April 12, 2023

The Honorable Alan Davidson
Assistant Secretary of Commerce
National Telecommunications and Information Administration
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, DC 20230

Re: BEAD Definition of Reliable Broadband Service

Dear Assistant Secretary Davidson:

NTCA–The Rural Broadband Association[1] hereby submits this letter (as well as the attached white paper[2]) to address an earlier WISPA request[3] to amend the definition of "Reliable Broadband Service" as found in the Broadband Equity, Access, and Deployment ("BEAD") Notice of Funding Opportunity ("NOFO").[4] In its proposal, WISPA urges the National Telecommunications and Information Administration ("NTIA") to reverse course and include fixed wireless service delivered via unlicensed spectrum within the definition of Reliable Broadband Service. NTIA's initial determination that such services do not meet the definition of Reliable Broadband Service was based in sound public policy, however, and is consistent with statute, and nothing offered by WISPA merits a rethinking of that determination. NTCA therefore urges NTIA to hold firm to its commitment to ensure as many unserved consumers as possible receive robust and reliable broadband and to utilize BEAD funding consistent with the goals of the Infrastructure Investment and Jobs Act ("IIJA").[5]

To assess the capability claims made in the WISPA letter, NTCA commissioned the attached white paper, authored by Vantage Point Solutions, an engineering firm with decades of experience in the design and building of broadband networks of all kinds in rural and urban areas. In examining the seven specific assertions contained in the WISPA letter, the VPS White Paper finds, among other things, that:

[1] NTCA–The Rural Broadband Association represents approximately 850 independent, community-based companies and cooperatives that provide advanced communications services in rural America and more than 400 other firms that support or are themselves engaged in the provision of such services.
[2] Response to WISPA Request to Change BEAD NOFO's Definition of Reliable Broadband Service, Vantage Point, March 2023 ("VPS White Paper").
[3] WISPA letter to The Honorable Alan Davidson, Assistant Secretary of Commerce, National Telecommunications and Information Administration (Jan. 6, 2023) ("WISPA letter").
[4] Notice of Funding Opportunity for the Broadband Equity Access and Deployment Program ("BEAD NOFO") (rel. May 12, 2022).
[5] Infrastructure Investment and Jobs Act, H.R. 3684, 117th Cong. (2021) ("IIJA").

- While WISPA points to the *amount* of spectrum available for operators' use on an unlicensed basis, it breezes past the fact that these bands have significant limitations that make them unsuitable for deeply rural areas (for example, short propagation characteristics and an inability to penetrate foliage, vegetation, or poor weather conditions);[6]

- The "oversubscription" assumptions made by WIPSA are largely unstated and appear wholly inadequate – as the VPS White Paper shows, WISPA's attempt to demonstrate "real world" deployments using unlicensed spectrum fail to account for the shared-capacity nature of spectrum-based broadband services;[7]

- Interference concerns are essential features of unlicensed wireless spectrum, and this is true even in the absence of another provider operating as a secondary user.[8]

In addition to these points, NTCA urges NTIA to recognize the two separate, but critical, weaknesses in WISPA's argument that demonstrate the wisdom of not considering unlicensed fixed wireless to be Reliable Broadband Service:

First, NTIA should look with skepticism at WISPA's attempt to focus on the "future-proof" nature of the network *equipment* used to deliver broadband over unlicensed spectrum. Even if these claims with respect to the *equipment* were true, this alone cannot overcome the limitations of the spectrum over which broadband services would be delivered. Nothing in the WISPA letter demonstrates that the advances in equipment used by fixed wireless operators can, standing alone, overcome: (a) the interference concerns that come with using unlicensed spectrum more generally; (b) the propagation/penetration limitations of the spectrum bands as identified by the VPS White Paper and that make these spectrum bands unsuitable for widespread rural applications; or (c) the "shared capacity" limitations of spectrum-based services more generally. This last point is of particular significance – ***in a program where the stated objective is "Internet for All," a network that is capable in theory of serving anyone at a required level of performance only as long as everyone does not subscribe to service at that desired level cannot credibly be said to represent "Internet for All."*** It would fly in the face of a stated mission of universal connectivity if the theoretical capability to deliver service to a single location were to override the demonstrated and confirmed ability to serve *all* locations.

Second, WISPA's attempt to overcome these limitations by pointing to "Actual Deployments Demonstrating Points Made Here"[9] offers little reassurance. As the VPS White Paper points out, the "actual deployments" are examples that "do not fit most rural applications"[10] – rather, these examples are all based upon the distances involved with respect to providing fixed wireless

[6] VPS White Paper, pp. 3-5.
[7] *Id*., pp. 6-7.
[8] *Id*., p. 7 (stating that the examples of "real world" deployments provided by WISPA "do not show the impacts of loading a sector with more subscribers or how the capacity is impacted if a second operator begins to utilize the same spectrum or interference is incurred from other external applications, such as Wi-Fi or Internet-of-things (IoT) deployments, to simulate real-world deployment scenarios.").
[9] WISPA letter, p. 2.
[10] VPS White Paper, p. 7.

broadband service in urban and suburban communities. More importantly, however, with respect to the "actual deployments," as the VPS White Paper correctly states, the deployment scenarios neglect once again that "[t]he goal is not to provide broadband to a single location but to provide broadband to all locations within the sector footprint."[11] As VPS highlights, the vendor documentation included in the WISPA letter represents service "being delivered to a single user or small sampling of users."[12] As an analogy, a person with a dozen cans of soda has the theoretical ability to offer a beverage to everyone in a community of 144 people. But, after twelve residents stake their claim, there is nothing left to offer to the others – or, at most, the finite resource could be redistributed so that every resident receives 1/12th of a can. With this in mind, given the purpose of the BEAD program is to ensure that *every* consumer lacking access to robust broadband service today can finally obtain it – the fundamental underlying principle of "Internet for All" – NTIA should rely neither on supposed "actual deployments" delivered to "a single user or small sampling of users,"[13] nor tests performed "under optimal test conditions,"[14] as proof that capacity limitations can be overcome.

To be sure, the delivery of fixed broadband using unlicensed spectrum can be a helpful tool in reaching consumers that otherwise might not be reachable via other technologies in the near-term. ***But in planning for the achievement and sustainability of "Internet for All" for decades to come, the practical capabilities and limitations of each technology must be critically assessed based upon real-world conditions and proven track records of performance rather than marketing promises and isolated product tests.*** A robust analysis of this marketplace indicates that the NOFO's definition of Reliable Broadband Service falls squarely within the text and underlying goals of the IIJA. The inclusion of "adaptability to changing end-user requirements" and "length of serviceable life" in Section 60101(a)(2)(L) is particularly instructive, as it indicates a Congressional desire for the BEAD program to have a longer-term impact, one that goes beyond basic availability that suits consumers' current needs but rather views the goal as broadband networks that can meet the needs of consumers now and over time.

NTCA appreciates NTIA's commitment to ensure that the BEAD program invests in robust and reliable broadband networks that can meet the needs of each and every consumer within a given service area, now and into the future. NTCA urges NTIA to hold firmly to this commitment as program implementation continues.

Sincerely,
/s/ *Michael Romano*
Michael Romano
Executive Vice President
NTCA–The Rural Broadband Association

[11] *Id*.
[12] *Id*.
[13] *Id*.
[14] *Id*.

VantagePoint
EMPLOYEE OWNED

APRIL 2023

Response to WISPA Request to Change BEAD NOFO's Definition of Reliable Broadband Service

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1. Executive Summary

In a January 6, 2023, letter to Alan Davidson, Assistant Secretary of Commerce, WISPA requested NTIA to publish an amendment to the Broadband Equity, Access, and Deployment (BEAD) Notice of Funding Opportunity (NOFO) that determines broadband networks using entirely unlicensed spectrum to serve last mile locations are included in its list of "reliable broadband services."[1] In the letter, WISPA included several specific points with technical information regarding its request. This document contains responses to specific points made in the WISPA letter and includes information that should be considered while evaluating these claims. These responses include the following key considerations regarding WISPA's unlicensed spectrum reliability claims:

- The majority of unlicensed spectrum is available in the millimeter wave (mmW) band which has significant limitations, particularly in rural areas. It can only propagate short distances, it cannot penetrate walls or vegetation, and it can be made unreliable by weather conditions.
- Unlicensed spectrum is shared with others and must accept any and all interference, with no protections or recourse. Another provider or other external applications could be deployed within the same service area or close proximity and degrade the performance.
- The deployment scenarios that were included do not consider loading wireless sectors with significant numbers of subscribers or the impact of a second operator or other external applications utilizing the same spectrum.

The following pages contain point by point responses to each of the bullets summarized in WISPA's letter.

[1] WISPA. Letter to Alan Davidson, Assistant Secretary of Commerce, National Telecommunications and Information Administration. 6 Jan. 2023. Request to Change BEAD NOFO's Definition of Reliable Broadband Service; WISPA Letter

2. Responses to WISPA Claims

WISPA Claim #1 – "*Spectrum Allocations for Unlicensed Use Show These Networks are Available Now and for the Foreseeable Future.* They explained that, over the past several years, the Federal Communications Commission (FCC) has allocated thousands of megahertz of spectrum for unlicensed use in certain spectrum bands. This demonstrates that unlicensed spectrum networks are available with a high degree of certainty both at present and for the foreseeable future."[2]

There are three general areas of spectrum used to deliver fixed wireless broadband services. These are the low band, mid band, and high band (often referred to as the millimeter wave "mmW" band) as can be seen in Table 1. As shown, only a portion of the low, mid, and high bands are available for unlicensed broadband.

Band Name	Frequency	Total Spectrum	Allocation	How Licensed
Low Band Spectrum				
600 MHz	600 MHz	70 MHz	2x5MHz Blocks	Licensed
700 MHz	700 MHz	104 MHz	2x[1, 5, 6, or 11] MHz Blocks	Licensed
ISM	900 MHz	26 MHz	5, 10, 15, or 20MHz Blocks	Unlicensed
AWS	1.7 and 2.1 GHz	185 MHz	5, 10, and 2x{5 and 10] MHz Blocks	Licensed
Mid Band Spectrum				
WCS	2.3 GHz	30 MHz	2x5MHz Blocks	Licensed
ISM	2.4 GHz	85 MHz	10, 20, or 40MHz Blocks	Unlicensed
BRS/EBS	2.5 GHz	190 MHz	6, 16.5, 49.5, 50.5MHz Blocks	Licensed
CBRS (secondary use)	3.5 GHz	150 MHz	10MHz Blocks (PAL)	Lightly Licensed
C-Band (secondary use)	3.7 GHz	280 MHz	20MHz Blocks	Licensed
U-NII	5 & 6 GHz	1,525 MHz	10, 20, 40, or 80MHz Blocks	Unlicensed
High Band (mmW) Spectrum				
UMFUS – Auction 101	28 GHz	850 MHz	425MHz Blocks	Licensed
UMFUS – Auction 102 (secondary use)	24 GHz	700 MHz	2x40MHz Blocks	Licensed
UMFUS – Auction 103	37/38/47 GHz	3,400 MHz	100MHz Blocks	Licensed
V-Band	60 GHz	5,000 MHz	2160MHz Blocks	Unlicensed

Table 1 – Portion of Radio Spectrum Available for Broadband

Licensed spectrum is where the FCC authorizes a single user utilization of the assigned frequencies throughout its specified market, providing interference protection. Lightly licensed spectrum, such as the Citizens Broadband Radio Service (CBRS) general authorized access (GAA), is shared amongst others and must have its usage coordinated through a spectrum access system (SAS) provider; while not providing full interference protections, it provides interference mitigation. The available unlicensed bands present challenges – these bands offer no interference protections and must be shared with all others, including nearly all common Wi-Fi enabled

[2] WISPA Letter, Pg. 1

equipment and home routers. This widespread shared unlicensed use makes it difficult for a provider to deliver broadband services on a consistent basis. Unlicensed shared-use spectrum has been allocated by the FCC to two or more different purposes, and fixed wireless uses are often the secondary user and must protect the existing services of the incumbent. To do this, fixed wireless providers have modest permissible power limitations when utilizing unlicensed bands.

The low band 900 MHz and mid band 2.4 GHz bands are part of the Industrial, Scientific, and Medical (ISM) service. The 900 MHz band, while having the best Non-Line-of-Sight (NLOS) capabilities of the unlicensed spectra, is a comparatively small spectrum allocation and does not allow for it to sustainably deliver the minimum speed tier specified in the Broadband Equity, Access, and Deployment (BEAD) Notice of Funding Opportunity (NOFO) in point-to-multipoint (PtMP) operations. The 2.4 GHz band also has a comparatively small spectrum allocation, which when coupled with it being common amongst Wi-Fi enabled equipment and home routers, will significantly impede its ability to deliver the minimum speed tier specified in the BEAD NOFO.

In the mid band spectrum, the 5 GHz and 6 GHz bands are part of the Unlicensed National Information Infrastructure (U-NII) service. However, due to complications with radiated power levels, practicality of antenna deployments, and existing interference levels, these mid band spectrums remain less "available" than it initially appears. In the 5 GHz bands, higher radiated power is permitted for point-to-point (PtP)[3] networks, requiring large parabolic dishes (or equivalent antennas) at both ends to provide service farther than a few kilometers. However, these antenna gains, and power levels are not available to PtMP operations, which would be needed to serve residential customers in rural areas, and large-scale use of PtP for PtMP applications would be absurd. The 6 GHz band faces different challenges to serve residential customers in rural areas. The automated frequency controller (AFC) necessary for 6 GHz operations has not yet been authorized by the Commission for commercial outdoor utilization. Incumbent licensed 6 GHz PtP links have historically been utilized for long distance microwave links over predominantly rural areas to support critical utilities, public safety, and commercial mobility network backhaul operations, with paths crisscrossing the nation. Upon being authorized for commercial operations, the AFC is to establish exclusion zones to protect these incumbent licensed 6 GHz operations. These exclusion zones have the potential to substantially impact any proposed unlicensed 6GHz operation, by further limiting the permissible power levels, as well as the quantity of spectrum available for unlicensed operations in rural areas. Further, within the 5 GHz and 6 GHz bands, the costs of employing PtP or PtMP networks in rural areas would resemble the costs of FTTP drops – but providing only a fraction of the capacity in the process.

Finally, while there is more unlicensed spectrum available in the mmW band than the low band or mid band, it has significant limitations. An essential and immutable characteristic of spectrum is that the higher it is in frequency, the less propagation and penetration power it will have. Frequencies in the mmW band can only propagate to very short distances before decaying to unusable levels when used in wireless networks. In addition, these frequencies are highly susceptible to fading due to diffraction by rain and moisture, and even to absorption by oxygen molecules. The result is that their usable reliable range – even on a clear day – is measured in the hundreds of feet, not in miles. This, along with the fact that they do not penetrate buildings or other obstacles such as foliage and must have an unobstructed Line-of-Sight (LOS) path, makes high frequencies very undesirable

[3] *Per* 47 CFR §15.407(a)(3), "fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information." There is good reason for this – allowing high power without these exclusions, even if automatically frequency coordinated, will raise the noise floor for everyone and will only lead to limiting of available channels for everyone and further overcrowding of the band.

for serving rural customers. Because mmW cannot penetrate walls or vegetation, it is necessary that the customer install an antenna on their house or a nearby structure (such as a pole) that has clear LOS to the provider's transmitting antenna. Using indoor customer equipment similar to what can be used at low and certain mid band frequencies is not possible when using mmW bands. Because of this, customer installs are typically more challenging and often require professional installation. They can also become unreliable or stop working altogether if the LOS is partially or fully lost due to an obstruction such as new building or tree growth.

This demonstrates the fact that more unlicensed spectrum may have been made available, however this does not directly translate into the conclusion that "unlicensed spectrum networks are available with a high degree of certainty." There may be more unlicensed spectrum available to deliver broadband services, nonetheless this does not necessarily translate by itself into the broadband being delivered by these unlicensed networks as *reliable*, a detailed analysis is required to determine whether and to what degree broadband delivered could be considered reliable in a given circumstance at any given location.

> **WISPA Claim #2 – "*Unlicensed Networks Can Exceed Licensed Networks in Performance and Reliability.* They detailed how the allocation of this much unlicensed spectrum, together with advances in engineering for networks using unlicensed spectrum, mean that fixed wireless networks using unlicensed spectrum are not limited to 10 or 20 megahertz of licensed spectrum channels. As a result, these networks are providing, and can continue to provide, fixed wireless broadband service with a high degree of certainty both now and for the foreseeable future and, in many cases, can provide more reliable broadband service than networks using licensed spectrum. The engineering advances include: frequency reuse and channel agility, channel bonding, interference mitigation and noise cancellation techniques, spatial processing, distributed massive MIMO, digital beam forming and beam steering, multi-path signal processing, and timing techniques."[4]**

If unlicensed networks exceeded licensed networks in performance and reliability, it is hard to see what value would be derived from licensed spectrum and why bidders would consistently pay so much for it. The reality of course is that unlicensed spectrum is shared with others and must accept any and all interference, with no protections or recourse. Due to the shared nature of the bands, unlicensed operations have lower EIRP[5] authorizations from the Commission than licensed operations. From a technical perspective, short of utilizing larger channel widths, to increase the capacity of the wireless network requires an improvement to the signal-to-noise ratio to permit higher-order modulation techniques. The lack of interference protection coupled with the lower EIRP levels permitted by the Commission, leads to unlicensed networks typically having lower signal-to-noise ratios than licensed operations, decreasing the likelihood of routinely achieving the improved signal-to-noise ratios required to support higher-order modulation techniques.

Realities on the ground in rural America compound the challenges of using mmW spectrum (which is the majority of the unlicensed spectrum) to deliver high speed broadband and confound the claims of vendors based upon laboratory or limited suburban and more urban conditions. As described previously, mmW spectrum is

[4] WISPA Letter, Pg. 2

[5] Effective Isotropic Radiated Power (EIRP) - the radiated power through an isotropic antenna. An isotropic antenna is a non-realizable theoretical antenna that propagates equally in all directions and is a useful reference when comparing practical antennas or in the Commission's case, establishing thresholds when the antenna gains vary between manufacturers.

susceptible to reliability issues based on environmental, weather, and line of sight factors. Weather events such as rain or fog may severely degrade the signal strength for mmW implementations, causing service outages or speed reductions for customers being served from these unlicensed bands. These events especially impact customers who are further from the tower, which is typical of most rural locations.

As stated previously foliage and other obstructions are challenges for mmW spectrum. For example, it is common for rural homes to be behind a "shelterbelt." Shelterbelts are lines of tall trees planted around one's property to block prevailing winds from wreaking havoc on one's home, and in colder climates, to prevent drifting snow on the downwind side. Customers living in rural areas must intentionally plant shelterbelts to protect their homes, especially necessary during the colder months. Consequently, where there is not already dense tree and foliage growth, we often find shelterbelts. In either case, there is a strong possibility that trees will obstruct the radio path – which is especially devastating for higher frequency bands like mmW.

As detailed here, the services delivered via unlicensed spectrum cannot be considered broadly as "reliable broadband"; again, a detailed analysis is required to determine whether and to what degree broadband delivered could be considered reliable in a given circumstance at any given location.

WISPA Claim #3 – "*Technology Has Advanced to Future-Proof Equipment in Networks Using Unlicensed Spectrum.* They explained why, with these evolving technologies, NTIA should expect that fixed wireless providers using entirely unlicensed spectrum will continue to provide reliable broadband service for more than 10 years and meet NTIA's sustainability goals."[6]

Because of the shared nature of unlicensed spectrum, it cannot be said with certainty that a service would remain reliable for the next 12 months, much less for more than 10 years. These bands are shared with others, as well as other applications, with no interference protection. For example, another provider could deploy within the same area or in very close vicinity and degrade the performance of the original network. This could diminish the level of broadband speed that can be delivered to subscribers.

Contrary to the claim of future-proof equipment, wireless electronics are typically depreciated over a span of 5-7 years. This relatively short lifecycle, coupled with the fact that it is extremely rare for technological advancements to be achieved merely with software updates, means that the entire electronic assembly typically must be replaced to permit access to the full capabilities offered by the next evolution of the deployed technology. With FWA networks, the majority of the upfront and overall project costs are associated with the FWA electronics themselves, whereas with a fiber network, the fiber electronics are a much lower percentage of the overall project costs.

[6] WISPA Letter, Pg. 2

WISPA Claim #4 – "*Technology and Equipment Serving in Unlicensed Spectrum Meet IIJA And BEAD NOFO Requirements.* They provided details about how technology and equipment in unlicensed spectrum bands have evolved to enable provision of reliable broadband service with download and upload speeds that far exceed the 100/20 Mbps requirement in the Infrastructure Investment and Jobs Act (IIJA) and BEAD NOFO and can, in many cases, provide Gigabit download speeds."[7]

All wireless spectrum transmitted from a given antenna or sector is "shared" amongst all customers served by that sector. Over the last 20 years, acceptable oversubscription ratios have been declining as network traffic migrates from its once "bursty" nature of short web browser sessions to more continuous applications like streaming video. In fact, some state grant programs, such as Iowa[8], are now requiring or preferring projects that meet or exceed the minimum data speeds (*e.g.,* 100/20 Mbps, 100/100 Mbps, etc.) to all subscribers simultaneously. Other states such as Michigan[9] are requiring that data speeds of 100/100 Mbps must be continuously available to all subscribers, which effectively requires that all locations within the targeted grant area be capable of receiving those data speeds simultaneously. This greatly reduces the number of subscribers that can be served on a sector. For example, the Tarana G1 has an aggregate capacity of 780 Mbps[10] utilizing 80 MHz of spectrum, a sector would only be capable of simultaneously supporting 6 subscribers of a 100/20 Mbps service without incurring oversubscription.

With unlicensed spectrum, another provider or other applications could be deployed within the same area or close proximity at any time. This further makes it uncertain that the unlicensed system could provide broadband speeds that are required as the spectrum would need to be shared between systems.

WISPA Claim #5 – "*Actual Deployments Demonstrating Points Made Here.* They provided examples of actual deployments of broadband services using entirely unlicensed spectrum to show how the available and evolving technology for these broadband services allows network providers to scale their reliable broadband in urban, suburban, exurban, and rural areas, successfully mitigate interference, and manage sharp increases in demand for broadband services."[11]

While the examples provided may be feasible for suburban and more urban areas presented, the distance limitations do not fit most rural applications. The goal is not to provide broadband to a single location but to provide broadband to all locations within the sector footprint. Vendor documentation, including the presentations attached to the WISPA letter, typically represent the touted throughputs as an aggregated total. While representing the aggregate total, typically it is failed to denote that this is the overall sectoral capacity being delivered to a single user or small sampling of users, and that these small samplings are being tested under optimal or near optimal test conditions, as well as they are not simultaneously being tested. These examples do not show the impacts of loading a sector with more subscribers or how the capacity is impacted if a second operator begins

[7] WISPA Letter, Pg. 2

[8] Notice of Funding Availability #006 – Program Design, https://ocio.iowa.gov/sites/default/files/exhibit_a_amended_-_notice_of_funding_availability_nofa_006.pdf, Pg. 23

[9] Realizing Opportunities with Broadband Infrastructure Networks (ROBIN) Grant Program Guidance, https://www.michigan.gov/leo/-/media/Project/Websites/leo/Documents/MIHI/ROBIN_Program_Guidance.pdf, Pg. 2

[10] WISPA Letter, attached Tarana Slide Deck, Pg. 2

[11] WISPA Letter, Pg. 2

to utilize the same spectrum or interference is incurred from other external applications, such as Wi-Fi or Internet-of-things (IoT) deployments, to simulate real-world deployment scenarios.

While the unlicensed spectrum deployments depicted within the presentations attached to the WISPA letter could in theory, assuming perfect or near perfect conditions otherwise, deliver the specified level of service to *anyone* in the area in question, there is substantial doubt that they could scale under real-world conditions to deliver those sustained throughput rates to *everyone* in that area in question.

> **WISPA Claim #6 – "*Actual Deployments to Anchor Institutions and Other Important Local Entities.* They presented examples of how fixed wireless operators are providing reliable broadband service to anchor institutions, as well as federal, state, and local government agencies with networks that are using entirely unlicensed spectrum."[12]**

Anchor Institutions and other important local entities require 1 Gbps services in most cases. In fact, grant programs such as NTIA Middle Mile require symmetrical 1 Gbps service to anchor institutions. These anchor institutions would be best served with fiber infrastructure. From a wireless perspective, they could be served with a dedicated point-to-point system, but it would be impractical to serve them with an unlicensed point to multipoint system.

Use of the crowded unlicensed bands, such as 5.8 GHz, do not fit anchor institution needs due to reliability issues associated with unlicensed frequencies, especially when considering the voice requirements that must provide reliable access to emergency services such as 911.

Providing gigabit services in the mmW band presents different challenges. While the mmW band has adequate spectrum to deliver gigabit services, the spectral characteristics are not well suited to provide the reliable services that anchor institutions require due to the weather, environment, and LOS issues that were discussed previously. For example, heavy rains could significantly degrade or make the service unavailable at times when it may be most needed.

> **WISPA Claim #7 – "*Broadband Equipment and Networks Using Entirely Unlicensed Spectrum are Resilient.* They listed examples where broadband networks using entirely unlicensed spectrum were able to better withstand hurricanes, tornadoes, and other natural disasters and restore service to first responders, businesses, and residences faster than other broadband technologies."[13]**

While the wireless portion of the network may be quicker to restore in an area that has aerial wireline infrastructure, most wireless sites utilize fiber backhaul to the network connection point over wireline (fiber) facilities. Additionally, a large-scale disaster would affect commercial power throughout the region and would affect all technologies until power was restored. Therefore, the wireless network would be subject to many of the same restoration challenges as the wireline network in the area.

[12] WISPA Letter, Pg. 3
[13] WISPA Letter, Pg. 3

Author Biographies

Nathan Weber, PE - VP of Engineering

Nathan Weber has been active in the industry since 2000. His primary focus is on the technical and regulatory aspects of broadband service providers. From the development of feasibility studies based on site-specific cost estimates to the design and project management of several state-wide telecom network deployments, he is involved. He has designed and implemented voice, data, and video networks as well as Packet Optical Transport, Carrier Ethernet Transport, Dense Wavelength Division Multiplexing (DWDM), Synchronous Optical Networking (SONET), Multiprotocol Label Switching (MPLS), Fiber to the Premises (FTTP), Digital Loop Carrier (DLC), and wireless networks.

Brian Bell, PE - Senior Technology Leader

Brian Bell has been in the telecom industry since 1999. He is heavily involved in both unlicensed and licensed wireless, FITL, FTTH, standby power and Central Office grounding. A licensed Professional Engineer, he has been responsible for the RF design and evaluations for wireless networks across the suite of current technology standards. His experience includes overseeing the implementation of WiMAX, CDMA and LTE networks. In addition to wireless, he has been responsible for conducting Central Office power and grounding audits, performing ground field measurements, performing soil resistivity measurements, and designing Central Office ground fields based upon soil resistivity measurements.

About Vantage Point Solutions

Better Broadband means Better Lives. Vantage Point Solutions, Inc. helps providers bring this promise to life through comprehensive engineering and consulting solutions tailored to the unique needs of the companies, Cooperatives, and communities we serve.

Vantage Point works with broadband and telecom providers in more than 40 states. Our 450+ employees include ten licensed professional engineers, three attorneys, and industry leaders in technology and advocacy. With professional engineers and regulatory experts under the same roof, we are able to understand the big picture for any individual company decision or broader industry policy.

Vantage Point is an employee-owned company. As such, we hold ourselves to a high standard for both service delivery and business ethics. These high standards extend to our industry involvement, where we are staunch advocates for the broadband deployment everywhere tied to the responsible use of broadband investment.

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