verizon

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VIA ELECTRONIC SUBMISSION

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1200 New Jersey Avenue, SE
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Re: *Framework for Automated Driving System Safety Advanced Notice of Proposed Rulemaking*, Docket No. NHTSA–2020–0106

Dear Ms. Bennett,

Verizon submits the following comments with respect to NHTSA's consideration of a safety framework for Automated Driving Systems (ADS), as set forth in the Advanced Notice of Proposed Rulemaking released on December 3, 2020.[1]

As a leading provider of wireless broadband connectivity in the United States, Verizon builds and powers the networks that not only connect people to one another, but more and more, connect people to our physical world, and connect elements of our physical world to each other. That connectivity holds particular potential for ADS, as vehicles capable of communicating with each other, road infrastructure, and even pedestrians can increase safety, improve traffic efficiency, and make transportation accessible to more communities. Verizon has leveraged its broadband expertise and expansive network to become an industry leader in automotive connectivity, including in-vehicle Wi-Fi, telematics, and cellular vehicle-to-everything connectivity ("C-V2X").

As it continues to develop the regulatory framework for ADS, NHTSA should maintain the measured approach it has taken thus far. Technology neutral, performance-based guidelines that promote NHTSA's priority on safety will allow industry the freedom to develop technology that can make our roads safer, while also providing incentives for continued innovation and improvement. While vehicle and transportation technology has rapidly evolved over the past decade, the technology in our vehicles ten years from now

[1] *Framework for Automated Driving System Safety*, Advanced Notice of Proposed Rulemaking, 85 FR 78058 (NHTSA Dec. 3, 2020) ("ADS ANPRM").

will undoubtedly look a lot different than the technology in vehicles today. Just as autonomous vehicles were initially developed with only on-board sensors to facilitate self-driving, it is now apparent that such vehicles will need off-board connectivity and capabilities to enable sufficiently safe and fully autonomous operation. That kinds of evolution should not only be expected, but encouraged.

Guidelines, as opposed to inflexible regulations, will provide a framework that gives industry clear direction on the overriding importance of safety, while avoiding inflexible rules that lack room for the growth of future technology.

I. VERIZON'S NETWORK PROVIDES THE CONNECTIVITY THAT MAKES THE INTERNET OF THINGS, INCLUDING CONNECTED VEHICLES, POSSIBLE.

A. Verizon is a leader in wireless connectivity, investing billions in our networks to deliver reliable, ubiquitous, and secure communications over the largest wireless footprint in America.

Verizon operates America's most reliable wireless network, with 94.4 million retail connections.[2] Since 2000, the company has invested $145 billion in reliability, innovation, and the latest engineering technologies for its network.[3] Verizon's 4G LTE network covers more than 2.68 million square miles and 327 million people, more than any other wireless company.[4] Verizon has consistently been at the forefront of the wireless industry. In 2003, Verizon was the first carrier to commercially launch 3G wide-area broadband wireless data service in major markets.[5] In 2010, Verizon turned on the world's first large-scale 4G LTE network.[6]

Reputable third party analyses show that Verizon's network leads the industry in performance and reliability. Rootmetrics' National RootScore Report—the nation's most rigorous, independent study—recently recognized Verizon as the best overall wireless provider in the U.S. for the 15th consecutive time.[7] In the 2020 RootMetrics report, Verizon swept all seven network categories, including reliability, data, speed, call, text,

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[2] Verizon, *Factsheet* (Jan. 26, 2021), https://www.verizon.com/about/sites/default/files/Verizon_Fact_Sheet.pdf.

[3] "4G LTE," Verizon, https://www.verizon.com/about/our-company/wireless-network (last visited Mar. 29, 2021).

[4] "Our Network," Verizon, https://www.verizon.com/featured/our-network/ (last visited Mar. 29, 2021).

[5] "Verizon Wireless Announces Roll Out of National 3G Network" (Jan. 8, 2004), https://www.verizon.com/about/news/vzw/2004/01/pr2004-01-07.

[6] "Verizon Wireless Launches The World's Largest 4G LTE Wireless Network On Dec. 5" (Nov. 30, 2010), https://www.verizon.com/about/news/vzw/2010/12/pr2010-11-30a.

[7] "Verizon Wins 2021 Award Season" (Jan. 27, 2021), https://www.verizon.com/about/news/verizon-wins-2021-network-award-season.

network accessibility and overall performance.[8] RootMetrics concluded that "Verizon remained the carrier to beat, sweeping the US RootScore Awards, bringing home by far the most state and metro area awards, and delivering excellent speeds, outstanding reliability, and an expanded 5G footprint in major cities."[9] In 2021, for the 13th consecutive year and the 26th consecutive testing period, Verizon won the J.D. Power Wireless Network Quality Performance Study, ranking at the top in all six geographic regions across the United States.[10]

Verizon is also the leader in 5G technology. In 2015, Verizon convened its inaugural 5G Technology Forum to help accelerate the introduction of 5G technology, which at the time was not expected until 2020.[11] In 2016, Verizon was the first U.S. carrier to complete 5G radio specifications.[12] Currently, 5G Nationwide is available in more than 2,700 US cities, covering more than 230 million people—more than two-thirds of the US population.[13] In the past 12 months, Verizon has expanded its 5G Ultra Wideband service to 64 US cities, 52 stadiums and arenas, and 11 airports with speeds of up to 4 Gbps in some places.[14] In the next 12 months, Verizon expects that 100 million people in the initial 46 markets will have access to our 5G Ultra Wideband connectivity; over 2022 and 2023, Verizon anticipates that coverage will increase to more than 175 million people and by 2024 and beyond, to more than 250 million people.[15] Verizon also recently more than doubled its midband spectrum holdings by adding an average of 161 MHz of C-Band spectrum in every available market nationwide. With these increased spectrum holdings, Verizon will soon be able to offer increased mobility and broadband services to millions more consumers and businesses, providing Ultra Wideband to more than 250 million consumers over the next few years, as well as 5G fixed wireless broadband.[16] Additionally, Verizon is actively engaged in developing and deploying the platforms and products that

[8] "RootMetrics: Verizon has the best wireless network … again" (Jan. 25, 2021), https://www.verizon.com/about/news/rootmetrics-verizon-best-wireless-network-again.

[9] *Id*.

[10] "Verizon breaks record as the most awarded brand for J.D. Power Wireless Network Quality Study" (Jan. 26, 2021), https://www.verizon.com/about/news/verizon-breaks-record-most-awarded-brand-jd-power-wireless-network-quality.

[11] "Verizon sets roadmap to 5G technology in U.S.; Field trials to start in 2016" (Sept. 8, 2015), https://www.verizon.com/about/news/verizon-sets-roadmap-5g-technology-us-field-trials-start-2016.

[12] "Verizon is first U.S. carrier to complete 5G radio specifications: pre-commercial trials continue full steam ahead" (July 11, 2016), https://www.verizon.com/about/news/verizon-first-us-carrier-complete-5g-radio-specifications-pre-commercial-trials-continue-full.

[13] "Verizon wins 2021 Award Season" (Jan. 27, 2021), https://www.verizon.com/about/news/verizon-wins-2021-network-award-season.

[14] *Id*.

[15] "Verizon announces C-Band Auction Results" (Mar. 10, 2021), https://www.verizon.com/about/news/verizon-announces-c-band-auction-results.

[16] *Id*.

enable people and vehicles to seamlessly connect with one another and with physical infrastructure such as traffic lights, stop signs, and other fixed or temporary road signage.

B. Verizon's networks are powering the evolution of transportation, providing connectivity that make travel safer, more efficient, and more accessible.

While primarily known for our award-winning wireless and fiber broadband services, Verizon also is deeply involved in connected vehicle technology, including ADS. Vehicle connectivity makes transportation safer, reduces traffic congestion, and brings freedom of movement to more Americans. Vehicle connectivity comes in many forms; the most straightforward connection is the simple addition of an in-vehicle Wi-Fi hotspot, allowing consumers to remain connected even while on the road. Today, Verizon provides fast and secure in-vehicle internet access through Connected Car Wi-Fi by Verizon.

Our patented telematics solutions allow complete connectivity to any vehicle, providing near real-time, 360 degree views of vehicle operations. Via either embedded, preinstalled technology or through after-market devices connected via the vehicle's onboard diagnostics port ("ODB-II"), telematics devices collect an array of vehicle-specific data that is then transmitted over the Verizon network. The data is processed and displayed to end users via secure websites and apps, allowing vehicle owners better insight into vehicle operations, driver safety, and location. This information can be applied to specific vehicles and drivers, or analyzed across an entire fleet for in-depth and actionable insights that can help decrease fuel consumption, improve safety, and elevate productivity. Verizon was named the leader in the fleet telematics space both from a global perspective and in the Americas by Berg Insight,[17] and named the global leader in innovation for fleet management systems by ABI.[18] Nearly one third of Verizon telematics customers report a positive ROI in just the first six months of implementing fleet tracking technology, including an 8% decrease in fuel expenses and 11% decrease in accident-related costs.[19]

Verizon is also an industry leader in C-V2X connectivity, which allows a vehicle to communicate with other vehicles, transportation infrastructure, pedestrians, and more. C-V2X holds huge potential for customers by enabling vehicles that are much more aware of their surroundings; capabilities include letting the driver know things such as a car is stopped short up ahead, a traffic signal is about to turn red, or even that a pedestrian is walking into a street from behind a parked car. Vehicles equipped with C-V2X can take an

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[17] *See* "Leading the Way In Fleet Management," Verizon Connect (Feb. 10, 2020), https://www.verizonconnect.com/resources/article/leading-the-global-fleet-management-industry/#:~:text=%E2%80%9CVerizon%20Connect%20is%20the%20clear,mobile%20technology%20platforms%20and%20solutions.%E2%80%9D (last visited Mar. 29, 2021).

[18] *See* "ABI Research Names Verizon Connect the Global Leader In Innovation for Fleet Management Systems" (Sept. 17, 2020), https://www.verizon.com/about/news/abi-research-verizon-connect.

[19] Verizon Connect, *2021 Fleet Technology Trends Report* 3, https://img.en25.com/Web/FleetMatics/%7B4936071e-6fbe-4e0c-b95e-bdc9cfc38de0%7D_VZC_Special_Report_Fleet_Technology_Trends_2021_ONLINE.pdf.

active role by warning drivers of potential collisions, assisting with emergency braking, and monitoring intersections—even helping to find on-street parking in a crowded downtown.

Verizon's 5G network is particularly situated to enable the full potential of C-V2X. Mobile edge computing (MEC) moves the data and processing closer to the end user at the edge of the network. This reduces the round trip that data needs to travel, decreasing latency and helping critical, performance-impacting applications respond more quickly and efficiently. Verizon has partnered with Amazon Web Services (AWS) to bring AWS computing and storage services to the edge of Verizon's 5G Ultra Wideband network, allowing users to develop applications with increased speeds, massive bandwidth, and ultra-low latency. And developers are already taking advantage of that technology. Verizon recently announced its partnership with HARMAN, a leader in connected automotive technology, to use Verizon 5G Edge with AWS for 5G Edge-based C-V2X.[20]

Verizon's 5G network provides the reliable, high-speed connection, while MEC provides hyper-local computing that further reduces latency and makes it possible to provide warning information to vehicles and pedestrians in near real-time. The benefits for daily life are clear and widespread, including increased safety, less gridlock, reduced environmental impact, and more creature comforts for drivers and passengers alike.[21] And C-V2X is crucial to reaching fully autonomous vehicles, providing data and analysis beyond the vehicle line of sight, where on-board sensors cannot reach.[22]

In addition, Verizon recently launched Hyper Precise Location using Real Time Kinematics (RTK), hyper-precise location technology that provides location accuracy within one to two centimeters on the Verizon network. Among other applications, RTK will support emerging technologies enabling mobility that depend on precise location accuracy, such as lane- level navigation needed by first responders during emergencies.

II. FLEXIBLE, TECHNOLOGY-NEUTRAL GUIDELINES WILL BEST ENCOURAGE THE SAFE AND INNOVATIVE DEVELOPMENT OF ADS.

A. Policy guidance, rather than formal regulations, will provide the best framework to support the development of ADS technology.

[20] *See* "Verizon and AWS Bring MEC to Denver and Seattle" (Dec. 28, 2020), https://www.verizon.com/about/news/verizon-aws-denver-seattle-mobile-edge-computing-cities.

[21] *See generally* 5G Automotive Association, *C-V2X Use Cases Volume II: Examples and Service Level Requirements* (Aug. 15, 2020), https://5gaa.org/wp-content/uploads/2020/10/5GAA_White-Paper_C-V2X-Use-Cases-Volume-II.pdf; 5G Automotive Association, *C-V2X Use Cases Methodology, Examples and Service Level Requirements* (June 19, 2019), https://5gaa.org/wp-content/uploads/2019/07/5GAA_191906_WP_CV2X_UCs_v1-3-1.pdf.

[22] *See* GSMA, *Connecting Vehicles, Today and In the 5G Era, With C-V2X* 1, 2, 4 (Aug. 2019), https://www.gsma.com/iot/wp-content/uploads/2019/08/Connecting-Vehicles-Today-and-in-the-5G-Era-with-C-V2X.pdf ("Ultimately, C-V2X will play a pivotal role in enabling the deployment of fully autonomous vehicles, which will transform the way people travel.").

ADS has enormous potential to save lives, reduce traffic congestion, and reduce vehicle emissions while increasing economic opportunities for communities and individuals across the country. But these benefits will only be achievable if ADS is developed and deployed in ways that encourage innovation and adoption. While innovation requires freedom from over-prescriptive regulations that preordain particular technology or platforms, adoption requires building public trust in the technology. NHTSA's efforts regarding ADS and autonomous vehicle policy thus far, along with the proposals set forth in the ADS ANPRM, indicate that NHTSA appreciates the need to pursue policies that care for both of those needs.

At this stage of ADS technological development, policy guidelines, rather than prescriptive rules, will best encourage the innovation necessary to advance ADS technology. As NHTSA recognizes in the ANPRM, "wide scale deployment [of ADS-equipped vehicles] still may be several years away," although "many companies are actively developing and testing ADS technology through the United States."[23] Guidelines will supply industry with the broad framework of NHTSA priorities—as NHTSA states in the NPRM, "improving safety, mitigating risk, and enabling the development and introduction of new safety innovations"[24]—providing sufficient regulatory certainty to industry that is investing significant amounts of time and capital into developing ADS. At the same time, guidelines avoid the adoption of rigid rules that may ultimately be superseded by future technology. And, as NHTSA acknowledges, "premature regulations" could "needlessly prevent" ADS deployment and "inhibit the development" of ADS and "stifle regulation," and "could even increase safety risk."[25]

With respect to the specific form the guidance should take, NHTSA should continue the path it began in 2016 with the Federal Automated Vehicles Policy[26] and has continued since then with the subsequent automated vehicles guidance documents.[27] As ADS technologies are developed and tested pursuant to that guidance, NHTSA can retain the elements of the guidance that prove useful and relevant, while easily discarding those elements that are not. Like the development process for ADS itself, the development of the

[23] ADS ANPRM at 78059.

[24] *Id*. at 78060.

[25] *Id*. at 78062.

[26] NHTSA, *Federal Automated Vehicles Policy* (Sept. 2016), https://www.transportation.gov/AV/federal-automated-vehicles-policy-september-2016.

[27] *See*, *e.g.*, DOT, *Automated Driving Systems 2.0: A Vision for Safety* (Sept. 12, 2017), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf; DOT, *Automated Vehicles 3.0: Preparing for the Future of Transportation* (Oct. 4, 2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf; DOT, *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0* (Jan. 8, 2020), https://www.transportation.gov/sites/dot.gov/files/2020-02/EnsuringAmericanLeadershipAVTech4.pdf.

regulatory framework for ADS is likely to be "complex and iterative,"[28] and the guidance can eventually form the basis for an FMVSS-like ADS regulatory regime.

B. Performance based, technologically neutral guidelines will best advance NHTSA's goals for the development of safe ADS deployment.

In addition to flexible guidelines, NHTSA should also adopt a framework that is technologically neutral. Doing so will ensure that technology is pursued and adopted based on its suitability and capabilities, not because of a regulatory advantage.

Adopting guidelines that are based on the performance outcomes NHTSA seeks to achieve is the best approach to ensuring technological neutrality.[29] Doing so will allow NHTSA to focus on its stated goals—"improving safety, mitigating risk, and enabling the development and introduction of new safety innovations"[30]—while providing suitable flexibility for industry to develop the technology that will best promote those goals. For example, rather than prescribe the use of GPS to determine vehicle location, NHTSA is better positioned to simply require the parameters of location accuracy and leave the decision as to which location technology, whether that's GPS, RTK, or some form of simultaneous localization and mapping (SLAM) technology, is best able to deliver that performance standard. Performance metrics also allow manufacturers to give consideration to other factors that may be relevant to deployment capabilities, such as supply chain, economy, scalability, and more.

NHTSA performance metrics should also be based on the type of application that a technology supports, rather than a one-size-fits-all metric based only on the technology specification. That is, those for safety critical applications may have separate, stricter performance metrics than informational applications, even if the technology is measuring or collecting the same type of information. For instance, mapping and location metrics should be different for route planning versus automated intersection crossing.

A technology-neutral, performance-based framework will allow manufacturers—those designing, building, and testing the technology—to develop and apply the best technological solutions to ADS. While NHTSA will always have a high bar for safety, the technology that is best able to meet that bar may change over time. Technology neutral guidance will ensure that ADS reflects the best current technology, not just the best technology at the time guidance or regulations are adopted. For example, autonomous vehicles have largely been developed with only on-board technology, such as cameras, radar, LiDAR, and GPS. But as telecommunications networks evolve, particularly with the deployment of 5G and MEC, network technology becomes more and more capable of performing ADS tasks as well as or even better than some on-vehicle technologies.[31]

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[28] ADS ANPRM at 78059.

[29] *See id*. at 78060.

[30] *Id*.

[31] *See* Keith Mallinson, "How C-V2X In 5G Will Transform Cars and Save Lives (Analyst Angle)," RCR Wireless News (Feb. 6, 2020), https://www.rcrwireless.com/20200206/analyst-angle/c-v2x-5g-transform-

Technology not located on the vehicle will often have greater awareness of the surrounding area, that is, may be able to see or sense activity happening outside of the view of the on-board sensors, such as the presence of pedestrians on a sidewalk lined by parked cars.

Additionally, locating the computing capability outside of the vehicle can reduce the costs of ADS, making the technology more affordable, and therefore accessible to more people, and increasing the pace of adoption. Utilizing technology located off the vehicle makes use of the faster upgrade cycle for telecommunications infrastructure. Today, the average age of vehicles on the road in the United States is 11.9 years.[32] And while some estimate that the current fleet of automobiles on the road takes 15 years to turn over, market trends have shown that consumers are keeping their vehicles increasingly longer.[33] Meanwhile, wireless carriers invest billions of dollars each year, constantly upgrading infrastructure to meet the demands of the competitive wireless marketplace. As a result, drivers may gain the benefits of ADS technology at a faster rate if the technology is located outside of their own vehicle.

III. CONCLUSION

Given the long timetable for widespread adoption of ADS technologies, NHTSA should maintain its approach to ADS, allowing manufacturers to develop the tools and applications that will achieve NHTSA's stated goals of improving safety, reducing risk, and encouraging innovation, while providing clarity around NHTSA's expectations and priorities for ADS. Granting industry room to determine how best to meet performance metrics will allow the best solutions to evolve and enable scale at a faster pace than under a rigid technology requirement.

As technologies that enable ADS evolve, technology-neutral, performance-based guidance will allow to develop new ways of meeting proposed outcomes for vehicle safety.

Respectfully submitted,

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cars-analyst-angle ("While sensors including cameras and light detection and ranging LIDARs can help a vehicle read the road, all such technologies have difficulties in some instances. For example, road markings disappear in snow and objects including obstructions may be misinterpreted. … Communications among cars, with nearby infrastructure (e.g. lamp poles) and with the network will complement sensor technologies and enable much-improved accuracy and reliability to be achieved in conjunction with AI software.").

[32] Colin Beresford, "Average Age of Vehicles on the Road Is Approaching 12 Years," Car and Driver (July 29, 2020), https://www.caranddriver.com/news/a33457915/average-age-vehicles-on-road-12-years/#:~:text=A%20study%20from%20IHS%20Markit,vehicles%20on%20the%20road%20higher.

[33] *See* Hart Schwartz, "America's Aging Vehicles Delay Rate of Fleet Turnover," The Fuse (Jan. 23, 2018), http://energyfuse.org/americas-aging-vehicles-delay-rate-fleet-turnover/; "U.S. Households Are Holding Onto Their Vehicles Longer," U.S. Energy Info. Admin. (Aug. 21. 2018), https://www.eia.gov/todayinenergy/detail.php?id=36914.

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