/article/20111031/CHEVY100/310319928/impalas-1973-experimental-airbags-held-up>.

safe operation of the exempted vehicles, the agency would consider carefully whether to establish terms and what types of terms to establish if it were to grant a petition. The manufacturer would need to agree to abide by the terms set for that exemption in order to begin and continue producing vehicles pursuant to that exemption.

Nothing in either the statute or implementing regulations limits the application of these terms to the period during which the exempted vehicles are produced. NHTSA could set terms that continue to apply to the vehicles throughout their normal service life if it deems that such application is necessary to serve the interests of safety.

Thus, if NHTSA were to grant an exemption, in whole or in part, it could establish, for example, reporting terms to ensure a continuing flow of information to the agency throughout the normal service life of the exempted vehicles, not just during the two-year period of exemption. Given the uniqueness of GM's vehicles, its petition, and public safety concerns, and especially given GM's expectations that the capabilities of the ZEAVs would evolve over their lifetime, extended reporting may be appropriate. Since only a portion of the total mileage that the vehicles, if exempted, could be expected to travel during their normal service life would have been driven by the end of the exemption period, the data would need to be reported over a longer period of time to enable the agency to make sufficiently reliable judgments. Such judgments might include those made in a retrospective review of the agency's determination about the anticipated safety effects of the exemption.

NHTSA could also establish terms to specify what the consequences would be if the flow of information were to cease or become inadequate during or after the exemption period. Other potential terms could include limitations on vehicle operations (based upon speed, weather, identified ODDs, road types, ownership and management, etc.). Conceivably, some conditions

could be graduated, i.e., restrictions could be progressively relaxed after a period of demonstrated driving performance. Further, as with data-sharing, it may be necessary to specify that these terms would apply to the exempted vehicles beyond the two-year exemption period.

NHTSA notes that its regulations at 49 C.F.R. Part 555 provide that the agency can revoke an exemption if a manufacturer fails to satisfy the terms of the exemption. NHTSA could also seek injunctive relief.⁹¹

VI. Request for Comments and Information

As noted above, the ADS in GM's ZEAV seeks to replicate and replace the complex perceiving and judging capabilities of a human driver. As GM states,

With the ADS as the driver, there is no need for features designed to interface with a human driver, such as manual human driver controls (e.g., steering wheel, brake pedal, and accelerator pedal), human-driver-specific information systems (e.g., telltales and indicator lamps), human-driver-oriented visibility features (e.g., rearview mirrors), or human-driver-specific occupant protection (e.g., steering-wheel-mounted airbag).⁹²

NHTSA anticipates that the complexity of the technologies involved in this petition will complicate its efforts to assess the safety performance of the ZEAVs. Further complicating those efforts will be the expected evolution of the capabilities of the ZEAVs throughout the course of their normal service life. This expectation is based on GM's statements in its petition that the ZEAVs would operate initially only in highly constrained driving scenarios, e.g., at low speed, in daylight and fair weather, on streets with one lane in each direction, but later in progressively less constrained circumstances. As a result, the safety record of the ZEAVs during the potential two-year period of requested exemption might not be predictive of their safety record during balance of their normal service life.

⁹¹ 49 U.S.C. 30163(a).

⁹² Petition, page 12.

An additional consideration raised by this petition is whether to set terms and conditions on the exemption and, if so, what terms and for what duration.⁹³

Given the complexity of projecting the safety effects of granting an exemption in this instance, it might be desirable to require reporting to validate the agency's projections and monitor the safety record of the ZEAVs. If the agency were to decide to require reporting, it would take into consideration the possibility that reporting terms sufficient for an early stage of the ZEAV's normal service life may not be sufficient for a later stage. Because of the anticipated progressive relaxation of operating scenarios, early data might not be predictive of later data.

Thus, for the above reasons, and because this is an important case of first impression and petitions for other vehicles with similar ADS are expected in the coming years, NHTSA has set forth below a list of questions to elicit public feedback to aid the agency in determining how to address and resolve the variety of novel and important issues presented in the petition and how to promote, through the setting of terms, the safe operation of such vehicles if the agency ultimately decides to grant an exemption.

Please note that answers supported by data and analysis will be given greater weight. GM is also encouraged to submit any supplemental information to the agency that the petitioner may deem persuasive. Commenters are requested to provide specific references to all sources for all studies, data, assumptions, scientific reasoning, and methodology they cite or submit.

Statutory bases for exemption

1. Which of the two bases for exemption (field evaluation of a new motor vehicle safety feature (30113(b)(3)(B)(ii)) or field evaluation of a low-emission vehicle

⁹³ Greenkraft Inc.; Grant of Application for a Temporary Exemption from FMVSS No. 108, 80 Fed. Reg. 12057, 12060 (March 5, 2015).

- (30113(b)(3)(B)(iii)) identified by GM in its petition is more appropriate for the agency to use in analyzing and in granting or denying the petition and why?
2. If the agency determines that its authority to grant exemptions to facilitate the development or field evaluation of a new motor vehicle safety feature is the more appropriate basis under which to evaluate GM's petition, does the petition provide sufficient information to enable the agency to make the required statutory finding as to whether the level of safety is equivalent to or exceeds the level of safety established in the FMVSS from which exemption is sought? If not, what additional information should the agency seek prior to rendering its final determination and why?
 3. If the agency determines that its authority to grant exemptions to facilitate the development or field evaluation of a low-emission motor vehicle is the more appropriate basis under which to evaluate GM's petition, does the petition provide sufficient information to enable the agency to determine whether exempting the vehicle would unreasonably degrade the safety of the vehicle? If not, what additional information should the agency seek prior to rendering its final determination and why?
 4. In lieu of either of the two bases relied upon by GM, would it be more appropriate to consider GM's petition under 49 U.S.C. 30113(b)(3)(B)(iv) (authority to grant exemptions from FMVSS for vehicles with an overall safety level at least equal to the overall safety level of nonexempt vehicles low-emission vehicles)? If so, why?

Safety Analyses

5. What studies, data, assumptions, scientific reasoning, and methodologies are needed for the agency to evaluate and compare the ZEAV and a FMVSS-compliant non-ADS vehicle? For example, should the agency assess whether an ADS steers, brakes, and accelerates at least as effectively and safely (e.g., as quickly) as the average human driver? If so, what methodology should it use? Are there other approaches to making the safety evaluation and comparison? Please provide specific references to all sources of such tools or evaluation approaches.
6. Given that the ZEAV is expected to evolve over its full-service life, how should the effects of that evolution be taken into consideration in assessing the safety of the exempted vehicle relative to the FMVSS-compliant vehicle?
7. What studies, data, assumptions, scientific reasoning, and methodologies should a petitioner submit to the agency to substantiate its record of research, development, and testing establishing the innovative nature of the safety feature?
8. What studies, data, assumptions, validation test results, scientific reasoning, methodologies, and analyses should a petitioner submit to the agency to validate that its ADS provides safety at least equal to the level of the standards for which an exemption is sought?
9. What studies, data, assumptions, validation test results, scientific reasoning, methodologies, and analyses should a petitioner submit to the agency to validate that its ADS during its operation will have sufficient reliability to accomplish its designed intent, e.g., timely and sufficiently applying the service brakes when braking is needed for safety purposes?
10. The test procedures of some FMVSS listed in the exemption petition involve the use of human drivers and controls (e.g., light vehicle braking). GM indicated that it plans

to perform tests with a human driver operating a version of the ZEAV modified to include human controls. Would performance of tests with such a modified vehicle be appropriate, or would programming the ADS of the ZEAV to perform test maneuvers be a better means of evaluating compliance with performance requirements?

11. 49 C.F.R. 555.6(b)(iii) requires the petitioner to submit “results of tests conducted on the safety or impact protection features that demonstrates performance which meets or exceeds the requirements of the standard” from which temporary exemption is sought. In the case of a petition submitted for a vehicle that has not yet been produced, and therefore, cannot be tested in order to compare its performance to that of existing vehicles, how should the agency evaluate the safety level of the vehicle? On what preliminary analyses, assumptions, and methodologies should the agency rely to assess whether such performance has been persuasively demonstrated? How would the answers to those questions change if a petitioner could demonstrate that the safety features and systems on the vehicle to be exempted are comparable in performance to those in a non-exempted vehicle and that the addition of the ADS to the vehicle to be exempted did not adversely affect the performance of those safety features and systems?

12. It could be argued that some FMVSS may either not be needed for safety or at least less needed for safety in the case of a vehicle that can be driven by only an ADS. Examples of potentially unnecessary features include inside and outside mirrors as well as the display of images from the rearview camera. Should test results or data be required to justify such an argument? If yes, what would be the most appropriate types of test results or data, and why?

13. GM asserts that a FMVSS that requires telltales to provide drivers with information is not applicable because the ADS would be receiving that information. The agency requests comment on whether and to what extent the telltales might serve a safety purpose for passengers in the vehicle, regardless of whether the information would be transmitted to the ZEAV's ADS and whether the ADS would act on that information in a timely and appropriate way.⁹⁴ What weight should the agency give to the extent of the ADS' ability to respond in appropriate ways to the information it receives?
14. For a FMVSS whose benefits depend, in part, on the attentiveness, judgment, and responsiveness of a human driver (e.g., FMVSS No. 135, which requires that a foot control be provided to activate service brakes), how should the agency, in considering a petition for the exemption of a vehicle equipped with ADS and with no human driver controls, evaluate the safety effects of substituting an ADS for a human driver? What types of testing and data, and how much, would the agency need to evaluate those effects?
15. Would it be appropriate to use computer simulation as one of the methods to determine equivalent safety? If yes, why and how? If not, why not? Are there adequately validated simulation models that could be used for this purpose?
16. If the ADS is responsible for decision-making aspects of driving that a human driver otherwise would control, is it appropriate for the agency to evaluate the responsiveness and driving skills of the ADS in relation to the component, system, test procedure, or performance requirement from which an FMVSS exemption is sought? If so, how should the agency evaluate the safety of the ADS in different scenarios, e.g., negotiating a path through oncoming traffic when making a left turn,

⁹⁴ See the discussion of "response states" on pages AII-11 through AII-13 of Appendix II of GM's petition.

- stopping when a pedestrian crosses the vehicle's path, and yielding to emergency vehicles? What kind of data would be needed for the agency to evaluate the performance of the ADS in these and other scenarios? How should the performance of the ADS be compared to that of a human driver in a nonexempt vehicle?
17. To what extent and how should GM's contemplated limited deployment (e.g., in a petitioner-controlled rideshare program, with established ODD constraints and the ability to pull vehicles off the street to remedy, including through software updates, any potential safety issues that might arise) be considered when evaluating safety equivalence? Does GM's continuous control over the exempted vehicles and the ability to make continual improvements in vehicle safety performance through software updates argue for acceptance of a greater degree of uncertainty about safety effects than in the case of a petition for exemption of vehicles to be sold to the public?
18. If some of the constraints of the ZEAV's initial deployment would eventually be progressively relaxed by GM, what types of data should the agency use in evaluating the safety of the ZEAV over its lifetime and deciding whether to grant or deny the petition? If an exemption is granted, should the agency monitor and periodically validate these data throughout the ZEAV's service life?
19. NHTSA requests comment on how NHTSA should evaluate whether granting this exemption would be consistent with the "public interest" and the Vehicle Safety Act. What elements of the public interest and the Act would be most important in that evaluation?

20. In the absence of real-world demonstration of quality of the decision-making by the ZEAV's ADS, if the petition were to be granted, what terms and conditions, if any, should the agency place on the exemption, and any similar future requests, to protect public safety, facilitate agency efforts to monitor the operations of exempted vehicles, and maximize the learning opportunities presented by the on-road experience of the exempted vehicles during the exemption period and thereafter?
21. Should NHTSA consider how the ZEAV would respond if it needed to deal with an unusual situation, e.g., cross the yellow line to pass a stopped vehicle blocking the way forward for a prolonged period of time or obey a policeman giving instructions instead of obeying a traffic light?

Terms and Conditions

22. Please comment on the potential utility of NHTSA's placing terms and conditions on an exemption requiring the submission of the following categories of data:
- a. Statistics on use (e.g., for each functional class of roads, the number of miles, speed, hours of operation, climate/weather and related road surface conditions).
 - b. Statistics and other information on performance (e.g., type, number, and causes, and results of collisions or near misses, disengagements, and transitions to fallback mechanisms, if appropriate). How can the term "near miss" best be defined so that there is uniform understanding of the term and consistent practices across all manufacturers in the identifying and reporting of "near misses"?
 - c. Metrics that the manufacturer is tracking to identify and respond to progress toward higher levels of safety (e.g., miles without a crash and software updates that increase the ODD).

- d. Information related to community, driver and pedestrian awareness, behavior, concerns, and acceptance related to vehicles with an ADS.
 - e. Metrics or information concerning the durability of the ADS equipment and calibration, and need for maintenance of the ADS. For example, would the ADS work in all identified operating conditions or would there be additional limitations? How would any limitations be addressed and managed?
 - f. Data and information on the initial and subsequent ODDs and software updates.
 - g. For all categories of information, how should any concerns about confidential business information and privacy be addressed?
23. If there would be other categories of data that should be considered, please identify them and the purposes for which they would be useful to the agency in carrying out its responsibilities under the Safety Act.
24. If the agency were to require the reporting of data, for what period should the agency require it to be reported--the two-year exemption period or the ZEAVs' entire normal service life?
25. Given estimates that vehicles with high and full driving automation would generate terabytes of data per vehicle per day, how should the need for data be appropriately balanced with the burden on manufacturers of providing and maintaining it and with the ability of the agency to absorb and use it effectively?
26. If supporting information (including analysis, methodology, data, and computer simulation results involving proprietary systems or specialized computer programs) is submitted by a petitioner under a request for confidential treatment and relied upon by the agency in its determination whether to grant or deny a petition, how can the

public be provided with an evaluation and a justification for the determination that are transparent, readily understandable and persuasive?

27. Are there any mechanisms that may help further mitigate the underlying safety risks, if any, presented by this petition? For example, what additional safety and engineering redundancies, if any, should NHTSA consider requiring as a condition to granting the exemption?
28. Over the history of the Agency, exemption petitions based on some form of safety analysis, as opposed to the much more common type of petition based on a claim of economic hardship, have averaged only 1-2 per year. Typically, these safety-based petitions have involved technologies that affect only a single vehicle function or at least a very narrow range of functions and that were well described and tested. Such petitions were resolved by the Agency's either granting or denying them after soliciting and considering public comments. In some cases, the Agency sent requests to the applicant for additional test data. In most cases, this second group of petitions were either granted or denied, again after public comment. In a few instances, the petition remained as "pending."

In our current innovative environment, such an approach presents challenges for technologies, e.g., automated driving systems for vehicles without manual driving controls, that affect a broad range of functions and that have not been developed sufficiently to incorporate them in vehicles in order to generate the real-world test data that has typically been required for granting petitions. The lack of real-world test data could result in lengthy delays and even non-approval.

To address this problem, NHTSA solicits public comment on alternative approaches to analyzing and resolving petitions for exemption from FMVSS in a timely and appropriate way, including but not limited to:

- After public comment, exercising our discretion to rely upon other forms of evidence in making the statutorily required findings quickly for petitions related to technology with significant lifesaving potential to allow for expedited approval for testing and development of a very limited number of vehicles⁹⁵ under well-defined, risk-managed conditions;
- Deny petitions if applicants are unable to respond adequately to NHTSA requests for further information within a specified time period;
- For vehicles that would be deployed only within very limited operating areas, go beyond seeking public comment by hosting public meetings or otherwise providing for targeted and transparent public engagement in the intended geographical operating area to allow for full and transparent public discussion of novel safety issues and concerns, emergency response considerations, or other issues of interest to state and local stakeholders regarding the exemption requested and relevant to NHTSA's review of the petition;
- Any other options to process petitions in a way that is timely, transparent and supportive of the safety goals of the FMVSS from which exemption is sought.

VII. Comment Period

Because of the novelty and complexity of the petition, the agency is providing a 60-day comment period. After considering public comments and other available information, NHTSA will publish a notice of final action on the petition in the **Federal Register**.

Please note that even after the comment closing date, we will continue to file relevant information in the docket as it becomes available. Further, some people may submit late comments. Accordingly, we recommend that you periodically check the Docket for new

⁹⁵ E.g., a number significantly less than the 2,500 vehicles per year authorized by 49 U.S.C. § 30113.

material. You can arrange with the docket to be notified when others file comments in the docket. See www.regulations.gov for more information. We will reopen or extend the comment period for this petition, as needed.

Authority: 49 U.S.C. 30113 and 49 U.S.C. 30166; delegations of authority at 49 C.F.R. 1.95 and 49 C.F.R. 501.8.

Issued in Washington, D.C. under authority delegated pursuant to 49 C.F.R. 1.95 and 49 C.F.R. 501.8.

Heidi R. King,

Deputy Administrator.

BILLING CODE: 4910-59-P

[FR Doc. 2019-05119 Filed: 3/18/2019 8:45 am; Publication Date: 3/19/2019]