August 28, 2019

The Honorable Jack Danielson
Executive Director
National Highway Traffic Safety Administration
United States Department of Transportation
1200 New Jersey Avenue S.E.
Washington, DC 20590

Re: Request for Comments Concerning National Highway Traffic Safety Administration Advance Notice of Proposed Rulemaking: Removing Regulatory Barriers for Vehicles with Automated Driving System, Docket No. NHTSA-2019-0036; posted 05/28/2018

Dear Executive Director Danielson:

On behalf of TechFreedom and the R Street Institute, we respectfully submit these comments in response to the U.S. Department of Transportation's (USDOT) request for comments on its advanced notice of proposed rulemaking, "Removing Regulatory Barriers for Vehicles with Automated Driving Systems. (Docket Number NHTSA-2019-0036)" issued in Washington, D.C. on May 28, 2019.[1]

TechFreedom is a post-partisan think tank dedicated to promoting the progress of technology that improves the human condition, R Street is a free-market think tank with a pragmatic approach to public policy challenges. Together, we applaud NHTSA for this particular effort to curb regulatory barriers impeding the promise of automated systems, while acknowledging potential barriers and unintended consequences that could result from such capabilities.[2]

At a high-level, we urge NHTSA to adopt separate and distinct control requirements between vehicle types to ensure that Federal Motor Vehicle Safety Standards ("FMVSSs") compliance for Automated Driving System Dedicated Vehicles ("ADS-DVs") reflects the fundamental differences that exist between AVs and their traditional counterparts. We believe that by using this approach, many of the barriers to compliance verification that NHTSA has identified are more readily overcome. Further, we note that no single compliance verification method proposed by NHTSA will appropriately assess ADS-DV capabilities without either modifying the development trajectory of the vehicles, or relying on inadequate results for safety assurance.

For these reasons, we believe that NHTSA must implement a multifaceted approach to compliance verification testing, reliant on various methods in consort with one another, in order to realize appropriate safety assurance. Specifically, NHTSA's approach should begin with a review of technical

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[1] Removing Regulatory Barriers for Vehicles with Automated Driving Systems, 84 Fed. Reg. 24449 (proposed May 28, 2019)[hereinafter "NHTSA ANPRM"], https://bit.ly/2GfiIPZ.

[2] *See, e.g.* Ian Adams & Caleb Watney, R Street Institute, *Mr. Nader Misses the Mark on Driverless Cars*, WSJ (Aug. 30, 2018), *available at* https://on.wsj.com/30IVIRA, ("An additional safety issue with self-driving vehicles is the effect an outage of cellular or GPS service would have on them and those around them. Will there be highways cluttered with thousands of inoperable vehicles? What will it cost and who will pay for this?").

documentation, proceeding if necessary to digital simulations, and thereafter to targeted physical testing.

Finally, we feel obligated to stress that NHTSA should not slow, or otherwise restrict, the terms on which developers seek to independently verify safety and that, throughout this process, testing should remain about safety verification, not permission or prior approval.

Our comments are divided into the following sections:

I. Comment on the NHTSA's Four Possible Approaches to Removing Regulatory Barriers

NHTSA states that it is considering four possible approaches to address requirements for "manual controls:"

> (1) NHTSA would retain the manual control requirement if the control is necessary for motor vehicle safety on all vehicles (even if that's redundant); (2) NHTSA could remove or modify controls if they are no longer necessary for any vehicle; (3) NHTSA could determine that the control is only necessary for the safety of traditional vehicles and exclude ADS-DVs without manual controls; or (4) NHTSA may create a separate control or equipment requirement for ADS-DVs without manual controls in order to fulfill the same safety function as traditional vehicles.

In 2012, the Transportation Research Board wrote, "[these] 'increasingly interconnected . . . systems are creating opportunities to improve vehicle safety and reliability as well as demands for addressing new system safety and cybersecurity risks.'"[3] For exactly this reason, NHTSA should consider creating separate control requirements to account for the advanced safety capabilities of L4 and L5 ADS-DVs that do not rely on traditional manual controls such as foot-operated brakes to safely operate a vehicle (option four). Not only would doing so obviate possible safety implications associated with the continued presence of otherwise redundant traditional manual controls, it would also be the first step toward developing a body of regulation tailored specifically to the technology.

We believe that contemplating the barriers that are presented by current FMVSS' application to ADS-DVs will yield suboptimal outcomes if NHTSA seeks only to nip-and-tuck existing regulation and avoids the true issue: the need to regulate a vehicle that operates unlike those for which all current FMVSS were drafted. At the center of the challenge is that ADS-DVs replace the operator component of a vehicle - who is governed by driver training and licensing requirements - with a computer-based system that commands the functionality of the series-100 components NHTSA regulates. While the current regulatory structure is being effectively massaged for now, because these systems are so distinct to traditional vehicles, NHTSA should create an entirely separate set of regulations to achieve its intended safety verification goals.[4]

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[3] Smith, Bryant Walker, Symposium: The Transformation of Transportation: Autonomous Vehicles, Google Cars, And Vehicles Talking To Each Other: Automated Driving And Product Liability, [hereinafter "Smith"], (2017) 2017 Mich. St. L. Rev. 1, 28, *quoting* Transp. Research Bd., Nat'l Acad. Of Sci., Special Report 308: The Safety Promise and Challenge Of Automotive Electronics: Insights From Unintended Acceleration (2012), *available at* https://bit.ly/2O2wGuW.

[4] For example, each manufacturer has its own physical and non physical testing capabilities that allow it to develop and improve its ADS-DVs.

The only way to effectively achieve that outcome is to, simultaneously, furnish separate control and equipment requirements while adopting compliance testing methods suited specifically to ADS-DV equipment.

II. Proposed alternative compliance testing methods for 100-series controls

NHTSA proposes six alternative compliance testing methods for all 100-series controls. They are:

(1) Normal ADS-DV operation;

(2) Test Mode with Pre-Programmed Execution (TMPE);

(3) Test Mode with External Control (TMEC);

(4) Simulation;

(5) Technical Documentation for System Design and/or Performance Approach; and,

(6) Use of Surrogate Vehicle with Human Controls.[5]

Below, the advantages and drawbacks of each is addressed. However, as a global matter, we note that none of the methods, in isolation, will be able to effectively verify FMVSS compliance. Only by using a combination of technical documentation review, non-physical simulations, and on-road physical testing, will NHTSA be able to achieve satisfactory compliance verification. By taking this approach, whereby compliance review ratchets up in intensity from the conceptual, to the digital, to the physical, NHTSA will effectively target its testing in a manner that will better focus its inquiries to high-risk areas while limiting associated expenses.

1. Normal ADS-DV Operation

In "Normal ADS-DV Operation" testing, ADS-DVs are tested without a human driver and are simply observed by testing engineers.[6] This approach has the benefit of being the best proxy for how such vehicles will operate in practice, but is not viable as a stand-alone option for safety verification because of the enormous number of testing hours needed to address any given scenario.[7] For this reason, "Normal ADS-DV Operation" testing is best when complemented in conjunction with other verification testing methods, like simulation, discussed below. This combined approach would allow "Normal ADS-DV Operation" testing to focus on areas highlighted by less costly testing methods.

Q13. Are there specific challenges that will be encountered with this kind of approach for vehicle compliance verification? Please be specific and explain each challenge.

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[5] NHTSA ANPRM at 29-30, *supra* note 1.

[6] *Id.* at 33

[7] Fraade-Blanar, Laura, et al., *Measuring Automated Vehicle Safety*, RAND, 26 (2018)[hereinafter "Fraade-Blanar"] , *available at* https://www.rand.org/pubs/research_reports/RR2662.html.

Researchers have found that ADS-DVs exhibit non-deterministic behavior,[8] which means that under the normal operating approach proposed by NHTSA, ADS-DVs must be driven for millions of miles in order to determine safety defects.[9] If employed in isolation, this method could set back development and production for years, putting the safety benefits of AVs on hold as more - and increasingly avoidable - human error-related accidents occur.[10]

Q15. <u>How would NHTSA ensure that the performance of the ADS-DV during testing is consistent with how the vehicle would perform during actual normal use?</u>

NHTSA can best ensure that ADS-DV testing is consistent with how vehicles would perform during actual normal use by using a combination of verification methods. Specifically, NHTSA should begin with a broad technical documentation review, moving on that basis to non-physical simulations, and then, informed by those simulations, turn to on-road physical testing. Doing so would target testing, thereby eliminating some of the guess-work and luck associated with random screenings on "normal operation" alone, while limiting its associated expenses.

2. Test Mode with Pre-Programmed Execution (TMPE)

The TMPE approach acknowledges that standard testing mechanisms designed for traditional vehicles will not work for ADS-DVs. However, the TMPE approach does not resolve the fundamental barriers to compliance posed by an ADS-DV's distinct functionality. That is because, in practice, while tailoring ADS-DVs better to existing testing methods otherwise suited for traditional vehicles, the TMPE approach remains limited.

Q. 19 <u>Can ADS-DV be expected to perform within tight tolerance levels using the regular on-board sensors?</u>

A key concern with testing ADS-DVs under the TMPE approach is that properly testing these vehicles will require millions of hours.[11] Simply running a pre-programmed test execution may satisfy regulators that the ADS-DV can pass NHTSA's tests, but will offer little assurance that the vehicle can handle unpredicted situations.[12] Risk tolerance levels placed on the regular on-board sensors are

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[8] Helle, Phillip, et al.,Testing of Autonomous Systems - Challenges and Current State-of-the-Art, INCOSE (2016)[hereinafter "Helle"], *available at* https://bit.ly/2XRIgNY.

[9] Fraade-Blanar at 26, *supra* note 8.

[10] *C.f.* Examining Technological Innovations in Transportation: Hearing Before the Subcomm. on Transportation and Safety of the S. Comm. on Commerce, Science, and Transportation, 115th Cong. (2019) (statement of Sen. Richard Blumenthal, Member, S. Subcomm. on Transportation and Safety) ("[Automated emergency braking is] life saving technology available right now. . . . [W]e'll be debating legislation that might further driverless cars, but automated emergency braking technology is available right now, and it could literally stop 80 percent of the rear-end collisions that we have in this country."), https://bit.ly/32wMWaN at 1:20:50 - 1:21:20.

[11] *See* NVIDIA, Self Driving Safety Report, 21 (2018)[hereinafter "NVIDIA Safety Report"], *available at* https://bit.ly/2PpZptp; *see also* Smith at 31, *supra* note 3 ("A statistical comparison between automated and conventional driving could require hundreds of millions of miles of representative driving--and probably much more.").

[12] *See* Koopman, Phillip & Wagner, Michael, Challenges in Autonomous Vehicle Testing and Validation, 4 SAE INT'L J. TRANSP. SAFETY 15, 16 (2016)[hereinafter "Koopman & Wagner]", ("While testers can define some

imperfect when applied to real-world situations,[13] but within the confines of a test track, NHTSA will find it difficult to "prove" that ADS-DVs fail to meet acceptable risk tolerance levels by using a traditional testing method.[14] The use of a TMPE testing method, which is similar to traditional testing methods with the exception of pre-programmed tasks, would perform roughly the same procedural functions as the normal testing method,[15] and would also likely run into this problem.

> Q. 23 <u>Are there other considerations NHTSA should be aware of when contemplating the viability of programmed execution-based vehicle compliance verification?</u>

As discussed above, the problem with implementing TMPE in ADS-DVs is that it merely modifies traditional testing mechanisms which are not effective in testing the safety of ADS-DVs.[16] Under the TMPE approach, NHTSA proposes that it would require manufacturers to include a compliance library, not unlike the testing programs used during a manufacturer's testing, from which an engineer could access various maneuvers pre-programmed into the vehicle.[17] The engineer would then monitor the vehicle as it performs commands along a designated test track.[18]

It is generally accepted that effectively testing ADS-DVs requires millions, if not billions, of hours monitoring these vehicles in order to ensure safety.[19] Employing a test engineer, or even a team of test engineers to monitor these systems for the millions of hours required would set the industry back an unnecessary number of years in red tape.

The TMPE approach prevents NHTSA from pursuing its mission to seek out newer and better alternatives to ensure safety on the roadways.[20] Contouring ADS-DVs to adapt to the traditional vehicle safety checklist represents a quick fix, providing not terribly instructive results related to the safety benefits of tested vehicles.

3. Test Mode with External Control (TMEC)

> Q. 29 <u>Are there other considerations NHTSA should be aware of when contemplating the viability of using an external controller-based vehicle certification?</u>

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off-nominal test cases, scalability of that testing is questionable due to the combinatorial explosion of exceptions, operational scenarios, and other factors involved."), *available at* https://bit.ly/2SpfluS.

[13]*See* Koopman & Wagner at 7 ("It seems likely that with the inherent complexity of an autonomous vehicle and the clear inability to demonstrate anything close to perfection via testing, it will be important for developers to create a safety assurance argument in the form of an assurance case.").

[14] *Id.*

[15] *See* NHTSA ANPRM at 35-36, *supra* note 1

[16] *See* Koopman & Wagner at 1, *supra* note 13; and *c.f.* Smith at 31, *supra* note 3.

[17] NHTSA NPRM at 37-41, *supra* note 1.

[18] *Id. at* 37.

[19] *See* Fraade-Blanar at 24 *supra* note 8; Koopman & Wagner at 1 *supra* note 13; Smith at 31 *supra* note 3; and *see* NVIDIA Safety Report at 21, *supra* note 1("To demonstrate that a self-driving system has a lower collision rate than human drivers requires a sizable test fleet driving many miles. As a result, it's very difficult to verify and validate vehicle self-driving capabilities solely using on-road testing.").

[20] Safety Act; and *see* NHTSA ANPRM at 5 ("NHTSA believes that safety should be the preeminent consideration when evaluating whether and how the test methods discussed in this document could be used to address regulatory barriers to ADS-DVs.").

Testing ADS-DVs for compliance using external controls ("TMEC") approach is largely similar to the TMPE approach, in that a human-operator monitors the AV until testing has been satisfied.[21] It is also similar to the surrogate vehicle approach, discussed below, because it fails to fully account for the advanced capabilities ADS-DVs provide. Given the fact that these vehicles will be operated autonomously, instead of by a human operator, NHTSA would disserve consumers by opting not to test AVs within the constructs of their anticipated operation. For these reasons, the TMEC approach's utility may best realized in the context of component testing.

For instance, in testing the braking mechanisms or transmission components of AVs. But, like the other approaches, it will not effectively measure the new variables posed by ADS-DVs. These new variables, traditionally thought of as driver responses that are ensured by driver training and licensing requirements,[22] are now within the remit of NHTSA's authority.

Failure to take into account ADS interaction with series-100 components could cause the agency to overlook non-compliant component applications.[23] For instance, it would be unreasonable to test braking mechanisms without also testing the amount of pressure the ADS applies to the brakes in emergency situations, icy weather, or rugged terrain. Similarly, it is not enough to test the transmission without also determining whether the ADS interaction with the transmission is an appropriate response to steep grades, highway entry and exit, or long-distance travel. A test engineer may be able to test all of the required test maneuvers using the TMEC approach, but will never be able to detect a system flaw that shifts the vehicle to park when travelling down a busy highway, or shifts the car into neutral when idle in a parking spot situated on an incline.

We recognize that testing the interaction between ADS-DVs and series-100 components requires millions of hours,[24] as previously mentioned, and the TMEC approach may be a component of the comprehensive multifaceted approach taken by NHTSA. However, the TMEC approach alone is insufficient to address the new challenges posed by ADS-DVs to NHTSA's compliance and verification testing.

4. <u>Simulation Testing</u>

As discussed above, NHTSA's current approach to testing and compliance is based on the conceptual model of a traditional, human-controlled vehicle. Since this model is ill-suited to test the safety and reliability of ADS-DVs, novel approaches are necessary. To this end, NHTSA should develop simulation-based testing methods to operate in concert with a compliance verification process predicated on physical operation.

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[21] *Compare* NHTSA ANPRM 35-40 *and* NHTSA ANPRM 41-43.

[22] Banks, Victoria A. & Stanton, Neville A., Analysis of driver roles: modelling the changing role of the driver in automated driving systems using EAST, 2 (2017)[hereinafter "Banks & Stanton"], ("Automation of the driving task brings with it a shift in the role and responsibilities of the human driver."), *available at* https://bit.ly/2LTSFlg.

[23] Smith at 28, *supra* note 3.

[24] *See* Fraade-Blanar at 24 *supra* note 8; Koopman & Wagner at 1 *supra* note 13; Smith at 31 *supra* note 3; and *see* NVIDIA Safety Report at 21, *supra* note 12.

We recognize that simulation testing has not historically been used as NHTSA's mode of verifying compliance[25] and that its novelty presents challenges, but AV simulation methods also present unique opportunities for regulators seeking to ensure safety.

Q. 30 How can simulations be used to assess FMVSS compliance?

In order to properly develop ADS-DVs, AVs must be exposed to a plethora of environments. Closed courses and millions of miles on public roads will account for much of the work, but to accurately demonstrate and ensure the effectiveness of the entire system digital simulations will also play a role.[26]

The use of simulations that can effectively replicate various testing environments should be a chief focus for NHTSA, because an AV's ability to respond appropriately to dangerous events is, in large part, informed by the situations it has already encountered.[27] Some experts even argue that ADS-DVs are only as good as their software designers' foresight.[28] For this reason, absent testing, ADS-DV systems will occasionally lack situational insights.[29]

NHTSA should have the ability to test these systems for millions of miles to identify and address their compliance with existing FMVSS.[30] With simulations, NHTSA can test AVs in a variety of situations and grades, to improve the results of physical testing.[31] But, again, only by employing a comprehensive multifaceted approach that involves additional technical review and physical deployments will the safety of these vehicles be appropriately vetted without setting them back years in red tape.

Q.31 Are there objective, practicable ways for the agency to validate simulation models to ensure their accuracy and repeatability?

Validating AV's using simulations alone suffers from the same deficits as AVs themselves: chiefly that a simulation model is only a good as the developer that designs it.[32] Conducting simulation testing on AVs, without also validating the results of the simulation, is insufficient to detect real-world situations where ADS-DVs may malfunction.[33] However, when used in conjunction with physical testing, such as operating the ADS-DV on a test track to verify a sample of testing scenarios, the accuracy with which simulation testing models verify compliance is improved.[34]

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[25] NHTSA ANPRM at 45.
[26] See Fraade-Blanar at 26 *supra* note 8.
[27] *Id.* at 20-21.
[28] See Koopman & Wagner at 3.
[29] *Id.*
[30] *See* Fraade-Blanar at 24 *supra* note 8; Koopman & Wagner at 1 *supra* note 13; Smith at 31 *supra* note 3; and *see* NVIDIA Safety Report at 21, *supra* note 12.
[31] Fraade-Blanar at 15-16.
[32] *Compare* Koopman & Wagner at 3; and Laura Fraade-Blamar at 16.
[33] NVIDIA Safety Report at 8, Fraade-Blanar at 16.
[34] See Fraade-Blanar, at 16.

Some experts have also argued for "fault injection," whereby defects are introduced to measure an ADS-DV's response to those defects and identify weaknesses.[35] For example, instead of monitoring an ADS's ability to drive a specified route programmed into the GPS, the system would be required to adapt to road conditions when the GPS maps are providing conflicting data.[36] The general theory behind fault injection on the manufacturing side of the regulatory equation is that by measuring the ADS-DV's ability to adapt and improvise in the face of programming errors, manufacturers can improve their vehicles to prepare them for unforeseen circumstances. On the agency side, fault injection may be a useful tool for NHTSA to ensure that manufacturers are not simply gaming the testing system, and the AVs on the road meet the agency's desired risk tolerance levels.

> Q. 32 - Is it feasible to perform hardware-in-the-loop simulations to conduct FMVSS compliance verification testing for current FMVSS?

As discussed in Q. 31 above, simulation testing alone is not sufficient to conduct compliance verification testing for current FMVSS. However, regarding the feasibility of hardware-in-the-loop simulations as a central component to NHTSA' multifaceted approach to compliance verification testing, it is worthwhile to note that manufacturers use their own versions of such simulation in the design stages of development to ensure that their vehicles are safe and reliable.[37] Such use is testamentary to the feasibility of simulation-based testing.[38]

5. Technical Documentation for System Design and Performance Approach

Technical Documentation sharing, as discussed in the simulation approach section, has merit provided the scope of what will be shared is cabined by the needs of verification and held in strict confidence.[39] Under such circumstances, sharing may help NHTSA refine safety testing and compliance verification methods that are more efficient and less costly for the agency and manufacturer alike.

Fortunately, the agency already has a conceptual framework for evaluating new technologies, stemming from its approach to the development of electronic stability control (ECS) systems.[40] The same model could be applied to ADS-DVs in order to verify compliance where possible, and could be employed in conjunction with other methods where not.

> Q. 34 How can the documentation-focused approach ensure compliance with FMVSS, considering it neither verifies that the vehicles on the road match the documentation nor confirms that the vehicles on the road comply with the FMVSSs?

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[35] See e.g. Koopman & Wagner at 7.

[36] *Id.* suggesting that incorrect GPS maps, and other defects could assure safety by measuring a vehicle's response.

[37] *See* Fraade-Blanar at 17.

[38] *See* NHTSA ANPRM at 46.

[39] 49 C.F.R. § 512.

[40] NHTSA ANPRM at 49, (referring to compliance demonstration for a portion of FMVSS No. 126 regarding Electronic Stability Control).

Reviewing technical documentation to ensure the compliance of ADS-DVs is not in all cases sufficient. The ANPRM points out that technical documentation does not confirm the level of performance for the physical vehicle,[41] nor does it anticipate the interaction between vehicle components.[42] Yet, such an interpretation does not account for circumstances in which documentation is, itself, a compendium of safety assessments. Nor does it account for cases in which systems are otherwise proven, or not meaningfully modified. In either case, documentation review - alone - may be sufficient.

Still, the use of technical documentation as a part of a more comprehensive, multifaceted approach is desirable and could ensure that compliance verification testing is well-rounded and well-considered in order to produce maximum safety assurance.

> Q. 35 If technical documentation were acceptable for compliance verification, how would the manufacturer assure the agency that the documentation accurately represents the ADS-DV and that the system is safe?

Some manufacturers have proposed an approach for technical documentation compliance testing in which the manufacturer would provide NHTSA with data from the manufacturer's tests in order to satisfy requirements.[43] While such an approach is facially desirable because of the expense it may save NHTSA, in the absence of universal outcome-based standards, the results reported by each manufacturer may be misleading. Worse, in the event of a system failure, the entire industry may be viewed as delinquent.

Axiomatic of this phenomenon is the California Department of Motor Vehicles' use of disengagement reports for autonomous vehicle testing in the state. As a result of this requirement, the CA DMV received fundamentally inconsistent data depending on the company's method of counting disengagement.[44]

That said, if NHTSA were to provide a specific standard for testing, as the agency proposes in the ANPRM,[45] this method may prove useful to establish desired verification thresholds to supplement testing methods.

What's more, technical documentation is also an effective primer for simulation testing, since simulations may be designed to test perceived weaknesses in a vehicle's design that are specific to that manufacturer.

6. Surrogate Vehicle

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[41] NHTSA ANPRM at 50.
[42] *Id.*
[43] NHTSA ANPRM at 49-50.
[44] *See* Andrew J. Hawkins, *California's Self-Driving Car Reports are Imperfect, but They're Better Than Nothing*, The Verge (Feb. 13, 2019), *available at* https://bit.ly/2XNYRlX.
[45] NHTSA ANPRM at 50.

Using a surrogate vehicle for compliance testing entails developing separate "test" vehicles that include manual controls, unlike ADS-DVs.[46] As the agency acknowledges, this method of testing is inadequate due to the inherent differences between the surrogate vehicle that includes traditional manual controls in anticipation of human interaction, and ADS-DVs that performs driving functions without human interaction.[47] This approach, similar to the TMEC approach discussed above, fails to factor in the functionality of the ADS system in conjunction with the series-100 components.

The surrogate vehicle approach also negates NHTSA's reliance on random vehicle testing because it would require a manufacturer to create a set number of surrogate models for the agency. This approach offers the least assurance that ADS-DVs comply with FMVSSs because the vehicles tested will not be ADS-DVs. This approach may also create a perverse incentive for manufacture surrogate vehicles to be built at a higher standard than the actual ADS-DVs, which will cause skewed compliance verification results.

> Q37. <u>To what extent could equivalence of the vehicle components used for conventional and ADS-DVs be demonstrated to assure that surrogate vehicle performance would be indicative of that of a surrogate ADS-DV?</u>

Testing ADS-DVs for compliance using the surrogate vehicle approach is significantly similar to those described in the TMEC approach because it fails to fully account for the advanced capabilities ADS-DVs provide. Given the fact that these vehicles will be operated autonomously, instead of by a human operator, NHTSA would disserve consumers by not testing AVs within the context of their anticipated operation.

NHTSA may find utility in testing components of AVs using the surrogate vehicle approach, but will not otherwise effectively measure the new variables posed by ADS-DVs. These new variables, traditionally thought of as driver responses that are ensured by driver training and licensing requirements,[48] are now within NHTSA's remit.

Respectfully Submitted,

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[46] *Id.* at 52

[47] Id. at 52.

[48] Banks & Stanton at 2.