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MOLLIE COHEN D'AGOSTINO
POLICY DIRECTOR
POLICY INSTITUTE FOR ENERGY, ENVIRONMENT, AND THE ECONOMY
Email: mdagostino@ucdavis.edu

1605 TILIA STREET, STE 100
DAVIS, CA 95616
TEL (530) 752-0670
FAX 9530) 752- 6572

February 1, 2021
Deputy Administrator
National Highway and Traffic Safety Administration
1200 New Jersey Avenue, SE Washington, DC 20590

Re: ANPRM - Part 571 – Request for Comments on NHTSA's Framework for Automated Driving System Safety

Dear Deputy Administrator,

Our comments on the Framework for Automated Driving System Safety represent best practices garnered from research insights from the UC Davis Policy Institute for Energy, Environment, and the Economy, the UC Institute of Transportation Studies, as well as the broader research community. We aim to underscore where academic research can inform this rulemaking, which is focused solely on the automated driving system (ADS) safety. We also aim to inform the Department of Transportation (DOT) more broadly, as they expand the scope of the AV regulatory framework, and address other principles in Automated Vehicles (AV) 4.0[1] as well as other critical topics.

The DOT guidance document AV 4.0 introduces ten principles to guide regulation of AVs, including prioritizing safety, emphasizing security and cybersecurity, ensuring privacy and data security, enhancing mobility and accessibility, as well as improving transportation system-level effects.[2] In outlining these priorities DOT is recognizing that AVs may have extensive impacts. Significant federal inter-agency coordination can ensure AVs bring societal and environmental benefits, and these priorities could be expanded greatly. We recognize enacting many of these principles will fall outside of the scope of NHTSA authority and this ANPRM.

Our comments for this ANPRM will begin by highlighting lessons learned from the research community that might inform a robust and comprehensive regulatory framework for AVs. The narrow scoping of this ANPRM may be counter to a more comprehensive AV framework that might holistically address safety in such a way that it also tackles other DOT priorities, including climate resilience, mobility for underserved individuals and communities, and accessibility for all, including people with physical or cognitive disabilities. A narrow AV or ADS framework may obscure or even impinge on the Department's broader transportation, mobility and sustainability objectives.

[1] ENSURING AMERICAN LEADERSHIP IN AUTOMATED VEHICLE TECHNOLOGIES: AUTOMATED VEHICLES 4.0, (2019), https://www.transportation.gov/av/4.
[2] *Id.* at 1.

A comprehensive AV policy framework might address the direct, secondary, and tertiary impacts of the widespread adoption of AVs. These impacts, if addressed holistically during the earliest stages of the market emergence, may improve overall outcomes and avoid some of the pitfalls that have come with widespread fossil fuel and auto-dependence. Our research demonstrates that if AVs are deployed in shared and electric fleets, this may result in air quality and equity benefits.[3] [4]

It will take public sector leadership to prioritize equitable and sustainable AV deployment. A recent example of such leadership is seen in the November 2020 decision issued by the California Public Utilities Commission (CPUC) authorizing the deployment of a Drivered and Driverless Autonomous Vehicle Passenger Service Program. This moves the program from a pilot phase to a full deployment. The original AV Pilot Program began with a very narrow scope, but after a stakeholder engagement process among industry, government, academia, advocates, the CPUC recognized that broader goal setting would be beneficial in aligning the Program with state priorities and statutory obligations. The CPUC Drivered and Driverless Autonomous Vehicle Passenger Service Program now has four stated goals.[5]

> *1.) Protect passenger safety; 2.) Expand the benefits of AV technologies to all of Californians, including people with disabilities; 3.) Improve transportation options for all, particularly for disadvantaged communities and low-income communities; and 4.) Reduce greenhouse gas emissions, criteria air pollutants, and toxic air contaminants, particularly in disadvantaged communities. The Commission will collect data to monitor permit holders' progress toward each of the goals.*[6]

These goals highlight an important role for state agencies to set goals for AV service that can align the market with state priorities. Another key outcome from the CPUC decision was an expanded data collection mandate, that aims to monitor whether the state can achieve these goals. This is a critically important aspect of the decision, but it does raise questions about the need to harmonize data collection across the states to encourage uniformity and reduce costs of data management (see section 1.4 *Prioritize Continuous Improvement through Strategic Data Collection*).

The remainder of our letter of comment will address the following topics:

- Clarify terminology — including the terms "safety", "security", and "unreasonable risk".
- Consider mechanisms for encouraging and safeguarding shared AV passenger service and determining whether shared AVs can capture safety benefits, in addition to the estimated environmental and congestion benefits of shared mobility.
- Evaluate safety for riders with physical and cognitive disabilities — considering doors, ramps, level boarding, seats, securement, wayfinding, and emergency protocols.
- Prioritize continuous improvement through strategic data collection in a secure federally administered database.

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[3] DANIEL SPERLING, THREE REVOLUTIONS: STEERING AUTOMATED, SHARED, AND ELECTRIC VEHICLES TO A BETTER FUTURE (2018).
[4] Lew Fulton, *Three Revolutions in Urban Passenger Travel*, 2 JOULE P575-578 (2018). https://doi.org/10.1016/j.joule.2018.03.005
[5] CALIFORNIA PUBLIC UTILITIES COMMISSION, *Decision Authorizing Deployment Of Drivered And Driverless Autonomous Vehicle Passenger Service*, Decision 20-11-046 PUC (2020), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M352/K185/352185092.PDF.
[6] *Id.* at 2.

- Consider binding regulations which may improve certainty and help advance a safe and secure AV industry.
- Address future research questions for AV sharing, bicycle and pedestrian safety, safety for people of color, and safety for people with disabilities.

Responses to Selected Questions Raised in ANPRM

Question 1. Describe your conception of a Federal safety framework for ADS that encompasses the process and engineering measures described in this notice and explain your rationale for its design.

1.1 Clarify Terminology

More clarity on AV safety terminology would be beneficial. Several terms to include are *safety, security,* as well as *unreasonable risk*, as they apply to AV operation. UC Davis researcher Ken Kurani highlights a lack of consensus around definitions as they apply to shared and electric AVs. Kurani proposes definitions for these core terms distinguishing *safety* from *security*, "*Safety* is defined here to be the condition of being secure from accidental harm; *security* is defined to be the condition of being safe from intentional harm."[7] Survey data supports the contention that personal perceptions of safety and security risks will vary based on many metrics, including socio demographic characteristics. Research into consumers' opinions around shared AVs shows that safety and security concerns are different depending on gender identity based on their historic and prospective use of pooled ride-hailing. For example, women are less inclined towards sharing rides and report that they are less comfortable with AV technology.[8]

This research draws attention to whether NHTSA definitions for passenger safety need expansion for automated vehicles operated in shared service. Does the safety of passengers within the vehicles fall solely under NHTSA's purview, or other agencies within DOT or the executive branch? The Motor Vehicle Safety Act defines "motor vehicle safety" as the prevention of "unreasonable risk of accidents occurring because of the design, construction, or performance of a motor vehicle, and against unreasonable risk of death or injury in an accident, and includes nonoperational safety of a motor vehicle (USC §30101 (a) (9))."[9]

NHTSA may need to address questions about whether "nonoperational safety" encompasses new risks posed to vehicle inhabitants in order to communicate with their vehicle, or with the partnering companies involved in hailing, cleaning, and operating the vehicle. For AVs operated in a passenger service fleet model, or a ridehailing model, which allow passengers to call an automated vehicle like a taxi, there are additional open questions about how federal regulations should address security risks that could take place in this type of operation, or whether this is under state purview. Some states, like California, are taking actions to enforce safety for commercial passenger AVs (in the absence of binding federal regulations).

[7] KENNETH S. KURANI, *User Perceptions of Safety and Security: A Framework for a Transition to Electric-Shared-Automated Vehicles* (2019), https://doi.org/10.7922/G2891438.
[8] *Id.*
[9] NATIONAL TRAFFIC AND MOTOR VEHICLE SAFETY ACT, 2011 49 - USC §30101 (a) (9) (1996).

For example, the California Public Utilities Commission is responsible for ensuring safety and security for AVs deployed in passenger service operation in that state, and additional clarity may be necessary to determine where there is a need for each state to address AV passenger service. Another open question DOT may need to tackle is whether there should be clear federal guidance to encourage some uniformity of state AV passenger service policy. However, DOT should work with local and state stakeholders to ensure that state enforcement purview is maintained — such that traffic and land-use management remain a state and local authority. This might include either guidance or regulations to instruct states about how to effectively designate state agencies to manage licensing AV fleet operations, and monitor impacts to ensure that AV service works in concert with other state policy objectives.[10]

1.2 Consider Mechanisms for Encouraging and Safeguarding Shared AV Passenger Service

The research is clear, shared AVs may carry societal and environmental benefits, but less is known about whether there may also be safety benefits from this type of service model. It is possible that more reliable maintenance in a fleet model might increase safety outcomes if vehicles in a shared fleet model could also be more rapidly decommissioned in real-time for not meeting safety performance standards. Such potential safety benefits or deficiencies of shared and private ownership should be further investigated and there should be a robust discussion about the ongoing role of AV manufacturers in ensuring reliable performance of the vehicles, whether they are operated by the manufacturers, shared fleet operating companies, or private individuals.

Additional process measures for shared AV use include NHTSA coordinating with the Federal Transit Administration in their ongoing and robust transit automation research and demonstration efforts. NHTSA should work with FTA to consider how public transit applications will impact safety, and whether AVs for transit use will meet requirements under the Americans With Disability Act.[11]

In terms of engineering measures related to shared AVs, the ADS must be able to communicate with passengers so that shared passengers know when it is their responsibility to enter and exit a vehicle safely and from which entrance. The ADS should also consider how to maximize a rider's experience for all occupants so that the vehicles are more conducive to sharing.

A research team at UC Davis led by Angela Sanguinetti investigated vehicle design features that will make sharing vehicles more comfortable. While the design features themselves are partially out of scope for this ANPRM, we include them here as a reference to the types of vehicle characteristics that will encourage sharing that might be considered for metrics to improve overall benefits of AVs. Sanguinetti et al. found that design features include territorial props such as armrests, tables, or physical barriers that demarcate personal space boundaries. Additionally, clearly labeled and easy to access shared storage will make shared vehicles more user friendly. This research also sought to address the potential for security issues among pooled passengers. Sanguinetti et al. found that "passenger based rating systems have been considered to build accountability into the systems, but limiting access based on passenger reviews could create equity issues".[12] These considerations may raise in-vehicle security questions that may fall to states to address. However, questions remain about where this

[10] KELLY FLEMING, *Technology is Outpacing State Automated Vehicle Policy* (2020), https://escholarship.org/uc/item/0k85r9jv.
[11] AMERICANS WITH DISABILITIES ACT. § 12101 42 U.S. CODE Chapter 126 (1990).
[12] ANGELA SANGUINETTI, KENNETH S. KURANI & BETH FERGUSON, *Is it OK to Get in a Car with a Stranger? Risks and Benefits of Ride-pooling in Shared Automated Vehicles* p. 9 (2019), https://escholarship.org/uc/item/1cb6n6r9.

type of accountability system can be incorporated into the ADS to improve security outcomes. [13] Both safety and security performance standards could be considered for shared AVs to encourage consistency among commercial service operators, so passengers can become familiar with security practices.

1.3 Evaluate Safety for Riders with Physical and Cognitive Disabilities

According to the Disability Rights Education and Defense Fund, approximately 17% of Americans (57 million people) have a disability in the U.S.[14] Therefore, addressing the safety of individuals with physical, cognitive, or mental disabilities is central to establishing safety for the general population. The AV Safety Framework should consider the safety considerations for passengers with disabilities, including those who may use wheelchairs for personal mobility, or whom currently require aids or drivers to assist them with many aspects of travel. [15] [16] Care must also be taken to consider the needs of riders with other disabilities who are not in wheelchairs. More information is needed to build a concrete and qualitative understanding of the needs of people with all types of disabilities, and DOT should convene NHTSA, FHWA, FTA, and other relevant agencies to consider how a proposed AV safety framework might improve mobility for disabled passengers. This could compliment a robust and ongoing effort to understand how individuals with a range of disabilities enter, exit, and safely ride inside AVs. If this is led by government in partnership with industry, it might ensure that all industry partners can benefit from such demonstrations.

It is also worthwhile to highlight qualitative safety issues found in the literature that will allow manufacturers, regulatory bodies, and other relevant organizations to develop metrics, standards, and regulations to address disability access issues. We provide a list of some examples of specific metrics that might ensure AV safety for disabled riders. These are exclusively fact-finding suggestions, or "process measures," but they may lead to strategies to mitigate these failures and result in "engineering measures".

- Metrics to assess whether wheelchair ramps, lifts or accessible doors can ensure users have entered or exited safely — particularly for a rider in a wheelchair or who has a cognitive or vision disability. This may include establishing criteria for AVs operating in private or commercial service to clarify when passengers will require an aid present in the vehicle.[17] [18] [19]
- Metrics to assess whether wheelchair ramps or lifts operation can sense where they can be safely deployed (e.g. considering slopes or unsafe surfaces) to ensure safe egress.[20]
- Metrics to assess whether wheelchair accessible commercially shared AVs can ensure smooth transitions between users with and without a wheelchair (e.g. seats folding appropriately and not prematurely).

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[13] SANGUINETTI, KURANI, AND FERGUSON, *supra* note 12.
[14] Susan Henderson, *Letter for the Record Disability Rights Education and Defense Fund Before the Consumer Protection and Commerce Subcommittee Committee on Energy and Commerce U.S. House of Representatives; Hearing: Autonomous Vehicles: Promises and Challenges of Evolving Automotive Technologies* (2020), https://dredf.org/wp-content/uploads/2020/02/DREDF-E-C-AV-Hearing-Letter-021120.pdf.
[15] Raquel Velho et al., *The Effect of Transport Accessibility on the Social Inclusion of Wheelchair Users: A Mixed Method Analysis*, 4 OPEN ACCESS JOURNAL (2016).
[16] Raquel Velho, *Transport accessibility for wheelchair users: A qualitative analysis of inclusion and health*, 8 INTERNATIONAL JOURNAL OF TRANSPORTATION SCIENCE AND TECHNOLOGY 103–115 (2019).
[17] Velho et al., *supra* note 15.
[18] Velho, *supra* note 16.
[19] Jill L. Bezyak, Scott A. Sabella & Robert H. Gattis, *Public Transportation: An Investigation of Barriers for People With Disabilities*, 28 JOURNAL OF DISABILITY POLICY STUDIES 28, 52 (2017).
[20] Velho, *supra* note 16.

- Metrics to assess securement protocols for wheelchairs (and under what circumstances these securements can be operated by the ADS in the absence of a human aid). Protocols should extend to address what happens if the seatbelt fails or is removed during a ride (considering especially riders with cognitive disabilities).
- Metrics to assess whether wayfinding technologies can meaningfully communicate with all disabled passengers— including individuals with hearing, vision, or cognitive disabilities. [21] [22]
- Metrics to assess whether mechanisms to communicate with external parties can be sufficiently effective for disabled riders, and whether these communication tools can assess whether there is an emergency, the vehicle is damaged, or any passengers require emergency medical assistance.

We anticipate that NHTSA will need to carefully consider these and many other safety issues in the ADS. A collaborative effort led by government to convene AV manufacturers, ADS developers, suppliers of other hardware or sensors, as well as disability advocacy groups may aid in better understanding relevant "process measures" and develop relevant "engineering measures" for universally accessible AVs.

1.4 Prioritize Continuous Improvement through Strategic Data Collection

Voluntary business-to-business data sharing platforms are available, and several of these platforms represent a good starting place for industry wide learning. However, these may not be adequate if the data is selective and narrow. Government at all levels can stand to learn best during this early phase of AV testing and deployment, if they can closely monitor early operations of AVs and collect data that will allow them to regulate effectively.[23] Federal leadership on data collection for AVs makes sense because of the scale and costs of managing big datasets which could include personally identifiable data.[24] There is a need to collect more data than simply collecting information on incidents such as near misses, such as the data points collected by the California DMV.[25] Basic data collections efforts such as California's do little to inform or improve safety outcomes. A more granular data collection effort can support industry-wide learning. While doing so will require careful navigation of consumer privacy and proprietary concerns, this is a task that DOT is well-equipped to handle and that many states and cities are not as well-positioned to carry out (with some exceptions).

The DOT Secure Data Commons, is a prime example of a data sharing platform which could be a model to create a data collection and sharing platform with clear parameters for data analysis that effectively manages proprietary and privacy concerns. The Secure Data Commons model is currently storing voluntary data, but it could be adapted to hold data required for safety authorizations, or broader sets of data that could encourage industry-wide learning. Establishing this type of exchange at the federal level would then allow DOT to determine data access for stakeholders who can make use of the data (e.g. AV manufacturers, AV ridehailing operators, cities, or researchers). Security protocols for the data sharing platform would allow differing levels of access to datasets which include sensitive and potentially personally identifiable (PII) information. The Secure Data Commons

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[21] *Id.*
[22] Bezyak, Sabella, and Gattis, *supra* note 19.
[23] Austin Brown & Greg Rodriguez, *Federal, State, and Local Governance of Automated Vehicles* (2018).https://policyinstitute.ucdavis.edu/wp-content/uploads/AV-Governance_IssuePaper_1218.pdf
[24] MOLLIE COHEN D'AGOSTINO, PAIGE PELLATON, & AUSTIN BROWN, *Mobility Data Sharing: Challenges and Policy Recommendations* (2019), https://escholarship.org/uc/item/4gw8g9ms.
[25] California Department of Motor Vehicles, *Disengagement Reports*, https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/disengagement-reports/.

allow analysts to execute statistical analyses within the Commons system, which can obfuscate the need to export big datasets (which could potentially have PII) while preserving the granular data that can encourage more meaningful analysis. While an alternative to this type of data commons model is to collect and publicize only aggregated data, mollifying some PII concerns, aggregation can blunt data utility and may not make the data collection effort adequate for encouraging industry-wide learning. [26]

Question 4. How would your framework assist NHTSA in engaging with ADS development in a manner that helps address safety, but without unnecessarily hampering innovation?

4.1 Binding Regulations May Improve Certainty

In developing a framework, certainty and clarity will allow innovation, while ensuring that minimum levels of safety are achieved. Binding (rather than voluntary) performance-based ADS safety standards within the FMVSS will likely result in more consistent and improved safety outcomes. Performance-based standards, rather than design-based standards, such as safety benchmarks, will be more flexible and allow the industry to evolve in a manner that preserves safety and consistency.[27] Performance-based standards can be effective at allowing flexibility while setting federal standards. These could be well-suited to complement FHWA's Transportation Performance Reporting.[28] Connecting the AV safety framework to FHWA will ensure that AV data can inform broader data-based decisions happening within DOT and states can inform transportation planning and operations.

Question 14. What additional research would best support the creation of a safety framework? In what sequence should the additional research be conducted and why? What tools are necessary to perform such research?

14.1 Research Related to Shared AVs

More research is needed to understand how an AV safety framework would differ for a shared commercial fleet, or shared public transit AV, compared to AVs sold to individual owners for private operation. This research should strive to understand the benefits and costs of these AVs, which would include metrics of safety as well as mobility, accessibility, environment and equity.

More research also should expand on Sanguinetti et al.[29] to uncover ADS and AV characteristics that make the vehicles more conducive to shared mobility applications. Additionally, more research is needed to assess safety outcomes for these different business models and to understand the expanded role of AV manufacturers in ensuring reliable ongoing performance of the ADS and vehicles whether they are operated by individuals or fleets.

Research questions to consider:

- Are shared AVs operated in a fleet safer than privately owned AVs? Why or why not?

[26] MOLLIE COHEN D'AGOSTINO, PAIGE PELLATON, AND AUSTIN BROWN, *supra* note 24.
[27] AUSTIN BROWN, GREG RODRIGUEZ, & TIFFANY HOANG, *Federal, State, and Local Governance of Automated Vehicles* (2018), https://policyinstitute.ucdavis.edu/wp-content/uploads/AV-Governance_IssuePaper_1218.pdf.
[28] US Department of Transportation, Federal Highway Administration, *Transportation Performance Management* (2020), https://www.fhwa.dot.gov/tpm/.
[29] SANGUINETTI, KURANI, AND FERGUSON, *supra* note 12.

- What are the full benefits and costs of shared AV service (and shared AV transit operation) compared to privately owned AVs?
- What vehicle design characteristics impact consumers' preference for using shared AVs. What characteristics also affect perceptions of risks and benefits of sharing versus riding alone?[30]
- How will consumers' perceptions of risks and benefits of shared AVs shift as the market emerges and expands.[31]

14.2 Research Related to Bicycle and Pedestrian Safety

Additional research is necessary to understand what safety standards can encourage safe operation of AVs in various operation design domains.
Research questions to consider:

- How can testing demonstrate and improve ADS perceptions and response to bicycles in all lane types?
- How will ADS respond to bicycle hand signals? How would interpretation of these signals differ for recumbent bicycles or other types of bicycles designed to accommodate wheelchair riders?
- What safety standards might apply in areas with high volumes of bicycles and pedestrians that might differ from areas without adequate bicycle and pedestrian infrastructure? [32]
- How can ADS ensure safety benefits for pedestrians are equitable- based on race, gender, and age (see 14.3 below).
- Can AVs be used to collect better data on walking and bicycling pinch points? How can this information be transferred securely and effectively to cities?

14.3 Research Related to AV Safety for People of Color

Questions remain about the ability of AVs to equitably identify people of all races. A study from Georgia Tech concluded that dark-skinned individuals were less visible to certain AV sensors.[33] Performance measures that ensure that these types of biases do not result in disproportionate injuries or fatalities for people of color will ensure that regulations are in line with federal equity and fairness objectives.
Research questions to consider:

- How can ADSs be tested to ensure there is no racial biases in the visibility of pedestrians based on race?
- What data collection efforts can ensure that there are no inequitable safety benefits for AV deployment based on race?

14.4 Research Related to Safety and Accessibility for People with Disabilities

People with disabilities are a diverse set of populations and individuals. There is a significant and ongoing need to conduct a nuanced study of the potential for maximizing the benefits of AVs for this diverse group of people with physical, mental or cognitive disabilities.
Research questions to consider:

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[30] *Id.*
[31] *Id.*
[32] SUSAN HANDY, *Active Transportation in an Era of Sharing, Electrification and Automation* (2017), https://3rev.sf.ucdavis.edu/sites/g/files/dgvnsk6431/files/files/page/3R.Active.InDesign.Final_%20%281%29.pdf.
[33] BENJAMIN WILSON & JAMIE MERGENSTERN, *Predictive Inequity in Object Detection* (2019), https://arxiv.org/pdf/1902.11097.pdf.

- **Doorways:** Research into best practices for doorway and seat entrance and exit timing, which includes accommodations for wheelchair riders with different types of chairs, as well as people in all disability categories, particularly for deaf, low-vision and cognitively disabled people.
- **Wheelchair Ramps and level boarding:** Best practices must be identified for automating ramps or level boarding devices that ensure safe entrance and egress for wheelchair riders with all disability types, with and without aids. This could include research into whether the speed of ramps lifting and lowering could result in side effects (e.g. dizziness or nausea); the ramps have failsafe sensors that can ensure the vehicle is not put into service if the ramp is dysfunctional.
- **Seats and Securements:** Research can ensure that an AV that has built-in seats that automatically fold to make room for a wheelchair when such a rider enters, and that those seats do not prematurely pop back up while such a rider is in position.
- **Communication and Wayfinding:** Best practices for communication for wayfinding and emergency alert between ADS and riders with all disability types. Including possible connections to disabled users' through smart phones, or wearable devices.
- **Failsafe Emergency Protocols:** If an AV has a "panic button" to be used by riders in severe physical or emotional distress, then there may need to be testing in controlled & field environments involving people with disabilities to determine appropriate design & functionality for calling for help in the event of a technical emergency (e.g. AV runs out of fuel/energy, an accident, or a medical emergency). Especially considering situations in which passengers with disabilities are operating in rural or otherwise disconnected locations.

5. Conclusion

A holistic AV Framework that addresses safety, environment and equity together will be more aligned to the findings from our research. A binding regulatory framework will address the considerable regulatory uncertainty for the AV industry, as well as local and state governments. This level of uncertainty leaves AV stakeholders questioning whether to comply with local regulation or wait for definitive federal actions. This may be linked to slowdowns in safe AV deployment, which carry opportunity costs for our communities. A binding regulatory framework should be focused on achieving a certain level of safety through performance-based standards, data collection and analysis. We suggest that NHTSA further clarifies terminology, takes steps to encourage safe and secure shared AV passenger service, evaluates safety for riders with physical and cognitive disabilities, and prioritizes continuous improvement through strategic data collection. We also suggest that future research address questions for AV sharing, bicycle and pedestrian safety, safety for people of color, and safety for people with disabilities. We welcome an opportunity to discuss these comments further within the DOT, and among all stakeholders participating in this rulemaking.

Sincerely,

Mollie Cohen D'Agostino
Policy Director,
3 Revolutions Future Mobility Program
UC Davis Policy Institute for Energy, Environment, and the Economy