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Public Interest Comment[1] on

The National Highway Traffic Safety Administration's Policy Guidance

Federal Automated Vehicles Policy: Accelerating the Next Revolution In Roadway Safety

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The George Washington University Regulatory Studies Center

The George Washington University Regulatory Studies Center improves regulatory policy through research, education, and outreach. As part of its mission, the Center conducts careful and independent analyses to assess rulemaking proposals from the perspective of the public interest. This comment on the National Highway Traffic Safety Administration's policy guidance on driverless car technology does not represent the views of any particular affected party or special interest, but is designed to evaluate the effect of NHTSA's policy on overall societal welfare.

Introduction

The National Highway Traffic Safety Administration's (NHTSA) *Federal Automated Vehicles Policy* establishes how the agency will address driverless car technology through its current regulatory framework and identifies new regulatory tools that could be used in the future.

[1] This comment reflects the views of the authors, and does not represent an official position of the GW Regulatory Studies Center or the George Washington University. The Center's policy on research integrity is available at http://regulatorystudies.columbian.gwu.edu/policy-research-integrity.

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NHTSA's policy establishes comprehensive vehicle performance guidance for vehicles with automated technology. To comply, regulated entities should first ensure compliance with all applicable Federal Motor Vehicle Safety Standards (FMVSS), and then address each of eleven cross-cutting areas including privacy, data collection, vehicle cybersecurity, ethical considerations, and federal, state, and local laws. NHTSA requests that regulated entities voluntarily submit reports to the agency on how their vehicles address these eleven cross-cutting areas, and to do so at least four months before new automated features are tested on public roads.

NHTSA also considers several new regulatory tools and authorities, including the potential for pre-market approval of automated vehicle technology. To ensure that these standards do not impede developing technology, NHTSA also considers imposing "sunsets" on rules setting FMVSS.

Considering the impact of this policy guidance on innovation and social welfare is critical because the safety gains from highly automated vehicles (HAVs) could be significant. There were 35,092 deaths on U.S. roadways in 2015 alone, and the pace of these deaths has increased by 10% in the first half of 2016.[3] What's more, 94% of crashes can be tied to a human choice or error.[4] HAVs hold the promise to reduce fatalities from crashes due to human mistakes and provide transportation independence to people with disabilities, aging communities, and households without the means to own a car.

Attention to innovation is particularly important because HAVs are highly likely to pose lower risks than the vehicles they replace. They will, of course, pose risks. Excessive attempts to reduce those risks, however, are likely to slow the introduction of products that have the net effect of reducing an even larger risk. Overregulation will make the perfect the enemy of the good, and the numerous victims of human error on the road will pay the price.

Regulation as a Barrier to Innovation

NHTSA is correct to be cautious of the potential effects that a federal policy could have on innovation. Regulatory policy is a powerful tool that can constrain markets and the availability of new products and technology.[5] Some aspects of NHTSA's HAV policy, particularly the components dealing with premarket approval, have the potential to act as significant barriers to entry, competition, and innovation in the HAV and HAV technology sphere. Below we explore some ways in which the new regulatory tools and authorities could act as a barrier to innovation, and the resulting effects on public health and safety.

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3. Melanie Zanona. "Feds aim to eliminate traffic deaths as fatalities climb," *The Hill*, October 5, 2016.
4. NHTSA, "Federal Automated Vehicles Policy." September, 2016. Page 5.
5. Miller et al. Public Comment to the National Economic Council on The President's Executive Order 13725: Steps to Increase Competition and Better Inform Consumers and Workers to Support Continued Growth of the American Economy. *The George Washington University Regulatory Studies Center*. May 12, 2016.

Pre-Market Approvals

NHTSA's policy outlines a number of new regulatory tools and authorities that the agency may use to regulate HAVs and HAV technology, including pre-market approval of HAVs and new safety technologies. This policy does not necessarily advocate or oppose any of the listed tools and authorities; instead, NHTSA seeks comment on those potential approaches that are "best at providing sound, predictable, consistent, transparent, and efficient regulatory pathways for manufacturers and other entities that ensure consumer safety while facilitating innovation."[6]

Within the category of new authorities, NHTSA considers pre-market safety assurance tools, which could include requiring manufacturers to report pre-market testing and analysis to the agency. The agency also considers pre-market approval authority, which would depart from the agency's current self-certification approach to vehicle regulation by prohibiting the manufacture or sale of HAVs until they have been proactively tested and approved by the agency.

Although such regulatory tools and authorities are intended to reduce risks, they also introduce risks of their own by delaying changes that could improve safety and by replacing regulated risks with new ones.[7] In such cases, regulators should evaluate the risk-risk tradeoffs to determine whether the benefits of risk regulation are sufficient to justify the costs.[8] As explored below, premarket approval authority for HAV technology could introduce significant risks in the form of traffic fatalities by delaying adoption of innovative safety technologies.

Costs of Delaying New HAV Technology

Although NHTSA notes the importance of avoiding regulatory barriers to innovation, any type of premarket approval (PMA) authority would significantly delay the introduction of new HAV technology. The Federal Aviation Administration typically takes between three and five years to certify new aircraft, and a recent certification took as long as eight years.[9] Particularly given the significant number of road fatalities under current conditions and the potential for new technologies to significantly improve safety, NHTSA should be very hesitant to adopt any type of PMA mechanism for HAVs or HAV technology. Such an approach has the potential to drastically delay lifesaving advances in automotive technology.

By using the Department of Transportation's (DOT's) value of statistical life (VSL) and projecting annual road fatalities as a proportion of the U.S. population, we analyzed the costs—

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6 NHTSA, "Federal Automated Vehicles Policy." September, 2016. Page 70

7 See Peter Huber, " Exorcists v. Gatekeepers in Risk Regulation," *Regulation Magazine*, Winter 1983.

8 For examples of this type of analysis, see W. Kip Viscusi, "Risk-Risk Analysis," Journal of Risk and Uncertainty, 8:5-17 (1994).

9 NHTSA, "Federal Automated Vehicles Policy." September, 2016. APPENDIX II: REGULATORY TOOLS USED BY FAA. Pages 95-96.

both in monetary terms and in lives lost—of delaying HAV technology.[10] This sensitivity analysis measures the benefit to human lives if HAV technologies introduced in new vehicles reduce fatalities due to human error from new vehicles by between 1% and 10%, and the potential costs therefore of delaying their introduction to the market.

Safety improvements introduced via HAVs are measured here in percent reductions in traffic fatalities caused by human error in new vehicles. Although new vehicles each year represent a relatively small proportion of the overall fleet, even marginal safety improvements represent significant decreases in annual traffic fatalities as vehicles introduced after 2018 compose a larger segment of the overall passenger vehicle fleet.

Our analysis is relatively conservative because it assumes relatively small safety gains resulting from new technology and does not build in cumulative safety improvements as overall rates of traffic fatalities decrease. Moreover, it ignores benefits after 2030 that will continue to be realized from improvements introduced in the 2018 model year. At that point, the first models introduced with improvements will have just passed the average age of cars on the road, 11.5 years at the end of 2014.[11] As such these estimates should be treated as lower bounds.

This analysis uses 2018 as the year that safety improvements from HAVs and HAV technology are introduced via new vehicles, and no safety improvements are assumed from vehicles already on the road pre-2018. Lives saved are calculated against a baseline in which traffic fatalities due to human error remain constant as a proportion of the projected U.S. population through 2030. Although this analysis is preliminary, it illustrates the significant safety gains advances in HAV technology could yield.

Decrease in Fatalities from New Vehicles	Total Lives Saved (2018-2030)	Lives Saved per Year	Total Benefits Discounted to 2018 (7%)	Annual Benefits Discounted to 2018 (7%)
1%	2,403	185	$12.14 billion	$934.1 million
3%	7,208	554	$36.43 billion	$2.8 billion
5%	12,014	924	$60.72 billion	$4.67 billion
10%	24,027	1,848	$121.43 billion	$9.34 billion

10 See the Department's *Memorandum to Secretarial Officers & Modal Administrators, From Polly Trottenberg: Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses*. 2013. Available at: https://www.transportation.gov/regulations/economic-values-used-in-analysis

11 Nora Naughton, "Average age of U.S. fleet hits record 11.5 years, IHS says." *Automotive News.* July 29, 2015.

If HAV technology has the potential to reduce traffic fatalities from new vehicles by as little as one percent in 2018, then a one-model-year regulatory delay could result in 26 additional traffic fatalities in 2018 alone, and over 300 additional traffic fatalities throughout the lifetimes of the Model Year 2018 fleet. A 3-5 model-year delay, as one might expect from FAA's experience, could result in between 850 and 1,297 additional traffic fatalities over the lifetimes of the Model Year 2018 fleet, at a discounted social cost of between $4.94 billion and $7.3 billion. If HAV technology reduces traffic fatalities from new vehicles by as much as three percent, the discounted social costs of a three-model-year delay increase to $14.83 billion.

Due to NHTSA's suggested page limit, this analysis is not further expanded upon in this comment. However, the George Washington University Regulatory Studies Center will publish a fuller analysis with an explanation of methodology and assumptions, which the agency is encouraged to review as it considers its options.[12]

Premarket Information

Costs of regulatory delay are not confined to a formal premarket approval requirement. The Policy Statement's contemplated requirement for a detailed regulatory submission at least four months before active road testing or actual deployment of a new automated system is likely to add at least four months to the process of introducing a new system. A new or revised Safety Assessment must be submitted for any hardware or software updates that "materially change the way in which the vehicle complies," even if the change is a clear improvement. Although there may be some overlap between regulatory review and other necessary steps to introduce a system, the requirement for four months advance is likely to delay testing or deployment. Additional delays are likely if NHTSA questions the Assessment (which is presumably the purpose of the advance notice requirement). NHTSA has a clear interest in reporting to keep it abreast of market developments in an area where technology is likely to evolve rapidly. It is far less clear why, in the absence of regulatory standards that manufacturers must meet, it needs *premarket* information, and the guidance document itself offers no rationale.

Though this analysis does not quantify aggregate lost consumer surplus from postponing HAV technology, Daziano et al. have calculated elsewhere that the average household is willing to pay between $3,500 and $4,900 for various levels of HAV technology.[13] As such, delaying HAV technology would also incur significant aggregate losses to consumer surplus, which may be in addition to significant costs in the form of lives lost.

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[12] View the full analysis at www.RegulatoryStudies.gwu.edu or contact author Sofie E. Miller for further information.

[13] Ricardo A. Daziano, Mauricio Sarrias, & Benjamin Leard. "Are consumers willing to pay to let cars drive for them? Analyzing response to autonomous vehicles." *Resources for the Future*. August 2016.

Benefits of Additional Regulation of HAV technology

Given the typical diffusion pattern of new innovations, the potential benefits of greater oversight of HAV technology are small. Both safety and other types of innovations are typically adopted initially by relatively small numbers of early adopters. If the innovation is successful, it then diffuses to a broader population, slowly at first and then more rapidly. The introduction of anti-lock braking systems is instructive. Ford introduced anti-skid systems in on high-end models in 1969.[14] By the 1990 model year, anti-lock braking was present on only 7.6% of cars. Market penetration grew more rapidly thereafter, reaching 58% of new cars in the 1995 model year.[15]

The fact that innovations typically start small limits the potential damage that mistakes might otherwise cause. Market-based diffusion allows time to work out the bugs that likely accompany any new product introduction while the stakes are relatively small, because few are using the technology. Even an innovation introduced on all units of the most popular model in 2015 would have impacted fewer than 430,000 vehicles,[16] and it seems far more likely HAV innovations will be introduced initially as options on a far more limited number of vehicles. Moreover, mistakes can be corrected at relatively low cost, limiting the damage to early adopters who are generally aware that they are assuming some risks with a new technology. Low cost correction seems particularly likely with HAVs, where automatically downloaded changes can correct software problems, just as they do for computer and smartphone operating systems (see the sections below for further comments on software updates).

Benefits from additional scrutiny of HAV technology occur only when that scrutiny reduces risks that would otherwise have occurred. The Insurance Institute for Highway Safety estimates the baseline risk for all 2011 model year vehicles at 28 driver fatalities per million registered vehicle years.[17] For the most popular model in 2015, this baseline risk would amount to approximately 6 deaths.[18] To justify the substantially higher safety risks of regulatory delay discussed above, NHTSA's prior review of a HAV innovation would have to prevent a truly disastrous HAV innovation that vastly increased the baseline risk.

The high cost of delaying risk-reducing innovation, compared to the low benefits of scrutinizing innovations before they are introduced, is presumably part of why Congress established an automotive safety scheme based on federal safety standards to reduce known hazards, rather than

14 Jim Koscs. "Anti-lock Brakes: Who Was Really First?" *Hagerty*, April 2013.

15 David E. Zoia. "These days, it's safety first: air bag, ABS installation rates continue to soar." *Wards Auto*, October 1, 1995.

16 Timothy Cain, "Top 25 Best-Selling Cars In America - 2015 Year End." *Good Car Bad Car*, January 5, 2016.

17 Insurance Institute for Highway Safety, Highway Loss Data Institute. "SAVING LIVES: Improved vehicle designs bring down death rates." *Status Report*, Vol. 50 No. 1. January 29, 2015.

18 The calculation assumes 430,000 vehicles sold uniformly over the year, for a total of 215,000 registered vehicle years in the first year.

a premarket approval scheme to make sure cars are "safe." That judgment is even more applicable to HAV technology than to other engineering innovations.

Preemptive Standards

The potential tensions between building the best possible HAV and the benefits of rapid introduction of risk reducing technology are apparent in at least two of NHTSA's cross cutting areas of guidance. Urging entities to consider the need to accommodate people with disabilities is surely a worthy goal, but detailed regulatory oversight of the accessibility of the interface while the system itself is still rapidly evolving is likely to delay the introduction of safer products. This is particularly true in the case of testing to identify capabilities and limitations of the technology, such as the Uber experiment with self-driving cars in Pittsburgh.[19] Why the interface should allow for the possibility of passengers with disabilities is not at all clear.

Perhaps more significant is the emphasis the Safety Assessment appears to place on how automated systems will address ethical considerations. Because there is not now, and probably cannot ever be, a comprehensive list of the ethical dilemmas that software may either create or resolve, regulatory scrutiny seems like a license for delay. Learning by doing may be a better way to identify and address the choices that automated systems may make, whether the dilemmas are operational or ethical. Although the requirement for a safety assessment would clearly apply to Uber's attempt to learn by doing in Pittsburgh, it is not at all clear what NHTSA might expect that assessment to say about ethical considerations.

Barriers to Safety Improvements

Regulation of Software Updates

NHTSA should ensure that its guidance to manufacturers regarding timetables and procedures for Safety Assessments and its regulation of software changes do not create unnecessary barriers to safety improvements. The following considers two safety assessment areas in particular: Object and Event Detection and Response (OEDR) and Vehicle Cybersecurity. As currently worded, NHTSA's guidance regarding its intended approach for regulating HAV software is unclear. At least two aspects of HAV development prescribe the use of caution in regulating software:

- **It may be too early for productive regulation in this area.** The uncertain direction of technological development—particularly for nascent technologies—"can render regulations and standards obsolete, or worse, a barrier to development."[20] In particular,

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[19] Signe Brewster. "Uber starts self-driving car pickups in Pittsburgh." *Tech Crunch*, September 14, 2016.
[20] Anderson et al. "Autonomous Vehicle Technology: A Guide for Policymakers" *RAND Corporation*, 2016. P. 104

the agency should avoid regulating in such a way that favors a specific technological approach over another.

- **NHTSA should not restrict the ability of manufacturers to provide software updates to vehicles.** At a minimum, the agency should ensure it does not create unnecessary barriers for the implementation of software that specifically addresses safety and security concerns.

Experimentation helps Avoid Path Dependency

The federal government, particularly DOT and the Federal Communications Commission (FCC), is currently working to preemptively assist in the development of Dedicated Short-Range Communications (DSRC) to allow HAV to communicate with each other.[21] This approach—"cooperative automation" versus "autonomous automation"—is widely considered by experts as a necessary development in achieving complete vehicle automation due to the fact that "the cooperative exchange of data [between vehicles]…provides vital inputs to improve the performance and safety of the automation system."[22] However, it is worth noting that DSRC is not the only approach to developing HAV. Forcing manufacturers to invest in this approach over other methods may create a path dependency that results in less effective technology, unnecessarily increased costs for consumers, or both.[23]

A recent report by the RAND Corporation includes a case study that echoes this concern:

> A global technology developer described how a DSRC only solution might inhibit mass-market deployment for up to 30 years, but a combined approach of sensors, radar, lidar, and DSRC could accelerate deployment of [HAVs] by bringing costs down for massmarket acceptance.[24]

In short, an overly restrictive regulatory approach at this stage could not only forestall the benefits of HAV, but could induce outcomes that run counter to NHTSA's stated goal of increased safety and security in transportation. Path dependency and a lack of experimentation

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[21] For example, the FCC is currently deciding on an approach to set aside the 5.9 GHz spectrum band solely for use in Vehicle-to-Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication. See: https://www.fcc.gov/news-events/blog/2016/06/08/defining-auto-safety-life-59-ghz

[22] Jonathan Petit and Steven E. Shladover "Potential Cyberattacks on Automated Vehicles" IEEE Transactions on Intelligent Transportation Systems, Vol. 16, No. 2, April 2015. P. 546

[23] The Center previously submitted comments in response to NHTSA's Advanced Notice of Proposed Rulemaking related to vehicle safety standards for Vehicle-to-Vehicle Communications. Available at: https://regulatorystudies.columbian.gwu.edu/sites/regulatorystudies.columbian.gwu.edu/files/downloads/Brock-Scherber-NHTSA-2014-0022.pdf

[24] Anderson et al. p. 83

with various methods for addressing HAV telematics are both outcomes that run counter to NHTSA's goals for safe and robust HAV OEDR.

Cybersecurity Risks

HAVs employ sophisticated technology that allows them to navigate with increasingly less human input. However, one tradeoff is that the increased use of micro controller units (MCU) and software code expands the number of "attack surfaces…increase[ing] the risks to cyber attack."[25] A demonstration by teams from the University of Washington and the University of California, San Diego proved that serious attacks can be mounted relatively cheaply; these teams simulated a successful attack against a HAV. They were able to reprogram the vehicle to lock the left rear brake once the car reached 70 mph using a cellular connection.[26]

Attacks such as these can generate "wrong reactions…that can be life-threatening for the driver, passengers and surrounding vehicles."[27] It is worth noting here that although there are important cybersecurity-related risks in expanding the use of—and reliance on—HAVs, the use of an evidence-based regulatory (EBR)[28] approach can facilitate manufacturer's efforts to mitigate these risks. An EBR approach "plans for, collects, and uses evidence to predict, evaluate and improve societal outcomes throughout a rule's life."[29] The agency can benefit from the data it intends to collect from HAV performance to shift its evaluative thinking and regulatory design from "what works" towards the more nuanced "what works for whom in what contexts."[30] This approach benefits from the use of continuous incremental improvements and the creation of knowledge to improve policymaking.

Speed is Invaluable for Defense

Cybersecurity can be viewed as an iterative game between attackers and defenders, and outdated software leaves defenders exponentially vulnerable to cyberattacks. Vehicles will likely require regular software updates to maintain an adequate level of effectiveness for mitigation techniques against active dangers.[31] Consistent updates become particularly crucial for HAV with high

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[25] H. Onishi, "Paradigm change of vehicle cyber security," in Proc. 4th Int. Conf. CYCON, 2012. P. 381

[26] A Weimerskirch "Security Considerations for Connected Vehicles" in SAE Government/Industry Meeting, Washington DC, 2012 January. Available at: http://www.sae.org/events/gim/presentations/2012/weimerskirch_escrypt.pdf

[27] Petit and Sladover p. 553

[28] The George Washington University Regulatory Studies Center proposes a framework for Evidence-Based Regulation, available at: https://regulatorystudies.columbian.gwu.edu/public-comment-commission-evidence-based-policymaking

[29] Ibid.

[30] Ibid. Fn. 57.

[31] Jonathan Petit and Steven E. Shladover "Potential Cyberattacks on Automated Vehicles" IEEE Transactions on Intelligent Transportation Systems, Vol. 16, No. 2, April 2015. P.552. Active dangers include malicious acts such

automation and full automation systems.[32] As currently worded, NHTSA's guidance regarding manufacturer submissions of Safety Assessment Letters for "software…updates [that] materially change the way in which the vehicle complies…with any of the 15 elements of the Guidance" does not clearly exclude routine software updates that address existing vehicle vulnerabilities to cyberattacks.

The agency's guidance states that a new Safety Assessment Letter (provided at least four months in advance) would be required whenever a "significant update to a vehicle or HAV system is made." NHTSA defines a significant update as "one that would result in a new safety evaluation for any of the 15 safety assessment areas." This includes Vehicle Cybersecurity. At a minimum, NHTSA should update its guidance to clarify that the agency intends to treat security updates separately from software updates that add other unrelated HAV features and functionality. Regulatory delays in this area could leave HAV networks unnecessarily vulnerable to cyberattacks.

One final point regarding the potential regulation of software updates concerns NHTSA's statement that it is considering making reporting by manufacturers mandatory via future rulemaking; this reporting would extend beyond vehicle cybersecurity and would include cross-cutting areas such as: consumer education and training, and ethical considerations. In addition to the aforementioned points regarding how regulatory delays can adversely impact HAV cybersecurity and safety, such reporting wades into an area of decision making that is likely best left to manufacturers and consumers—handling risk tradeoffs. For example, deciding whether to apply a software patch to a system involves weighing the protection it provides from cyberattacks against the risk that it might create problems elsewhere.[33]

Ultimately, manufacturer's profits are at risk in the event that they cause more harm than good. Additionally, research indicates that HAV may result in a significant shift in the burden of liability of vehicle-related incidents from drivers to manufacturers.[34] Ensuring the safety and security of HAV will, necessarily, remain a top priority for manufacturers without NHTSA's intervention.

as cyberattacks while passive dangers include neutral—yet potentially dangerous—situations such as roadwork, other vehicles, pedestrians, etc.

32 Ibid. p. 548

33 See: Grant Buckler. "Speed vs. caution: The patch management dilemma." *itbusiness.ca*, December 12, 2006.

34 John Villasenor. "REPORT: Products Liability and Driverless Cars: Issues and Guiding Principles for Legislation." *Brookings*, April 24, 2014.

Retrospective Review

The Unpredictable Nature of Developing Technology

It is not possible to predict the future of HAV technology such that NHTSA can prescribe safety standards that will benefit society many years from now. As Brock and Scherber have noted in a separate comment to NHTSA on vehicle-to-vehicle communication:

> Economic historian Douglass North concluded that adaptive efficiency is more significant for economic success than allocative efficiency. That is, the ability to adapt to new circumstances and new technology is more important than the standard kind of economic efficiency generated by a competitive market system. It is important that any new technological requirements be structured with enough flexibility that they can be modified in light of future events.[35]

Recognizing this, NHTSA is correct to consider new regulatory tools that would enable the agency to revisit any resulting standards and adjust them as necessary based on new information, such as whether such a standard acts as a barrier to the development of new HAV technology.

New Regulatory Tools for Regulatory Review

NHTSA's policy guidance includes two provisions that would encourage ongoing review of its standards: iterative FMVSS, and implementing sunset provisions for FMVSS that may otherwise hinder the development of HAV technology. These provisions are consistent with President Obama's Executive Order 13563, which instructs agencies to "consider how best to promote retrospective analysis of rules that may be outmoded, ineffective, insufficient, or excessively burdensome, and to modify, streamline, expand, or repeal them in accordance with what has been learned."[36]

Given the state of change in automated vehicle technology, NHTSA considers use of an iterative process to set future FMVSS so as not to limit the use of future technologies. This approach builds retrospective review into the structure of the policy and also attempts to remove regulatory barriers to HAV innovation. Pursuant to the principles of EO 13563, NHTSA should seek input from the public and the regulated community when determining whether FMVSS rules are an obstacle to the development of HAVs and HAV technology.

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[35] Gerald W. Brock and Lindsay M. Scherber, Public Interest Comment on the National Highway Traffic Safety Administration's Advance Notice of Proposed Rulemaking: Federal Motor Vehicle Safety Standards: Vehicle-to-Vehicle (V2V) Communications. *The George Washington University Regulatory Studies Center*. October 20, 2014. Docket No. NHTSA-2014-0022; RIN: 2127-AL55.
Brock & Scherber reference Douglass North, "Economic Performance through Time," *American Economic Review* 84.3 (1994): 359-368.

[36] Executive Order 13563 §6. January 18, 2011.

NHTSA also considers the option of implementing a "sunset" on FMVSS final rules so that the agency can reconsider whether the standard is still effective. Such a step would provide an effective incentive for ongoing review of the effects of the FMVSS.[37] Although sunsets are typically implemented by state legislatures, they could still have an important role in federal agencies such as NHTSA for soliciting feedback from the regulated public and evaluating the effects of its standards on innovation.

Conclusion

NHTSA should be commended for recognizing the significant impact of federal policy on innovation in the sphere of highly automated vehicles. These recommendations attempt to steer NHTSA's policy by cautioning against approaches that could stifle innovation and result in lives lost relative to a baseline of unregulated HAV technology.

As NHTSA considers new regulatory tools and authorities for regulating HAVs and HAV technology, the agency should avoid regulatory tools—such as premarket approval—that are likely to impose high societal costs without providing significant safety benefits. HAV technology has the potential to decrease fatalities from human error; even as little as a 1% decrease in these fatalities from new vehicles has the potential to save thousands of human lives between 2018 and 2030. Regulatory tools that impose as little as a 3-5 model-year delay could result in over 1,000 additional traffic fatalities over the lifetimes of the Model Year 2018 fleet, at a discounted social cost of up to $7.3 billion, without providing any compensating benefits. The costs of premarket approval are too high—and the benefits far too low—for NHTSA to pursue this regulatory path without significant loss to human life.

Similarly, it may be too early for productive regulation in the area of software updates. Overly prescriptive approaches and regulatory barriers to implementation are likely to leave HAV networks unnecessarily vulnerable to cyberattacks. There is a lack of evidence indicating any potential market failure in this area. NHTSA's goals for safe and secure HAV operation are best advanced via technological experimentation and innovation.

Consistent with the Regulatory Studies Center's Evidence-Based Regulation framework, NHTSA is correct to consider new mechanisms for reviewing its existing standards and ensuring that they do not act as barriers to innovation. Both the iterative standard process and the use of "sunsets" would aid in achieving this goal.

[37] Russell S. Sobel and John A. Dove. "Analyzing the Effectiveness of State Regulatory Review." Public Finance Review Vol. 44(4) 446-477