

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Expanding Flexible Use in Mid-Band Spectrum)	GN Docket No. 17-183
Between 3.7 and 24 GHz)	
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COMMENTS OF TUCSON ELECTRIC POWER COMPANY

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1. Introduction

The Federal Communications Commission (“Commission”) is seeking input on potential opportunities for additional flexible access—particularly for wireless broadband services—in spectrum bands between 3.7 and 24 GHz (“NOI”).¹ Tucson Electric Power Company (“TEP”) respectfully submits the following comments in response to the Commission’s NOI.

TEP is a regulated utility that generates, transmits, and distributes electricity to approximately 422,000 retail customers in a 1,155 square mile area in southeastern Arizona. TEP extensively utilizes mid-band spectrum in the 5.925-6.425 GHz and 6.425-7.125 GHz bands (collectively, “6 GHz”) for its day-to-day operations. To a lesser extent, TEP also utilizes mid-band spectrum in the 11 GHz and 18 GHz bands.

As a regulated public utility that provides critical infrastructure and services across urban, rural, and tribal service areas and along the U.S.-Mexico border, TEP has a clear-eyed view of the scarcity of currently available spectrum. TEP needs access to dependable, protected wireless spectrum to provide reliable power and to restore service if a catastrophe, natural disaster, or other incident disrupts operations of the electric grid. TEP entreats the Commission to apply the highest level of scrutiny and skepticism to any proposal with a potential to negatively impact the communications circuits electric utilities use to support their generation and delivery of electricity. TEP submits that there are few issues the Commission could consider that are of greater public interest or import to the nation.

2. Critical Importance of Protected Spectrum for Electric Utilities and the Nation

Our nation’s safety and security depend on reliable electric service. Not only do everyday citizens and businesses across the country rely on electricity, but also our first responders, hospitals,

¹ Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz, Notice of Inquiry, GN Docket No. 17-183 (released Aug. 3, 2017).

federal, tribal, state, and local governments, as well as our nation's military installations. Without immediate access to electricity, our nation immediately suffers.

Such is the importance of ensuring reliable electric service that vast arms of the federal government are focused on the task. Every electric utility, large or small, is required to comply with mandatory electric reliability standards overseen by such authorities as the Federal Energy Regulatory Commission, the North American Electric Reliability Corporation, and the U.S. Department of Homeland Security. Reliable electric service mandated by these federal authorities requires dedicated communication and control systems. Widespread outages across our interconnected electric grids can occur if communication and control systems fail during normal operations. The consequences of such a failure could affect millions of people. The potential harm is amplified during natural disasters, as we saw recently when delays in restoring electric service hampered hurricane relief efforts in Puerto Rico.

TEP and other electric utilities are entirely reliant on the availability of dedicated wireless spectrum to conduct utility operations and serve the public. Moreover, spectrum must be reliably available under the most demanding and harsh operating conditions. TEP uses wireless spectrum to control and protect its most critical operations, including:

- SCADA (Supervisory Control and Data Acquisition)
- Direct transfer trip protective relaying
- Energy management for generation load control
- Telemetry
- Power line fault location
- Communications with field crews during restoration and maintenance operations

If such spectrum, and thus, communications, are lost or degraded, TEP's ability to provide electric service is immediately compromised, potentially impacting an area far beyond TEP's service

territory. TEP cannot overemphasize the importance of the dedicated spectrum it uses to support reliable electric service.

3. TEP Opposes Expanded Use of the 6 GHz Bands

Dedicated communications are critical for providing reliable electric service in Southern Arizona and throughout the United States. Expanding use of the 6 GHz band, as contemplated in the NOI, would directly threaten TEP's ability to effectively communicate throughout its service area. If TEP cannot effectively communicate throughout its service area, it likewise cannot reliably provide electric service. As such, TEP strongly opposes any expansion of the 6 GHz band for any additional uses by allowing unlicensed users to share the band or by relocating incumbent users.

3.1 Part 101 Fixed Microwave Operational Requirements

Fixed Microwave Operations administered under the Commission's Part 101 rules,² like those employed by TEP in the 6 GHz band, are predicated on interference-free communications. TEP relies on the Commission's rigorous licensing and prior coordination notice ("PCN") processes under its Part 101 rules to allow it and multiple other licensees to coexist interference-free in the same geographic area. Interference-free communications are essential for providing reliable electric service.

On a grander scale, the regulatory certainty engendered by the Commission's Part 101 rules has promoted the proliferation of complex wireless communications systems all across the country. These systems support our most vital national functions like utilities, critical infrastructure, first responders, 911 systems, and essential transportation like railroads and airports. At both a local and national scale, interference-free communications are essential for our nation's safety and security.

² 47 C.F.R. § 101.1 *et seq.*

3.2 Unlicensed Use is Not Compatible with Part 101 Bands

TEP believes that there is no way forward to share traditional Part 101 bands on an interference-free basis with unlicensed operators.³ This belief is due to the inherently chaotic, contentious use typically employed by Part 15 users in their operations. Part 15 users understand and accept that they have no expectation of protection from harmful interference, even if such interference causes undesired operation of their own communications systems. The Part 15 paradigm for operating communications systems simply is not compatible with communication systems operating under Part 101 of the Commission's rules.

TEP also does not believe that there exists any mechanism to effectively mitigate interference from unlicensed users in traditional Part 101 bands. For example, detect-and-avoid interference mitigation strategies currently used by Part 15 users will not work for Part 101 incumbents. This is because detect-and-avoid mechanisms assume that by solely detecting the transmitter of the protected system, mitigation efforts can be employed to protect the receiver. In fixed microwave systems the transmitter of the protected system may be very far away with a signal that most detect-and-avoid methods are not able to sense. However, the far-end receiver of the protected system might very well be in close proximity to the Part 15 transmitter and fall victim to unintentional harmful interference from Part 15 operations. This misfortune is analogous to a "hidden node" effect that will be impossible for the protected Part 101 system to predict, identify, or mitigate. For the critical control systems of most utilities, this type of interference could be catastrophic.

The National Telecommunications and Information Administration ("NTIA") also recognized the "hidden node" problem and the insufficient protection from Part 15 operations in the National Information Infrastructure (U-NII) band for federal Dedicated Short Range Communications Service

³ TEP hereinafter refers to any unlicensed user under the moniker "Part 15" in reference to the Commission's Part 15 rules that allow for unlicensed operations. *See, e.g.,* 47 C.F.R. § 15.1 *et seq.*

(“DSRCS”) systems.⁴ TEP also observes that the federal government, after rigorous technical review, concluded that there is no feasible path forward for sharing certain bands with unlicensed users for its critical radar systems.⁵ TEP submits that the same logic applies to communication systems operating under Part 101 of the Commission’s rules.

Experience has shown that once equipment becomes commercially available to operate on new unlicensed Part 15 bands, certain parties will illegally modify software configurations, employ amplifiers or use high-gain antennas, resulting in effective radiated power that exceeds the emissions authorized by the Commission. The Commission itself recognizes this reality as does NTIA.⁶ The potential for illegal modification and operation of Part 15 equipment on Part 101 protected spectrum, especially if unlicensed operations are authorized in the 6 GHz band, is particularly worrisome given the inherent challenges associated with identifying and eliminating illegal transmissions. While TEP has every confidence in the Commission’s process for accepting new equipment, we have no faith that our primary operations will be protected from harmful interference if unlicensed users are authorized to operate across traditional Part 101 spectrum.

⁴ See Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012, U.S. Department of Commerce, January 2013, available at https://www.ntia.doc.gov/files/ntia/publications/ntia_5_ghz_report_01-25-2013.pdf.

⁵ Lawrence E. Strickling, Assistant Secretary of Commerce for Communications and Information, Remarks on the 5G Wireless Future and the Role of the Federal Government, U.S. Department of Commerce, National Telecommunications & Information Administration, Prepared Remarks to the Hudson Institute, Washington, D.C., December 16, 2016, available at <https://www.ntia.doc.gov/speechtestimony/2016/remarks-assistant-secretary-strickling-5g-wireless-future-and-role-federal>.

⁶ See Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, Notice of Proposed Rulemaking, 28 FCC Rcd. 1769, 1775, para. 17 (2013); NTIA Technical Report TR-11-473, Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed Information Infrastructure Devices, Part 1 (Nov. 2010), available at <http://www.its.bldrdoc.gov/publications/2548.aspx>; NTIA Technical Report TR-11-479, Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part II (July 2011), available at <https://www.its.bldrdoc.gov/publications/2554.aspx>; and NTIA Technical Report TR-12-486, Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part III (June 2012), available at <http://www.its.bldrdoc.gov/publications/2677.aspx>.

Part 101 operations are predicated on interference-free communications and are protected from such under the Commission's rules. Still, interference can and does occur. For Part 101 operations like TEP's, the damage is done the instant the interference occurs because communications networks must respond in milliseconds to protect the electric grid. There is no remedy, other than prevention, that is acceptable for Part 101 operators.

3.2.1 Alternate Frequency Coordination Processes Not Viable for Part 101 Bands

TEP opposes any proposals that take the frequency protection process out of the hands of established, experienced Part 101 frequency coordinators. These include using lightly licensed frameworks, Part 96 spectrum access system-like approaches, as well as the use of proprietary frequency protection schemes using private (non-FCC managed) databases, such as those proposed by Higher Ground, LLC and more recently by the Broadband Access Coalition ("BAC") in their petition for rulemaking in the 3.7 to 4.2 GHz band.⁷ None of these alternate frequency coordination mechanisms are viable to protect communication systems operating under Part 101 of the Commission's rules.

Complex modulation used in modern digital microwave systems requires the radio receivers to receive a signal that is free from harmful interference and noise above a minimum threshold. Given the ever-increasing scarcity of additional channels for Part 101 operations, current and future incumbents must resort to more complex modulations to achieve higher throughputs using the same channel sizes as less spectrum bandwidth is available. While TEP recognizes the importance of maximizing scarce spectrum and continues to be spectrally-efficient in its selection and deployment of radio equipment, the more complex the modulation, the more fragile the microwave link will be. The more fragile the

⁷ Higher Ground Application for a Blanket License to Operate C-band Mobile Earth Terminals, IBFS File No. SES-LIC-20150616-00357 (Application and Waiver); Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3700 – 4200 Band, RM-11791, Public Notice, Consumer and Governmental Affairs Bureau Reference Information Center Petition for Rulemaking, Report No. 3080 (July 7, 2017) ("BAC Petition").

microwave link, the more susceptible to inter-symbol interference from noise and co-channel operations growing geometrically with every increase in modulation complexity.

TEP is extremely skeptical of alternate frequency coordination approaches, especially those that do not contemplate frequency coordination in advance with incumbent users, have not been tested and demonstrated to be effective, or that use underlying models that have shown to be flawed. Until the legitimate concerns of critical infrastructure providers can be given a proper hearing, involving a broad technical review by industry subject matter experts, along with a significant evaluation period of a live test system that conclusively demonstrates the viability and effectiveness of these proposed alternate approaches, TEP will oppose such unproven, non-traditional frequency assignment and protection methods. We note that we are not alone in our distrust.⁸

TEP implores the Commission not to alter or change the proven, robust licensing and PCN process that is in place today. Any frequency coordination mechanism or database employed for these purposes should be clear, consistent, and available for public review. Any schemes that rely upon proprietary and/or non-public methods would be incompatible with sound engineering principles and contrary to good public policy.

3.3 It Impossible to Relocate Incumbent Part 101 Users off 6 GHz

There are no alternative spectrum options below 10 GHz acceptable for the miles-long paths typical of TEP's communication operations. Of primary concern is attenuation. For all fixed microwave links, outages resulting from rain fade are of paramount concern when designing and operating microwave systems. Frequencies below 10 GHz are much less susceptible to attenuation from rain fade than higher frequencies.

⁸ See Notice of *Ex Parte* Presentation by Utilities Technology Council supporting Petition to Deny the Higher Ground LLC Blanket License Application for C-band Mobile Earth Terminals, IBFS File No. SES-LIC-20150616-00357 (filed Sep. 6, 2016).

As an example, consider that at a rainfall rate of 100 mm (4 inches) per hour, a typical 4- or 6-GHz path of 30 to 60 km (20 to 30 miles) designed for a 40 dB fade margin is unaffected by rain. See Exhibit 1. However, to maintain the path within the 40 dB fade range, the path length would have to be reduced to 9.2 km (5.7 miles) at 11 GHz, 3.7 km (2.3 miles) at 18 GHz, or 2.1 km (1.3 miles) at 30 GHz.

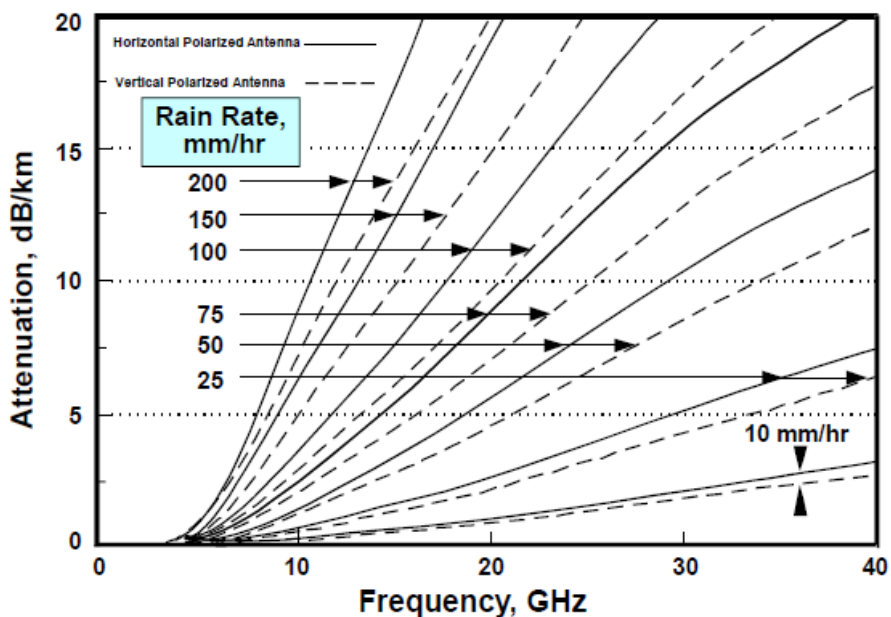


Exhibit 1.

While effects on actual path lengths will vary from rain climate to rain climate, the considerable effect of rain on high frequency radio transmission is clear. Therefore, for users like utilities with typical path lengths between 30 and 50 miles, there is no option other than to rely on spectrum below 10 GHz for these critical applications. In practical terms, this means critical infrastructure providers must rely exclusively on the 6 GHz band for all but short microwave paths. Given the congestion across all other sub-10 GHz bands, there is simply nowhere to relocate these Part 101 operations.

3.3.1 The 6 GHz Band is Already Overcrowded

Currently, we count more than 27,000 licenses for Part 101 operations in just the 5.925 to 7.125 GHz band. This band is heavily utilized across the nation. New frequency assignments are almost

impossible to obtain, even for the most critical users like electric service providers. For example, TEP is attempting to obtain new 6 GHz frequency assignments and has found that frequencies in the 6 GHz band are being fully utilized, even in rural areas.

In conversations with other critical infrastructure users across the country, TEP has learned that this congestion appears to be pervasive and getting worse by the day. Filings with the Commission by utilities and frequency coordinators further reflect this reality.⁹ In 2009, the Commission itself recognized the increasing overcrowding in the 5.925 to 6.425 GHz band when it opened the 6.525 to 6.875 GHz band for wide channel use.¹⁰ Any suggestion that the 6 GHz band is somehow underutilized or can support additional co-channel operations on top of current incumbent uses is not supported by the facts or the experience of actual spectrum users today.

4. Opportunities for Additional Flexible Broadband Access – 3.7 to 4.2 GHz

Given the shortage of spectrum, TEP remains keenly interested in new ideas for utilizing spectrum outside the 6 GHz band. The most promising band in the near term, without requiring the costly and time-consuming relocation of incumbents, is the 3.7 to 4.2 GHz band. Considering that most of the existing spectrum allotted to Part 101 fixed terrestrial microwave in the 3.7 to 4.2 GHz band is fallow, there appears to be a significant opportunity here for increased terrestrial broadband utilization. This opportunity may be especially the case for point-to-multipoint (“P2MP”) applications that would require relatively few modifications to the Commission’s existing Part 101 rules.

One necessary element for utilizing the 3.7 to 4.2 GHz band is to abandon the odd paired Part 101 channel plan 3.7 to 4.2 GHz, and allow unpaired use for P2MP operations. Such an approach is

⁹ Comments of PacifiCorp to BAC, filed Aug. 7, 2017; Comments of Micronet Communications to BAC Petition, filed Aug. 7, 2017.

¹⁰ See Amendment of Part 101 of the Commission's Rules to Accommodate 30 Megahertz Channels in the 6525-6875 MHz Band Amendment of Part 101 of the Commission’s Rules to Provide for Conditional Authorization on Additional Channels in the 21.8-22.0 GHz and 23.0-23.2 GHz Band, Notice of Proposed Rulemaking, 24 FCC Rcd. 9620, 9623, para. 3 (2009).

described in the BAC Petition. While TEP took issue with the frequency protection schemes and certain other technical details of BAC's proposal as a standalone rulemaking,¹¹ we do find many aspects to be viable, well-considered and worth advancing. To that end, TEP previously asked the Commission to instead consider the BAC proposal within the context of this NOI. Accordingly, TEP agrees in principle with the BAC and others that Part 101 of the Commission's rules are the appropriate framework, subject to modification, to allow P2MP operations in the 3.7 to 4.2 GHz band.

5. International Considerations

TEP is concerned that expanded terrestrial broadband operations might produce harmful interference in the U.S.-Mexico border area, absent adequate protocols and enforcement mechanisms to protect spectrum users in each country. TEP has only been able to identify bilateral agreements relating to certain satellite services. TEP does not believe that P2MP terrestrial operations in the 3.7 to 24 GHz band would be sufficiently protected under existing law in the U.S.-Mexico border area.

Recognizing that international frequency coordination is addressed almost exclusively through bilateral agreements, TEP feels that in order for any wide-area broadband operations in the U.S.-Mexico region to be viable, specific frequencies must be assigned. Such frequencies would be for primary use in the United States and must be free from cross-border interference. Moreover, they would need to deploy in a manner that would prevent domestic spectrum users from violating international agreements and treaties to which the United States is a signatory.

Owing to the broad international implications of this NOI, TEP strongly encourages the Commission to fully engage the Cross Border Negotiations and Treaty Compliance Branch of its International Bureau's Global Strategies and Negotiation Division. Further, any such engagement should be conducted in close coordination with the Bureau of Economic and Business Affairs Office of International Communications and Information Policy at the U.S. Department of State.

¹¹ See Opposition of Tucson Electric Power Company to BAC Petition, filed Aug. 7, 2017.

6. Conclusion

Respectfully Submitted,

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