



January 10, 2023

Dr. Cem Hatipoglu  
Associate Administrator, Vehicle Safety Research  
National Highway Traffic Safety Administration  
1200 New Jersey Ave, SE  
Washington, D.C., 20590

**RE: NHTSA Safety Research Portfolio Public Meeting: Fall 2022 [Docket Number: NHTSA-2022-0091]**

The Alliance for Automotive Innovation (“Auto Innovators”) appreciates the opportunity to provide comments in response to the National Highway Traffic Safety Administration’s (“NHTSA”) Public Meeting that was held from November 1-3, 2022, as part a joint effort between the Agency's Vehicle Safety Research and Behavioral Safety Research offices.<sup>1</sup>

As noted in Auto Innovators comments in response to the agency’s 2021 research briefing, NHTSA research is fundamental for ensuring an effective and data-driven rulemaking process, and is important for informing the development of policies and programs aimed at improving roadway safety.<sup>2</sup> We appreciate the agency’s continued efforts in organizing these comprehensive research briefings and request that NHTSA continue to hold similar events in future on an ongoing annual basis.

Auto Innovators members continue to make significant investments in vehicle safety, supported by comprehensive research and development efforts in both the US as well as internationally. These research investments are driving innovative designs to improve occupant and vulnerable road user safety, enhance crash avoidance capabilities, support automated vehicle operations, and leverage connectivity and V2X communication to enhance awareness of the roadway environment. It remains critical that NHTSA research continue to keep pace with the changing environment to ensure the right policies are in place so that consumers can have access to life-saving technologies – particularly when these systems are already available in other international markets. As noted in Auto Innovators comments in response to the 2021 research briefing:

*Given the importance of research in supporting NHTSA rulemaking activities, we recommend that in addition to periodic research briefings, the agency also publish a combined Research and Rulemaking priority plan (with opportunity for notice and comment). Such a plan would help highlight key research activities, expected timeframes for completion, and ongoing research efforts support anticipated rulemaking actions in future. While we recognize that research milestones can be subject to change, it would be helpful to have a clearer picture of the*

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<sup>1</sup> Auto Innovators is the singular, authoritative, and respected voice of the automotive industry, representing motor vehicle manufacturers responsible for nearly 98 percent of cars and light trucks sold in the U.S., original equipment suppliers, technology companies, and others within the automotive ecosystem.

<sup>2</sup> NHTSA-2021-0060-0011

*outstanding activities and questions that the agency is seeking to address, and these might impact the timing of regulatory actions or updates to the New Car Assessment Program (NCAP). Ongoing regulatory uncertainty create significant challenges that can stifle investment in the development, production, and introduction of new technologies, particularly when existing regulations may limit the deployment of new vehicle designs and systems that are being made available in other parts of the world (e.g., advanced lighting).<sup>3</sup>*

Auto Innovators also urges the agency to consider the development of a research and rulemaking priority plan to help enhance transparency and ensure a more informed policymaking process. This is consistent with the recommendations issued by GAO as part of its April 2022 report to the agency on implementing leading practices to improve management of mandate rulemakings and reports.<sup>4</sup> The agency has previously published similar reports in the past, so it is not without precedent.<sup>5</sup> Such a plan could also be structured to complement the agency's mid-to-long term NCAP roadmap that was referenced in the agency's March 9, 2022, request for input on proposed updates to the Program.<sup>6</sup>

### **Auto Innovators Comments on Specific Panel Presentations**

The following section provides high-level comments on various research topics that were presented during the public meeting.

#### **Panel 1: Human Factors**

- We support NHTSA research efforts to further understand driver distraction strategies beyond task-based and eyes-off-road time-based approaches. Complementary industry/academia efforts are underway in this area and we encourage the agency to consider opportunities for collaborative discussion to avoid conflicting and divergent approaches for addressing this issue.

#### **Panel 2: Vulnerable Road Users**

- **Definition of Vulnerable Road User:** During the research meetings, NHTSA appears to have broadened its definition of what is considered a Vulnerable Road User (VRU). More specifically, it appears that VRU is defined as any person who is not the driver, and we are concerned that this definition may cause confusion throughout the safety community. VRU traditionally refers to as occupants outside the vehicle (although not motorcyclist) while vulnerable occupants traditionally refers to smaller/older occupants that are inside the vehicle. We therefore urge NHTSA to continue to use the DOT definition that was published by the Federal Highway Administration in October 2022 that states:

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<sup>3</sup> NHTSA-2021-0060-0011

<sup>4</sup> <https://www.gao.gov/products/gao-22-104635>

<sup>5</sup> [https://www.nhtsa.gov/staticfiles/rulemaking/pdf/2011-2013\\_Vehicle\\_Safety-Fuel\\_Economy\\_Rulemaking-Research\\_Priority\\_Plan.pdf](https://www.nhtsa.gov/staticfiles/rulemaking/pdf/2011-2013_Vehicle_Safety-Fuel_Economy_Rulemaking-Research_Priority_Plan.pdf)

<sup>6</sup> For reference, a copy of Auto Innovators supplemental comments in response to the NCAP notice are included in Appendix A. This includes several recommendations related to the importance of defining clearer and more transparent timeline for both current and future research efforts. In these comments, we also urged NHTSA to include an annual NCAP research update in conjunction with its annual research briefing (or as part of an annual NCAP stakeholder meeting).

*A vulnerable road user is a non-motorist with a fatality analysis reporting system (FARS) person attribute code for pedestrian, bicyclist, other cyclist, and person on personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedal cyclist as defined in the ANSI D16.1-2007. (See 23 U.S.C. 148(a)(15) and 23 CFR 490.205). A vulnerable road user may include people walking, biking, or rolling.*

*Please note that a vulnerable road user:*

- Includes a highway worker on foot in a work zone, given they are considered a pedestrian.*
- Does not include a motorcyclist.<sup>7</sup>*

Given that FARS, the CFR, and ANSI all appear to provide written definitions for VRU that align with being outside of a vehicle, we urge NHTSA to maintain a more suitably narrowed definition. This definition is also consistent with the definition used by the European Commission.<sup>8,9</sup>

- **Subdural Hematoma Injury Risk Research** – The agency’s research showed up to 25mm of movement of the brain relative to skull in some angular motion tests of the head, which was attributed to atrophy of brain especially in elderly. According to some experts, this level measured displacement may be too high. We recommend that further evaluation of the experimental setup and results should be pursued.
- **Vehicle Crashworthiness Research for Pedestrian Safety** – Auto Innovators remains supportive of efforts to address pedestrian safety; however, we have significant concerns should the agency seek to implement headform performance requirements inconsistent with GTR No. 9. While we recognize that the exact language used in the GTR is open to interpretation by the agency, the application and implementation of the standard globally, is not. Adopting an approach that is inconsistent or based on a unique interpretation of the GTR No. 9 requirements creates the potential for long-term international regulatory misalignment, which is counter to the intent of the GTR process, and the spirit of the directive issued by Congress in the recently passed Bipartisan Infrastructure Law. We therefore strongly urge the agency to harmonize any proposed pedestrian protection standard with those already being implemented in other regions. Similarly, the agency should look to leverage research ongoing in other parts of the world to help reduce the potential for unnecessarily divergent requirements to help accelerate pedestrian safety in the United States. Any cost-benefit analysis should include a comprehensive assessment of the impact of regulation on existing vehicle designs, compared to if the agency were to simply adopt the requirements of GTR No. 9 as implemented in other regions.

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<sup>7</sup> [https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL\\_508.pdf](https://highways.dot.gov/sites/fhwa.dot.gov/files/2022-10/VRU%20Safety%20Assessment%20Guidance%20FINAL_508.pdf)

<sup>8</sup> [https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/action-plan-and-directive/its-vulnerable-road-users\\_en](https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/road/action-plan-and-directive/its-vulnerable-road-users_en)

<sup>9</sup> <https://www.euroncap.com/en/vehicle-safety/the-ratings-explained/vulnerable-road-user-vru-protection/>

**Panel 4: Driver assist and driver automation: several topics not covered by CW WG**

- **Motorcycle and Bicycle Automatic Emergency Braking (AEB) Performance Research Testing** – Auto Innovators is supportive of additional research on new targets to address VRU safety. However, it is important to ensure these efforts take a deliberate/phased approach based on crash scenarios that are most representative of the real world, in order to achieve faster and more meaningful improvements to safety. For example, the GVT currently is not designed for nighttime car to car AEB performance assessment because it does not have the ability to illuminate taillamps. Without this capability, the assessment is more akin to a car-to-object (parked car) AEB assessment, and would encourage AEB performance changes that do not substantially improve real world safety and may also drive false-positive performance. Instead of focusing on so-called “worst case scenarios” for VRU targets, the agency should ensure that “most common case scenarios” are covered first, including harmonizing with EuroNCAP.

**Panel 6: Occupant protection and advanced ATD’s**

- **ATD Development Updates** – While we recognize there are a comprehensive number of research projects underway, it would be helpful if the agency could include a timeline for the anticipated completion of research for each ATD and how this may correspond with the agency’s planned updates to Part 572. This will help inform internal research and development and support future product planning during the transition to new ATDs.
- **Occupant response after pre-crash maneuvers** – It would be helpful to understand the extent to which occupant kinematics may be affecting injury outcomes in the field based on analysis real world crash data (using EDR data based on both the presence and absence of hard braking maneuvers).
- **Lower interior rear seat occupant protection** – We suggest the agency consider research to explore differences in injury outcomes as a result of the widescale introduction of curtain airbag technology.

**Panel 7: Virtual Testing & Computational Biomechanics**

We support the potential of virtual testing to lead to steady improvements in real world safety, and it is important to ensure the reliability and quality of virtual models. We support the introduction of virtual testing in Euro NCAP which could inform a similar path for NHTSA.

- **NHTSA interest in Math Modeling and HBM’s**: There is substantial ongoing support for work ongoing within the Global Human Body Modeling Consortium (GHBMC). The use of simulation presents significant advantages for evaluating different occupant sizes when compared with the sizable time, cost, and research challenges that come with developing new ATDs. However, the suggested volume and complexity of currently proposed HBMs may make it impractical for use in the vehicle development process. The agency must first establish what the crash data is indicating in prioritizing development of HBMs and how it will be used to further enhance safety.

- **Machine learning for occupant safety research** – We see opportunities to apply machine learning for improving occupant safety, however this may be the wrong application. All adult ATDs have instrumentation in the head to measure linear and angular accelerations or angular velocities. We do not foresee relying entirely on high-speed film analysis to predict angular accelerations or velocities. Perhaps the research should be diverted to predicting dynamic strains and strain rates in the brain. A direct prediction of maximum principal strain (MPS), cumulative strain damage measure (CSDM), etc., would be more reasonable and accurate than relying on Brain injury criteria (BrIC) for injury prediction.
- **ATD FE Model overview** – Overall, we support the agency’s efforts to develop FE models. There is a need for more open source ATD models that can be used for simulation testing.
- **HBM use in injury criteria development and evaluation** – We request that the agency make available the angular velocity data and scaled human angular velocity data used to predict human brain MPS and CSDM responses and correlation with animal injuries. At present, it does not appear as though the data is readily available. The human brain model has changed since 2013, so there is a need to update MPS and CSDM correlation with injuries.
- **Applications of math models in comparing field vs. fleet testing predicts injury cases** – We have concerns with the agency’s analysis that seeks to validate the accuracy of BrIC in predicting real world brain injuries by averaging BrIC over all PDOFs. Similar arguments were presented in the 2019 ESV Conference.
- **Computational reconstruction of real-world injury cases** – The approach presented is a logistically complex but may provide opportunities to understand more about real world occupant injuries. For example, to ensure the accuracy of any given reconstruction, detailed information on an occupant’s physical characteristics as well as component testing of the surfaces contacted by the occupant may be needed. For these reasons, we encourage NHTSA to consider opportunities to engage with OEMs during the simulated reconstruction process.
- **Towards virtual testing** – In general, the use of virtual testing presents greater opportunities for evaluating occupant safety when compared with the significant time, cost, and complexity required to develop new ATDs for different size and stature occupants. Manufacturers will often conduct additional analysis using virtual simulation to evaluate the performance of restraint systems in crash conditions outside of those specified in FMVSS. However, the models used in testing are often sensitive and proprietary in nature and using a generic model of a vehicle interior may not represent the vehicle being simulated. Auto Innovators is supportive of additional dialogue on the future use of modeling as an alternative to new ATDs, particularly if the agency were to consider actions to incorporate virtual testing requirements as part of its assessment protocols.

**Panel 8: Equity in Vehicle Safety**

- We support ongoing research to evaluate safety equity including research in to female crash safety as well as elderly occupants. However, when evaluating whether additional dummies are needed, we recommend more in-depth analysis to determine where the potential gaps may be. This involves looking at real-world crash data, reviewing existing regulations, and evaluating the protections afforded by existing test devices to better understand what updates are needed. Vehicle manufacturers have employed the use of simulation to extend the reach of physical testing with existing ATDs to address different occupant sizes/weights as well as off-axis crash orientations. As computer simulations become more robust and representative of the real world, modeling vehicles and crash scenarios can allow the manufacturer to more efficiently develop crashworthiness systems that provide enhanced levels of safety for all vehicle occupants regardless of age, gender, or size, in more diverse crash modes than would otherwise be possible through physical testing.

Please let me know if you have any questions on the above comments. We look forward to continued engagement on many of these important topics.

Sincerely,



Scott Schmidt  
Vice President, Safety Policy  
Alliance for Automotive Innovation

**Enclosed:**

Appendix A – Auto Innovators Supplemental NCAP Comments – September 6, 2022

# Appendix 1

**Auto Innovators Supplemental Comments in Response to the March 9, 2022,  
NHTSA Request for Comments on updates to the New Car Assessment Program**

**[Docket Number: NHTSA-2021-0002]**



September 6, 2022

Dr. Steven Cliff  
Administrator  
National Highway Traffic Safety Administration  
1200 New Jersey Avenue SE  
Washington, D.C. 20590

**RE: Request for Comments; New Car Assessment Program [Docket Number: NHTSA-2021-0002]**

Dear Administrator Cliff,

The Alliance for Automotive Innovation (“Auto Innovators”) writes to provide supplemental comments and policy recommendations to NHTSA on the development of its roadmap to upgrade the New Car Assessment Program (NCAP) over the next several years. These recommendations build upon Auto Innovators prior comments in response to the agency’s March 9, 2022, Request for Comment (RFC) on proposed upgrades to NCAP, and emphasize the importance in defining a clear process and pathway forward for the evolution of the program.

Auto Innovators strongly supports the development of an NCAP roadmap. As noted in our comments on the NCAP notice, “[t]he importance of NCAP providing a clearly defined roadmap outlining the implementation plan and schedule for how emerging safety technologies will be integrated within the program cannot be overstated. This enables automakers to develop long term safety strategies that are aligned with the identified NCAP safety priorities and expected updates. When updated ratings are eventually implemented, manufacturers are then able to have product in place that provides the enhanced safety performance and meet the challenges of a more comprehensive program.”<sup>1</sup> However, it is our view that the current proposal in the RFC does not meet the criteria to be considered a roadmap under the Bipartisan Infrastructure Law (BIL), as it lacks sufficient detail in defining a clear path forward for the program.<sup>2</sup>

This supplemental comment is therefore intended to help support the development of a more detailed agency roadmap, and builds upon Auto Innovators 21<sup>st</sup> Century NCAP recommendations that were released last year.<sup>3</sup> These recommendations are designed to be consistent with the core elements of the Bipartisan Infrastructure Law (BIL), which provides clear parameters and expectations for what should be considered essential elements for a robust NCAP roadmap. While we recognize that the agency may not have all of the necessary information to build out certain aspects of the roadmap, it is critical that the plan outline the process and timeline for moving forward. Ensuring that a solid foundation for future success is arguably more important than the specific details of the plan.

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<sup>1</sup> Auto Innovators comments in response to the NHTSA NCAP RFC [Docket Number: [NHTSA-2021-0002-3788](#)]

<sup>2</sup> *Infrastructure Investment and Jobs Act – Section 24213 (c) New Car Assessment Program Roadmap*

<sup>3</sup> *Auto Innovators 21<sup>st</sup> Century Roadmap Recommendations – April 2021*

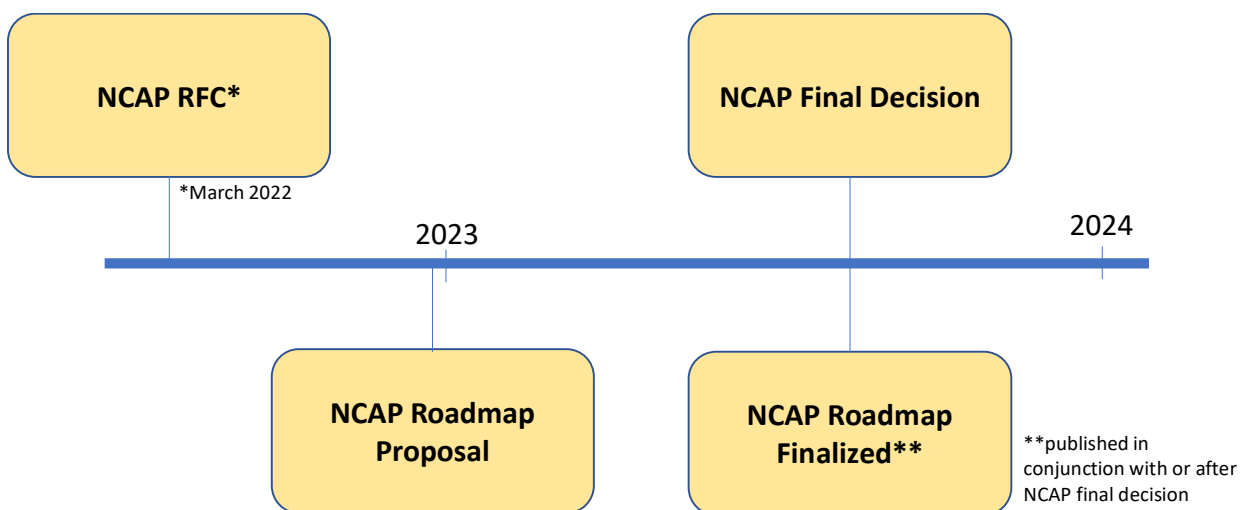


### **Prioritizing the near-term development of a detailed NCAP Roadmap**

We appreciate the importance of the agency's final decision on near-term updates to the program, but these efforts should not delay the development or publication of a more comprehensive roadmap. We recommend that the development process be conducted in parallel to this current round of updates to the program.

- **Development of a draft Roadmap** – A key element of the BIL is a requirement that the agency publish a NCAP roadmap within one year to document the agency's planned actions for updating the program over the next 5 to 10 years. Given the aforementioned shortcomings identified with the proposed roadmap included in the March 2022 notice, we urge the agency to publish a more comprehensive draft for comment as soon as practicable/feasible in 2022. This initial draft roadmap may be informed by comments submitted to the docket in response to the RFC and updated to include any relevant planned activities related to future program updates.
  
- **Establishing a clear timeline and process** – The roadmap should provide not just the dates of when planned actions will be initiated, but also target dates for key milestones (e.g., supporting research) and decision points (i.e., goal focused). This is critical from a product planning perspective, so that manufacturers can be responsive to changes in the program. In this regard, we encourage an approach similar to Euro NCAP with consideration for the following elements. Without these parameters in place, there is no way to assure that NCAP be updated on a regular basis or that the program will encourage implementation of new safety technologies.
  - **Program Evaluation** – The roadmap should include a timeline and cadence for periodic reviews of performance, details of any planned consumer survey related activities, and any international assessment benchmarking efforts. Periodic evaluations should also verify the relationship between ratings and real-world safety performance, identify technologies or provisions that are no longer appropriate for NCAP (or have been superseded by regulation), and reaffirm program elements remain relevant and valuable, or whether these should be removed. The roadmap should have a strong correlation between safety improvement opportunities and potential vehicle countermeasures, based on research, validation, and finally implementation into assessment. This commitment to regular evaluation of the program's effectiveness will help ensure that NCAP can continue to provide high-value information to consumers and promote awareness of safety technology. At a minimum, these evaluations should occur at least once before the roadmap is updated.
  
  - **Stakeholder engagement** – Consistent with 49 USC 32310, Auto Innovators recommends that NHTSA conduct stakeholder meetings at least annually to learn about new safety technology developments and other safety opportunities, and to provide stakeholders with information about the Agency's roadmap status and other programmatic research priorities. These meetings should consist of bi-direction communication, and could be conducted as technical workshops, roundtables, or other forums focused on specific topics that the agency deems important to future program updates. It is important that these events serve to inform the development, implementation, and periodic update of the Mid- and Long-Range NCAP Opportunity Roadmaps, as well as the identification and prioritization of safety opportunities that lend themselves to a market-based/consumer information approach. Auto Innovators recommends, at a minimum, an annual day-long stakeholder meeting each spring to coincide with the agency's updates to the Buying a Safer Car (BSC) process.

- **Transparency** – Increased transparency can help bolster the program by providing opportunities for peer review, collaboration, and recommendations for agency consideration. This also avoids overburdening the eventual RFC process once NHTSA has developed its more comprehensive proposal for updating the program. We urge NHTSA to include an annual NCAP research update in conjunction with its annual research briefing or as part of the annual stakeholder meeting referenced above.
- **Opportunity for public comment** – Consistent with the BIL, we encourage the agency to make the first draft roadmap available for public comment as soon as possible, with sufficient opportunity for notice and comment. Based on its review of public comments received in response to the draft roadmap, as well as the RFC, the agency would have the opportunity to incorporate any additional stakeholder and other expert input as deemed appropriate. This ensures a more informed and transparent process and is consistent with the intent of the BIL.
- **Finalizing the initial roadmap** – The agency should consider finalizing its inaugural NCAP roadmap in conjunction with its final decision on near-term updates to the program. This would help ensure consistency in terms of the key activities defined in the plan, and would avoid the potential need to revisit the roadmap to make adjustments after the agency’s final decision. Alternatively, the roadmap development process can be conducted and finalized separately to avoid any delays in implementing updates to the program.
- **A roadmap for the future** – The roadmap should always be forward-looking and extend beyond any pending proposal or request for comment. For example, it would be redundant to include elements of the most recent March 2022 RFC, unless it were to provide a retrospective summary of changes to the program, or if there were elements from the proposal that were ultimately deferred to a future update with further research required. This provides added justification for finalizing the roadmap in conjunction with (or shortly after) the agency’s final decision on near-term updates to the program, and should not affect the agency’s ability to draft a roadmap in parallel.



### **Building out the NCAP Roadmap**

Auto Innovators supports the development of a comprehensive NCAP roadmap that defines a clear path forward for the program. In the section that follows, we outline several recommendations for building out the NCAP roadmap to help support the agency's efforts in defining the mid-, long-term updates, as well as any related actions necessary to ensure continued advancement of the program. Auto Innovators is supportive of the requirements outlined in the BIL as these provide the necessary clarity on the direction of the program.<sup>4</sup> As such, these recommendations are largely consistent with that legislation.

#### **Mid-Term Road mapping**

- **Overview of Mid-Term Updates Being Considered** – The mid-term NCAP roadmap should include a high-level description outlining the agency's ongoing and pending actions for updating the program as part of its next planned update. Each of these items should be expanded upon further within the roadmap document as described below. This aspect of the roadmap should also include a target date (or estimation) of when the agency expects to issue its next RFC.
- **Emerging Technologies Under Consideration** – The mid-term roadmap should include specific details of potential changes to both the crashworthiness and crash avoidance rating aspects of the program that are being considered, as well as any safety features that may be included on the recommended technology list. For each of the technologies identified in this portion of the roadmap, the agency should provide a general description of the technology countermeasures, the expected benefits, the current (and expected) fleet penetration, and any potential knowledge gaps that may impact a final agency decision in future. This aspect of the plan should also include acknowledgement of how potential updates may overlap existing or future FMVSS requirements. More specifically, the roadmap should reflect specific rulemaking actions that may impact NCAP (e.g., Part 581, FMVSS 108) as these may impact final decision timing, protocol issues may still need to be resolved. While we recognize that the March 2022 NCAP RFC identified several emerging technologies and program updates under consideration, additional details are needed in terms of how the agency plans to evaluate and assess their potential inclusion in future.
- **Mid-term NCAP Research Roadmap** – Consistent with the BIL, for each of the identified technologies or related updates to the program, the agency should provide an overview of any ongoing, pending, or outstanding research that may need to be conducted, as well as a listing of any relevant standards or test procedures that the agency may be considering for measuring performance.<sup>4</sup> We anticipate that the research efforts needed to support NCAP decisions will be a subset of the broader agency research and rulemaking priority plan, particularly where certain technologies may be considered for inclusion in both NCAP and Federal Motor Vehicle Safety Standards.

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<sup>4</sup> Infrastructure Investment and Jobs Act – [Sec. 24213 \(c\)](#)

### Long-Term Road Mapping

- **Overview of the long-term NCAP roadmap** – The long-term roadmap should identify emerging technologies that may be considered for NCAP beyond the next planned program update. There may be insufficient information to make a determination on whether or not to include these technologies as part of future vehicle evaluations, but more data and supporting standards development work is expected as more systems enter the marketplace.
- **Overview of technologies under consideration** – Similar to the mid-term roadmap, the agency’s long-term roadmap should include a description of technologies under consideration for future inclusion in the program. The inclusion of these technologies should be reflective of NHTSA’s vision for the program and include an assessment of current (and expected) technology maturity and fleet penetration, an overview of the anticipated benefits, and details of any exploratory research or monitoring activities.
- **Long-term research roadmap** – In addition to identifying emerging technologies, the long-term roadmap should outline related research questions that need to be addressed. This could overlap or be distinct from the agency’s research and rulemaking priority plan, the agency should begin to identify elements that may be considered for inclusion in the program beyond the next programmatic update. NHTSA has already identified several technologies for consideration as part of this latest RFC, but the agency must take the next step in defining research objectives and timeline, as well as key decision dates based on the findings of this research. This should be informed by stakeholder input.
- **Future roadmap development and adding new elements** – It is fundamental that the agency not only execute the mid-term roadmap, but also ensure its continued evolution. Our assumption is that the long-term roadmap will eventually feed elements into the mid-term roadmap in subsequent updates. However, we also recognize that innovation moves at a rapid pace and technologies may emerge that were not previously on the roadmap agenda. The agency must ensure a process is in place for determining how new technologies or design features are integrated into the roadmap and potential future NCAP plans.

Please contact me if you have any questions on any aspect of these comments.

Sincerely,



Scott Schmidt  
Vice President, Safety Policy  
Alliance for Automotive Innovation