Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Unlicensed White Space Device Operations in the Television Bands	)	ET Docket No. 20-36
	)	

To: The Commission

COMMENTS OF
THE BROADBAND CONNECTS AMERICA COALITION

Broadband Connects America ("BCA"), a coalition of nonprofit groups dedicated to closing the rural broadband divide, submits these comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding.[1] BCA is a diverse group of organizations representing the voice of rural America in the fight for affordable broadband and connectivity.[2] BCA's goal is to close today's unjust digital divide by ensuring reliable, consistent access to the internet and the economic opportunities it provides. BCA generally supports the TV White Space ("TVWS") rule changes proposed in the *NPRM*, but we also urge the Commission to go further to update and strengthen the utility of TVWS technology to help narrow the digital divide in rural, tribal and other hard-to-serve areas.

[1] *Notice of Proposed Rulemaking, Unlicensed White Space Operations in the Television Bands, ET Docket No. 20-36* (rel. March 2, 2020) ("NPRM").
[2] *See* Broadband Connects America: A Coalition to Connect Rural America, http://www.broadbandconnectsamerica.com/. Groups specifically signing onto these comments are listed at the end.

TABLE OF CONTENTS

I. SUMMARY

BCA generally supports the TV White Space ("TVWS") rule changes proposed in the *NPRM*. BCA supports these changes, but we also urge the Commission to go further to update and strengthen the utility of TVWS technology to help narrow the digital divide in rural, tribal and other hard-to-serve areas.

First, BCA strongly supports the authorization of real-world, terrain-based propagation models as an option for calculating the allowable channels, power and height above average terrain ("HAAT") for TVWS operation at a particular location. The unrealistic assumption of free space propagation both limits the benefits to rural areas and wastes spectrum capacity. The Commission today has far more experience and recent precedent that justify updating the rules to allow more intensive use of available TV band capacity. As the Commission recently decided in its 6 GHz Report and Order, White Space Databases should be authorized, or even required, to use propagation models that take real-world terrain and clutter losses into account.

Second, BCA supports the Commission's proposals to increase both the power limit and the allowed height above average terrain (HAAT) limit for fixed White Space Devices ("WSDs") operating with at least 6 megahertz separation from local TV stations, at least in "less congested areas." These modest changes would allow TVWS operators to cover more customers with a given amount of investment, a critical factor in the availability and affordability of rural broadband.

Relatedly, BCA recommends that the Commission not limit the higher transmit power and HAAT proposed in the *NPRM* to "less congested areas" defined as a percentage of TV channels that are vacant. If the Commission authorizes (or even requires) terrain-based propagation modeling, White Spaces Databases will be able to rely on power, height and terrain

to accurately determine whether the fixed WSD can operate in that location without causing harmful interference. The existence of greater or fewer vacant channels on other, non-adjacent frequencies in the band become irrelevant to the interference calculation, making the congested-area constraint unnecessary.

Third, the Commission should modernize the TVWS rules to allow a White Space Databases to factor into its calculation whether a WISP or other operator is using a directional antennas and sectorization to coordinate a fixed point-to-multipoint ("P2MP") deployment that poses no risk of harmful interference in a location where an omnidirectional antenna might do so.

Fourth, BCA supports allowing fixed WSD operations in the first adjacent channel at a power level substantially above the current, overly-protective 40 mW limit. This revision is critical now that the TV incentive auction has greatly reduced the number of contiguous vacant channels, even in rural areas.

Fifth, BCA strongly supports the Commission's proposal to authorize the operation of fixed WSDs on mobile platforms (such as school buses, library bookmobiles and farm vehicles) in geofenced areas calculated by the White Space Databases. This should not be limited to "less congested areas" as currently defined, particularly if the Commission authorizes or requires terrain-based propagation modeling.

Finally, BCA supports the Commission's proposal to create a new class of narrowband WSDs specifically crafted to support the Internet of Things (IoT), with appropriate technical and operational rules that both protect licensees and facilitate robust use for a wide range of valuable applications.

II. MORE EFFECTIVE TV WHITE SPACE TECHNOLOGY IS AN OPPORTUNITY TO REDUCE THE RURAL DIGITAL DIVIDE AND PROMOTE ECONOMIC PROSPERITY

Our organizations strongly agree with the Commission that "targeted changes to the white space device rules in the TV bands [will] provide improved broadband coverage that will benefit American consumers in rural and underserved areas."[3] We are also heartened that the National Association of Broadcasters ("NAB") expressed early support for a number of these changes, including very important proposals to permit the operation of fixed TVWS services on movable platforms (such as school buses and farm equipment) within geofenced areas, and to permit the use of TVWS for narrowband Internet of Things connectivity.[4] BCA supports the changes proposed in the *NPRM*, but also urges the Commission to go further to update and strengthen the utility of TVWS technology to help narrow the digital divide in rural, tribal and other hard-to-serve areas.

The broadband digital divide is particularly harmful to rural and low-income Americans. The Commission's most recent Broadband Deployment Report stated that over 19 million Americans do not have access to high-speed broadband.[5] Studies from the Government Accountability Office,[6] Microsoft,[7] and independent researchers[8] have found that the

---

[3] *NPRM* at ¶ 8.
[4] Notice of Ex Parte Communication of the National Association of Broadcasters, ET Docket Nos. 16-56, 14-165 (March 21, 2019), available at https://ecfsapi.fcc.gov/file/10321690718368/Letter%20re%20white%20spaces%20FNPRM%20and%20geolocation%20-%20revised.pdf.
[5] 2020 Broadband Deployment Report, GN Docket No. 19-285, at Figure 1 (rel. April 24, 2020).
[6] Government Accountability Office, "Broadband Internet: FCC's Data Overstate Access on Tribal Lands" (Sept. 2018), https://www.gao.gov/assets/700/694386.pdf.
[7] Microsoft, "United States broadband availability and usage analysis" (accessed on May 4, 2020), https://news.microsoft.com/rural-broadband/#broadband-availability.
[8] Sascha D. Meinrath *et al.*, "Broadband Availability and Access in Rural Pennsylvania," The Center for Rural Pennsylvania (June 2019), https://www.rural.palegislature.us/broadband/Broadband_Availability_and_Access_in_Rural_Pennsylvania_2019_Report.pdf.

Commission's Form 477 data grossly overstates the availability of broadband, particularly in rural and underserved areas where census blocks are far larger than in central cities. A recent study by BroadbandNow Research found that 42 million Americans lack access to wireline or fixed wireless broadband, nearly 13 percent of the population, with a disproportionate share in rural and small town communities.[9] Another study found the number of Americans lacking broadband internet access could be as high as 162 million.[10] Further, the Pew Research reported that only 63 percent of rural Americans said they having broadband at home, compared to 79 percent of suburban Americans and 75 percent of Americans living in urban areas.[11]

Rural Americans too often do not have the same opportunities as people living in urban and suburban areas when it comes to broadband internet access.[12] People living in rural areas are far more likely to have no provider at all. Even when there is an option for high-speed broadband, rural Americans are far less likely to enjoy the benefits of choice and competition among providers. As a result, many less-densely-populated areas suffer from poor service and high costs. This lack of high-speed broadband reduces economic opportunity and plays a major role in the ongoing migration of people and businesses from rural and other underserved areas. Many low-income areas, even within urbanized areas, face these same disadvantages.

---

[9] John Busby et al., "FCC Reports Broadband Unavailable to 21.3 Million Americans, BroadbandNow Study Indicates 42 Million Do Not Have Access," BroadbandNow Research (Feb. 3, 2020), https://broadbandnow.com/research/fcc-underestimates-unserved-by-50-percent.

[10] Microsoft, "United States broadband availability and usage analysis," (accessed on May 4, 2020), https://news.microsoft.com/rural-broadband/#broadband-availability .

[11] Andrew Perrin, "Digital gap between rural and nonrural America persists," Pew Research Center (May 31, 2019), https://www.pewresearch.org/fact-tank/2019/05/31/digital-gap-between-rural-and-nonrural-america-persists/.

[12] These comments are directed at the needs of rural America. This is not to say that residents elsewhere, especially low-income people in many urban core areas, do not also lack adequate internet access or, indeed, any internet access.

Chairman Ajit Pai has correctly described this reality and has even stated that "closing the digital divide" would be his "top policy priority as FCC Chairman."[13]

> If you live in rural America, you are much less likely to have high-speed Internet service than if you live in a city. If you live in a low-income neighborhood, you are less likely to have high-speed Internet access than if you live in a wealthier area. The digital divide in our country is real and persistent.[14]

The Covid-19 crisis has highlighted just how important it is for the Commission to do everything possible to facilitate cost-effective and higher-capacity fixed wireless service to unserved and underserved homes in rural, tribal and small town America. School closures have turned homes into temporary classrooms, revealing even more starkly that the "homework gap" disproportionately impacts children in rural areas, as well as low-income students nationwide. Although the Commission's E-Rate program has made great strides in connecting schools and libraries since its 2014 modernization, rural schools are still struggling to gain access to high-speed broadband.[15] According to the nonprofit EducationSuperHighway, at least 6.5 million students remain unconnected at school and 77 percent of those students live in rural areas.[16]

Similarly, the Department of Education reported that 71 percent of students aged 5-to-17 years old in rural areas have fixed broadband, compared to 84 percent of students in the same age

---

[13] "Remarks of FCC Chairman Ajit Pai at the Fourth Meeting of the Federal Communications Commission's Broadband Deployment Advisory Committee," at 1 (Jan. 23, 2018). *See also* "Remarks of FCC Chairman Ajit Pai at the Farm Foundation/U.S. Department of Agriculture Summit," at 1 (April 18, 2018) ("On my first day as FCC Chairman, in January 2017, I said that my number one priority was closing the digital divide and bringing the benefits of the Internet age to all Americans.").

[14] Remarks of FCC Chairman Ajit Pai at the American Enterprise Institute, *The First 100 Days: Bringing the Benefits of the Digital Age to All Americans*, at 2 (May 5, 2017). "In urban areas 98% of Americans have access to high-speed fixed service. In rural areas, it's only 72%. 93% of Americans earning more than $75,000 have home broadband service, compared to only 53% of those making less than $30,000." Remarks of FCC Chairman Ajit Pai at 'Broadband for All' Seminar, Stockholm, Sweden, at 1 (June 26, 2017).

[15] E-rate Progress Report, Wireline Competition Bureau and Wireless Telecommunications Bureau staff (Jan. 18, 2017), https://www.fcc.gov/document/e-rate-progress-report.

[16] EducationSuperHighway, "2017 State of the States" (2017), https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/educationsuperhighway_2017_state_of_the_states.pdf.

bracket in suburbs, and 74 percent of students in cities.[17] Given the uncertainties surrounding the extent to which students will need to learn from home, affordable broadband internet access at home and at school is crucial for students to complete homework assignments, conduct research and access school networks and learning resources.

Rural areas in particular struggle with broadband adoption because of the high costs for both backhaul and last mile buildout. Too many Americans in high-cost areas are left with either no high-capacity fixed terrestrial coverage or at best an option to pay exorbitant prices for satellite internet access that can be less reliable due to weather and inherent latency. Fixed wireless deployments represent the most cost-effective option for affordable broadband in many rural, tribal and other less densely-populated areas *if* sufficient low- and mid-band spectrum is made available on a localized basis. While unlicensed TVWS spectrum may represent just part of the solution, BCA has little doubt that equipping hundreds of local wireless internet service providers (WISPs), schools, libraries, local community-based efforts, and other local and regional operators with "Super Wi-Fi" spectrum can immediately narrow the rural digital divide and boost the economies in those areas.

Despite the very restrictive technical rules that limit its impact, TVWS technology has proven uniquely able to extend broadband connections to tens of thousands of households in rural, tribal and other hard-to-serve areas. Deployments relying on unlicensed spectrum in the unlicensed TVWS channels in dozens of states across the nation demonstrate enormous potential to extend broadband connectivity in rural, remote and hard-to-serve areas. In comments supporting the petition that served as the basis for this *NPRM*, the Public Interest Organizations described a wide variety of successful TVWS pilots in rural America, including deployments

[17] "Student Access to Digital Learning Resources Outside of the Classroom," U.S. Department of Education, Figure 11.1, at 65 (April 2018), https://nces.ed.gov/pubs2017/2017098.pdf.

extending broadband for the first time to unserved communities and efforts by school districts to extend internet access to the homes of students lacking it.[18]

An early and leading example of the benefits of more robust TVWS rules is a joint initiative by the Appalachian Regional Commission and Garrett County, Maryland. In partnership with a commercial WISP, the project is leveraging TVWS technology to bring broadband access to 3,000 rural and unserved households and small businesses in remote areas. It was declared a success and model effort by Maryland Gov. Larry Hogan in 2017.[19]

III. THE COMMISSION SHOULD MODERNIZE THE TVWS RULES BY ADOPTING MORE REAL-WORLD, TERRAIN-BASED PROPAGATION MODELING TO DETERMINE THE SPECTRUM AVAILABLE FOR TVWS USERS

BCA strongly supports the authorization of real-world, terrain-based propagation models as an option for calculating the allowable channels, power and height above average terrain ("HAAT") for TVWS operation at a particular location.[20] Under current rules, White Space Databases ("WSDBs") protect TV viewers within standardized and static contours calculated using a very conservative FCC propagation model that is in practice both unrealistic and overly protective. This constraint unnecessarily limits the benefits to rural areas and wastes spectrum capacity. The current model assumes free-space propagation and considers only the average

[18] Comments of the Public Interest Organizations, *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands*, ET Docket No. 14-165, RM-11840, at 3-5 (June 10, 2019).

[19] *See* Office of the Governor, "Governor Larry Hogan Announces Successful Rural Broadband Launch in Garrett County," Press Release (Oct. 12, 2017), http://governor.maryland.gov/2017/10/12/governorlarry-hogan-announces-successful-rural-broadband-launch-in-garrett-county/. A feasibility study by Garrett County"s economic development office "concluded that a public-private partnership using fixed wireless technology (TV White Space (TVWS) and other unlicensed spectrum) is the best solution for the rugged, remote areas of Garrett County." Garrett County, Office of Economic Development, "Rural Broadband Expansion – Home," https://www.garrettcounty.org/broadband.

[20] The *NPRM* requests comment on whether "more sophisticated models, such as Longley-Rice, [could] be used to permit higher power unlicensed operations on adjacent channels." *NPRM* at 19, ¶ 52.

height above terrain in a given direction, thereby taking no specific account of basic geographic features (e.g., mountains, dense forests, lakes), nor of buildings or other "clutter" that more sophisticated GIS models use.[21]

While this simplistic model may have been justified when it was adopted a decade ago for what was then a trail-blazing experiment in automated geolocation database coordination of WSDs, the Commission now has far more experience and precedent upon which to update the rules and improve the efficient use of available TV band capacity. Indeed, the United Kingdom later adopted a more accurate modeling approach. As a report by the Dynamic Spectrum Alliance explains: "Ofcom's TVWS rules, promulgated later and with the benefit of more granular pixel-based simulations of TV signal strength, permits more accurate database calculations and hence both more bandwidth for WSDs and more protection for viewers."[22] Propagation loss due to real-world terrain (e.g., hills, mountains, forests) has been studied extensively and is now well understood. A geolocation database informed by real-world GIS datasets does not need to make generic, worst-case assumptions about terrain.[23]

More recently, in two other proceedings, the FCC itself has authorized terrain-based propagation modeling for automated frequency coordination. The Spectrum Access Systems ("SAS") already in use to protect U.S. Navy radar and other incumbents in the 3.5 GHz band are authorized to use the terrain-based Longley-Rice ITM to compute interference over longer

---

[21] *See Automated Frequency Coordination: An Established Tool for Modern Spectrum Management*, Dynamic Spectrum Alliance, at 23 (March 2019), available at http://dynamicspectrumalliance.org/wp-content/uploads/2019/03/DSA_DB-Report_Final_03122019.pdf.

[22] *Ibid.*

[23] *See* Preston Marshall, *Three-Tier Shared Spectrum, Shared Infrastructure, and a Path to 5G*, at 104-105 (Cambridge Univ. Press, 2017). Marshall explains that the current TVWS propagation model depicts the island as it was in 1600 – without buildings or even trees – while in reality, particularly for terrestrial use at higher frequencies, an actual RF propagation view of Manhattan is dominated by scatter loss from physical obstacles that could accommodate dense deployments of low-power devices without interference to incumbents in a number of bands.

distances.[24] Similarly, the Report and Order adopted last month, opening 850 megahertz of heavily-occupied spectrum in the 6 GHz band for coordinated sharing on an unlicensed basis, authorizes terrain-based modeling and requires Automated Frequency Coordination ("AFC") that uses ITM to compute path loss beyond a 1 kilometer distance.[25] AFCs are also authorized to use a supplemental model to apply clutter losses.[26] We urge the Commission to similarly authorize TVDBs to utilize real-world propagation models that take accurate account of real-world terrain and clutter in the local area where operators request use of TVWS.

IV. THE COMMISSION SHOULD ALLOW HIGHER TRANSMIT POWER AND OTHER TECHNICAL TVWS RULE CHANGES THAT IMPROVE COVERAGE AND QUALITY

BCA strongly agrees with the Commission that "targeted changes to the white space device rules in the TV bands [will] provide improved broadband coverage that will benefit American consumers in rural and underserved areas." We also urge the Commission not to limit these changes to what a single company (petitioner Microsoft) and trade association (National Association of Broadcasters) have negotiated as mutually acceptable. Robust TVWS rules are vital to rural America and the Commission should consider all the possible ways it can enhance the use of this unlicensed spectrum in the public interest. To that end, BCA offers a few recommendations in addition to generally supporting the changes proposed in the *NPRM*.

First, BCA supports the Commission's proposal to increase the power limit for fixed White Space Devices ("WSDs") operating with at least 6 megahertz separation from TV stations,

[24] *See* WinnForum Requirement R2-SGN-03, et al. in WINNF-TS-0112v1.8.0.
[25] *Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, ET Docket No. 18-295 and GN Docket No. 17-183 (rel. Apr. 24, 2020).
[26] *Ibid.* We recognize that clutter modeling will be important for TVWS in rural areas, since very low-band TV frequencies have lower clutter losses than do mid-band VWS6 GHz frequencies.

at least in "less congested areas."[27] Permitting fixed WSDs to operate at a maximum 16 Watts EIRP in less congested areas is a modest change that allows TVWS operators to cover more customers with a given amount of investment, a critical factor in the availability and affordability of rural broadband. This modest increase in power would not diminish interference protections for incumbents, since it would simply change a parameter used by the geolocation database (the WSDB) to calculate which channels (if any) are available to use at a higher power limit in less congested areas. Moreover, as noted just below, we urge the Commission to permit this transmit power on any channels where the WSDB determines that fixed WSDs can operate.

Second, BCA supports the Commission's proposal to increase the allowed height above average terrain (HAAT) limit from 250 to 500 meters for fixed WSDs.[28] Because the proposal would require a streamlined coordination with protected licensees for operations above 250 meters HAAT, it should not increase risk of harmful interference to television viewers.[29] Like increased power, the WSDB will simply factor this into its calculation of the allowable HAAT for channels available at a particular location. The geographies where the WSDB verifies a higher HAAT is permitted will generally be in rural or remote areas where operators often can only provide even basic broadband service by locating a WSD base station at a higher elevation on natural features, such as a mountainside or ridge line. Moreover, with this change and the adoption of terrain-based propagation modeling, there seems to be no reason to maintain a separate limit on height above ground level (AGL).

Third, the Commission should not limit the higher transmit power and HAAT proposed in the *NPRM* to "less congested areas" defined as a percentage of TV channels that are vacant. If

[27] *NPRM* at ¶ 12.
[28] *NPRM* at ¶ 17.
[29] *See NPRM* at ¶ 20.

the Commission modernizes TVWS rules to authorize (or even require) terrain-based propagation modeling, as BCA recommends in the section above, a White Space Database will be able to rely on power, height and terrain to accurately determine whether the fixed WSD can operate in that location without causing harmful interference. The existence of greater or fewer vacant channels on other frequencies in the band become irrelevant to the interference calculation, making the congested-area constraint unnecessary.

Fourth, the Commission should modernize the TVWS rules to allow the TV White Space Database to factor into its calculation whether a WISP or other operator is using a directional antenna and sectorization to coordinate a fixed point-to-multipoint ("P2MP") deployment, which could pose no risk of harmful interference in a location where an omnidirectional antenna might do so. The current rules assume all fixed WSDs use omnidirectional antennas, which is unrealistic, limiting and inefficient. A WISP can easily calculate and coordinate a sectorized P2MP deployment scenario to avoid harmful interference to incumbents while simultaneously serving a targeted area needing service. This could be defined as a value-added service provided by the WSDB's for an additional fee.

Fifth, BCA supports allowing fixed WSD operations in the first adjacent channel at a power level substantially above the current, overly-protective 40 mW limit. In the *NPRM*, the Commission seeks comment on whether it should permit higher power operations on channels adjacent to TV operations.[30] This revision is critical now that the TV incentive auction has greatly reduced the number of contiguous vacant channels, even in rural areas, a problem exacerbated by the Commission's failure to ensure that displaced stations requiring a new channel were located to minimize the loss of contiguous TVWS spectrum available for

[30] *NPRM* at ¶ 52.

broadband. Under current rules a contiguous block of three vacant channels is required to operate at a power sufficient to provide fixed broadband connectivity, thereby foreclosing opportunities to use TVWS technology to bring broadband to unserved and underserved communities. But, as the *NPRM* acknowledges, "even in rural areas, there may not be three contiguous vacant channels available for use by white space devices."[31]

BCA believes that allowing fixed WSDs to operate across the middle 6 megahertz of two vacant channels at a higher power would maintain a sufficient guard band to protect TV viewers, while also greatly expanding the number of locations where TVWS can extend connectivity, or increase capacity, and put fallow spectrum to work to bridge the digital divide. Tests in South Africa and Ghana have found that a WSD operating at 4 watts of effective radiated power ("EIRP") can operate on a first adjacent channel to an over-the-air television broadcaster *without* causing harmful interference. Although the Ghanaian trial looked into the potential effects on analog television broadcasts, the South African trial reviewed both analog and digital television broadcast stations.[32]

V. THE COMMISSION SHOULD AUTHORIZE FIXED TVWS DEVICES ON MOVING PLATFORMS, INCLUDING SCHOOL BUSES, WITHIN GEOFENCED AREAS

BCA strongly supports the Commission's proposal to authorize the operation of fixed WSDs on mobile platforms (such as school buses, library bookmobiles and farm vehicles) in geofenced areas calculated by the WSDBs. As the *NPRM* proposes, these WSDs should be allowed "to operate on TV Channels 2-35 on mobile platforms within geo-fenced areas at higher

[31] *NPRM* at ¶ 51 (citing Microsoft Petition at 6-10).
[32] M.T. Masonta, L.M. Kola, A.A. Lysko, L. Pieterse and M. Velempini, "Network Performance Analysis of the Limpopo TV White Space (TVWS) Trial Network," *IEEE Africon 2015,* 14-17, at 2 (Sept. 2015).

power levels than the rules currently permit for portable devices, ...[33] However, as we urge in the second section above, these operations should not be limited to "less congested areas." If the Commission updates the TVWS rules to allow or require WSDBs to use terrain-based propagation modeling, as we urge above, TV viewers and other licensees can be protected equally well regardless of how many other vacant channels exist in a given area. For example, if one or more TVWS channels can safely be used to extend internet access to a farm combine or a school bus in the 500 MHz band, for example, it shouldn't matter how many other vacant channels exist on other TV band frequencies.

Given the growing sophistication of automated frequency coordination systems, the Commission's geofencing proposal is a simple extension of what the rules already allow. The Commission's rules currently allow personal and portable WSDs to operate on available channels, under the control of an access point, within a geofenced area that has been pre-determined by a WSDB to avoid harmful interference to incumbents.[34]

A similar framework for fixed devices within a geofenced area should be adopted by the Commission. These geofenced operations can particularly benefit use cases and innovation related to farming, ranching, education, telehealth (e.g., monitoring) and other industries operating in rural and remote areas. A successful test of geofenced operations has brought broadband connections to students taking long school bus routes in rural areas.[35]

[33] *NPRM* at ¶ 39.
[34] 47 C.F.R. § 15.711(d)(5).
[35] *See, e.g.*, Microsoft Petition at 22-26.

VI. THE COMMISSION SHOULD AUTHORIZE A NEW CATEGORY OF NARROWBAND WHITE SPACE DEVICES WITH SUFFICIENT TRANSMIT POWER TO SERVE IMPORTANT USE CASES

BCA supports the Commission's proposal to create a new class of narrowband WSDs specifically crafted to support the Internet of Things (IoT), with appropriate technical and operational rules that both protect licensees and facilitate robust use for a wide range of valuable applications. While the Commission could not have anticipated the use of TVWS for narrow-band IoT a decade ago, when it promulgated the original rules, it is clear today that use cases including agribusiness, utilities and environmental sensing could greatly benefit from NB-IoT on unlicensed spectrum with TV band propagation characteristics. Because of the clear economic benefits and low risk of interference, BCA strongly supports the Commission's proposal to create a new class of NB-IoTs designed to use TVWS.

Updating the rules to facilitate narrowband applications will be particularly beneficial to farms, ranches, utilities and remote infrastructure of sensing, monitoring and other applications. The potential benefits of unlicensed, high-propagation spectrum for agriculture are already apparent today. Wi-Fi plays a large role in the rapid adoption of smart agriculture, where next-generation services are being deployed across the country. Microsoft's FarmBeats program—which provides complex data analytics to the farming industry—is a prime example of how TV White Space and other unlicensed technologies can offer advances to efficient farming techniques.[36] For smart farming operations, Wi-Fi networks are preferable to LTE and 4G

[36] Kyle Wiggers, "With FarmBeats, Microsoft makes a play for the agriculture market," VentureBeat (Nov. 4, 2019), https://venturebeat.com/2019/11/04/with-farmbeats-microsoft-makes-a-play-for-the-agriculture-market/. "FarmBeats leverages unlicensed TV white spaces . . . to establish a high-bandwidth link from a farmer's home internet connection to a base station, . . . Sensors, drones, and the like connect to the base station, which draws power from a battery-backed solar panel pack. . . . The Wi-Fi module lets farmers connect off-the-shelf soil temperature, pH, carbon dioxide, and moisture sensors with their phones to access farming productivity apps. *Ibid.*

networks because, once deployed, they are more cost-effective to sustain, customize, and operate.[37] Using Wi-Fi-enabled smart agriculture, farmers can review data and weather conditions using mobile devices, and smaller farms will benefit most from Wi-Fi networks.[38]

Another example is the Wi-Fi network built by the company BlueTown, in partnership with the University of California's Kearney Agricultural Research and Education Center (KARE). Each Wi-Fi access point delivered 250 Mbps throughput and provided coverage over a 250-meter radius.[39] KARE's solution brought significant benefits for farming, by placing sensors throughout an alfalfa field that detect and review subsurface irrigation in comparison to flood irrigation.[40] "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," Dr. Jeffery A. Dahlberg, director of KARE, told RCR Wireless.[41]

By tailoring TVWS rules to facilitate innovative applications like these, BCA believes the Commission can help to generate economic benefits for rural communities. Agriculture equipment manufacturers expect IoT connectivity to play a crucial role in the future of agribusiness, as Deere & Company Deere & Company has emphasized in prior proceedings: "[T]he ability of farmers using Deere's agricultural equipment and systems to improve efficiency, yield, and smart resource use will depend on their ability to leverage high speed

---

[37] 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.").

[38] *Ibid.*

[39] 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-atag-research-center-may-be-blueprint-for-rural-communities-tag41.

[40] *Ibid.*

[41] *Ibid.*

broadband connections capable of enabling real-time M2M and machine to farm (M2F) interaction. The Internet of Things in rural America will include not only smart meters and smart appliances, but also smart farming equipment and systems needed to drive local economies."[42]

[42] Comments of Deere & Company, *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in Reasonable and Timely Fashion*, GN Docket No. 17-199 (Sep. 21, 2017), https://ecfsapi.fcc.gov/file/109212496527376/FINAL_Deere%20Comments%20on%20Section%20706%20NOI.pdf.

VII. CONCLUSION

The undersigned groups urge the Commission to expedite the adoption of the agency's proposed improvements to the TVWS rules, as well as the additional changes outlined above, on an expedited basis. Particularly now, during a period of uncertainty about the necessity of working and learning from home, it is more imperative than ever to enhance the unique functionality of TVWS spectrum and thereby promote more affordable broadband connectivity in rural, tribal and hard-to-serve areas, as well as for mobile connectivity platforms, NB-IoT and other unlicensed innovation.

Respectfully submitted,

THE BROADBAND CONNECTS AMERICA COALITION

Access Humboldt
California Center for Rural Policy
Center For Rural Strategies
Institute for Local Self-Reliance
National Digital Inclusion Alliance
Tribal Digital Village Network
South Carolina Office of Rural Health
Palmetto Care Connections
Schools, Health & Libraries Broadband Coalition (SHLB)
National Hispanic Media Coalition
New America's Open Technology Institute
MuralNet
Public Knowledge
X-Lab

/s/ Michael Calabrese
Amir Nasr
New America's Open Technology Institute
740 15th Street, NW Suite 900
Washington, DC 20005

May 4, 2020