Before the
Department of Transportation

In the Matter of	)	
	)	
V2X Communications	)	Docket No. DOT-OST-2018-0210
	)	

To: Office of the Secretary, Department of Transportation

COMMENTS OF THE OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA

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I. Introduction

The Open Technology Institute at New America ("OTI") is pleased to respond to the Department of Transportation ("Department") Request for Comment on V2X Communications. OTI applauds the Department for rethinking its approach to V2X safety signaling. Since 2013, OTI has actively participated in the Federal Communications Commission's still-pending 5 GHz rulemaking that proposed authorizing more intensive, shared use of the 5.9 GHz band by low-power unlicensed devices, a band that remains almost entirely unused after nearly two decades.[1]

OTI strongly agrees that the Department's position on V2X communications in the 5.9 GHz band should be technology-neutral and market-driven. To clarify the Administration's commitment to a technology-neutral and more deregulatory approach, OTI urges the Department to officially abandon the DSRC mandate, which would be outdated long before it could be effective (15 to 20 or more years from now) and extraordinarily costly to implement. The steady trend toward vehicle connectivity as an application on emerging general purpose 5G mobile networks suggests that to the extent V2X radio communications is necessary for auto safety, it will be more rapidly and economically adopted as an application, or 'slice,' of those cellular networks. No separate network or technology mandate is necessary.

The Department should also cooperate with the Federal Communications Commission ("FCC") to reconsider how much spectrum is needed for exclusive allocation to real-time road and vehicle safety signaling and whether, if Cellular V2X ("C-V2X") is the future of vehicle connectivity, some other band should be dedicated to serve that purpose. The European Union

[1] FCC Reply Comments of the Open Technology Institute at New America, ET Docket No. 13-49 (July 24, 2013), https://ecfsapi.fcc.gov/file/7520933356.pdf; FCC Comments of the Open Technology Institute at New America Public Knowledge, Engine, Common Cause, and Next Century Cities, ET Docket No. 13-49 (July 7, 2016), https://ecfsapi.fcc.gov/file/1070891696307/5.9GHz_RefreshPN_ PublicInterestComments_ FINAL_070716.pdf.

has continued to allocate 30 megahertz for V2X safety signaling, which is all that is necessary to successfully deploy real-time V2X safety applications even if DSRC and C-V2X are allowed to compete and potentially coexist on the band (as 5GAA has proposed for Europe).[2]

Moreover, while the Department must certainly seek to ensure a sufficient amount of spectrum is available to achieve its goals for V2X safety signaling, it should also acknowledge that the FCC is the expert agency in the best position to determine the optimal allocation and balance between competing public interest communications goals. Today, 20 years after the allocation of the 5.9 GHz band for Intelligent Transportation Services that have never been deployed (and are now overtaken by general purpose networks and devices), the reality is the band has an immense economic and social value to virtually every American consumer and business as the spectrum bridge necessary to create wide contiguous channels necessary for gigabit-fast Wi-Fi. OTI therefore urges the Department to maintain an open mind with respect to relocating V2X safety communications to a band that may have both better propagation and better integration with the commercial 5G networks that are the future of car connectivity.

Since the entire 75 megahertz in the band is not needed to protect public safety, the Department should defer to core principles of modern spectrum management, principles the FCC has reiterated for more than 15 years, which maintain that exclusive allocations of this nature should be strictly limited to the amount of spectrum necessary to achieve the government's compelling public interest purpose. In this context, the public safety application is real-time V2X signaling, not auto industry use of the band for commercial or other purposes that could be achieved using shared spectrum. The Department should determine the number and size of

[2] *See* 5GAA, "Coexistence of C-V2X and ITS-G5 at 5.9 GHz" (April 5, 2018) at 1, http://5gaa.org/wp-content/uploads/2018/10/Position-Paper-ITG5.pdf.

spectrum channels necessary for real-time safety signaling and then defer to the FCC to allocate the appropriate spectrum, while ensuring an optimal use of the 5.9 GHz band.

II. The Department Should Ensure that V2X Safety Communication has Sufficient Spactrum Limited to and Appropriate for its Public Interest Objectives

The Department of Transportation should adhere to its stated principles in favor of a technology-neutral, forward-thinking and market-driven framework for V2X communications that would not mandate one specific technology. The DSRC mandate, which this Administration has wisely tabled, is an example of a restrictive and outdated policy when it comes to innovation, and this Administration should clarify that it will *not* impose the DSRC mandate.

The Department should review how much spectrum is needed for V2X safety signaling – and any related critical safety applications – and what spectrum propagation and location in relation to 5G networks will best serve these needs. Public safety is of immense importance, but as the European Union has shown, no more than 30 megahertz is necessary to successfully protect drivers and passengers with real-time, peer-to-peer V2X signaling. For example, the 4.9 GHz public safety band and the 3450-3550 MHz federal band are two possibilities for the Department and FCC to consider in a collaborative approach as alternative for an exclusive V2X safety communications band.

A. The Department Should Continue To Seek Technology-Neutral Policies Regarding the 5.9 GHz Band

OTI appreciates the Department's commitment to "remain technologically neutral and avoid interfering with the many innovations in transportation and telecommunication

technologies."[3] The Department made this a key priority (the second of three priorities in its recent *Automated Vehicles 3.0* report) and highlighted the importance of adopting "market-driven, technology-neutral policies that encourage innovation in the transportation system" which the Department stated would advance its effortst to "fuel economic growth and support job creation and workforce development."[4]

With this rationale at the forefront, OTI urges the Department to clarify that the prior Administration's DSRC mandate has been terminated. Trends in both vehicle connectivity (which is rapidly moving to general purpose 4G and, ultimately, 5G networks) and automated vehicle and driver assist technologies strongly suggest that a DSRC mandate would be outdated long before it could be effective (15 to 20 or more years from now) and extraordinarily costly to implement. As recently as this month, FCC Commissioner Michael O'Rielly stated: "DSRC as it is currently in our rules is an outdated technology" compared to what automakers actually want to offer.[5] 5GAA's extensive reports and filings at the FCC show the industry has moved towards 5G-based cellular vehicle-to-everything (C-V2X) technology for the functions that DSRC would have fulfilled.[6] As NCTA recently argued, the burgeoning use of unlicensed operations in U-NII-3 (reflected by the FCC's recent proposal to authorize unlicensed operations at immediately above 5925 MHz in the 6 GHz band), suggests that "[i]f engineers were starting today with a

[3] Department of Transportation Request for Comment, Docket No. DOT-OST-2018-0210 (Dec. 26, 2018), https://www.regulations.gov/docket?D=DOT-OST-2018-0210, at 6.
[4] U.S. Department of Transportation, "Automated Vehicles 3.0" (Oct. 2018), https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle-30.pdf at 5.
[5] FCC February Open Meeting, Press Conference with Commissioners O'Rielly and Carr (Feb. 2019), https://www.youtube.com/watch?v=1dCW8jiM7xc.
[6] FCC Public Notice, "Office of Engineering and Technology and Wireless Telecommunications Bureau Seek Comment on 5GAA Petition for Waiver to Allow Deployment of Cellular Vehicle-to-Everything (CV2X) Technology in the 5.9 GHz Band," DA 18-1231 (rel. Dec. 6, 2018).

clean slate and looking for a home for automotive operations, they would never choose the 5.9 GHz band."[7]

The DSRC mandate would also be extremely costly to consumers, in large part because it would operate separately from the nation's general purpose 5G mobile networks. The National Highway Traffic Safety Administration (NHTSA) reported that mandating DSRC would cost an estimated $5 billion each year and that by 2060 total costs would reach $108 billion.[8] The expensive nature of the DSRC mandate is reflected in reports from the Brattle Group and the Government Accountability Office as well.[9] As Brent Skorup of the Mercatus Center argues: "The DOT acknowledges that 'estimating the potential costs and benefits of V2V [is] quite difficult' because V2V 'improve[s] safety only indirectly.' The indirect safety benefits, plus the long timeline before net benefits arise [15 to 30 years], plus the unreasonably optimistic predictions of market-ready units should counsel caution. The agency's estimate that cumulative benefits will match cumulative costs in 2030 should be viewed skeptically."[10]

5GAA, a group that includes Audi, BMW Group, Ford, General Motors, AT&T, Verizon and several other major companies in the telecom and automotive industries as its members, said

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[7] NCTA ex parte letter, ET Docket No. 13-49 (Oct. 23, 2018), https://ecfsapi.fcc.gov/file/1023778523876/Oct%2023%205.9%20GHz%20Ex%20Parte.pdf.

[8] National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT) NPRM, Docket No. NHTSA-2016-0126 (Jan. 12, 2017), at 4000, https://www.federalregister.gov/documents/2017/01/12/2016-31059/federal-motor-vehicle-safetystandards-v2v-communications; Letter of Competitive Enterprise Institute, American Commitment, Niskanen Center, Reason Foundation, and R St. Institute to Transportation Secretary Elaine Chao (April 3, 2017), https://cei.org/sites/default/files/Letter%20to%20USDOT%20on%20V2V%20April032017.pdf.

[9] The Brattle Group, "The Economic Costs and Benefits of a Federal Mandate that All Light Vehicles Employ 5.9 GHz DSRC Technology," (May 2, 2016), http://files.brattle.com/system/publications/pdfs/000/005/284/original/brattle_costs_benefits_of_v2v_mandate_may_2_2016.pdf; Government Accountability Office, ―Vehicle-to-Infrastructure Technologies Expected to Offer Benefits, but Deployment Challenges Exist‖ (Sep. 2015), https://www.gao.gov/assets/680/672548.pdf.

[10] Brent Skorup, "The Department of Transportation's Proposed Vehicle-to-Vehicle Technology Mandate Is Unprecedented and Hasty," Mercatus Center Blog (April 14, 2017), https://www.mercatus.org/publications/department-transportation-v2v-technology-mandate.

as much about the costliness of DSRC in comments to NHTSA: "The estimated regulatory costs of the proposed DSRC mandate is expected to be the second most expensive regulation in more than a decade, with total costs reaching $108 billion by year 2060. By comparison, deployment of Cellular-V2X is being achieved at a fraction of that cost by leveraging decades of multi-industry investment in cellular LTE and new investment in 5G."[11]

While DSRC is an outdated standard, attempts to substitute a specific new technology in its place on an exclusive or preferred basis in the 5.9 GHz band would be equally shortsighted. Tests show that Wi-Fi can share the band with at least DSRC, which suggests the possibility the band could be shared even without the specific auto safety technology of DSRC. As we detail further below, the importance of strengthening Wi-Fi through the 5.9 GHz are immense for American consumers and the economy.[12] Maintaining an open field regarding the 5.9 GHz band is essential not just for Wi-Fi, but for the automotive companies and other tech firms that may find new ways to use the band for auto safety and other innovations going forward.

B. The Department Should Reconsider the Current Allocation of Auto Safety Spectrum

Considering the radical recent changes in automotive technologies (e.g., driver assist technologies), in telecommunications (emerging 5G mobile networks), and in consumer and business reliance on Wi-Fi in 5 GHz spectrum immediately below the ITS band (and soon in 6 GHz, immediately above the ITS band), OTI urges the Department to collaborate with the FCC

[11] Comments of the 5G Automotive Association, ET Docket No. NHTSA–2016–0126, at ii (April 12, 2017), http://5gaa.org/wp-content/uploads/2017/10/5GAA_V2V_Comments_-_FINAL_4-12-2017-1.pdf.
[12] Monica Alleven, "FCC tests show Wi-Fi can share with DSRC in 5.9 GHz band," *FierceWireless* (Oct. 31, 2018), https://www.fiercewireless.com/wireless/fcc-tests-show-wi-fi-can-share-dsrc-5-9-ghz-band ("the FCC's Office of Engineering and Technology (OET) released the results of tests that were conducted to see if unlicensed devices can share spectrum with Dedicated Short Range Communications (DSRC) in the 5.9 GHz band, and sure enough, tests showed prototype devices reliably detected DSRC signals.").

to reconsider how much spectrum would be optimal to set aside for auto safety and where that spectrum should be allocated. The rapid emergence of C-V2X technology as a "slice" of general purpose 5G mobile networks that will rely on hundreds of megahertz of licensed and unlicensed spectrum suggests that an exclusive allocation at 5.9 GHz is not necessary.

Further, the European Union has already determined that 30 megahertz is all that is necessary for real-time auto safety applications even if DSRC and C-V2X deployments are allowed to both compete and coexist. In its Europe-based advocacy, 5GAA itself has acknowledged the ability of the two V2X technologies to both achieve real-time V2V safety signaling and coexist within a 30 megahertz allocation (5875-5905 MHz), initially relying on exclusive 10 MHz channels, and later sharing the total of 30 megahertz the EU has allocated for V2X safety. The group's 2018 whitepaper touts the ability of ITS-G5 (the 802.11-based equivalent of DSRC) and Cellular-V2X to eventually share the entire 30 MHz the EU has decided to allocate using detect-and-avoid. 5GAA proposed "a spectrum sharing solution based on technology detection and dynamic frequency/channel selection – to be agreed among the stakeholders – to be implemented in up to three steps."[13] 5GAA described a two-step evolution to band sharing:

> In all steps, each of C-V2X and ITS-G5 can operate safety-related ITS services free from co-channel interference from the other technology. The difference between the distinct steps lies in the overall usage of the spectrum resource: **In the short-term first step, we propose to specify preferred 10 MHz channels at 5875- 5905 MHz to each of the two technologies, while in the longer term third step, the solution will allow full sharing of all available channels [30 MHz] by the two technologies.**[14]

There are other bands of spectrum that should be considered for V2X safety operations. One option, the 4.9 GHz band, is already used for public safety but is woefully underutilized.

[13] 5GAA, "Coexistence of C-V2X and ITS-G5 at 5.9 GHz" (April 5, 2018) at 1, http://5gaa.org/wp-content/uploads/2018/10/Position-Paper-ITG5.pdf.
[14] *Ibid* (emphasis added).

"Although nearly 90,000 public safety entities are eligible under our rules to obtain licenses in the band, there were only 2,442 licenses in use in 2012 and only 3,174 licenses in use nearly six years later in 2018," the FCC highlighted in a 2018 Further Notice of Proposed Rulemaking, noting that only 3.5% of potential licensees use the band.[15] The FCC has struggled for years to justify a continued public safety allocation in this band, which has better propagation and is not situated immediately adjacent to heavily-trafficked Wi-Fi bands. The Wireless Internet Service Providers Association (WISPA) further pointed out that despite the fact that the 4.9 GHz band has been restricted to public safety entities since 2002, the band's 50 megahertz of contiguous spectrum remains "seriously underutilized" and echoed the FCC's argument that the band has "fallen short of its potential."[16]

The 4.9 GHz band can facilitate more public safety functions through a tiered system, as tests for the sharing system in the 3.5 GHz band's new Citizens Broadband Radio Service (CBRS)—which facilitates the sharing of spectrum allocated primarily for U.S. Navy radar operations— have demonstrated. "As extensive testing of CBRS has shown, dynamic sharing databases are capable of enforcing a priority access regime while coordinating thousands of simultaneous connections without harmful interference occurring," the internet service provider Federated Wireless argues.[17] "Because public safety users can be classified with Tier 1 priority status (and because a dynamic spectrum controller can enforce priority access for public safety networks by classifying users) there is virtually zero threat that first responders and others will not be able to access the spectrum interference free when needed. Indeed, the Navy and other

[15] FCC Sixth Further Notice of Proposed Rulemaking, WP Docket No. 07-100 (March 22, 2018), https://www.fcc.gov/document/fcc-seeks-expand-use-and-investment-49-ghz-band-0 ¶ 1.
[16] Comments of the Wireless Internet Service Providers Association, WP Docket No. 07-100 (July 6, 2018), https://ecfsapi.fcc.gov/file/10706024512062/Comments_on_4_9_GHz_Sixth_FNPRM.pdf.
[17] Comments of Federated Wireless, WP Docket No. 07-100 (July 6, 2018), https://ecfsapi.fcc.gov/file/10706037937202/Federated%20Wireless%20Comments%20to%204.9%20GHz%206th%20FNPRM.pdf at 10-11.

DoD users have extensively vetted dynamic spectrum sharing and concluded that it does not present a material risk of interference to mission critical operations."[18]

Another band which could be reallocated for V2X public safety use is the 3450-3550 MHz band. As National Telecommunications and Information Administration Administrator David Redl recent wrote, the NTIA and DoD identified this 100 MHz of spectrum as a potential new band for wireless broadband.[19] Although Redl suggests this mid-band spectrum to be used for wireless broadband, he notes, "DOD plans to submit a proposal under the Spectrum Pipeline Act to carry out a comprehensive radio-frequency engineering study to determine the potential for introducing advanced wireless services in this band without harming critical government operations."[20] If these tests determine that the band can be cleared or shared, in part or fully, the Department and FCC should consider whether V2X safety communications could be relocated into a portion of that band on an exclusive basis. In addition to freeing up the 5.9 GHz band for Wi-Fi and other valuable unlicensed technologies, this could have the added benefit of locating future C-V2X deployments in a band immediately adjacent to other 5G mobile bands.

Due to the evolution of the technology and the knowledge that less spectrum is necessary for the facilitation of auto and road safety, the Department should review ways to reduce the amount of spectrum allocated for these functions and/or moving them to a new band of spectrum.

[18] *Ibid.*
[19] David Redl, "NTIA Identifies 3450-3550 MHz for Study as Potential Band for Wireless Broadband Use," NTIA Blog (Feb. 26, 2018), https://www.ntia.doc.gov/blog/2018/ntia-identifies-3450-3550-mhz-study-potential-band-wireless-broadband-use.
[20] *Ibid.*

III. Principles of Modern Spectrum Management Require the Department and FCC to Limit the Spectrum Exclusively Allocated For V2X to the Amount Necessary for Public Safety

The Department should ensure that the amount of spectrum it allocates exclusively for automotive safety is the minimum possible while still protecting public safety. The recent history of spectrum allocation at the FCC has followed this blueprint. The FCC, in several reports spanning the past few decades, has repeatedly stated that the allocation of spectrum for very specific purposes or technologies should be limited to what is necessary to serve a compelling public interest. While real-time V2X safety signaling serves a compelling public interest, OTI urges the Department to collaborate with the FCC to ensure that an adequate amount of spectrum is limited to that purpose. The Department should determine the requirements needed for real-time safety signaling and support limiting the amount of spectrum it exclusively allocates for V2X safety signaling in alignment with longstanding FCC precedent. Although the FCC allocated spectrum bands to narrowly defined services with specific service rules until the late 1990s, the approach it took in adopting the original 1999 ITS allocation has since been reversed. Today there is a clear consensus that narrowly-tailored and restrictive rules for spectrum bands can become obsolete quickly due to the fact that "[a]ny narrow allocation locks in a particular technology or spectrum use" long after "it has been surpassed by an existing service or technology ... or by an entirely new service or technology."[21]

In fact, shortly after the FCC adopted the 1999 Report and Order that allocated 75 megahertz exclusively for Intelligent Transportation Systems, the Commission adopted a new

[21] Covington & Burling, Prospects for U.S. Spectrum Management, at 4 (June 2002) ("Narrow allocations are likely to be suboptimal: Any system that demands ex ante evaluation of competing technologies and their public benefits involves some risk of error, even by an expert agency"); Michael Calabrese, "Spectrum Silos to Gigabit Wi-Fi," New America Report, at 30 (January 2016), https://bit.ly/2IhWe4t ("Spectrum Silos Report").

statement of spectrum policy principles, concluding that "[f]lexible allocations may result in more efficient spectrum markets." The FCC acknowledged there could be exceptions for public safety and certain other services "where market forces would fail to provide for the operation of important services."[22]

This shift in policy led to the Commission's seminal 2002 Spectrum Policy Task Force Report recommending that older technology-specific rules governing spectrum bands should be transitioned to "more flexible rules."[23] The task force's report also recommended that the FCC, when possible should "seek to designate additional bands for unlicensed spectrum use to better optimize spectrum access and provide room for expansion in the fast-growing market for unlicensed devices and networks."[24]

The Commission's 2010 National Broadband Plan further reiterated this approach, arguing that "where there is no overriding public interest in maintaining a specific use, flexibility should be the norm" and that "the failure to revisit historical allocations can leave spectrum handcuffed to particular use cases and outmoded services, and less valuable and less transferable to innovators who seek to use it for new services."[25] As both the FCC's 2002 Spectrum Policy Task Force and the FCC's 2010 National Broadband Plan emphasized, exceptions made for public safety or other public interest allocations should be narrowly defined ***"and the amount of***

[22] Policy Statement, Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, 14 FCC Rcd 19868, 19870 (rel. Nov. 22, 1999) ("1999 Reallocation Order"), at ¶¶ 9, 11, available at https:// transition.fcc.gov/Bureaus/Engineering_Technology/Orders/1999/ fcc99354.txt; *Ibid.*

[23] Report of the Spectrum Policy Task Force, ET Docket No. 02-135 (Nov. 2002), available at http://sites.nationalacademies.org/cs/ groups/bpasite/documents/webpage/bpa_048826.pdf ("Task Force Report").

[24] *Id.* at 6.

[25] Federal Communications Commission, "Chapter 5: Spectrum," National Broadband Plan: Connecting America, (2010), at p. 75, available at http://download.broadband.gov/plan/nationalbroadband-plan.pdf; Spectrum Silos Report at 31.

spectrum . . . limited to that which ensures that those [compelling public interest] objectives are achieved."[26]

Assigning portions of the 5.9 GHz band exclusively to any technology or industry group is clearly problematic. Neither faction of the auto industry (DSRC or C-V2X) acquired licenses by auction. And absent a DOT safety mandate neither faction has any incentive other than to spin promises of voluntary V2X deployments for safety into the free use of 75 megahertz for mostly commercial services (infotainment, mobile payments, in-car display advertising, etc.). And even if one or both eventually deploy effective safety signaling, an industry-specific allocation that risks leaving most of the band's capacity essentially fallow for the indefinite future is distinctly inconsistent with FCC spectrum management principles adopted in the years since the original 1999 ITS allocation.

The admonition in the 2012 report and recommendations of the President's Council of Advisors on Science and Technology (PCAST) is as relevant for the 5.9 GHz band as it is for sharing underutilized Navy radar spectrum at 3.5 GHz:

> The incongruity between concern about a 'looming spectrum crisis' and the reality that only a fraction of the Nation's prime spectrum capacity is actually in use suggests the need for a new policy framework to unlock fallow bandwidth in all bands, as long as it can be done without compromising the missions of Federal users . . . .[27]

As Julius Knapp, chief of the FCC's Office of Engineering and Technology, stated back in 2014: "The days of service-specific spectrum allocations are over – the Commission's flexible rules in both unlicensed and licensed bands obviate the need for allocations narrowly tailored to

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[26] *Report of the Spectrum Policy Task Force*, ET Docket No. 02-135, at 41 (Nov. 2002), *available at* http://sites.nationalacademies.org/cs/groups/bpasite/documents/webpage/bpa_048826.pdf (emphasis added).

[27] The President's Council of Advisors on Science and Technology (PCAST), "Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth" (July 20, 2012), *supra* note 28, at 16, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf.

specific uses."[28] Until the late 1990s, the FCC authorized exclusive allocations to accommodate specific technologies and business models with restrictive service and technical rules. Supporters of both flexible licensing and unlicensed use of spectrum widely criticized this "command-and-control" method.

While OTI strongly supports the Department's efforts to facilitate real-time V2X safety signaling, the Department should only exclusively license the amount of spectrum actually needed to promote auto safety. The Department should defer to the FCC concerning how and where to allocate the spectrum actually needed for non-time-critical V2X safety applications, as well as other commercial applications such as mobile payments, in-car advertising, and other services that will come with the next generation of smart cars.

IV. The Department Should Factor in the Value of Wi-Fi to the U.S Economy

Although the Department's primary mission with respect to V2X is auto safety, the Administration should also pursue this goal in a manner that optimizes the overall public interest, which must take account of the opportunity cost of using more or less spectrum than necessary, as well as whether to use one particular set of frequencies or another. Multiple economic studies have shown that Wi-Fi generates hundreds of billions of dollars in economic surplus in the U.S. alone each year, a value proposition that is growing rapidly. Wi-Fi makes wireless broadband connectivity more available, fast and affordable for nearly every home and business. Like electricity, it is increasingly an input into every other industry. The use of Wi-Fi connected

[28] Alton Burton Jr., "Winnik Forum: U.S. Federal Communications Commission's chief engineer explains that flexible use spectrum policy will readily accommodate the Internet of Things," Hogan Lovells Blog (Nov. 18, 2014), *available at* http://www.lexology.com/library/detail.aspx?g=0b64c821-c219-4d0d-8229-8b4a887dc7f7.

devices also brings autonomy to American consumers seeking connectivity throughout their homes, businesses, and other public spaces.

A recent report, written by Dr. Raul Katz, Director of Business Strategy Research at Columbia University's Center for TeleInformation, found that the current economic surplus from a selected set of applications using unlicensed spectrum in the U.S. is valued at $496 billion at least, and also contributes $29 billion to the country's GDP.[29] The 5.9 GHz band, if used for Wi-Fi, presents an opportunity to add to Wi-Fi's importance to the economy. Research from the RAND Corporation estimated that freeing up the 5.9 GHz band to be used for Wi-Fi could "provide gains to economic welfare in the form of consumer and producer surplus of $82.2 billion to $189.9 billion."[30]

The Katz report detailed how the offloading of mobile device data onto Wi-Fi networks generates $25.2 billion in economic value in 2017 alone.[31] Mobile carrier networks are heavily reliant on Wi-Fi to provide backhaul for mobile data. The latest edition of Cisco's Visual Networking Index reports that 54% of all mobile data traffic was offloaded onto the fixed network through Wi-Fi or femtocell that year.[32] The report further predicted that by 2022, 59% of traffic will be offloaded onto Wi-Fi networks from cellular networks.[33] Other estimates, including by the major mobile carriers, are even higher.

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[29] NEW REPORT: Economic Value of Unlicensed Spectrum in the U.S. Tops $525 Billion, Wi-Fi Forward, (May 17, 2018), http://wififorward.org/2018/05/17/new-report-economic-value-of-unlicensedspectrum-in-the-u-s-tops-525-billion/.
[30] Diana Gehlhaus Carew et al., "The Potential Economic Value of Unlicensed Spectrum in the 5.9 GHz Frequency Band," RAND Corporation (2018), https://www.rand.org/pubs/research_reports/RR2720.html.
[31] *Ibid.*
[32] "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022," Cisco White Paper (Feb. 2019), https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.pdf ("Cisco 2019 VNI").
[33] *Ibid.*

Wi-Fi networks also play a crucial role in a wide variety of modern-day industries such as farming, manufacturing, education, and healthcare. The importance of the 5.9 GHz band to the future of Wi-Fi is particularly important considering the FCC is currently seeking comment on a proposal to open up the 6 GHz band (5925-7125 MHz) for unlicensed use as well.[34] Large, contiguous tracts of unlicensed spectrum for Wi-Fi are absolutely necessary moving into the 5G ecosystem. In fact, in its proposal the FCC highlights the importance of Wi-Fi to the modern-day economy, noting that Wi-Fi "has become indispensable for providing high data rate local area network connections for smart phones, tablets, mobile computers, and other devices to interconnect and access the Internet. Wi-Fi has also enabled the offloading of data from commercial wireless networks . . . and it has provided a means for devices throughout the home to wirelessly interconnect."[35]

Wi-Fi networks have the potential to play a major role in farming and agriculture as the Internet of Things ("IoT") develops. Farmers already use internet-connected services and devices widely across the country. For these internet-connected agriculture devices, Wi-Fi networks are preferable to mobile networks because once they are constructed and built, they are more cost-effective to maintain and operate.[36] Wi-Fi networks have already been found to be very effective in rural areas, in particular for real-time analysis of agricultural data for farmers.[37]

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[34] FCC Notice of Proposed Rulemaking, ET Docket No. 18-295 (Oct. 23, 2018), https://docs.fcc.gov/public/attachments/FCC-18-147A1.pdf ("6 GHz NPRM").
[35] *Id.* at ¶ 4.
[36] Stephanie Bergeron Kinch, "Agriculture: A cash cow for Wi-Fi-based IoT?," Wi-Fi NOW (June 2, 2018), https://wifinowevents.com/news-and-blog/agriculture-a-cash-cow-for-wi-fi-based-iot/, ("[Agnov8's CEO Andrew] Cameron says that Wi-Fi has a competitive advantage over LTE and 4G networks because it is more economically feasible to maintain and operate once it is installed. Farmers can check data and conditions on their smartphones and tablets, and the system is compatible with other Wi-Fi-enabled technology. Wi-Fi works especially well for smaller farms, he says.").
[37] Susan Rambo, "High-speed Wi-Fi at ag research center may be blueprint for rural communities," RCR Wireless (July 20, 2018), https://www.rcrwireless.com/20180719/internet-of-things/high-speed-wifi-at-ag-research-center-may-be-blueprint-for-rural-communities-tag41. ("For example, one alfalfa field has sensors throughout, looking at sub-surface irrigation compared to flood irrigation. That data is currently

Warehouses and the manufacturing industry make effective use of Wi-Fi networks as well, which coordinate an entire network of robots, sensors, and inventory tracking. Through unlicensed spectrum and an indoor network reportedly founded on the Wi-Fi 802.11 standard, Amazon facilitates the movement of robots in their massive fulfillment centers and warehouses, coordinating more than 100,000 robots as of late 2017.[38] Amazon warehouse employees manage the robots using a centralized computer connected to the network of robots through a secured WiFi network.[39] Robots, controlled using a variation of Wi-Fi, help increase efficiency in the manufacturing industry as they help humans avoid excessive time unnecessarily searching through shelves. This is the business model behind the robotics startup 6 River Systems (6RS), whose robots work with humans to find specific items on the shelves of a warehouse, inform them how much of a specific product is required, and help the person carry up to 160 pounds.[40]

Hospitals provide another example of an important and heavily-trafficked use of Wi-Fi networks. Because of the large amounts of data transferred for imaging and other bandwidth-intensive applications, hospitals represent a use case where wider channels of unlicensed spectrum with higher capacity are absolutely necessary.[41] As G.E. Healthcare recently told the FCC concerning hospitals' needs for more unlicensed spectrum above 5925 GHz: "The U.S. healthcare industry has developed and deployed a wide array of wireless-enabled devices that

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kept on-location in the field until someone goes to collect it and take it back to the office for processing. 'One of the nice things about the W-Fi is we can move to real-time evaluation of the data that is coming off this field,' said Dahlberg. That data is being sent now to a company that returns the data after processing.").

[38] Nick Wingfield, "As Amazon Pushes Forward With Robots, Workers Find New Roles," New York Times (Sep. 10, 2017), https://www.nytimes.com/2017/09/10/technology/amazon-robots-workers.html.

[39] Pablo Valerio, "Amazon Robotics: IoT in the Warehouse," InformationWeek (Sep. 28, 2015), https://www.informationweek.com/strategic-cio/amazon-robotics-iot-in-the-warehouse/d/d-id/1322366.

[40] Alex Knapp, "This Robot Startup Just Raised $25 Million To Make Warehouse Fulfillment Easier," Forbes (April 4, 2018), https://www.forbes.com/sites/alexknapp/2018/04/04/this-robot-startup-just-raised-25-million-to-make-warehouse-fulfillment-easier/#18d3693d6ffe.

[41] *See* Comments of G.E. Healthcare, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019).

improve healthcare delivery, medical facility resource administration, and patient outcomes."[42] The next generation of high-capacity and lower-latency Wi-Fi is vital for the networks in hospitals that populate interconnected devices with patient data and real-time analysis, the ability of nurses to remotely monitor patients, and the exchange of real-time alerts, video and other observation data.[43] Similarly, the Wi-Fi Alliance has observed: "Hospitals are a perfect example of congested, high traffic, constantly changing environments that would benefit from Wi-Fi 6. Wi-Fi is common in hospitals given the many benefits it provides."[44]

More wide-channel unlicensed spectrum for Wi-Fi is also vital for education, since it is relied on increasingly in classrooms and libraries across the country. While many schools might have access to broadband in classrooms, the utility of that broadband access is highly restrictive without the capability to actually distribute it across an entire school or library. To make this broadband available throughout an entire school or library, high-capacity Wi-Fi networks are necessary. Personalized and connected learning rely on robust Wi-Fi networks. Fast and affordable Wi-Fi is also critical so students can do homework so teachers can prepare lesson plans. Eighty percent of teachers surveyed from Alexandria City Public Schools in Virginia said that two of the most common student uses for internet-connected devices (Chromebooks, iPads, and desktop computers) are (1) to vary the daily instruction methods offered to students, and (2) to personalize learning experiences for each individual student.[45] The continued success of the

[42] *Id*. at 2.
[43] Jay White, "Wi-Fi 6 and healthcare," Wi-Fi Alliance (Jan. 15, 2019), https://www.wi-fi.org/beacon/jay-white/wi-fi-6-and-healthcare.
[44] *Ibid.*
[45] Lindsey Tepe and Chris Ritzo, "Measuring Broadband in Alexandria City Schools," New America (June 6, 2017), https://www.newamerica.org/in-depth/measuring-broadband-alexandrias-schools/iii-teacher-survey-and-discussions/.

FCC's E-Rate program reflects how crucial schools and libraries find Wi-Fi networks as a tool for modern learning.[46]

V. Conclusion

The Department should continue to embrace technology-neutral and market-driven policies for V2X safety communications and explicitly terminate its DSRC mandate NPRM. DOT should collaborate with the FCC to adhere to the Commission's stated principles of modern spectrum management. The Department and FCC should limit the amount of spectrum allocated on an exclusive basis for V2X safety communications to what is strictly necessary to enable important and real-time public safety applications. In adopting these policies, the Department should keep in mind the importance of Wi-Fi to the American economy and a wide array of specific industries and use cases, so that in collaboration with the FCC it can optimize the public interest in both auto safety and faster, more affordable wireless broadband connectivity.

Respectfully submitted,

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[46] Comments of New America's Open Technology Institute, American Library Association, Consumer Federation of America, CoSN—Consortium for School Networking, Public Knowledge, Access Humboldt, ET Docket No. 18-295, GN Docket No. 17-183 (Feb. 15, 2019), https://ecfsapi.fcc.gov/file/10216231854762/Public%20Interest%20Orgs%206%20GHz%20Comments_Final_AsFiled_021519.pdf at 11-14 ("The success of the Commission's E-Rate program, and specifically the high participation rate of schools and libraries in the program's 'category two' funding for internal connections (generally Wi-Fi), is an example of how indoor use of unlicensed spectrum can have a profound impact. . . . According to the Wireline Competition Bureau's latest report on E-Rate's category two budget, the average number of schools receiving category two funding (or pending requests) is at about 45,000 per year, which marks a 525% increase from the time period of Fiscal Year 2008 and Fiscal Year 2012. Libraries experienced a similar boom in participation—about 2,700 libraries per year receive category two commitments or pending requests, which marked an 865% increase. Most libraries are small and thinly funded, making access to low-cost, off-the-shelf networking solutions imperative.").