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U.S. Department of Transportation
Docket Operations, M-30
Room W12-140
1200 New Jersey Avenue, SE
Washington, DC 20590

**RE: Nuro, Inc.; Receipt of Petition for Temporary Exemption for an Electric Vehicle
With an Automated Driving System [Docket No. NHTSA-2019-0017]**

AAMVA is excited to explore the safety benefits of Automated Driving Systems (ADS) and is committed to continued collaboration with NHTSA as the policy framework for the safe testing and deployment of automated vehicles continues to evolve. With respect to the current application of existent FMVSS on ADS, AAMVA offers the following comments on the petition:

I. Introduction

The petition lists the exemptions for which Nuro is submitting exemption. NHTSA cites that, “Because this vehicle would not have any designated seating positions, Nuro states that the vehicle should not be required to have any seatbelts, and thus, does not need an exemption from that requirement.”

While AAMVA agrees that a vehicle designed only to transport cargo may not need seatbelts, the general applicability of exemptions is something NHTSA should consider. Vehicles are required to conform with all FMVSS unless granted an exemption. State and other authorities rely on NHTSA exemptions in order to ensure a vehicle either conforms completely or has been endorsed by federal design authorities to operate under a granted exemption. The exemption process should serve as the sole means for relief from federally established standards, and this specific case represents a logical way NHTSA could grant a standard based on vehicle design and utility. However, the decision not to apply for exemptions from the standard based on how a manufacturer feels that standard should be applicable to their design represents a slippery slope and should be given careful consideration. In AAMVA’s opinion, any vehicle deviating from the standard should apply for exemption from that standard – even when the rationale seems logically apparent.

II. Background

The Nuro petition takes a different approach from the GM petition in that it solely cites [49 USC 30113\(b\)\(3\)\(B\)\(iii\)](#) as its rationale for exemption. This section provides that “The Secretary may act under this subsection on finding that 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.” Though the exemption application primarily cites its low-emission status as the rationale for exemption, the petition makes numerous arguments where the primary basis for exemption deals more with the removal of the driver than it does its zero-emission status. AAMVA can not advise NHTSA on how best to deal with exemption applications relating to more than one acceptable exemption application “category,” but notes that they may carry different substantiation requirements.

Nuro states that the R2X would be classified as a Low-Speed Vehicle (LSV). NHTSA states that:

“Unlike other vehicle categories that must meet a wide array of FMVSSs and other standards, LSVs are only required to meet a single standard: FMVSS No. 500. Currently, FMVSS No. 500 requires that LSVs be equipped with headlamps, stop lamps, turn signal lamps, tail lamps, reflex reflectors, parking brakes, rearview mirrors, windshields, seat belts for all designated seating positions, a vehicle identification number and a rear visibility (backup camera) system. NHTSA created the LSV classification and FMVSS No. 500 in June 1998 in response to safety concerns over the growing use of golf carts and other similar-sized, 4-wheeled, ‘Neighborhood Electric Vehicles’ (NEVs) on public roads. In developing FMVSS No. 500, NHTSA determined that, given the speed and weight limitations of the LSV classification, and the closed or controlled environments in which LSVs typically operate (usually planned communities and golf courses), there was not a safety need to apply the full range of FMVSS to them. Thus, the safety equipment required under FMVSS No. 500 is far more limited than what is required for other vehicle categories.”

Given that NHTSA established FMVSS No. 500 based on the expectation of limited use and constrained impact on public roads, consideration of how the R2X will be integrated into public transportation should be a primary consideration. Further, if expanded use beyond a well-defined ODDs occurs, the light weight rating and low-speed threshold could become serious detriments to mixed traffic. Given the conditional aspect of LSV ODDs, this may present a case where a conditional exemption is considered by NHTSA as the design “proves” its design intentions. NHTSA should require clear documentation and validation data throughout the exemption (if granted) and emphasize the temporary nature of the exemption. The post-production operation of the vehicles may be subject to close inspection, and state and local authorities must retain the ability to

govern how best to protect all road users, including vulnerable populations such as cyclists and pedestrians, as the R2X seeks the appropriate operational domain.

III. Nuro's Petition

AAMVA appreciates NHTSA's precision in citing the conditions for a LSV to meet appropriate GVWR requirements. Given that the R2X would have a GVWR of 2,500 pounds, the GVWR could only accommodate an additional 501 pounds of cargo before violating the threshold for a LSV. Given that Nuro does not provide a precise GVWR for the R2X, AAMVA endorses the requirement for precise overall weight ratings in order for the vehicle to be considered a LSV.

The petition also states that Nuro "indicates throughout its petition that it has designed the R2X's ADS to operate the vehicle on low-speed surface roads in 'neighborhood' environments." As a SAE Level 4 equipped ADS vehicle, the distinct Operational Design Domain (ODD) needs to be clearly described in order for any limitations in the vehicle's operational capacity to be documented and understood. Further, a clear and definitive description of what is meant by "low-speed surface roads" may need to be evidenced so that their intentions are clear with respect to operational safety. The more information provided in this context, the better regulators will have a clear understanding of the vehicle's intended use.

The petition states that, "Nuro has conducted two on-road testing programs to develop the ADS used in the R2X. For the first program, Nuro retrofitted FMVSS-certified passenger vehicles with its ADS, and states that it has 'continuously operated' these retrofitted vehicles (with a safety driver backup) on public roads for the past year. For the second program, Nuro operated a prototype of the R2X on the company's private testing facility, which Nuro says is intended to simulate driving conditions in urban and suburban neighborhood settings. Nuro's petition did not include additional information concerning either of these programs, including how many miles were driven and in what conditions." The submission of safety data will prove essential in making any safety equivalency rating for the vehicle. Manufacturers should be forthcoming in certain areas, including the number of test miles, the number of observed incidents during that period, and basic safety data (such as engagement of the failsafe). While these may not paint a complete picture of all incidents, they will provide a global understanding of how design intention are meeting with actual operation under test conditions. The data will also evidence the extent of the testing performed on the vehicle.

AAMVA finds the first testing scenario interesting - in that the ADS was equipped to a vehicle unrelated to the vehicle type being considered for exemption. AAMVA wonders whether NHTSA should require pairing of the specific decision-making ADS under consideration to the specific R2X vehicle design features in order to make a valid safety equivalency determination. While the second testing scenario provided for this comparison under controlled testing conditions, the ability to make true data

comparisons on retrofitted FMVSS compliant vehicles in the first scenario seems questionable.

NHTSA also cites that, “Nuro does not provide the metrics by which the company measures the safety of the ADS, nor does Nuro provide specific information about how the ADS’s decision-making process works beyond general statements that the ADS would avoid collisions with obstacles.” The submission of additional substantiated testing data seems a reasonable, if not obligatory.

AAMVA understands the sensitivity of developers with respect to sharing proprietary data. While proprietary claims may limit the prudence of submission of certain data, in absence of provision, the manufacturer should attest to having data supporting the relative safety measurement of performance and should attest to its veracity. Petitioners declining to provide data for proprietary reasons should be prepared to claim ownership of the technologies as their own. Manufacturers should also provide enough of a detailed description to allow for comparison against existent technologies so that it can be differentiated from other models and evaluated for any safety equivalency against currently operating vehicles.

AAMVA and its membership have no interest in serving as an impediment to the close interaction that manufacturers share with federal authorities in developing the appropriate framework for safety specifications during the vehicle design process. AAMVA does, however, request that NHTSA carefully consider the evolving dynamic between intended vehicle design elements and how they intersect with the removal of an adaptable human driver. As exempted vehicles transition out of the production environment and are expected to safely perform with a mixed fleet of various conforming and non-conforming vehicles, it will more likely than not be state and local resources that are taxed with oversight of the vehicle population as they operate. Enforcement of problematic vehicle populations, both exempted and non-exempted, driver and driverless, will require state and local authorities respond directly to public safety concerns. AAMVA encourages both manufacturers and the federal government to keep this in mind as they consider public exposure to a potentially untested fleet.

Nuro states that the R2X would have “‘built-in’ operational limits that are consistent with this intended use, such as maximum speed of 25 mph, and being restricted to marked surface streets that Nuro has extensively pre-mapped.” What does this mean in terms of areas of controlled operation (any place that has been pre-mapped)? How will those areas of operation be communicated, and how will enforcement of vehicles operating beyond their stated ODD be enforced? This will require a high level of coordination between federal and state authorities.

The petition also cites that, “Nuro intends to own and centrally operate the entire fleet of R2Xs through partnerships with local businesses such as retailers.” What does Nuro mean by “centrally operate?” Does this include central reporting of vehicle conditions

and the ability to pull and repair vehicles from a remote monitoring operation? Assuming a remote operator/monitor environment, AAMVA directs NHTSA to its comments to follow regarding remote operation.

c. Why Nuro Believes That Granting Its Petition Would Not Unreasonably Degrade Safety

i. Exterior Mirror Requirement

“Per FMVSS No. 500 S5(b)(6), all LSVs must be equipped with an exterior mirror mounted on the driver’s side of the vehicle and either an exterior mirror mounted on the passenger’s side of the vehicle or an interior mirror.” Given the removal of the driver from the vehicle, and the vehicle’s reliance on ADS to detect obstacles, AAMVA defers to NHTSA’s expertise in making a safety equivalency determination on the exemption. AAMVA does wonder about the description of pedestrian “crumple zones,” and whether this may impact the vehicle’s crashworthiness in the event of a vehicle-to-vehicle crash.

While an exterior mirror/visual of what the vehicle experiences while operating may not be necessary for a (non-existent) driver, data on what the vehicle experiences in the event of a crash or incident may be necessary for law enforcement, first responders, crash investigators, or other oversight authorities. While the presentation of the data to a human operator of the vehicle may not prove essential, the ability to understand the circumstances surrounding incident data may prove useful in furthering the vehicle’s learning, assuring appropriate safety oversight, and informing the appropriate ODD for the vehicle.

ii. Windshield Requirement

Per FMVSS No. 500, S5(b)(8), all LSVs are required to be equipped with “a windshield that conforms to the Federal motor vehicle safety standard on glazing materials (49 CFR 571.205).” Nuro states that, “the R2X would not be equipped with a windshield of any kind. Instead the front face of the R2X would be equipped with the various pedestrian safety features described in the previous section.”

As rationale for the removal of the windshield, Nuro states that “First, the absence of human occupants in the R2X would make the windshield unnecessary for occupant protection because there would not be any risk that human occupants would be injured by an impact with glazing or ejected from the R2X. Second, Nuro argues that there is not any need for a windshield to ensure driver visibility because the driving task would be performed by the ADS, which would not require a transparent windshield to observe the driving environment.” Even in the absence of passengers, AAMVA has concerns about cargo ejection from the vehicle and how Nuro envisions protections from loose loads affecting the driving public. Nuro states that the “front of the vehicle would be equipped with a ‘plate’ that resembles the appearance of a windshield and states that

this design is intended to indicate to other road users the front of the vehicle, which would provide visual cues as to the R2X's potential driving behavior, reducing confusion." AAMVA appreciates this orientation cue for other drivers, but wonders whether the plate provides reasonable crashworthiness standards for ejection of up to 500 pounds of cargo and whether the plate is comparable to the crash impacts associated with the current windshield standard.

iii. Rear Visibility (Backup Camera) Requirement

FMVSS No. 500, S5(b)(11) requires that all LSVs "comply with the visibility requirements specified in paragraph S6.2 of FMVSS No. 111 [Rear visibility]. This requirement states that vehicles to which it applies must be equipped with a rear visibility (i.e. backup camera) system that produces an image of the area immediately behind the vehicle under specified test conditions. The standard includes a number of provisions that are designed to minimize the risk of backover crashes, such as requirements for minimum image size and quality."

AAMVA defers to NHTSA expertise in evaluating the sufficiency of this exemption, as most conditions are met except those regarding "linger time" and "deactivation." NHTSA is suitably the appropriate party to comment on whether the standards serve exclusively as safeguards against driver distraction when moving in the forward rather than in reverse. AAMVA does understand that requiring rear-facing camera and sensor deactivation under certain conditions could compromise the integrity of the ADS.

While a visual of what the vehicle experiences while operating may not be necessary for a (non-existent) driver, data on what the vehicle experiences in the event of a crash or incident may be necessary for law enforcement, first responders, crash investigators, or other oversight authorities. While the presentation of the data to a human operator of the vehicle may not prove essential, the ability to understand the circumstances surrounding incident data may prove useful in furthering the vehicle's learning, providing adequate safety evaluation, and informing the appropriate ODD for the vehicle.

This section includes Nuro's suggestions for modifying the test conditions for the purpose of compliance verification. In the table provided, Nuro lists that driver seating position can be accomplished by "treating a remote operator's seat as the driver's seating position." Very little is previously disclosed in the petition about how Nuro intends to use remote driver functionality.

With respect to vehicle safety performance issues (such as battery failure or tire pressure monitoring) AAMVA notes that the removal of the driver raises some concerning questions regarding remote driving/remote monitoring of actively engaged fleets. To date, there have been no standards or applicable safety requirements for the remote oversight of driverless vehicle performance. Until now, all vehicles have

required a human driver. If the petition is to seriously consider the removal of a human driver for reliance on the ADS, then NHTSA must consider what it means for the vehicles to be operated, monitored, and maintained “by proxy.” Vehicle performance issues can arise as they are actively affecting public safety. The communication of vehicle safety issues to a remote operator/monitor has not been applied to conditions directly related to individual driverless vehicle performance issues in the past. In removal of the driver, AAMVA requests NHTSA consider how vehicle safety and maintenance issues are not only reported to the manufacturer, but also how a manufacturer ensures the position is filled by personnel qualified and capable of safety oversight. In doing so, NHTSA may consider qualification standards as well as the process by which safety information communicated to a remote monitor is acknowledged, processed and utilized to affect a responsible remedy. Communicating a safety issue is very different from resolving one.

Given state-specific, geographic signal availability; road and weather conditions; and general familiarity with constrained operating areas; AAMVA wonders whether individual circumstances regarding remote oversight might best be something more appropriately considered by state and local authorities. With approval of the petition, is NHTSA tacitly setting the precedent for remote operations without taking advantage of the opportunity to establish industry-wide expectations of what this means?

The points raised above do not necessarily convey a desire by AAMVA for the petition to be denied. However, there are aspects of the petition that extend beyond the normal capacity of a petition to grant relief from the design standards of a vehicle. With this in mind, AAMVA directs NHTSA to its comments regarding the granting of conditional exemptions and supports NHTSA’s discretion in emphasizing the “temporary” nature of any exemption.

e. Why Nuro Believes That Granting Its Petition Would Be in the Public Interest

While there is little doubt regarding ADS’s potential to improve the level of roadway safety, AAMVA defers the argument that safety benefits would be realized to NHTSA and its ability to make safety equivalency comparisons for individual technologies. In its nascent state, ADS technologies require public support in order to achieve their potential. The rush to brand ADS technologies as “self-driving” or as safer alternatives prior to their commensurate evaluation may ultimately harm safe fleet penetration. A measured approach that includes manufacturer-submitted attestation to safety assurances based on substantiated testing seems like a prudent approach for NHTSA to take. Further, NHTSA should consider how to effectively differentiate those vehicles undergoing various levels of testing from those that have been deployed.

AAMVA strenuously cautions against any approach that would tacitly endorse “immediate deployment” of any vehicle granted exemption status. Exemption status should apply solely to the manufacturers’ ability to produce the vehicle, and should not be viewed as relief from the testing and performance obligations that exist beyond the

scope of the exemption environment. AAMVA also feels obligated to reiterate that exemptions applicable to a business plan for immediate public exposure seems premature. The ability to ensure accountability between design plans, testing data, and limited scale exposure will ultimately play a significant role in “public interest” assurances.

i. ADS Safety

AAMVA is concerned that Nuro does not provide any information regarding the quality of the ADS’s decision-making process when performing the driving task. While AAMVA understands the need to protect proprietary information, we still feel it is important for manufacturer attestation to safety equivalency to be documented and recorded in areas the manufacturer claims proprietary interest.

“Nuro states that the R2X would at all times be monitored by ‘experienced human operators who are extensively trained in the vehicle’s systems,’ and would be able to take over driving control from the ADS if needed. According to Nuro, these safety operators would play a similar backup safety role as safety drivers utilized in other ADS vehicle testing programs.” Beyond AAMVA’s prior comments regarding remote operation, it is unclear what “experienced human operators who are extensively trained in the vehicle’s systems” means. Does this mean they are experienced exclusively with the vehicle’s systems? That they are competent at driving and operating the vehicle? That they have proven their operational proficiency to independent parties? That they are licensed? Some or all of the above? AAMVA again refers NHTSA to its previous comments regarding the qualification standards for professionals on remote operation.

V. Terms

AAMVA is pleased to see NHTSA cite that, “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 Nuro’s vehicles, its petition, and public safety concerns, and especially given Nuro’s expectations that the capabilities of the vehicles would evolve over their lifetime, extended reporting may be appropriate. AAMVA further equates it to the tried and proven enforcement process by which driver violations over the course of a driver’s lifetime have carried reporting requirements for convictions to a centralized repository. This ensures that only safe drivers are given the authority to operate vehicles. Given manufacturers are requesting exemptions to the vehicle safety standards, they should not be exempt from the performance reporting requirements otherwise applicable to human drivers once they have been exposed to public roadways. NHTSA will need to consider how they anticipate monitoring, recognizing, and enforcing problematic vehicle operational concerns that may only be realized in the post-production environment. One way they may be able to more closely monitor these issues is to require expansive

reporting terms throughout the vehicle's lifecycle that serve as a condition of exemption.

AAMVA would leave it up to NHTSA discretion on what the consequences should be if the flow of information were to cease or become inadequate during or after the exemption period. One would presume that during the exemption period, NHTSA would be able to limit all aspects of the vehicle operations. Under these conditions, NHTSA would need to have a very robust communication mechanism in place to alert the appropriate state and local authorities that such a decision had been reached, and that a manufacturer had breached the acceptable terms of the exemption. In grave cases, it is conceivable that NHTSA may have to exercise its vehicle design recall authority. AAMVA also understands NHTSA's considerations that some conditions could be relaxed as a vehicle proves its roadworthiness over time. Whether problematic or exceptionally proficient, NHTSA must consider how vehicle-specific exemptions will be effectively communicated to state and local oversight and enforcement authorities. Reporting on the status of conditional exemptions will be essential for ensuring safety, and state and local observation of issues and problems also need to be reported to a centralized federal authority. This data exchange may need to be restricted by use (such as by law enforcement and government agencies), but separately allow for reporting (to the appropriate oversight agencies) by the general public.

VI. Request for Comments and Information

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?

AAMVA appreciates NHTSA stating that the "choice of the basis for an exemption petition can significantly affect the scope and depth of the safety analysis and finding that NHTSA must make in order to grant an exemption." While a difficult choice to make in terms of qualifying the petition, AAMVA believes that the more applicable of the design features subject to exemption relate to the removal of the driver. Nuro has requested exemption from the standards for mirrors and windshield based on removal of a human driver (and occupant). Therefore, it is our opinion that this should be the primary basis for exemption, and may more accurately align with 49 USC 30113(b)(3)(B)(ii) than it aligns under their current rationale under 49 USC 30113(b)(3)(B)(iii) for low emission vehicles. AAMVA defers to NHTSA's expertise and experience in determining what bearing this may have on their ability to process and review the petition.

2) Is the basis for exemption (field evaluation of a low-emission vehicle 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?

See response provided for question 1.

3) In lieu of the low-emission basis, would it be more appropriate to consider Nuro's petition under field evaluation of a new motor vehicle safety feature or authority to grant exemptions from FMVSS for vehicles with an overall safety level at least equal to the overall safety level of nonexempt vehicles?

See response provided for 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 passengerless ADS vehicles like the R2X to which a subset of FMVSS requirements would apply.

AAMVA defers to NHTSA expertise with respect to applicability of FMVSS and whether creating specific categories best suit the agency's intended use of standards. In the instance of low-speed vehicles or other vehicles whose intent may not be for full-scale public road use, the issue becomes one of ensuring those vehicles can safely interact with the vehicles and road users around them. Vehicles like the R2X may have specific intended use cases, but as we have seen with other categories of vehicles not intended for full public road use, the vehicle ultimately become pressed into situations not intended for them. For instance, state authorities have seen road users using off-road, low-speed and specialty use vehicles on highways and other places where their use was not intended and their FMVSS are not sufficient to protect all users. While the creation of a separate subgrouping of FMVSS for light and low-speed passengerless ADS vehicles would be helpful in categorizing the vehicles and providing a special standardization based on their use, the ability to tie FMVSS applicability to specific use cases carries the potential to complicate the use-case environment. Ultimately, the states rely on our federal partners for making safety determinations for vehicle design that assures the safety for all users. While the establishment of FMVSS for each specific use case would be initially helpful in moving the vehicles towards public exposure for their specific ODD, as those design exemptions and use cases intermingle, and as the number of applicable standards for each subset expand, the environment becomes increasingly complex and difficult to enforce. AAMVA is somewhat neutral in this regard, but emphasizes that state and local authorities rely heavily on federal expertise to make vehicle design conformance readily apparent and enforceable – regardless of intended use.

5) AAMVA defers to NHTSA's expertise on the subject of qualifications of low-emission motor vehicles.

6) NHTSA asks, "If AI machine learning is being used to continuously change its ADS software, how should the safety of the ADS be monitored and evaluated." First and foremost, AAMVA would cite that all vehicles are subject to all applicable FMVSS unless they are granted a temporary exemption. The fact that these vehicles do not have mirrors or a windshield does not preclude them from all other applicable standards.

With respect to operations under a temporary exemption, if NHTSA considers granting an exemption, the agency should require all applicable and relevant testing data that applies to exemption from the standard. Where sensitivity around sharing that data for proprietary reasons may limit the prudence of submission of this data, the manufacturer should attest to having data supporting the relative safety measurement of performance and should attest to its veracity. Petitioners declining to provide data for proprietary reasons should be prepared to claim ownership of the technologies as their own. Manufacturers should also provide enough of a detailed description to allow for comparison against existent technologies so that it can be differentiated from other models and evaluated for its “innovative” nature. Any gaps in conclusive safety data should be considered as a potential risk and should be weighed against the gravity of those safety performance features.

7. AAMVA believes NHTSA should consider vehicle safety in the most general terms possible. Given that we are seeing exemption applications that very lightly touch on one of the most serious aspects of operational performance - the ADS as “driver” - it is important to understand that the majority of FMVSS were comprehensively developed for vehicles transporting a human driver. Those human drivers have been evaluated based on competency at the state level in order to legally operate the vehicle. The ADS described here may not have definitively proven it will not “unreasonably lower the safety level,” so ensuring a manufacturer is accountable for the safe operation of the vehicle is essential. Whether this is substantiated by performance data or includes an attestation that the vehicles will operate as described is an important consideration for NHTSA. But because current FMVSS assume a capable human driver, AAMVA encourages NHTSA to consider the safety of the vehicle in its most general sense.

8) AAMVA defers to NHTSA’s expertise in making determinations on the quality of Nuro’s ADS as part of its assessment.

9) How should safety considerations be included in the “terms” of a granted exemption?

AAMVA has provided previous comments regarding the potential for “conditional” exemptions. See comments in section II and III above.

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?

AAMVA defers to NHTSA’s expertise in making sufficiency judgments on petition requirements.

11) See AAMVA’s previous comments relative to each exemption description above with respect to whether the exemptions are not relevant to the R2X because it would not have any occupants.

12) AAMVA defers to NHTSA's expertise with respect to the rear visibility requirements and how the agency would assess whether the R2X actually would meet the "field of view" and "image size" requirements. AAMVA provides additional comments to each of the specific exemption requests above.

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? AAMVA reiterates that the exemptions should be granted only on a temporary (2 year) basis, and that all vehicles will need to still conform to operational requirements in the post-production environment. While over the air updates may potentially affect vehicle capabilities, they should not change any of the ODD constraints listed under the temporary exemption until they have been evaluated under separate conditions describing those changes and how they affect the ODD.

14) This question asks about the crashworthiness of the vehicle and its potential for interaction with other road users. AAMVA has previously provided comment on this under each exemption request and more broadly around how the vehicle is intended for use as a low speed vehicle.

15) This question asks about unintended safety risks in the instance of a malfunction. While AAMVA is unclear on the sufficiency of data provided to NHTSA in this regard, AAMVA as an organization has developed a comprehensive document on ["Jurisdictional Guidelines for the Safety Testing and Deployment of HAVs."](#) Numerous sections of this guidance deal with guidance on how to deal with HAVs should they engage their failsafe operations. Specifically, section 6.6 deals with first responder safety and 6.7 deals with first responder training recommendations.

16) This question asks whether enough information was provided on development and testing to support the safety performance of the vehicle. AAMVA has provided numerous comments on sufficiency of safety data and how we might suggest approaching limitations due to proprietary data.

17) This question asks about the sufficiency of data around responding to other road users, including school buses, pedestrians, emergency vehicles, etc. It further requests whether the R2X would be able to understand traffic laws.

AAMVA and its membership have no interest in serving as an impediment to the close interaction that manufacturers share with federal authorities in developing the appropriate framework for safety specifications during the vehicle design process. AAMVA does, however, request that NHTSA carefully consider the evolving dynamic between intended vehicle design elements and how they intersect with the removal of an adaptable human driver. As exempted vehicles transition out of the production environment and are expected to safely perform with a mixed fleet of various

conforming and non-conforming vehicles, it will more likely than not be state and local resources that are taxed with oversight of the vehicle population as they operate. Enforcement of problematic vehicle populations, both exempted and non-exempted, driver and driverless, will require state and local authorities respond directly to public safety concerns. AAMVA encourages both manufacturers and the federal government to keep this in mind as they consider public exposure to a potentially untested fleet. AAMVA is not positioned to comment on whether or not the vehicle has previously proven its ability to interact with other road users, but would note that state and federal authorities must have a clear mechanism for exercising full enforcement for any vehicles that do not obey all traffic laws, up to and including the ability for NHTSA to exercise its recall authority.

18) This question asks about public interaction, including police interaction. AAMVA would again refer NHTSA to its [Jurisdictional Guidelines](#) resource. (See Section 6.)

19) AAMVA defers to NHTSA expertise on how the R2X should “prioritize” the safety of other road users.

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? AAMVA would defer to NHTSA expertise in making determinations on what they deem “safety critical.” From the question, it is hard to anticipate which FMVSS the statement would apply to, but if they concern the ADS, the more information provided the better. AAMVA would again reference the importance of manufacturers providing accountability between described safety functions and their ability to meet expectations.

21) AAMVA would defer to NHTSA expertise in evaluating the pedestrian safety features described in the petition. AAMVA has previously commented on the “crumple zones” and their effectiveness both within the pedestrian safety realm and in the overall crashworthiness of the vehicle. As with all safety features seeking an exemption, the more testing data available, the more it seems possible to make an informed safety equivalency determination.

22) While the number and adequacy of all “trigger” events requiring a remote operator to take over could be difficult to gauge, AAMVA does support a catch-all approach that describes that the manufacturer is ultimately accountable for the responsible remote operation of the vehicle under safety-critical situations and is expected to act in the best interests of public safety (whether remotely operated or not). AAMVA also refers to its previous comments regarding the qualifications and proficiency of remote operators and what that means with respect to adhering to state and local traffic laws. In AAMVA’s Guidance document, refer to Section 5.6.5.

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

Given Nuro categorizes the R2X as a Level 4 vehicle, that means that it has operational limitations as described by its ODD. Any performance limitations that exist as a result of its described ODD, including weather, should be documented prior to production. This may prove especially important as exemption relief is granted to a vehicle. Meaning, as a vehicle is exempted from one aspect of FMVSS design, it may become more vulnerable in other areas. For instance, because it has no windshield, would that expose the vehicle to other potential environmental issues that degrade the functional design of the vehicle as a whole? Any issue that limits the ODD of the vehicle and is a part of the exemption requirement should be documented so that accountability between performance expectations and actual performance can be evaluated competently.

24) AAMVA defers to NHTSA expertise in describing what constitutes a sufficient fail-safe protocol, but requests that this be documented for the vehicles. Further, AAMVA again reiterates the request that manufacturers submit a first-responder safety plan so that if the fail-safe protocol becomes engaged, any interacting first-responders have access to information ensuring their safe engagement of the vehicle.

25) See previous comments regarding training levels of remote operators and how they should be evaluated.

26) See previous comments regarding remote operators and how they monitor and maintain the safety of their fleet.

27) AAMVA appreciates Nuro's commitment to include human-manned professional safety drivers, but wonders what this means in terms of the very exemptions they are applying for. Meaning, if the vehicles are manned, will they still come equipped with mirrors and a windshield? This question also asks about an incremental and "controlled approach to deployment" as a result of being granted the exemptions. This question again begs the question of whether or not the exemptions relieve the manufacturer of any obligation to actually test the technologies before considering them deployed. AAMVA emphasizes that the exemption application is applicable for only two years and should be considered temporary. The vehicles should only be able to operate (should they be granted any exemption) for that two year period until FMVSS have been appropriately modified to accommodate these emerging technologies. NHTSA should monitor and periodically validate the data from the R2X throughout its service life. NHTSA should absolutely remain engaged with the data provided by any driverless vehicle operating under an exemption. At a minimum, NHTSA should stay engaged throughout the duration of its exemption. Exempted vehicles should expect to be monitored as long as they are subject to exemptions, and until they conform appropriately with all FMVSS without exemption. Many of the questions posed near the

end of this section are best submitted directly to Nuro, but represent valid safety considerations.

28) AAMVA defers to NHTSA's expertise on the frequency of map updates.

29) AAMVA defers to other parties with respect to vehicle cybersecurity best practices.

31) AAMVA has previously commented on Nuro's "public interest" rationale in section e. above.

32) AAMVA defers to NHTSA's expertise regarding low-emission vehicles and applicability of the petition.

33) Question 33 speaks to terms and conditions, and the applicable data that would facilitate the granting of conditional exemptions. AAMVA would support NHTSA accepting as much data that would present a genuine picture of the vehicle's safety performance as possible. AAMVA would also support as much data as is required to hold each vehicle and its manufacturer accountable to performing as described in its exemption application, under the controls described in the application, and under the conditions described by NHTSA in its response. AAMVA notes that information related to the vehicles that may come from external sources, such as communities they serve and law enforcement, may also help present a clear safety picture of how the vehicles are operating under the terms of their exemption.

35) This question asks for what duration the agency should require data reporting. AAMVA has previously commented that data should be mandatory for the duration of the exemption, and that the exemption should be required for as long as the vehicle does not conform with the FMVSS.

36) AAMVA defers to NHTSA expertise on how best to accommodate oversight of manufacturer data.

37) AAMVA defers NHTSA on how best to handle instances of sensitive data used in making a safety equivalency determination.

39) AAMVA has previously commented on this question in Section V. Terms above.

AAMVA thanks NHTSA for the opportunity to comment on these groundbreaking technologies. Our membership takes their role in public safety seriously, and looks forward to a greater understanding of how we can protect public interest in the exemption application process. Ensuring we have a clear sense of how these vehicles will standardize performance in the absence of FMVSS is a difficult consideration, but we are confident that as shared safety partners, with a commitment to realizing their true potential, we can accommodate them best by ensuring their safe integration.

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