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Testimony of:
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Chair Holmes Norton, Ranking Member Davis, Members of the Subcommittee, good morning, my name is Ariel Wolf, and I serve as General Counsel to the Autonomous Vehicle Industry Association, on whose behalf I appear today. I also serve as a partner at the law firm Venable LLP, where I head the Autonomous and Connected Mobility practice. Thank you for giving me the opportunity to provide testimony for this hearing today.

The Autonomous Vehicle Industry Association ("Association") was founded in April 2016 by Ford Motor Company, Waymo, Lyft, Volvo Cars, and Uber to be the voice of the nascent autonomous vehicle ("AV") industry. Since then, we are proud to have tripled in size, adding many of the world's leading technology, trucking, ridesharing, and automotive companies as members of the Association.[1] This cross-section of companies demonstrates the widespread interest in developing AV technology across different sectors. As the unified voice of the AV industry, we are committed to bringing the tremendous safety and mobility benefits of AVs to consumers in a safe, responsible, and expeditious manner.

Our mission is to realize the benefits of AVs—otherwise known as SAE Levels 4- and 5-capable vehicles—and support the safe and timely deployment of this technology. For a dozen years, AV technology has been tested on our roads for tens of millions of miles and maintains a

[1] AV Industry Association members include Argo AI, Aurora, Cruise, Embark, Ford, Kodiak, Lyft, Motional, Navya, Nuro, TuSimple, Uber, Volvo Cars, Waymo and Zoox.

remarkable safety record. At the same time, as I will discuss, roadway fatalities in this country involving vehicles with human drivers have gone up dramatically. So let me be clear at the outset of this discussion: **autonomous vehicles will save lives, which is why the AV industry is so committed to developing this technology and to deploying it in a timely manner.**

AV technology not only will make our roads safer, but also can transform our transportation system by making it more accessible, efficient, and sustainable. Just last week I visited several AV Industry Association members to see firsthand how this transformation is taking shape. I rode in AVs that are being used to safely navigate the streets of San Francisco, Las Vegas, Phoenix, Miami, Pittsburgh and other cities across the country. I climbed into autonomous trucks that are hauling freight in Texas, New Mexico, and beyond, and that are helping to solve our supply chain crisis and reduce costs to consumers. I saw how zero-occupant electric delivery vehicles are expanding access to fresh food and reducing emissions. To experience AV technology and see its capabilities is to understand the potential for this industry to change our lives for the better. On a personal note, I think about safer streets for my four daughters as they grow up; expanded independence for my grandmother in Florida and for my parents as they soon enter retirement; opportunities to expand equitable transportation options to all communities here in DC where I live. And I see this happening all while we can grow the economy and expand job creation.

I. AVs Offer Significant Benefits to Consumers, Workers, and the Economy

AVs have the potential to: (a) improve road safety; (b) improve transportation equity; and (c) create jobs and broadly benefit the American economy.

A. AVs Will Improve Road Safety

As members of the Subcommittee may know, the National Highway Traffic Safety Administration ("NHTSA") reported that 20,160 Americans died on the road in the first six months

of 2021—an increase of 18.4 percent over 2020 and more fatalities than in any first half-year over the past 15 years.[2] In fact, in 2020, despite fewer vehicles on the road and fewer vehicle miles traveled compared to the previous year, the number of deaths on the road was the highest it had been since 2007.[3] As terrible a tragedy as these numbers reflect, the toll cannot be measured in fatalities alone. Since 2016, the number of motor vehicle crashes resulting in injury has averaged nearly 2 million per year.[4] According to the National Safety Council, the estimated cost of motor-vehicle deaths, injuries, and property damage in the first half of 2021 was $241.9 billion.[5]

The 2021 fatality numbers are part of a pattern of increasingly unsafe driving that is occurring across the country. According to the U.S. Department of Transportation ("USDOT"), human behavior is a contributing factor to the overwhelming majority of serious and fatal crashes;[6] NHTSA attributes an increasing share of roadway fatalities to distracted driving and other risky driving behaviors. While AV technology continues to develop and advance, the simple fact is that AVs do not drive drunk, they do not text while driving, they do not fall asleep at the wheel, and they do not recklessly speed. And unlike human drivers, AVs do not present a risk of misusing driver assistance systems.

The AV industry was created to confront the monumental and ongoing tragedy on our roads—over the last ten years, there have been 374,432 reported deaths and nearly 16 million

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[2] Nat'l Highway Traffic Safety Admin., U.S. Dep't of Transp., DOT HS 813 199, Early Estimates of Motor Vehicle Traffic Fatalities for the First Half (January-June) of 2021 1 (2021), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813199 [hereinafter NHTSA Jan.-June 2021 Fatality Estimates].

[3] NHTSA Jan.-June 2021 Fatality Estimates.

[4] *National Statistics*, NAT'L CTR. FOR STAT. AND ANALYSIS, https://cdan.nhtsa.gov/ (last visited Jan. 30, 2022). According to the National Safety Council, the number of "medically consulted injuries" from crashes is 4.5 million. *See Introduction*, NAT'L SAFETY COUNCIL: MOTOR VEHICLE INJURY FACTS OVERVIEW, https://injuryfacts.nsc.org/motor-vehicle/overview/introduction/ (last visited Jan. 30, 2022).

[5] *Preliminary Semiannual Estimates*, NAT'L SAFETY COUNCIL, https://injuryfacts.nsc.org/motor-vehicle/overview/preliminary-estimates/ (last visited Jan. 28, 2022).

[6] NATIONAL ROADWAY SAFETY STRATEGY, U.S. DEPT. OF TRANSP. 14 (Jan. 2022), https://www.transportation.gov/sites/dot.gov/files/2022-01/USDOT_National_Roadway_Safety_Strategy_0.pdf.

crashes with injuries on our roads due to human-operated vehicles. The remarkable safety record of autonomous vehicles, which have been involved in only one fatality in more than a decade of testing and deployments, gives me hope that we will be able to make progress against this public health crisis. The record is clear: ***autonomous vehicles are being developed safely, and they will make our roads safer***.

As USDOT Secretary Buttigieg has recognized, we cannot accept the reality of our roads as the "cost of doing business." Though we may have grown numb to the grim roadway statistics in our country, each fatality and injury is a tragedy that affects countless lives. To reduce fatalities and injuries, Americans need a comprehensive approach to roadway safety that includes a full suite of solutions, from safer road design to drunk-driving prevention systems, in addition to the deployment of AVs.

B. AVs Can Improve Transportation Equity

By improving safety and providing greater mobility, AVs will be a vital tool in securing transportation equity and connecting communities and individuals to the resources and jobs they need. Specifically, AVs will allow those who previously had limited or no access to a personal vehicle or transit system the freedom to travel, commute, and conveniently obtain goods and services.

1. Roadway Safety and Equity

Roadway crashes, and the resulting injuries and deaths, are not evenly distributed across socioeconomic, racial, or ethnic groups. An analysis published by the Governors Highway Safety Association highlights the disproportionate number of traffic fatalities experienced by Black, Indigenous, and People of Color ("BIPOC").[7] In particular, per capita rates of traffic fatalities

[7] GOVERNORS HIGHWAY SAFETY ASS'N, AN ANALYSIS OF TRAFFIC FATALITIES BY RACE AND ETHNICITY 18 (2021), https://www.ghsa.org/sites/default/files/2021-

among American Indian/Alaskan Natives and Black populations were all higher than the national average,[8] and pedestrian death rates per capita were higher than the national average for American Indian/Alaska Natives, Black, and Hispanic individuals.[9] Estimates published by NHTSA indicate that these discrepancies have become exacerbated in recent years, with traffic fatalities of Black individuals up 23% in 2020 compared to 2019, while American Indian deaths rose 11%.[10]

This analysis and other research indicate that socioeconomic status can also influence the risk of motor vehicle crash involvement. Census tracts have recorded pedestrian fatality rates within low-income metropolitan areas approximately twice that of more affluent neighborhoods.[11] These patterns are echoed in a City of Chicago report revealing that Black residents and those living in communities with high levels of economic hardship were more at risk of dying in a traffic crash compared to white residents and those living in communities with low and medium levels of economic hardship, respectively.[12] By reducing crashes across the board, AVs can reduce these inequities and improve the quality of life for all communities.

2. Connecting Underserved Communities to Transit, Resources, and Jobs

AVs can provide vital connections to areas with high demand but low supply of transportation, otherwise known as transit deserts.[13] Access to transportation and average length

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06/An%20Analysis%20of%20Traffic%20Fatalities%20by%20Race%20and%20Ethnicity.pdf [Hereinafter GHSA RACE AND ETHNICITY ANALYSIS].

[8] *Id.* at 8.

[9] GHSA RACE AND ETHNICITY ANALYSIS at 13.

[10] *Id.* at 18; NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., DOT HS 813 118, EARLY ESTIMATES OF MOTOR VEHICLE TRAFFIC FATALITIES AND FATALITY RATE BY SUB-CATEGORIES IN 2020 8 (2021), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813118.

[11] GOVERNING, AMERICA'S POOR NEIGHBORHOODS PLAGUED BY PEDESTRIAN DEATHS 1 (2014), http://media.navigatored.com/documents/Governing_Pedestrian_Fatalities_Report.pdf.

[12] VISION ZERO CHICAGO, ACTION PLAN 2017-2019 17, https://visionzerochicago.org/wp-content/uploads/2016/05/17_0612-VZ-Action-Plan_FOR-WEB.pdf.

[13] *Frequently Asked Questions*, TRANSIT DESERT RESEARCH, http://www.transitdeserts.org/faq.html (last visited July 22, 2021).

of commute are connected to upward mobility,[14] and studies have found links between public transit access, income, and unemployment.[15] A 2011 study showed that an average person can access only about 30% of all jobs and 25% of low- and middle-skilled jobs in a given metropolitan area via public transit within 90 minutes.[16] AVs have the potential to reduce or eliminate gaps in transportation access by improving integration with mass transit, whether by providing both first mile and last mile connections to transit, servicing direct trips to workplaces and other endpoints, or by broadly increasing supply that helps free up other conventional and AV transportation options to build those linkages. Projections indicate that the transportation connections facilitated by the adoption of AVs would increase access to jobs within a metropolitan area by 45% by 2040.[17] Through these various means, AVs will further connect Americans with a variety of key features of their communities, improving access and quality of life.

Access to food is another area of inequality that AVs can help alleviate. Transit deserts often overlap with food deserts, which are defined as areas with high poverty (20% or greater) and low access to food (at least 33% of people living more than one mile from a grocery store or supermarket).[18] A 2017 report by the U.S. Department of Agriculture's Economic Research Service ("ERS") estimates that 54 million individuals, or 17.1 percent of the total U.S. population, had limited access to a supermarket or grocery store between 0.5 and 10 miles from their home.[19]

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[14] Mikayla Bouchard, *Transportation Emerges as Crucial to Escaping Poverty*, N.Y. TIMES (May 7, 2015), https://www.nytimes.com/2015/05/07/upshot/transportation-emerges-as-crucial-to-escaping-poverty.html.
[15] Gillian D. White, S*tranded: How America's Failing Public Transportation Increases Inequality*, THE ATLANTIC (May 16, 2015), https://www.theatlantic.com/business/archive/2015/05/stranded-how-americas-failing-public-transportation-increases-inequality/393419/.
[16] Adie Tomer Et Al., *Missed Opportunity: Transit and Jobs in Metropolitan America*, BROOKINGS (May 11, 2011), https://www.brookings.edu/research/missed-opportunity-transit-and-jobs-in-metropolitan-america/.
[17] RICHARD EZIKE ET. AL., WHERE ARE SELF-DRIVING CARS TAKING US?, 6 (2019), https://ucsusa.org/sites/default/files/attach/2019/02/Where-Are-Self-Driving-Cars-Taking-Us-web.pdf.
[18] Michele Ver Ploeg et al., *Mapping Food Deserts in the United States*, ECONOMIC RESEARCH SERVICE (Dec. 1, 2011), https://www.ers.usda.gov/amber-waves/2011/december/data-feature-mapping-food-deserts-in-the-us/.
[19] ECON. RSCH. SERV., EIB-165, U.S. DEP'T OF AGRIC. LOW-INCOME AND LOW-SUPERMARKET-ACCESS CENSUS TRACTS, 2010-2015 12 (2017), https://www.ers.usda.gov/webdocs/publications/82101/eib-165.pdf?v=3395.3.

Further, a 2009 ERS report found that, at the time, 2.3 million people lived more than one mile from a supermarket and did not have access to a vehicle.[20] The COVID-19 pandemic has increased overall food insecurity—the lack of access to food due to financial constraints—across the nation, with projections suggesting that up to 42 million (1 in 8) people in the U.S. may experience food insecurity in 2021.[21]

AVs can prove particularly useful for improving access to food, both by transporting people to previously inaccessible or difficult to access supermarkets and grocery stores, and also by bringing food directly to their doors. AV companies are already preparing to use their vehicles in such ways, exemplified by Cruise delivering over one million meals to food-insecure families in San Francisco,[22] TuSimple using autonomous tucks to deliver more than 3.5 million pounds of food (2.7 million meals) for food banks in Arizona,[23] and Nuro vehicles helping the Houston Food Bank feed people in Texas.[24] With more widespread deployment, AVs could improve access to fresh food for 14 million low-income households, with roughly 70% of the total low-income population living in food deserts.[25] The addition of safe and affordable options into the transportation ecosystem will create the capacity to execute on these trips.

3. Expanding Mobility Options for All

AV deployment offers new and improved transportation options for people with disabilities as well as for older residents. Studies by USDOT estimate that 25.5 million Americans have travel-

[20] ECON. RSCH. SERV., ACCESS TO AFFORDABLE AND NUTRITIOUS FOOD: MEASURING AND UNDERSTANDING FOOD DESERTS AND THEIR CONSEQUENCES iii (2009) https://www.ers.usda.gov/webdocs/publications/42711/12716_ap036_1_.pdf?v=8423.6.
[21] FEEDING AMERICA, THE IMPACT OF THE CORONAVIRUS ON FOOD INSECURITY IN 2020 & 2021 1 (2021), https://www.feedingamerica.org/sites/default/files/2021-03/National%20Projections%20Brief_3.9.2021_0.pdf.
[22] Dan Ammann, *Introducing Cruise for Good*, MEDIUM (Apr. 23, 2021), https://medium.com/cruise/introducing-cruise-for-good-8ebf9bfdaf4a.
[23] *Hunger-Free AZ News*, ARIZ. FOOD BANK NETWORK (Summer 2020), https://azfoodbanks.org/wp-content/uploads/2020/09/AzFBN_S20_Newsletter_DIGITAL.pdf.
[24] Sola Lawal, *Serving America's Food Deserts*, MEDIUM (July 15, 2020), https://medium.com/nuro/serving-americas-food-deserts-a7442e922053.
[25] *Id.*

limiting disabilities,[26] while roughly 560,000 people with disabilities never leave their homes due to transportation difficulties.[27] These difficulties are often due to a lack of accessible or convenient public transportation or an inability to operate their own vehicle, as is the case for the over 7.6 million Americans over the age of 16 who have significant vision impairment.[28] This lack of transportation impacts employment as well—only 17.5% of people with disabilities are employed, compared to 65% of people without a disability.[29]

AVs can allow those with disabilities greater freedom to move about the world on their own schedule. AV mobility-as-a-service offerings can help improve transportation for individuals who cannot drive. For instance, Cruise has made public its work to develop a wheelchair accessible version of its Origin vehicle platform.[30] For low vision individuals, companies like Lyft, through a partnership with Motional and the National Federation of the Blind, have worked to create Braille guides for AV riders.[31] Likewise, in Arizona, Waymo has highlighted the use of its AVs by vision impaired people of all ages, while its ongoing efforts to develop additional accessibility features were recognized by the federal government when the USDOT named the company as a semifinalist in its Inclusive Design Challenge.[32]

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[26] *Accessibility*, U.S. DEP'T OF TRANSP. (July 29, 2020) https://www.transportation.gov/accessibility.
[27] BUREAU OF TRANSP. STAT., TRANSPORTATION DIFFICULTIES KEEP OVER HALF A MILLION DISABLED AT HOME (2012), https://www.bts.gov/archive/publications/special_reports_and_issue_briefs/issue_briefs/number_03/entire.
[28] *Blindness Statistics*, NAT'L FED'N OF THE BLIND, https://nfb.org/resources/blindness-statistics (last visited Jan. 28, 2021).
[29] Economic News Release, U.S. Bureau of Labor Stat., Persons with a Disability: Labor Force Characteristics Summary (Feb. 24, 2021), https://www.bls.gov/news.release/disabl.nr0.htm.
[30] Sam Abuelsamid, *Cruise CEO Shows Off Locker Module and Wheelchair Accessible Origin Robotaxi*, FORBES (Oct. 6, 2021), https://www.forbes.com/sites/samabuelsamid/2021/10/06/cruise-ceo-shows-off-locker-module-and-wheelchair-accessible-origin-robotaxi/?sh=567dd9d61c78.
[31] *Lyft, Aptiv, and the National Federation of the Blind Partner to Provide Rides to Blind and Low Vision Passengers*, LYFT: BLOG (July 8, 2019), https://www.lyft.com/blog/posts/lyft-aptiv-nfb-low-vision-riders.
[32] *See Max's Story*, LET'S TALK AUTONOMOUS DRIVING, https://ltad.com/story/maxs-story-foundation-for-blind-children.html (last visited Jan. 28, 2022); *Brian's Story*, LET'S TALK AUTONOMOUS DRIVING, https://ltad.com/story/brians-story-foundation-senior-living.html (last visited Jan. 28, 2022); *Inclusive Design Challenge Semifinalists*, U.S. DEP'T OF TRANSP., https://www.transportation.gov/inclusive-design-challenge/inclusive-design-challenge-semifinalists#Waymo (last visited Jan. 28, 2022).

Additionally, older populations also stand to benefit from the deployment of AVs. The number of Americans over the age of 65 grew by 34% between 2010 and 2020,[33] with 2016 estimates putting their total population at 46.2 million (10.6 million in rural areas alone).[34] By 2030, that number will grow to more than 70 million, or roughly 20% of the population.[35] While transportation challenges can vary greatly between individuals, roughly 600,000 older adults a year give up driving, with many more changing their driving habits as they age.[36] Studies have shown that older Americans without access to a car make 15% fewer trips to the doctor and 65% fewer trips to visit friends and family.[37]

In particular, AVs are well positioned to assist older Americans as they navigate the world. As more people "age in place" by staying in their own homes, on-demand AVs could carry them to doctor's appointments and shopping trips, and help them visit friends and family whenever they like.[38] AVs can also provide similar connections to the residents of retirement communities, as Voyage (now part of Cruise) did in a San Jose-based pilot program.[39] AVs can keep millions of older Americans connected to their families and communities, and allow them to retain their independence without risking their safety or the safety of vulnerable road users.

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[33] Press Release, U.S. Census Bureau, 65 and Older Population Grows Rapidly as Baby Boomers Age (June 25, 2020), https://www.census.gov/newsroom/press-releases/2020/65-older-population-grows.html.
[34] AMY SYMENS SMITH AND EDWARD TREVELYAN, ACS-41, U.S. CENSUS BUREAU, THE OLDER POPULATION IN RURAL AMERICA: 2012-2016 (2019), https://www.census.gov/library/publications/2019/acs/acs-41.html.
[35] Dabid Dudley, *The Driverless Car is (Almost) Here*, AARP THE MAG. (Dec.2014/Jan. 2015), http://www.aarp.org/home-family/personal-technology/info-2014/google-self-driving-car.html.
[36] *Transportation*, NAT'L ASS'N OF AREA AGENCIES ON AGING, https://www.n4a.org/transportation (last visited Jan. 28, 2022).
[37] TRANSP. FOR AMERICA, AGING IN PLACE, STUCK WITHOUT OPTIONS: FIXING THE MOBILITY CRISIS THREATENING THE BABY BOOM GENERATION (2011), https://t4america.org/docs/SeniorsMobilityCrisis.pdf.
[38] Dudley, *supra* note 35.
[39] Tara Andringa, *When AVs Get Real, Attitudes Change*, MEDIUM (May 19, 2020) https://medium.com/pave-campaign/when-avs-get-real-attitudes-change-2463101d4dcf.

4. Connecting Rural Communities

AVs also serve as a useful tool in rural communities, which face many of the same problems as urban and suburban ones, with the added issue of individuals often having to travel much farther to take care of their needs. Rural areas are threatened by food deserts[40] while also facing motor vehicle death rates three to ten times higher than other areas.[41] NHTSA's 2020 early estimates project an 11% increase in rural road deaths in 2020,[42] while 2017 numbers show more than half of all passenger vehicle occupant deaths occur on rural roads.[43] At the same time, approximately 40% of all rural residents live in areas with no public transportation.[44] Almost a quarter of all people over 65 live in rural areas,[45] leading to diminishing transportation options as they age in place. In rural areas, AVs are positioned to provide the same safety and mobility improvements as they will elsewhere and to improve the quality of life for residents.

5. Improving Public Health

In addition, AVs can serve important environmental goals that advance public health.[46] Emissions from motorized vehicles are a major source of air pollution, which is a leading risk factor for mortality and morbidity.[47] Although the American Lung Association has found that more than 40% of Americans are living in places with unhealthy air, the effects of poor air quality

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[40] LOIS WRIGHT MORTON AND TROY C. BLANCHARD, STARVED FOR ACCESS: LIFE IN RURAL AMERICA'S FOOD DESERTS, 1 RURAL REALITIES 1, 2007, https://web.archive.org/web/20131021015542/http://www.ruralsociology.org/wp-content/uploads/2012/03/Rural-Realities-1-4.pdf.

[41] *Passenger Vehicle Occupant (PVO) Deaths and Seat Belt Use among Rural Americans*, CTR. FOR DISEASE CONTROL (Sept. 20, 2017), https://www.cdc.gov/ruralhealth/motorvehicle/policybrief.html.

[42] NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., *supra* note 10 at 1.

[43] *Id.*

[44] TRANSP. FOR AMERICA, *supra* note 37 at 10.

[45] *Id.* at 9.

[46] *See* David Rojas-Rueda, et al., *Autonomous Vehicles and Public Health*, 41 ANN. REV. OF PUB. HEALTH 329 (2020), https://www.annualreviews.org/doi/10.1146/annurev-publhealth-040119-094035.

[47] *Id.* (citing HEALTH EFFECTS INST., STATE OF GLOBAL AIR/2018, https://www.stateofglobalair.org/sites/default/files/soga-2018-report.pdf).

are disproportionately experienced by BIPOC.[48] Specifically, the American Lung Association's most recent "State of the Air" report demonstrates that BIPOC were 61% more likely to live in a county with unhealthy air than white peers.[49]

AVs can positively impact air pollution by reducing emissions as well as offer an array of significant environmental benefits, ranging from greater fuel efficiency and reduced congestion to reduced agricultural spoilage and related preservation of soil and water resources. In the context of emissions specifically, AVs are helping to lead the way on reducing emissions, with numerous companies already using battery electric vehicles ("EVs") or gasoline-electric hybrids for their AV fleets, and adoption of EVs is increasing. A study by Steer found that autonomous, electric local delivery vehicles could avoid more than 400 million tons of CO2 from 2025-2035.[50] Embark Trucks has partnered with HP to help expedite this transition. The two companies are using Embark's network of transfer hubs to allow for the direct transfer of goods from autonomous-equipped trucks onto zero-emissions drayage vehicles which carry computer parts to their final destination. It is estimated that this process will remove up to 50,000 tons of carbon dioxide and other pollutants from HP's distribution network over the next decade.[51] Additionally, a recent study demonstrated that AV trucks can reduce fuel consumption of heavy-duty trucks by at least 10% as a result of more efficient driving, resulting in a significant reduction of CO2 emissions.[52]

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[48] *State of the Air: Key Findings*, AMERICAN LUNG ASS'N, https://www.lung.org/research/sota/key-findings (last visited Jan. 28, 2022).
[49] Press Release, American Lung Association, More Than 4 in 10 Americans Breath Unhealthy Air, People of Color 3 Times as Likely to Live in Most Polluted Places (Apr. 21, 2021), https://www.lung.org/media/press-releases/sota-2021.
[50] STEER, ECONOMIC IMPACTS OF AUTONOMOUS DELIVERY SERVICES IN THE U.S. XV (2020), https://www.steergroup.com/sites/default/files/2020-09/200910_%20Nuro_Final_Report_Public.pdf.
[51] Alan Adler, *Embark Knits BYD Electric Trucks with its Autonomous Tractors for Cleaner Air*, MODERN SHIPPER (Sept. 14, 2021), https://www.freightwaves.com/news/embark-knits-byd-electric-trucks-with-its-autonomous-tractors-for-cleaner-air.
[52] Ryan Gehm, *Self-driving trucks cut fuel consumption by 10%*, SAE INTERNATIONAL (Dec. 19, 2019), https://www.sae.org/news/2019/12/tusimple-autonomous-trucks-cut-fuel.

C. AVs Can Create Jobs and Broadly Benefit the American Economy

The AV industry is currently creating new jobs and bringing new investment, tax revenue, resources, and human capital to states across the country, including California, Arizona, Nevada, Pennsylvania, Michigan, Massachusetts, Florida, Washington, Colorado, Texas and the District of Columbia. A study performed for the Pittsburgh-based Regional Industrial Development Corporation found that in the Pittsburgh region alone the autonomous vehicle industry has created 6,500 new jobs, and the global autonomous vehicle industry could be worth $1 trillion globally by 2026.[53] The further development of the AV industry is poised to support the economic competitiveness of American businesses and help grow the U.S. economy. Currently, the U.S. is the world leader in the AV industry due to the strength and breadth of American innovation in the industry. Policies that support the deployment of AVs are also policies that support the growth of the U.S. economy. By saving lives, creating jobs, and reducing costs for consumers the economic benefits of AVs promise to be significant in the decades to come. Additionally, AV trucking alone is anticipated to produce substantial economic benefits for both consumers and workers.

1. Job Expansion in the AV Industry

The AV industry is creating jobs and providing opportunities for workers with a wide array of expertise and educational backgrounds, including many jobs that do not require a college degree. Today, in locations across the country, AV developers and manufacturers are hiring auto technicians, fleet managers, safety operations specialists, sensor calibrators, transportation planners, engineers, and many others to support the testing and deployment of AV technology. Additionally, as the industry continues to expand, delivery workers, and grocery store employees

[53] TECONOMY PARTNERS, FOREFRONT: SECURING PITTSBURGH'S BREAK-OUT POSITION IN AUTONOMOUS MOBILE SYSTEMS ES-1-2 (2021), https://ridc.org/wp-content/uploads/2021/10/PGH-Autonomy-Report-Executive-Summary.pdf.

will be involved in selecting, packing, and delivering goods to consumers, among other jobs and roles that will emerge. AVs can expand access to affordable delivery while also creating over three million new jobs by 2035, as retailers and delivery providers expand their services, according to a study by Steer.

In addition, the AV industry is investing in partnerships to create the jobs of the future. For example, Nuro's program with De Anza Community College will offer a new career pathway to prepare the next generation of autonomous fleet technicians.[54] The initiative, which will include more locations in the near future, includes a free tuition option, access to paid internships and part time work, and preference for full time jobs and full benefits upon graduation. Another example is TuSimple's work with Pima Community College, which established an AV certificate program to prepare drivers for new jobs such as training AV systems as test drivers, operating the AV in situations where autonomous driving is not suitable, and remotely monitoring the system from a command center.[55]

2. Consumer Savings

AVs can reduce the costs of consumer goods as well as transportation. To highlight one example, AVs have the potential to significantly reduce the cost of deliveries for consumers, with some pilots costing only $5.95 per grocery delivery, compared to the added costs of between $10 and $20 charged by existing delivery services.[56] With respect to transportation costs—which

[54] *Autonomous and Electric Vehicle Technician Pathway*, DE ANZA COLLEGE, https://www.deanza.edu/autotech/av#:~:text=A%20New%20Career%20Pathway%20With,nation%20%E2%80%94%20for%20De%20Anza%20students (last visited Jan. 28, 2022).
[55] Linda Baker, *TuSimple and Pima Community College Launch First-Ever AV Certificate Program for Truck Drivers*, FREIGHT WAVES (June 13, 2019), https://www.freightwaves.com/news/tusimple-and-pima-community-college-launch-first-ever-av-certificate-program-for-truck-drivers.
[56] STEER, *supra* note 49 at XI.

amount to the second-largest expense for most households[57]—AVs could reduce average household costs by as much as $5,600 per year when consumers rely on shared fleets of AVs.[58] This would be particularly impactful in food deserts, rural communities, and other areas that do not yet have significant, accessible public transit options.

3. Economic Benefits of AV Trucking

In the coming years, autonomous trucking will fundamentally alter interstate commerce by changing the manner and speed in which goods move in our country while making roads safer for everyone, AV trucks can increase long-haul efficiency and capacity, which will in turn improve the efficiency of countless industries that rely on moving goods on trucks, such as agriculture, retail, and manufacturing. Importantly, AV trucks will be part of a comprehensive trucking ecosystem that works with human drivers, not against them. Adoption of this technology will not lead to mass layoffs; it will lead to a positive lifestyle change for thousands of truckers, allowing them to stay closer to home during the day instead of driving routes that keep them on the road for weeks at a time. Our members' technology will allow drivers to spend more nights in their own beds instead of in the sleeper berth of a truck. That's a change we believe will be welcomed by many truckers.

A recent study funded by USDOT and the Federal Highway Administration also indicated that adoption of AV trucking will increase total U.S. employment by 26,400 to 35,100 jobs per year on average and raise annual earnings for all U.S. workers by between $203 and $267 per worker per year.[59] Given the timeline for AV truck deployment, autonomous trucking is not likely

[57] *Fostering Economic Opportunity through Autonomous Vehicle Technology*, SAFE (Jul 16, 2020) https://secureenergy.org/fostering-economic-opportunity-through-autonomous-vehicle-technology-2/.
[58] *Id.*
[59] ROBERT WASCHIK ET AL., JOHN A. VOLPE NAT'L TRANSP. SYS. CTR., MACROECONOMIC IMPACTS OF AUTOMATED DRIVING SYSTEMS IN LONG-HAUL TRUCKING (2021), https://rosap.ntl.bts.gov/view/dot/54596.

to cause significant displacement of jobs in the trucking industry,[60] but it can serve as one tool to reduce strains on the supply chain caused, in part, by the longstanding truck driver shortage.

AV trucking also holds substantial potential to decrease the cost of goods. Sixty-five percent of U.S. consumable goods are brought to market by trucks, and the implementation of full autonomy in the trucking sector stands to decrease operating costs by about 45%—resulting in savings between $85 billion and $125 billion.[61] The benefits to our nation's economy, workers, and supply chains make AV trucking well positioned to complement the broader array of economic benefits that AV deployment will bring.

II. U.S. Leadership in AV Development Should Not be Taken for Granted

The United States is leading the world in the development and deployment of AV technology, but the U.S. risks losing our technological and automotive leadership in a global market worth an estimated $8 trillion[62] due to foreign competition. America's leadership role is integral to securing the economic growth, job creation and many safety and societal benefits offered by AVs. However, as explained below, foreign competitors are moving to surpass our progress through policy changes and government investment.

China. China's government is investing heavily in developing autonomous vehicles as part of its strategy to overtake and replace foreign market leaders. The Chinese government has prioritized AV development and included AVs in the Made in China 2025 strategic initiative,

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[60] *See* SECURING AM. FUTURE ENERGY, AMERICA'S WORKFORCE AND THE SELF-DRIVING FUTURE REALIZING PRODUCTIVITY GAINS AND SPURRING ECONOMIC GROWTH (June 2018), https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

[61] AISHA CHOTTANI, ET AL., MCKINSEY & CO., DISTRACTION OR DISRUPTION? AUTONOMOUS TRUCKS GAIN GROUND IN US LOGISTICS (Dec. 10, 2018), https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/distraction-or-disruption-autonomous-trucks-gain-ground-in-us-logistics.

[62] Michael Wayland, *GM's Cruise Values Autonomous Vehicle Industry at $8 Trillion*, CNBC (Feb. 5, 2020), https://www.cnbc.com/2020/02/05/gms-cruise-values-autonomous-vehicle-industry-at-8-trillion.html. The estimate includes ride-hailing, trucking, data services, and telematics/infotainment.

which encourages local governments to open roads for testing.[63] One company, AutoX, backed by e-commerce giant Alibaba, announced the launch of autonomous taxis on public roads across an area three times the size of Manhattan within Shenzhen in January 2021.[64] In 2020, Apollo Go, backed by China's leading search engine Baidu, was authorized to launch a pilot of the first paid AV taxi (or "robotaxi") service in Beijing,[65] and has also begun public tests in Shanghai.[66] Many other Chinese companies are investing in AV technology and testing, including Huawei, Pony.ai, WeRide.ai, Didi Chuxing, and Momenta. These companies are also attracting investment from other countries around the world. However, Chinese companies recognize that American talent and investment is a key to competing with the U.S. for leadership in the AV industry.

Singapore. Singapore is ranked #1 in the world in regard to AV readiness[67] and has launched an autonomous commuter bus available to residents for a small fee.[68] The government of Singapore has also opened over 620 square miles of road for AV testing, and has set a target of having AV bus service to three new towns by the end of 2022.[69]

Germany. Germany passed a law in 2021 that amended the national road traffic law to create an approval framework for L4+ capable vehicles.[70] Mobileye is already testing vehicles in

[63] Michael Dunne, *China Races for Global Leadership in AVs*, AXIOS (Oct. 27, 2018), https://www.axios.com/china-races-for-global-leadership-in-autonomous-vehicles-6a3a8059-d170-47e6-87d5-fbb6fa8e738b.html.
[64] Rita Liao, *China's Robotaxis Charged Ahead in 2021*, TECHCRUNCH (Jan. 14, 2022), https://techcrunch.com/2022/01/14/2021-robotaxi-china/.
[65] *Id.*
[66] Rebecca Bellan, *Chinese Tech giant Baidu Begins Publicly Testing Apollo Go Robotaxis in Shanghai*, TECHCRUNCH (Sept. 14, 2021), https://techcrunch.com/2021/09/13/chinese-tech-giant-baidu-begins-publicly-testing-apollo-go-robotaxis-in-shanghai/.
[67] KPMG INTERNATIONAL, 2020 AUTONOMOUS VEHICLES READINESS INDEX 12 (2020), https://home.kpmg/xx/en/home/insights/2020/06/autonomous-vehicles-readiness-index.html.
[68] Eileen Yu, *First Commercial Autonomous Bus Services Hit Singapore Roads*, ZDNET (Jan. 25, 2021), https://www.zdnet.com/article/first-commercial-autonomous-bus-services-hit-singapore-roads/.
[69] KPMG INTERNATIONAL *supra* note 66 at 12.
[70] Jack Ewing, *How Germany Hopes to Get the Edge in Driverless Technology*, N.Y. TIMES (July 14, 2021), https://www.nytimes.com/2021/07/14/business/germany-autonomous-driving-new-law.html.

Munich,[71] and in 2021, Argo AI and Volkswagen announced they would commence on-road testing in Germany with an intended launch date for AV commercial delivery and micro-transit services in 2025.[72]

United Kingdom. In 2021, the United Kingdom ("UK") legalized automated lane keeping systems (SAE Level 3), and on January 26, 2022, the Law Commission of England and Wales, along with the Scottish Law Commission released a joint report recommending new laws to regulate AVs in Great Britain.[73] The UK government also touted a report last year that AVs could generate £41.7 billion and 40,000 skilled jobs by 2035 for the UK, and the country has invested £200 million into British AV startups.[74] AV testing is already underway across the country with backing from the UK government, universities, technology companies, and research institutions.

France. The French Council of Ministers passed an ordinance on April 14, 2021 amending the French road traffic law to allow L4+ deployment.[75] Late last year, the French government also approved a Level 4 AV shuttle to carry passengers on public roads.[76] Further, France has indicated it will implement its own L4+ type approval requirements by September 2022, if the EU has not done so already.

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[71] Kyle Hyatt, *Intel's Mobileye Goes for an Autonomous Spin Around Munich*, CNET: ROADSHOW (Dec. 15, 2020), https://www.cnet.com/roadshow/news/mobileye-self-driving-munich-demonstration/.
[72] Andrew Hawkins, *VW Will Start Testing its Argo AI-powered Self-driving Vans in Germany this Summer*, THE VERGE (May 12, 2021), https://www.theverge.com/2021/5/12/22430813/vw-argo-autonomous-delivery-ride-pooling-germany.
[73] LAW COMM'N OF ENGLAND AND WALES & SCOTTISH LAW COMM'N, AUTOMATED VEHICLES: SUMMARY OF JOINT REPORT (2022), https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2022/01/AV-Summary-25-01-22-1.pdf.
[74] *UK on the Cusp of a Transport Revolution, as Self-driving Vehicles Set to be Worth Nearly £42 billion by 2035*, GOV.UK (Jan. 13, 2021), https://www.gov.uk/government/news/uk-on-the-cusp-of-a-transport-revolution-as-self-driving-vehicles-set-to-be-worth-nearly-42-billion-by-2035.
[75] Johnna Crider, *France is Preparing for the Arrival of Autonomous Driving*, CLEANTECHNICA (July 4, 2021), https://cleantechnica.com/2021/07/04/france-is-preparing-for-the-arrival-of-autonomous-driving/.
[76] David Rogers, *Europe's First Fully Autonomous Vehicle to Carry People in Toulouse*, GLOBAL CONSTRUCTION REV. (Nov. 29, 2021), https://www.globalconstructionreview.com/europes-first-fully-autonomous-vehicle-to-carry-people-in-toulouse/.

Japan. Japan enacted a Road Transport Vehicle law in 2020 recognizing AVs and establishing an inspection regime and permit system.[77]

Other Countries. Other countries, including the Netherlands, Norway, Finland, South Korea and the United Arab Emirates, also continue to make significant strides to incorporate AVs into the transportation landscape.

The American automobile and technology industries will continue to develop, test, and eventually deploy AVs. However, as other foreign governments move forward, and in some cases give a leg up to their own domestic industries, the U.S. risks ceding its leadership position and market opportunity. To guard against this outcome, the U.S. should adopt a national policy framework that unlocks more opportunities for American companies to test and deploy AVs safely.

III. National Framework

In order to advance toward a future that maximizes the benefits of AV technology, both the AV industry and policymakers will need to work together to establish a national framework for the safe and swift deployment of AVs. In the section below, we outline the core elements of such a framework: (a) enhancing public trust in safety, and (b) maximizing the deployment of safe AV technology with clear federal and state roles.

A. Enhance Public Trust in AV Safety

As with any new technology, the AV industry understands that many people have questions about how AVs work and how they affect local communities. To answer these questions, the industry will continue to take steps to educate the public about the safety of AV systems. Autonomous Vehicle Industry Association member companies that are engaged in AV testing and development have joined or will join NHTSA's voluntary "Automated Vehicle Transparency and

[77] Kazuhiro Ogawa, *Japan Revamps Laws to put Self-driving Cars on Roads*, NIKKEIASIA (Mar. 9, 2019), https://asia.nikkei.com/Politics/Japan-revamps-laws-to-put-self-driving-cars-on-roads.

Engagement for Safe Testing Initiative" ("AV TEST Initiative") to provide the public with direct and easy access to information about testing of automated driving system-equipped vehicles. Participation in the AV TEST Initiative will increase the public awareness of on-road testing, safety precautions, and principles guiding the testing. Our members that are engaged in AV testing and development also are publishing, and updating as necessary and appropriate, safety evaluation reports that contain detailed information meant to educate the public and NHTSA about the SAE Level 4 technology being tested or deployed. Other initiatives that the industry is taking include working with public safety officials to educate them about how to interact with AVs with no human driver present in the vehicle and supporting increased funding for NHTSA to reinforce the role that the agency is playing to support the safe deployment of AV technology and to help ensure that the agency is able to resolve rulemakings and exemption petitions in a timely fashion.

B. Maximize Deployment of Safe AV Technology

The industry's work to enhance public trust in AV safety goes hand in hand with a policy framework that is optimized to bring the swift deployment of AV technology to the public. Below, we identify the core elements of such a framework:

i. Preserving traditional state roles in vehicle operation licensing, registration, inspection, and insurance, and the federal government's exclusive authority over vehicle safety performance.

ii. Preserving the traditional federal role in vehicle operation, licensing, inspection, repair, and maintenance for commercial vehicles transporting property or passengers in interstate commerce.

iii. Lifting vehicle exemption caps and creating predictable processing timelines.

iv. Completing a rulemaking or series of rulemakings on removing barriers to the deployment of AV technology.

v. Expanding eligibility for the test exemption in the FAST Act to level the playing field among all stakeholders in the AV and automated driving system development ecosystem.

vi. Clarifying that practices to avoid rider interference with conventional driver controls during autonomous operation do not fall within NHTSA's interpretation of the "make inoperative provision."

vii. Ensuring that no government policy, legislation, or regulation should require people who are unable to obtain a driver's license to obtain a license to be a passenger in an AV. People without a driver's license should not be precluded from obtaining the mobility benefits of this technology.

IV. Conclusion

We face a safety crisis on our roads caused in large part by human behavior. AV deployment will make our roads safer, and can improve transportation equity, freight efficiency, and economic growth. As other countries take steps to realize these benefits, the U.S. should not take its leadership position for granted. Through a national framework that enhances consumer trust and maximizes AV deployment, we can seize this momentous opportunity. I want to thank the Subcommittee for its leadership on these important issues. The Autonomous Vehicle Industry Association looks forward to serving as a resource concerning both technical and policy questions and working with you to make safe autonomous vehicles a reality for Americans nationwide. I look forward to answering any questions that you may have.