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May 20, 2019

Ms. Heidi King
Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E., West Building
Washington D.C. 20590-0001

Re: NHTSA Notice of Receipt of Petition for Temporary Exemption*: 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*, NHTSA Docket No. 2019-0016, 84 Fed. Reg. 10182 (March 19, 2019) and *Nuro, Inc., Receipt of Petition for Temporary Exemption for an Electric Vehicle with an Automated Driving System*, NHTSA Docket No. 2019-0017, 84 Fed. Reg. 10172 (March 19, 2019)

Dear Ms. King:

The Alliance of Automobile Manufacturers ("Auto Alliance" or "Alliance")[1] appreciates this opportunity to provide input to the National Highway Traffic Safety Administration's ("NHTSA" or "Agency") request for public comments regarding the General Motors and Nuro Part 555 Petitions.

Vehicles operated by an Automated Driving System (ADS) have the potential to significantly improve overall safety on our nation's roadways. In 2017 alone, 37,133 fatalities occurred as a result of vehicle crashes in the United States. ADS-operated vehicles have the potential to reduce this number by using advanced sensing technologies combined with artificial intelligence programming to avoid crashes. Unlike conventional human drivers, the ADS can't get distracted, drive impaired, or fall asleep at the wheel. In addition to safety benefits, ADS-operated vehicles hold promise to provide numerous social and economic benefits, including less congestion, lower fuel consumption, and increased mobility for the elderly and people with disabilities.

The Part 555 petition/exemption process is an important bridge to permit limited deployment of ADS equipped vehicles while the Agency completes research and rulemaking to revise the Federal Motor Vehicle Safety Standards (FMVSS) to remove regulatory barriers to the deployment of these vehicles.

[1] The Auto Alliance is the leading advocacy group for the auto industry. Its members include BMW Group, FCA US LLC, Ford Motor Company, General Motors Company, Jaguar Land Rover, Mazda, Mercedes-Benz USA, Mitsubishi Motors, Porsche, Toyota, Volkswagen Group of America and Volvo Cars North America, and represent approximately 70 percent of all car and light truck sales in the United States. For further details, see http://www.autoalliance.org/

Exemption Basis

Each of the current Part 555 petition bases may be appropriate given the specific operating circumstances and vehicle attributes. As such, the Alliance recommends that NHTSA consider petitions on the merits of each submission with respect to whichever basis was selected for the petition.

Maintain Scope of Part 555 to Specific FMVSS under Consideration for Exemption

The Alliance opposes an expansion of exemption petition safety equivalency demonstration to cover nominal driving safety performance of an ADS. The agency has implemented ADS policies via ADS 2.0[2] and AV 3.0[3] and Voluntary Safety Self-Assessment (VSSA) criteria and guidance to address interim ADS safety performance. Instead, for purposes of Part 555 limited exemption petitions, the agency should focus on the vehicle performance with respect to the specific FMVSS(s) for which the specific limited exemption is requested.

NHTSA should not attempt to use the Part 555 petition process to introduce new safety requirements for an ADS that have not gone through the rigorous rulemaking process. In consideration of ADS driving performance, vehicle manufacturers have significant incentive to ensure the real-world safety of their product since any significant field issues would likely be subject to NHTSA's broad statutory oversight and authorities.

Role of Prima Facie Evidence in Petition Evaluation

Given the lack of quantitative data to compare the safety performance of ADS-operated vehicles to human operated vehicles, the agency should take into account certain design characteristics (e.g., that ADS-operated vehicles are designed to drive defensively while humans are known to sometimes drive aggressively or without appropriate attention) that are expected to result in lower overall crash risk. To the extent a petitioner can demonstrate safety readiness and a robust system to adhere to the expected lower crash risk, such technical proficiency should be considered as prima facie evidence that the vehicle provides an equivalent or greater level of safety than a traditional, human-operated vehicle.

Human Driver Focused HMI Requirements

For FMVSSs that are designed to supplement a human driver's ability to safely operate a vehicle (e.g. FMVSS 111, etc.), no safety benefit is derived from incorporating systems into an ADS-DV as the requirements are currently defined because the ADS cannot use these for its perception or visibility capabilities.

For telltales/indicators/warnings that are required by existing FMVSS language, these are in place to provide information to the human driver on the state and condition of vehicle systems so the human driver can appropriately operate the vehicle in a safe manner. The ADS will receive this information directly from the systems and control units, making these visible telltales/indicators/warnings of no use for the safe operation of the vehicle.

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[2] *Automated Driving Systems 2.0: A vision for Safety,* U.S. Department of Transportation and the National Highway Traffic Safety Administration, 2017.

[3] *Preparing for the Future of Transportation: Automated Vehicles 3.0 (AV 3.0),* U.S. Department of Transportation and Office of the Secretary, 2018.

Methods to Evaluate Performance

Simulation - While actual vehicle testing will always be an important method for demonstrating vehicle performance, the additional complexity of ADS systems as well as unavailability of appropriate ATDs to evaluate unconventional seating positions (if present) will require the expanded use of simulation. Simulation is an important tool for the development and validation of ADS performance; it can complement and expand on any actual vehicle/hardware testing.

"Sister" Vehicle Compliance Equivalency - For cases where the ADS system is integrated into a vehicle that has a conventionally operated "sister," vehicle manufacturers should have the option to provide compliance data from the sister vehicle with technical documentation substantiating the equivalence of performance to the exempted FMVSS.

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Attached, please find the following Appendix 1 that provides specific responses to the questions posed in the General Motors notice and Appendix 2 that provides specific responses to the questions posed in the Nuro Notice.

The Alliance appreciates the opportunity to provide input to NHTSA on this important topic. We look forward to any follow up with the Agency to expand on these comments further.

Sincerely,

Scott Schmidt

Senior Director, Safety & Regulatory Affairs

Appendix 1 – Response to Questions Regarding GM Petition

Statutory Basis

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 (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?***

   Each of the current Part 555 petition bases may be appropriate given the specific operating circumstances and vehicle attributes. As such, the Alliance recommends that NHTSA consider petitions on the merits of each submission with respect to whichever basis is most appropriate.

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?**

   See general response to question 1

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?***

   See general response to question 1

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?***

   See general response to question 1

Safety Analysis

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.

The Alliance opposes an expansion of exemption petition safety equivalency demonstration to cover nominal driving safety performance of an ADS. The agency has implemented ADS policies via ADS 2.0 and AV 3.0 and VSSA criteria and guidance to address interim ADS safety performance. Instead, for purposes of Part 555 limited exemption petitions, the agency should focus on the vehicle performance with respect to the specific FMVSS(s) for which the specific limited exemption is requested.

NHTSA should not attempt to use the Part 555 petition process to introduce new ADS requirements that have not gone through the rigorous rulemaking process.

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?

Any significant change in the operating characteristics or hardware that, as determined by the ADS/ADS-equipped vehicle developer, impacts the equivalent safety argument used in the Part 555 exemption petition may require a new or modified petition – just as any significant change in an FMVSS-compliant product requires re-validation/self-certification today.

However, improvements in core competency should not require a new or revised petition, as such improvements augment safe performance of the ADS feature, which was already deemed to be sufficiently safe for deployment. That is, if, as part of the petition process, a manufacturer provides evidence that the ADS system/vehicle provides a sufficient level of safety to warrant an exemption, then performance upgrades (e.g., further evolution of ADS's core capabilities) that further enhance the safety of the vehicle should not require a new petition.

Likewise, de minimis changes should also not require the manufacturer to re-petition under Part 555. This would include things such as replacing suppliers for an existing sensor or actuator, revising hardware or software that does not affect ADS performance (e.g., diagnostic software or vehicle hardware, such as tire and suspension parts).

For cases where changes are significant enough to require a new or revised petition, the Alliance recommends that NHTSA set up an expedited process for the review of such petitions.

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?

A – The innovative nature of ADS technology is well-understood since this technology did not exist in the past, and has yet to be deployed for commercial use. There are a number of publications, research, and demonstrations that show how this potentially life-saving technology is unique and innovative from previous technologies, which has encouraged and motivated manufacturers and developers to further advance its development for production.

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?

A - While actual vehicle testing will always be an important method for demonstrating vehicle performance, the additional complexity of ADS will require the expanded use of simulation. Since simulation is an important tool for both the development and the validation of ADS performance, it should be permitted to complement and expand on any actual vehicle/hardware testing results submitted by a petitioner in support of their exemption request.

For cases where the ADS system is integrated into a vehicle that has a conventional "sister" vehicle, manufacturers should have the option to provide compliance data or documentation for vehicle systems, components, or performance aspects that are not altered by the addition of ADS relative to the non-ADS-equipped sister vehicle. This data or documentation would be used to demonstrate compliance equivalence to the exempted safety standard.

As previously indicated, the agency should accept simulation or technical documentation in lieu of whole vehicle or physical test data where appropriately justified.

In addition, the agency should refrain from using the Part 555 petition process to introduce new ADS requirements that have not gone through the rigorous rulemaking process. The Agency developed the VSSA process to address ADS-specific aspects of performance.

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?

See response to question 5.

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?

This question is product-specific and not appropriate for an Alliance response.

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?

For cases where the ADS system is integrated into a vehicle that has a conventionally operated "sister," vehicle manufacturers should have the option to provide compliance data from the sister vehicle with technical documentation substantiating the equivalence of performance to the exempted safety standard for the ADS-operated "sister" vehicle.

In cases where a "sister" vehicle is not available, the manufacturers should be able to provide safety performance data via other means such as, but not limited to, simulation, technical documentation, or sub-system testing as appropriate for the FMVSS requirement under review for exemption.

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?

Given the lack of quantitative data to compare the safety performance of ADS-operated vehicles against that of human operated vehicles, the agency should take into account certain design characteristics (e.g., that ADS-operated vehicles are designed to consistently operate defensively while humans are known to sometimes drive aggressively or without appropriate attention) that are expected to result in lower overall crash risk. To the extent a petitioner can demonstrate safety readiness and a robust system to adhere to the expected lower crash risk, such technical proficiency should be considered as prima facie evidence that supports a finding that the vehicle provides an equivalent or greater level of safety than a traditional, human-operated vehicle.

For FMVSSs that are designed to supplement a human driver's ability to safely operate a vehicle (e.g., FMVSS 111), no safety benefit can come from having these systems incorporated into an ADS-DV as the requirements are currently defined because the ADS cannot use these for its perception or visibility capabilities.

For telltales/indicators/warnings that are required by existing FMVSS language, these are in place to provide information to the human driver on the state and condition of vehicle systems so the human driver can appropriately operate the vehicle in a safe manner. The ADS will receive this information directly from the systems and control units, making these visible telltales/indicators/warnings of no use for the safe operation of the vehicle.

FMVSS 203 and FMVSS 204 crashworthiness standards have no relevance for vehicles that are not equipped with a steering column, and they should not be required to demonstrate equivalency.

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. What weight should the agency give to the extent of the ADS' ability to respond in appropriate ways to the information it receives?

See answer to previous questions regarding inapplicability of telltales and other HMI requirements to ADS-DVs.

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?

See responses to question 12 and 13 above.

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?

Yes - ADS is particularly well-suited for simulation. Simulation to demonstrate the vehicle meets or exceeds the FMVSS requirements that are under evaluation for exemption is one of many potential tools available that vehicle manufacturers can employ to evaluate/demonstrate safety performance.

Choice to use simulation, other analysis and testing methods, and/or technical documentation should remain with the OEM for validating safety performance, and the OEM need only submit validation information related to the FMVSS requirements under evaluation for exemption--not for the ADS decision making "brains" of the vehicle. OEMs will need to provide information demonstrating that their simulations are appropriately validated.

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, 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?

See response to question 5.

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?

Yes - Greater OEM monitoring and control over the subject fleet of vehicles should permit acceptance of greater levels of uncertainty. In addition, close fleet monitoring facilitates early identification of potential issues that can be addressed expeditiously.

However, this should not preclude the ability for a manufacturer to seek exemption for an ADS-dedicated vehicle intended to be sold to a third party or consumer, and not managed by the manufacturer as the fleet operator. In such a case, the petitioner would still need to prove to the Agency that they would monitor the performance of the exempted vehicles in the field in an effective and reasonable manner.

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?

See response to question 6. Substantive changes would likely require a new exemption petition.

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?

ADS-operated vehicles have the potential to significantly improve overall safety on our nation's roadways. In 2017 alone, 37,133 fatalities occurred as a result of vehicle crashes in the United States – the vast majority of which were caused by driver error. ADS-operated vehicles have the potential to reduce this number by using advanced sensing technologies combined with artificial intelligence programming to avoid crashes. Unlike conventional human drivers, the ADS can't get distracted, drive impaired, or fall asleep at the wheel. In addition to safety benefits, ADS-operated vehicles hold promise to provide numerous social and economic benefits, including less congestion, lower fuel consumption, and increased mobility for the elderly and disabled. It is the Alliance position that the significant benefits detailed above are consistent with the public interest and the Vehicle Safety Act.

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?

Any potential restrictions should be focused specifically on aspects of performance related to the FMVSS's that the exemption is granted for. With respect to ADS performance, NHTSA has

developed and implemented the VSSA process. This is supplemented with the Agency's enforcement authority. As a result, additional restrictions are necessary.

Any expanded data collection requirements for ADS vehicles should be implemented as part of the demonstration program (see comments to ANPRM).

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?

This would be an expansion of the scope of exemptions and FMVSS. Such ADS performance aspects are covered under the VSSA.

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:

Any potential "terms and conditions" should be focused specifically on aspects of performance related to the FMVSSs for which the exemption(s) is granted, and not for ADS performance in general. With respect to ADS performance, NHTSA has developed and implemented the VSSA process. This is supplemented with the Agency's defect enforcement authority. As a result, the Alliance does not believe that additional restrictions are necessary.

Any expanded data collection requirements for ADS vehicles should be implemented as part of the NHTSA-proposed ADS-DV demonstration program (see Alliance comments to Pilot Program ANPRM).

22.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).

This should not be required as part of a Part 555 petition for limited exemption; rather, if NHTSA wants this information it should be pursued as part of the proposed Pilot program mentioned above. Such detailed data are not required to support a limited petition for exemption from specific FMVSS requirements.

22.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"?

See response to question 22a.

22.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).

See response to question 22a.

22.d. Information related to community, driver and pedestrian awareness, behavior, concerns, and acceptance related to vehicles with an ADS.

See response to question 22a.

22.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?

See response to question 22a.

22.f. Data and information on the initial and subsequent ODDs and software updates.

See response to question 6 above.

22.g. For all categories of information, how should any concerns about confidential business information and privacy be addressed?

NHTSA should address confidential business information and privacy as they currently do for treatment of sensitive data, including that which is covered under 49 CFR Part 512.

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.

No additional reporting of data should be required. The current exemption process has stood the test of time with respect to protection of safety for the standards that are subject to exemption. As such, there is no need to expand the data requirements. Especially since the ADS aspects of performance are covered through the current VSSA process.

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?

No reporting of data should be required. However, if reporting of data was required, it should be limited to the current Part 555 two-year exemption period tracking requirements.

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?

See response to question 22a.

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?

NHTSA (with manufacturers' assistance) can provide a non-proprietary summary similar to the VSSA.

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?

Requiring additional safety and engineering redundancies is out of scope for the Part 555 process. It is the manufacturers' responsibility to do the necessary engineering and development to ensure appropriate safety performance. Furthermore, safety performance according to the 12 safety principles is described in manufacturers' VSSAs.

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:

The agency should keep its focus on the safety intent and specific aspect of performance relevant to the exempted standard(s) in each petition. If the Agency expands the scope of its considerations to ADS performance which is not regulated and currently covered under the VSSA process, the petition evaluation will take significantly longer.

We encourage the Agency to prepare for an increased number of petitions for exemption over the coming years. Extensive review times would greatly impede the development of ADS technology and the collection of real world test data that the Agency needs to develop future regulations. Also, lengthy petition evaluation times will slow the pace of safety improvements for automated vehicles for the driving public.

28. 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 vehicles under well-defined, risk-managed conditions; ("E.g., a number significantly less than the 2,500 vehicles per year authorized by 49 U.S.C. § 30113.")

No response.

28. Deny petitions if applicants are unable to respond adequately to NHTSA requests for further information within a specified time period;

This is the current policy.

28. 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;

Alliance supports appropriate public and stakeholder engagement including potential stakeholders at targeted deployment locations.

28. 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.

See response to question 7 above.

Appendix 2 – Response to Questions Contained in Nuro Petition Notice,

Statutory Bases for Exemption

1 ***To what extent and in what ways does the choice of the basis affect the scope, depth and appropriateness of the safety analysis and finding?***

Each of the current Part 555 petition bases may be appropriate given the specific operating circumstances and vehicle attributes. As such, the Alliance recommends that NHTSA consider petitions on the merits of each submission with respect to whichever basis is most appropriate.

2 ***Is the basis for exemption (field evaluation of a low-emission vehicle (30113(b)(3)(B)(iii)) chosen by Nuro in its petition appropriate for the agency to use in determining whether to grant or deny an exemption for Nuro's vehicle? If not, what basis would be appropriate, and why?***

See General response to question 1

3 ***In lieu of the low-emission basis, would it be more appropriate to consider Nuro's petition under 49 U.S.C. 30113(b)(3)(B)(ii) (field evaluation of a new motor vehicle safety feature) or 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)? If so, why?***

See General response to question 1

4 ***Independent of the agency's disposition of this petition, NHTSA seeks comment on whether, and if so how, the agency should also consider creating a new vehicle classification category for light and/or low-speed passenger less ADS vehicles like the R2X to which a subset of FMVSS requirements would apply.***

See General response to question 1

The Development of a Low-Emission Vehicle

5 ***Nuro contends that an exemption is necessary [to] facilitate the development of and LEV because it has ''exhausted the safety gains that can accrue'' from its current testing. Does the petition provide sufficient information to enable the agency to determine whether exempting the vehicle would make the development or field evaluation of a low-emission motor vehicle***

easier? If not, what additional information should the agency seek prior to rendering its final determination and why?

No response

6 ***Does Nuro ADS's reliance on ''advanced machine learning'' to improve driving performance justify public on-road testing to obtain additional ADS safety gains? Are there diminishing returns to continued testing with passenger cars retrofitted with ADS functionality? If AI machine learning is being used to continuously change its ADS software, how should the safety of the ADS be monitored and evaluated? IF AI is continuously improving – so once it has an acceptable level of maturity/safety further improvements will only further increase safety.***

Yes, once an acceptable safety threshold is exceeded it is not a significant consideration from a regulatory standpoint. While it is possible that continued on-road testing may have diminishing returns, the value of such data is best determined by the vehicle manufacturer.

Safety - General Questions

7 ***In determining whether to grant the petition, how should NHTSA consider whether an exemption would ''unreasonably lower the safety level''? Should this consideration be solely limited to safety level provided by the exempted standards or the safety of the vehicle more generally?***

The Alliance opposes an expansion of exemption petition safety equivalency demonstration to cover nominal driving safety performance of an ADS. The agency has implemented ADS policies and VSSA criteria and guidance to address interim ADS safety performance. Instead, for purposes of Part 555 limited exemption petitions, the agency should focus on the vehicle performance with respect to the specific FMVSS(s) for which the specific limited exemption is requested.

NHTSA should not attempt to use the Part 555 petition process to introduce new ADS requirements that have not gone through the rigorous rulemaking process.

8 ***Is it appropriate for the agency to give any consideration to the quality of the performance of Nuro's ADS as part of its assessment whether granting Nuro's petition is in the public interest and consistent with the Safety Act?***

See response to question 7 above.

9 ***How should safety considerations, including the performance of the ADS, be included in the ''terms'' of a granted exemption?***

Terms should clarify that the vehicle must address all of the issues included in ADS 2.0 and detailed in the safety assessment letter.

10 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?

No Response

Safety - Exempted Standards

11 Is Nuro correct in its conclusion that the safety purposes of the three requirements from which it is requesting an exemption are not relevant to the R2X because it would not have any occupants? Do these requirements serve any safety purposes beyond those discussed in the petition?

The Alliance agrees that exemption from the mirror, windshield, and back up camera requirements is supported by the fact that they are not relevant to a vehicle that uses ADS with sensors (as contrasted to drivers with eyes that operate in the visual spectrum) and that does not have occupants that need to see out of a windscreen or be retained by it in a crash.

12 Regarding the rear visibility requirement, how would the agency assess whether the R2X actually would meet the ''field of view'' and ''image size'' requirements?

The agency has implemented ADS policies and VSSA criteria and guidance to address interim ADS safety performance. Instead, for purposes of Part 555 limited exemption petitions, the agency should focus on the vehicle performance with respect to the specific FMVSS(s) for which the specific limited exemption is requested.

In this case compliance with requirements laid out in ADS 2.0 and AV 3.0 should be sufficient.

Safety - Performance of the ADS

13 To what degree could the R2X's capabilities or ODD be changed through post-deployment software updates over the lifetime of the R2Xs for which Nuro is seeking an exemption? While Nuro states that it does not intend to ''upgrade'' the R2X's ADS to L5, are there ODD or other changes Nuro should be able to make to the R2X over the lifetime of the vehicles? How should NHTSA address the possibility of such changes in conducting its safety analysis?

Any significant change in safety argument basis, Operational Design Domain (ODD), operating characteristics or hardware that impact the specific safety standards that are the subject of the

Part 555 exemption should require a new or modified petition – just as any significant change in an FMVSS-compliant product requires re-validation/self-certification today.

However, improvements in core competency should not require a new or revised petition, as such improvements only augment safe performance of the ADS feature, which was already deemed to be sufficiently safe for deployment. That is, if, as part of the petition process, a manufacturer provides evidence that the ADS system/vehicle provides a sufficient level of safety to warrant an exemption, then performance upgrades (e.g., further evolution of ADS's core capabilities) that further enhance the safety of the vehicle should not require a new petition.

Likewise, de minimis changes should also not require the manufacturer to re-petition under Part 555. This would include things such as replacing suppliers for an existing sensor or actuator, revising hardware or software that does not affect ADS performance (e.g., diagnostic software or vehicle hardware, such as tire and suspension parts).

For cases where changes are significant enough to require a new/revised petition, the Alliance recommends that NHTSA set up an expedited process for the review of such petitions.

14 Did Nuro provide sufficient information about how the R2X would interact with human-controlled vehicles on the road? Should the agency be concerned about the front-end stiffness of the R2X and its impact on collision partners?

The Nuro vehicle should interact the same with other road users as an ADS-operated vehicle that carries passengers.

Furthermore, there are no specific requirements for front-end stiffness. As such, the Alliance cannot identify any reason that the front structures would be excessively stiff. In fact, the opposite is likely and thus will probably be less aggressive toward potential crash partners

15 Did Nuro provide enough information about its design features to enable the ADS to operate reliably and to minimize safety risks that may occur if the ADS malfunctions or otherwise encounters a driving situation it cannot handle? If not, what should the agency ask to see?

See response to question 12 above.

16 Did Nuro provide enough information on development and testing to support the safety performance of the vehicle? Should more specificity on the types of sensors and their limitations be provided?

See response to question 12 above.

17 Did Nuro provide enough information about pedestrian detection and mitigation strategies? Would the R2X be able to sense and respond appropriately around school buses, emergency vehicles, neighborhood construction, etc.? Would the R2X be able to understand traffic laws?

See response to question 12 above.

18 What communication protocols should the R2X follow when faced with unexpected human interactions, such as being pulled over by a police officer or being directed through a construction zone by a road worker?

Out of scope of this exemption process – Consensus of what such protocols should be have not been established – as such protocols that are needed based on the vehicles specific ODD should be detailed as part of ADS 2.0 and AV 3.0.

19 How should the R2X's ADS ''prioritize'' the safety of other road users?

No response.

20 What importance should NHTSA place on Nuro's statement that some safety-critical components in the R2X perform at the levels required under the FMVSS, even though those requirements are not applicable to LSVs?

NHTSA should appreciate manufacturer efforts to exceed minimum safety performance required by FMVSS.

21 Would the pedestrian safety features described in the petition (rounded edges, pedestrian ''crumple zones'') be effective in the environment in which the R2X would be used? Can the effectiveness of these measures be validated? If so, should NHTSA require Nuro to provide testing data to demonstrate the effectiveness of these measures?

Such measures are not required for conventional vehicles and thus go beyond the scope of the exemption process.

22 Did Nuro's petition provide enough information regarding what types of ''trigger'' events would require the remote operator to take over? What sorts of events should ''trigger'' the remote operator to take over? Should these be specifically articulated as a term if the petition is granted? If so, did the petition provide sufficient information for the agency to establish such terms?

No response

23 What additional situations and risk events (e.g., weather) should NHTSA consider when assessing the safe operation of the vehicle?

Vehicle ODD should include weather considerations and be able to determine whether to operate and put the vehicle into a minimal risk/remote operator mode if weather suddenly exceeds vehicles ODD.

24 Would the various fail-safe protocols described in the petition provide a sufficient level of safety? What criteria/methodology should be used to assess their sufficiency? If the protocols

are believed to be sufficient, explain why. If the protocols are not believed to be sufficient, explain why and discuss how the fail-safe protocols could be improved to deal with both expected and unexpected situations and events, so that they would provide a sufficient level of safety?

No response

25 ***Did Nuro provide sufficient information concerning the training of the remote operators? What should be the level of training of remote operators? How should they be trained? How should be they evaluated?***

No Response

26 ***How should remote operators ''monitor'' the R2X's operation to detect reductions in or complete losses of its ADS' functionality (i.e., could they observe the R2X's sensor readings in real time, or would they simply wait for the ADS to send an alert)? How much discretion should the remote operator have in deciding whether to take control or decommission the vehicle? For the range of circumstances in which the remote operator is free to exercise discretion, what guidance should Nuro provide regarding whether it would be appropriate to take control?***

No Response

27 ***Nuro states, if it receives the exemptions, it ''would take a highly incremental and controlled approach to deployment'' which would include extensive evaluation and mapping of any area where the vehicles would be deployed, and that ''any early on-road tests would occur with human-manned professional safety drivers with override abilities supervising the vehicle for any anomalies in behavior.'' Over what portion of the R2X's life would this level of supervision be provided? What would be the circumstances under which Nuro would reduce or eliminate its supervision? Once this initial testing period is over, what is the expected ratio of remote operators to R2Xs, and would this ratio change over time? What would be the human oversight protocol for the R2X once it is past the initial testing stage?***

No response

28 ***How frequently should Nuro update its maps for accuracy, especially with regard to the reliability of cellular data? What other information is mapped?***

This is the responsibility of the manufacturer and not within scope of a Part 555 exemption.

29 ***How should Nuro address the issue of the potential effects of cyber threats on safety? In particular, is Nuro's assurance of ''end-to-end encryption'' sufficient for the agency to grant an exemption? If not, what additional assurances should Nuro provide?***

See response to question 12.

30 Are there any additional safety considerations that the agency should analyze in deciding whether to grant Nuro's petition?

None

Other Public Interest Considerations

31 We seek comment on whether the potential environmental and economic benefits described by Nuro in its petition are sufficient (or sufficiently likely to occur) to enable NHTSA to make a finding that an exemption is in the public interest and is consistent with the Safety Act, per 49 U.S.C.30113(b)(3)(A).

No response

32 In particular, we seek comment on whether a petitioner under the low emission vehicle exemption basis must cite benefits that are directly related to the original purpose of 30113(b)(3)(B)(iii), which was to encourage the development of vehicles with low-emission propulsion technologies.

No response

Terms

33 If NHTSA were to grant Nuro's petition, what would be the potential utility of NHTSA's placing terms requiring the submission of the following categories of data?

Any potential "terms and conditions" should be focused specifically on aspects of performance related to the FMVSSs for which the exemption(s) is granted, and not for ADS performance in general. With respect to ADS performance, NHTSA has developed and implemented the VSSA process. This is supplemented with the Agency's defect enforcement authority. As a result, the Alliance does not believe that additional restrictions are necessary.

Any expanded data collection requirements for ADS vehicles should be implemented as part of the NHTSA-proposed ADS-DV demonstration program (see Alliance comments to Pilot Program ANPRM).

a. Statistics on use (e.g., for each functional class of roads, provide the number of miles, speed and hours of operation, climate/weather and related road surface conditions).

This should not be required as part of a Part 555 petition for limited exemption; rather, if NHTSA wants this information it should be pursued as part of the proposed Pilot program mentioned above. Such detailed data are not required to support a limited petition for exemption from specific FMVSS requirements.

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 manufacturers in the identifying and reporting of ''near misses''?

See response in question 33a.

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).

See response in question 33a.

d. Information related to measures to be taken by Nuro to address community, driver and pedestrian awareness, behavior, concerns, and acceptance related to vehicles with an ADS.

See response in question 33a.

e. Metrics or information concerning the durability of the ADS equipment and calibration, and need for maintenance of the ADS. For example, does the ADS work in all identified operating conditions or are there additional limitations? How are any limitations addressed and managed?

See response in question 33a.

f. Data on the initial and subsequent ODDs and software updates.

This should not be required as part of a Part 555 petition for limited exemption; rather, if NHTSA wants this information it should be pursued as part of the proposed Pilot program mentioned above. Such detailed data are not required to support a limited petition for exemption from specific FMVSS requirements.

Any significant change in safety argument basis, Operational Design Domain (ODD), operating characteristics or hardware that impact the specific safety standards that are the subject of the Part 555 exemption should require a new or modified petition – just as any significant change in an FMVSS-compliant product requires re-validation/self-certification today.

However, improvements in core competency should not require a new or revised petition, as such improvements only augment safe performance of the ADS feature, which was already deemed to be sufficiently safe for deployment. That is, if, as part of the petition

process, a manufacturer provides evidence that the ADS system/vehicle provides a sufficient level of safety to warrant an exemption, then performance upgrades (e.g., further evolution of ADS's core capabilities) that further enhance the safety of the vehicle should not require a new petition.

Likewise, de minimis (non-significant) changes, such as replacing suppliers for an existing sensor or actuator; revising hardware or software that does not affect ADS performance (e.g., diagnostic software or vehicle hardware, such as tire and suspension parts, or similar, should also not require the manufacturer to re-petition under Part 555.

g. For all categories of information, how should any concerns about confidential business information and privacy be addressed?

NHTSA should address confidential business information and privacy as they currently do for treatment of sensitive data, including that which is covered under 49 CFR Part 512.

34 If there are 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.

No additional reporting of data should be required. The current exemption process has stood the test of time with respect to protection of safety for the standards that are subject to exemption. As such, the Alliance does not see a need to expand the data requirements. Especially since the ADS aspects of performance are covered through the current VSSA process.

35 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, the R2X's entire normal service life, or a time period in between?

No reporting of data should be required. However, if reporting of data was required, it should be limited to the current part 555 two-year exemption period tracking requirements.

36 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 the ability of the agency to absorb and use it effectively?

See response to 33a.

37 If supporting information (including analysis, methodology, data, and computer simulation results involving proprietary systems or specialized computer programs) were submitted by Nuro 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?

NHTSA (with manufacturers' assistance) can provide a non-proprietary summary similar to the VSSA.

38 ***Are there any mechanisms that may help further mitigate the underlying safety risks, if any, that might result from granting this petition? For example, what additional safety redundancies, if any, should NHTSA consider requiring as a condition to granting the exemption?***

Requiring additional safety and engineering redundancies is out of scope for the Part 555 process. It is the manufacturers' responsibility to do the necessary engineering and development to ensure appropriate safety performance. Furthermore, safety performance according to the 12 safety principles is described in manufacturers' VSSAs.

39 ***In the absence of information demonstrating the safe real-world operation of the Nuro vehicle, would it be prudent for NHTSA to place terms on the exemption to protect public safety? If so, what terms would be appropriate? In addition, what terms, if any, should the agency consider placing on an exemption to 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?***

Terms if any should only be focused on the aspect of the Part 555 standards being exempted with the ADS operational aspects being covered by the current ADS 2.0 process.