

**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 )

**REPLY COMMENTS OF THE UTILITIES TECHNOLOGY COUNCIL AND THE EDISON  
ELECTRIC INSTITUTE**

Pursuant to sections 1.415 and 1.419 of the Federal Communications Commission’s (“FCC” or “Commission”) Rules, the Utilities Technology Council (“UTC”) and the Edison Electric Institute (“EEI”) hereby submit their reply comments in response to the Commission’s Notice of Inquiry (“*NOI*”) in the above-referenced proceeding.<sup>1</sup> Consistent with the comments of UTC and EEI, comments on the record overwhelmingly oppose expanding the use of the 6 GHz bands. Meanwhile, comments on the record overwhelmingly support expanding the use of the 4 GHz band, consistent with the comments of UTC and EEI.

These comments reflect the reality that the Commission should not attempt to expand the use of the 6 GHz bands for new unlicensed and licensed operations, because the 6 GHz bands are already heavily used for mission critical communications by utilities, railroads, and public safety, as well as for enterprise communications by commercial communications service providers and other businesses and industries. Interference and congestion from new unlicensed and licensed operations would jeopardize the safety of life, health and property that incumbent licensees help to protect. Comments on the record agree with UTC and EEI that the potential for interference and congestion from new unlicensed and licensed operations cannot be easily mitigated by technical means, particularly to the extent that such services are mobile, which will add to the complexity of determining the source of interference and

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<sup>1</sup> *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, GN Docket No. 17-183 (rel. Aug. 3, 2017)(hereinafter “*NOI*”).

enforcing restrictions to protect incumbents. As a practical matter, expanded use of the 6 GHz bands would displace incumbents because the risk of interference to mission critical communications would be too great for incumbents to remain in the band. The problem is that incumbents have no place left to go. The 6 GHz bands are uniquely suited to providing the long-range, high capacity links that utilities and other incumbents in the band need. Moving to other microwave bands would compromise the quality of communications and increase costs, even assuming that incumbents could modify their existing infrastructure by adding sites to fill the gaps in their links and boost reliability to make up for the loss of the 6 GHz bands. It is also important to recognize that many utilities and other incumbents in the 6 GHz bands were forced to relocate to the 6 GHz band, after the Commission reallocated the 2 GHz bands to make way for Personal Communications Services and Mobile Satellite Services. They should not be forced to relocate again.

Instead of the 6 GHz band, the Commission should look to the 4 GHz band for mid-band spectrum. The 4 GHz band has 500 MHz of spectrum that is lightly used and that could be much more easily shared with new licensed and unlicensed operations for fixed and mobile operations, particularly if the Commission eliminated the practice of coordinating satellite earth stations to preclude any terrestrial stations from operating on any frequency in the entire band anywhere across the entire geostationary arc of the satellite earth station. This full-band, full-arc coordination approach is a relic from the 1960s and has outlived its usefulness, if there ever was one. Gone are the days in the 1980s when the 4 GHz band was used to support the reception of television broadcast in remote areas, and the comments on the record reflect the reality that today many of the sites that were licensed back then simply do not exist anymore and many more probably aren't even used today. As such, the 4 GHz band is much more suited to sharing to support new unlicensed and licensed operations for fixed and mobile operations. Therefore, UTC and EEI support expanded use of the 4 GHz band.

**I. The Commission Should Not Expand the Use of the 6 GHz Bands, which is Already Heavily Used for Mission Critical Communications to Protect the Safety of Life, Health and Property.**

Comments on the record are overwhelmingly opposed to expanding the 6 GHz bands to support new unlicensed and licensed operations. The 6 GHz bands are heavily used to support mission critical communications, and utilities are one of the biggest if not the biggest single group of incumbents in the 6 GHz bands.

**A. Utilities rely heavily on the 6 GHz bands for mission critical communications.**

Lower Colorado River Authority exemplifies how utilities are using the 6 GHz band. LCRA is a Texas conservation and reclamation district that provides many vital services to Texans, including delivering electricity, managing the water supply and environment of the lower Colorado River basin, providing public recreation areas, and supporting community development.<sup>2</sup> It supplies wholesale electricity to 34 Texas retail utilities, including cities and electric cooperatives that serve more than one million people in 55 counties.<sup>3</sup> LCRA operates approximately 80 licensed microwave hops in the Lower 6 GHz and Upper 6 GHz bands to support its mission critical utility operations, including protective relaying, load management, water management, flood control, Supervisory Control and Data Acquisition (“SCADA”), and voice and data communications.<sup>4</sup> These systems also support the LCRA trunked radio system, which utilizes 900 MHz Business/Industrial Land Transportation (“B/ILT”) spectrum to provide mission critical voice and data to LCRA as well as public safety and public transportation entities in central Texas.<sup>5</sup> In addition, LCRA’s microwave hops support a 700 MHz regional system licensed by the State and several local law enforcement entities that operates on narrowband 769-775 MHz and 799-805

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<sup>2</sup> Comments of Lower Colorado River Authority in GN Docket No. 17-183 at 1 (filed Oct. 2, 2017).

<sup>3</sup> *Id.*

<sup>4</sup> *Id.* at 3.

<sup>5</sup> *Id.*

MHz spectrum. This 700 MHz P25 interoperable regional radio system supports emergency response efforts along the Texas gulf coast region and is accessible by any public safety agency engaged in such efforts.<sup>6</sup>

Southern Company is another example of how utilities are using the 6 GHz band. Southern is a holding company that operates 11 regulated utilities serving 9 million customers in 9 states in the Southeast.<sup>7</sup> Southern holds more than 175 point-to-point microwave licenses that collectively authorize the operation of about 150 frequency paths in the 6 GHz band.<sup>8</sup> Southern explains that, because of its extensive service areas and the need to communicate with facilities in very rural areas, the 6 GHz band is the only band that can accommodate Southern's bandwidth and performance objectives over very long paths.<sup>9</sup> Like LCRA, Southern uses its 6 GHz microwave paths to backhaul voice and data communications between and among energy control centers, transmission and distribution substations, power generating stations, and the other utilities with which Southern must coordinate in real-time for management of the interconnected power grid.<sup>10</sup> These 6 GHz links also backhaul voice and data from land mobile radio systems to communicate with Southern's personnel in the field.<sup>11</sup>

Duke Energy also extensively uses microwave systems in the 6 GHz bands to help support its electric and gas services to 7.5 million electric customers and 1.6 million gas customers in seven states—North Carolina, South Carolina, Indiana, Ohio, Kentucky, Florida, and Tennessee—across its service area of over 95,000 square miles.<sup>12</sup> Duke Energy has 117 links licensed in the Lower 6 GHz band and 56 links

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<sup>6</sup> *Id.*

<sup>7</sup> Comments of Southern Company Services, Inc. in GN Docket No. 17-183 at 1 (filed Oct. 2, 2017).

<sup>8</sup> *Id.* at 2.

<sup>9</sup> *Id.*

<sup>10</sup> *Id.*

<sup>11</sup> *Id.* at 2-3.

<sup>12</sup> Comments of Duke Energy Corporation in GN Docket No. 17-183 at 1 (filed Oct. 2, 2017).

licensed in Upper 6 GHz band. In addition to its existing 6 GHz links, Duke Energy is actively upgrading unlicensed links to licensed Lower 6 GHz as it installs new microwave radio equipment. Moreover, Duke Energy is planning to request additional frequencies in the Lower 6 GHz band in the near future as its bandwidth requirements increase.<sup>13</sup> Like Southern, Duke uses the 6 GHz microwave systems to support many mission-critical applications that control electric power generation, as well as the transmission and distribution of both natural gas and electricity, and are critical to both employee and public safety.<sup>14</sup> In addition, Duke Energy has invested approximately \$15 million in equipment cost alone in these systems, which reflects the critical nature of the traffic that is carried over these networks.<sup>15</sup>

PacifiCorp provides electric service to approximately 1.6 million retail customers in service territories covering about 136,000 square miles in portions of six western states: Utah, Oregon, Wyoming, Washington, Idaho and California; and it operates the largest non-governmental bulk power system west of the Mississippi River.<sup>16</sup> It relies on extensive private point-to-point (“P2P”) Fixed Service (“FS”) microwave system throughout its service territory, including systems in the 6, 10, 11, and 18 GHz bands – most of which are paths in the 6 GHz bands with typical path lengths of 35-45 miles.<sup>17</sup> As PacifiCorp explains, it designs its microwave facilities for very high availability (*e.g.*, mere seconds of outage per year) due to the criticality of the communications carried on this network; and it deploys microwave facilities in very rural areas where other communications facilities are not available and/or where it would be prohibitively expensive or problematic to install fiber optics. This high reliability is necessary to meet performance requirements for protective relaying, which is another 6 GHz-supported utility application that enables PacifiCorp to continuously monitor power

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<sup>13</sup> *Id.* at 2.

<sup>14</sup> *Id.*

<sup>15</sup> *Id.*

<sup>16</sup> Comments of PacifiCorp in RM-11791 at 1-2 (filed Aug. 7, 2017).

<sup>17</sup> *Id.* at 2.

flows along its high voltage transmission lines and automatically interrupt power flows within milliseconds after detecting a change in operating parameters that could signify a fault on the electric system.<sup>18</sup>

Tucson Electric Power Company generates, transmits, and distributes electricity to approximately 422,000 retail customers in a 1,155 square mile area in southeastern Arizona.<sup>19</sup> TEP reports that it 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.<sup>20</sup> It underscores the importance of wireless communications to utility reliability, and it “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.”<sup>21</sup> TEP states that “[i]f 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.”<sup>22</sup>

Westar Energy (Westar) is an investor-owned electric utility headquartered in Topeka, Kansas. Westar delivers electricity to nearly 700,000 customers in 55 counties across the east and east-central regions of the state, a service area of 10,100 square miles. Because Westar provides services to customers largely in rural areas, its service area is extremely large and geographically

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<sup>18</sup> *Id.* (adding that “[a]bsent such real-time and instantaneous action, a fault condition could allow the damage to quickly cascade beyond the immediate area of the fault, causing outages and potentially millions of dollars of damage to the power grid and/or threaten other property or persons on or near the transmission system.”)

<sup>19</sup> Comments of Tucson Electric Power Company in GN Docket No. 17-183 at 2 (filed Oct. 2, 2017).

<sup>20</sup> *Id.*

<sup>21</sup> *Id.* (stating that “TEP and other electric utilities are entirely reliant on the availability of dedicated wireless spectrum to conduct utility operations and serve the public,” and adding that “TEP submits that there are few issues the Commission could consider that are of greater public interest or import to the nation.”).

<sup>22</sup> *Id.* (adding that “TEP cannot overemphasize the importance of the dedicated spectrum it uses to support reliable electric service.”)

dispersed. Westar currently has 15 licensed microwave paths in the lower and upper 6 GHz bands and is preparing a proposal to go before its Executive Committee to add up to 23 additional paths, all in the 6 GHz bands. These microwave systems support many mission critical applications including monitoring and control of electric power generation, transmission, and distribution, and are critical to both employee and public safety.

**B. Expanding the use of the 6 GHz bands threatens the reliability of incumbent utility and public safety microwave systems.**

All utilities vehemently oppose expanding the use of the 6 GHz bands. As LCRA points out, interference and congestion would threaten public safety operations, as well as utility operations. On that note, APCO, NPSTC and several state and local governmental parties have also opposed expanding the use of the 6 GHz band, as well.<sup>23</sup> They also see this as a threat to public safety, and they also envision being forced out of the band, just as the Commission did when it forced them out of the 2 GHz band. The biggest difference here is that unlike the 2 GHz relocation, incumbents would have nowhere else to relocate from the 6 GHz band, and several utilities express justifiable concerns about reimbursement of their relocation costs.<sup>24</sup> Moreover, the disruption that this would cause to mission critical communications systems by utilities and public safety entities is also a major concern. Parties are loath to undergo another process like the one during 800 MHz rebanding, which is still ongoing and has cost billions of dollars. Nor do the incumbent licensees believe that unlicensed operations are compatible with licensed operations in the 6 GHz bands or that technical solutions might be able to mitigate the potential for interference. Even CenturyLink and several organizations representing other fixed wireless microwave incumbents are opposed to expanded use of the 6 GHz band, citing many of the same concerns about the potential for interference.

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<sup>23</sup> Comments of APCO International in GN Docket No. 17-183 (filed Oct. 2, 2017) and Comments of the National Public Safety Telecommunications Council (NPSTC) in GN Docket No. 17-183 (filed Oct. 2, 2017).

<sup>24</sup> See Comments of Southern at 9-12.

Specifically, utilities and other incumbent licensees in the band believe that mixing mobile with fixed operations in the 6 GHz bands will result in interference. Southern underscores that new services cannot be readily accommodated at 6 GHz or other fixed service bands unless they are fixed and subject to prior coordination.<sup>25</sup> There are several underlying reasons for this.

First, Southern explains that sharing between mobile services and point-to-point microwave is not a viable long-term solution.<sup>26</sup> On that point, Southern contrasts the time-tested process of prior coordination that has protected against interference between fixed operations as compared to mobile operations, which “create a dynamically changing spectrum environment, and thus are incompatible with fixed operations, absent special technical and/or operational requirements on the mobile systems.”<sup>27</sup> As Southern notes, mobile design models are predicated on general estimates about coverage and interference without any degree of precision as to impact on a specific receive point.<sup>28</sup> Also mobile systems do not adapt to changes in the spectrum environment, and therefore cannot protect new fixed systems that would be deployed in the same band.

Several utilities cite to the recent decision to authorize mobile operations in the 6 GHz band as an illustration of why the Commission should not be mixing mobile and fixed operations in the 6 GHz band.<sup>29</sup> Specifically, Southern and others expressed concerns about the intermittent nature of the interference from mobile operations and the lack of transparency with allowing the use of proprietary

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<sup>25</sup> Comments of Southern at 3.

<sup>26</sup> *Id.* at 4.

<sup>27</sup> *Id.*

<sup>28</sup> *Id.* at 5.

<sup>29</sup> See e.g. Comments of Southern Company Services in GN Docket No. 17-183 at 2-5 (filed Oct. 2, 2017); Comments of Tucson Electric Power Company in GN Docket No. 17-183 at 8 (filed Oct. 2, 2017), *citing* In the Matter of Higher Ground LLC, *Order and Authorization*, IBFS File No.: SES-LIC-20150616-00357, DA 17-80 (rel. Jan. 18, 2017).



interference mitigation techniques as problems with this approach.<sup>30</sup> There are concerns about the time it would take to confer with mobile licensees regarding instances of interference, and there were larger concerns raised about compliance by mobile licensees and enforcement mechanisms, particularly if licensees illegally modify equipment as has been the case in other contexts with unlicensed operations in the past.<sup>31</sup> Even if interference mitigation techniques could be developed for unlicensed operations, these may prove moot if the band becomes saturated and the noise floor is raised as a result of numerous unlicensed devices operating in the band.<sup>32</sup>

**C. The record does not show that the potential for interference can be sufficiently mitigated by technical means.**

While comments from proponents for expanding the use of the 6 GHz band claim that they will be able to mitigate interference to incumbent fixed operations, they fail to substantiate these claims. Instead, most of their comments are devoted to supporting their need for access to additional spectrum, and the convenience for them of using the 6 GHz band by virtue of its proximity to the 5 GHz band and

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<sup>30</sup> *Id.* at 5.

<sup>31</sup> Southern Comments at 5. (stating that “Southern is opposed to the introduction of unlicensed devices in the 6 GHz band. The risks of interference from unlicensed devices are even greater than with licensed devices because it truly would be impossible for fixed service licensees to identify the sources of interference or the operators of those devices.”) *See also* Comments of Tucson Electric Power at 6, *citing 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 I (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>. (stating that “[e]xperience 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.”)

<sup>32</sup> Comments of Duke Energy at 3 (stating that “Duke Energy is concerned that the noise floor in these bands will rise as a result of the aggregated operation of many unlicensed devices.”) *See also* Comments of Tucson Electric Power Company at 7-8 (explaining that “[c]omplex 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,” and that unlicensed operations would potentially interfere with microwave systems that would be rendered more susceptible to inter-symbol interference from noise and co-channel operations growing geometrically with every increase in modulation complexity.).

the ability of equipment to operate in both bands.<sup>33</sup>

These comments tend to be self-serving and do not dispel the interference concerns of utilities and other incumbents who rely on the 6 GHz band for mission critical communications.<sup>34</sup> To the extent that the comments engage in detail regarding interference mitigation techniques, they generally tend to object to restrictions that they claim would discourage unlicensed deployment in the band. For example, they seem to favor the use of ULS/geolocation approaches to mitigating interference. By contrast, they oppose restrictions that would require dynamic frequency selection techniques. Moreover, they refer to unlicensed bands, such as 2.4 GHz and 5 GHz, where restrictions have been minimal and deployment has been heavy; and they compare those “successes” with other bands where restrictions have been greater and deployment has been low.<sup>35</sup> The correlation they claim supports reducing regulatory restrictions in the 6 GHz band, but the correlation ignores important distinctions that underlie the need for these restrictions.<sup>36</sup>

In that regard, all comments recognize that the bands are heavily used and that they support a variety of communications, including common carrier microwave, industrial/business microwave, and

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<sup>33</sup> See e.g. Comments of the Wireless Broadband Alliance at 12-17 (arguing that both bands should be opened for unlicensed use based mainly on the sufficiency of the bands to meet their bandwidth requirements.) See also Comments of Broadcom Ltd. at 9 (underscoring that “the 6 GHz band is an important opportunity to make needed spectrum available for unlicensed services.”) and see Comments of the Mid-Band Spectrum Coalition at 12-13 (filed Oct. 2, 2017)(recommending principles for unlicensed coexistence with incumbents in the 6 GHz band.)

<sup>34</sup> See Comments of the Mid-Band Spectrum Coalition at 12 (stating that unlicensed operations must protect incumbent operations from harmful interference (by rule and by practice), but urging the FCC to hold off on the details of the interference mitigation techniques until the Commission has issued a Notice of Proposed Rulemaking (NPRM)). See also Comments of the Dynamic Spectrum Alliance at 10-13 (underscoring that the “6 GHz band is ideal for unlicensed use and that unlicensed can provide necessary protections for incumbents across the band.”)

<sup>35</sup> See Comments of Hewlett Packard Enterprise Company at 4-7 (describing ways that Wi-Fi is being used in various different bands, but observing that “[d]espite this success, the FCC has not opened any mid-band spectrum to unlicensed operations in nearly 15 years.”)

<sup>36</sup> See Comments of All Points Broadband, Amplex Internet, Apple Blaze Broadband, Broadcom, Cambium Networks, Cisco Systems, Cybress Semiconductor, Dell, Extreme Networks Facebook, Fire2Wire, Google, Hewlett-Packard Enterprise, HP, Intel, Joink, MediaTek, Metalink Technologies, Microsoft, New Wave Net, Pixius Communications, Qualcomm, Rise Broadband, Ruckus, A Unit of Brocade, Snappy Internet, Sony Electronics, Western Broadband, Wireless Internet Service Provider Association, Wisper ISP, GN Docket No. 17-183 at 15-17 (filed Oct. 2, 2017).

public safety microwave.<sup>37</sup> That said, proponents for unlicensed use of the 6 GHz bands advocate for more accurate data in the ULS database in order to be able to better protect against interference to incumbents. These comments implicitly concede that the information in the ULS database is insufficiently accurate to protect against interference. They also place the onus on the licensees to update the information in the ULS database. Finally, they recommend that the Commission should develop different interference mitigation approaches for various different bands, including for those bands that are used for mobile (as opposed to fixed) operations, as well as those bands that exhibit a high degree of antenna gain.<sup>38</sup> In that regard, some claim that they are developing enhanced spectrum sharing technologies to improve spectrum utilization, but these mitigation techniques appear directed towards protecting satellite or wi-fi operations, rather than terrestrial fixed microwave operations in the band.<sup>39</sup>

Although proponents urge the Commission to move quickly to a rulemaking, UTC and EEI are concerned that the record is clearly insufficient to demonstrate that incumbent operations can coexist with unlicensed operations in the 6 GHz band as a technical matter. As AT&T observes, “attempting to shoe-horn unlicensed use into the 6 GHz band poses grave dangers.”<sup>40</sup> As AT&T explains, “[e]ven very weak

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<sup>37</sup> See e.g. Comments of Broadcom Ltd. at 11-14 (illustrating that the 6 GHz band is heavily used by primarily three types of FCC microwave licensees, including common carrier, industrial/business and public safety). See also Comments of the Wireless Broadband Alliance at 13 (filed Oct. 2, 2017)(underscoring that “[i]ncumbent use of the band is extensive and better lends itself to unlicensed use...”) See also Comments of the Fixed Wireless Communications Coalition at 7 (stating that “[t]he 5.925-6.425 GHz band (“Lower 6 GHz”) is the most heavily used FS band for long links, with 63,260 transmit frequencies in use. The only other significant application in the band is FSS uplink earth stations.”) And see Comments of Comsearch at 2 (stating “FS bands 3.7-4.2 GHz (“4 GHz”), 5.925-6.425 GHz (“Lower 6 GHz”), and 6.525-6.875 GHz (“Upper 6 GHz”) include tens of thousands of common carrier and private operational-fixed point-to-point microwave links.”); and Comments of the National Spectrum Management Association at 4-5 (stating that “There is no location in the United States where new radios could be placed that would not potentially impact existing fixed service users in the bands of interest.”)

<sup>38</sup> *Id.* at 15-16.

<sup>39</sup> See e.g. Comments of Qualcomm at 12-13 (stating that “[v]ertical sharing techniques can be used to enable sharing between systems that have some form of hierarchy in terms of priority. One such approach currently in use is the sharing between federal radar systems and unlicensed systems in the 5 GHz band, where unlicensed systems use DFS to sense and avoid the radars.”) See also *Id.* at 13 (stating that “[h]orizontal sharing techniques are used today to enable access to spectrum by users who are in the same tier in terms of priority, such as sharing between LTE Unlicensed technologies and Wi-Fi in the 5 GHz bands.”)

<sup>40</sup> Comments of AT&T at 15 (filed Oct. 2, 2017)

signals will create interference, which will reduce the effectiveness of the link’s engineered fade depth. Microwave systems are most vulnerable to interference when the signal is faded to just above the receiver threshold due to propagation anomalies—a condition that rarely occurs given the high availability of the links.”<sup>41</sup> Mobile operations would compound the potential for interference because a “microwave licensee would never be able to identify the source of the interference—the itinerant nature of most unlicensed activity, even if it was identified as causing interference, means that the device may never be located, since it may be transmitting only intermittently and is likely to be in motion.”<sup>42</sup> UTC and EEI submit that the comments of AT&T and numerous others like it echo the concerns of utilities and other incumbents in the 6 GHz band that there is a significant potential for interference, and the risk to mission critical communications on these incumbent systems dictates that the Commission should not consider adopting a rulemaking to expand the use of the 6 GHz band.

**D. The Commission must prevent interference to utility systems in the 6 GHz band *a priori* using the existing process of prior coordination.**

UTC and EEI agree with these concerns. As UTC and EEI stated at the outset in their initial comments, the Commission needs to remain mindful that the 6 GHz band is used for mission critical communications. Interference to these communications could have catastrophic consequences, including but not limited to widespread power outages. Due to the critical nature of the communications carried over incumbent fixed microwave systems, the Commission should not resort to fixing interference after it has occurred. Instead, it must prevent interference before it occurs.<sup>43</sup> As several utilities reported in their comments, they rely on 6 GHz systems to backhaul data from supervisory control and data acquisition (“SCADA”) systems, which are incredibly important to maintaining operational reliability and safety for

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<sup>41</sup> *Id.*

<sup>42</sup> *Id.*

<sup>43</sup> See Comments of UTC and EEI at 12 (stating “UTC and EEI also oppose any approach that would rely on *post hoc* interference mitigation.”)

their own services and for the services many other wholesale and retail power distributors (e.g. municipally-owned utilities, rural electric cooperatives, and other investor-owned electric utilities) with which utility electric system are interconnected.<sup>44</sup>

As UTC and EEI stated in their initial comments and as many of the other comments on the record confirm, the 6 GHz bands are being used efficiently already, and the process of prior coordination that protects against interference makes it all work and must be preserved going forward – particularly given the importance of the mission critical communications that are being carried over the fixed microwave systems in the band. In this regard, UTC and EEI agree with the Fixed Wireless Communications Coalition, which reports that “the 6 GHz FS bands see consistently heavy use,” and that there is increasing use of the bands as systems expand.<sup>45</sup> Further, UTC and EEI agree with the FWCC’s observation that “[t]he frequency coordination techniques used by the FS (and the FSS, in shared bands) result in essentially zero interference.”<sup>46</sup> Utilities also agree that the 6 GHz band is already overcrowded and is being used efficiently.<sup>47</sup>

Prior coordination has proven effective and the Commission should not adopt unproven spectrum sharing database schemes for use in the 6 GHz band, particularly considering the heavy use of the band for mission critical communications – which cannot tolerate interference even if only for milliseconds.<sup>48</sup> As UTC and EEI as well as other commenting parties have reported, most links in the 6 GHz band are designed for availabilities of 99.999 percent or better; some operate at 99.9999 percent.<sup>49</sup> Therefore, the

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<sup>44</sup> Southern Comments at 3.

<sup>45</sup> Comments of the Fixed Wireless Communications Coalition in GN Docket No. 17-183 at 6-7 (filed Oct. 2, 2017).

<sup>46</sup> *Id.* at 4.

<sup>47</sup> Comments of Tucson Electric Power at 9-10 (concluding that “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”).

<sup>48</sup> Utility applications such as protective relaying are extremely sensitive to latency and must be able to respond in the event of a fault on the grid so that protective relaying systems isolate the fault from cascading and causing a widespread power outage.

<sup>49</sup> Comments of UTC and EEI at 7-8. *See also* Comments of NPSTC at 7, citing RFPs that require 5-nines reliability

Commission should not alter the existing process of prior coordination that has worked successfully at protecting against interference in the 6 GHz band.<sup>50</sup>

**E. Utilities lack reasonable alternatives to using the 6 GHz band.**

As UTC and EEI emphasized in their initial comments and as other parties agree, incumbent licensees such as utilities and others who rely on the 6 GHz band for mission critical communications lack reasonable alternatives to using the 6 GHz band.<sup>51</sup> The 6 GHz band is uniquely suited for long distance, high capacity communications. Higher frequency microwave bands do not provide the same propagation, and unlicensed systems also suffer from distance and reliability issues as well.<sup>52</sup> As Tucson Electric notes in its comments, attenuation is of primary concern. 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.<sup>53</sup>

Switching to higher frequencies would degrade performance of microwave facilities, and would require additional links to fill gaps to meet reliability requirements for SCADA and other utility mission

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for 6 GHz microwave systems used by public safety entities.

<sup>50</sup> See also Comments of Tucson Electric Power at 8 (imploing the Commission not to alter or change the proven, robust licensing and PCN process that is in place today,” and adding that “[a]ny frequency coordination mechanism or database employed for these purposes should be clear, consistent, and available for public review,” while “[a]ny schemes that rely upon proprietary and/or non-public methods would be incompatible with sound engineering principles and contrary to good public policy.”)

<sup>51</sup> See Comments of the Fixed Wireless Communications Coalition at 12-13 (underscoring that “clearing the 6 GHz FS bands is not a practical option,” and explaining that “[m]ost 6 GHz links cannot be relocated because they have nowhere to go.”)

<sup>52</sup> See UTC and EEI comments at 9 (reporting that “In some cases, utilities have resorted to using unlicensed solutions in the 2.4 and 5.8 GHz bands, but interference in these bands renders them unreliable for mission critical operations.” Also reporting that “Due to increasing outages, utilities are replacing their 2.4 GHz microwave links with 6 GHz systems. Also, dynamic frequency selection has been employed, but utilities often cannot find any open frequency pairs to operate on without interference”)

<sup>53</sup> *Id.* at 8-9 (providing graphs to illustrate the effect of rain fade on link margin.) See also Comments of the FWCC at 13 (stating “the impaired propagation and existence of rain fade at 11 GHz makes it unsuitable for links to cover the long distances that work well at 6 GHz.”)

critical applications.<sup>54</sup> As UTC and EEI reported in their initial comments and other parties agree, utilities and other incumbents need additional capacity to expand their systems, and the 6 GHz permits licensees to use 30 MHz, 40 MHz or even 60 MHz channels – which is another attribute that sets it apart from other spectrum alternatives. While the risk of stranded investment in the 6 GHz band is a major concern for utilities who relocated to the 6 GHz band relatively recently, utilities are primarily concerned about the impact on performance that would result to their mission critical systems if the Commission expanded the use of the 6 GHz band for licensed and unlicensed operations. Therefore, the 6 GHz bands are uniquely and perfectly suited to utilities’ bandwidth needs for point-to-point microwave communications and utilities lack reasonable alternatives that would meet their performance requirements for latency, availability and reliability.

**II. The Commission Should Expand the Use of the 4 GHz band, and Eliminate Full-Band, Full-Arc Coordination of Satellite Earth Stations.**

UTC and EEI reiterate their support for expanding the 4 GHz band for fixed operations. The band is significantly underutilized. There is 500 MHz of spectrum available for use and the band is currently allocated in 20 MHz channels. In addition to providing capacity, the 4 GHz band has excellent propagation characteristics compared to high-band spectrum, offering near-line-of-sight (“NLOS”) capability at low power for last-mile services. The main thing holding back expanded use of the 4 GHz band is the process of full-band, full-arc coordination of satellite earth stations, which precludes any terrestrial stations from using any frequency in the entire band anywhere across the full geostationary arc of the satellite earth station. This coordination process is spectrally inefficient and should be eliminated. For all of these reasons, UTC and EEI reiterate their support for expanding the use of the 4 GHz band and eliminating full-band, full-arc coordination of satellite earth stations in the 4 GHz band.

Comments on the record overwhelmingly support expanding the use of the 4 GHz band as well.<sup>55</sup>

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<sup>54</sup> See Comments of UTC and EEI at 7, n. 16, citing IEEE standards for reliability requirements for SCADA systems.

<sup>55</sup> Comments of Tucson Electric Power at 10 (stating that “[g]iven the shortage of spectrum, TEP remains keenly interested in new ideas for utilizing spectrum outside the 6 GHz band,” adding that “[t]he most promising band in

In that regard, UTC and EEI support the comments of Tucson Electric Power Company which suggest that the Commission eliminate “the odd paired Part 101 channel plan [in] 3.7 to 4.2 GHz, and allow unpaired use for P2MP operations.”<sup>56</sup> In addition, UTC and EEI echo Tucson’s concerns that P2MP terrestrial operations in the 3.7 to 24 GHz band would not be sufficiently protected under existing law in the U.S.-Mexico border area.<sup>57</sup> Finally, UTC and EEI support the FWCC’s comments regarding the 4 GHz band, which condition its support for expanded use of the 4 GHz band upon the requirement that existing FS links be fully protected from harmful interference, and that new services be required to accept any interference received from those links.<sup>58</sup>

### **III. Conclusion**

For all of these reasons, UTC and EEI oppose expanded use of the 6 GHz bands for unlicensed and licensed broadband wireless fixed and mobile services. The band is already heavily used by utilities for mission critical operations. UTC and EEI believe that the interference mitigation approaches that the FCC is considering would not be effective as a practical matter, particularly in the long term due to increases in the noise floor that would cause interference from the proliferation of unlicensed devices operating in the band. Any benefit from the expansion of the bands would be outweighed by the threat of interference to utility mission critical communications in the bands.

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the near term, without requiring the costly and time-consuming relocation of incumbents, is the 3.7 to 4.2 GHz band.”)

<sup>56</sup> *Id.*

<sup>57</sup> *Id.* at 12 (adding that “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.”)

<sup>58</sup> Comments of the FWCC at 6.



UTC and EEI support expanding the use of the 4 GHz band by eliminating full-band, full-arc coordination of satellite earth stations. This spectrum could be put to effective use, and there is sufficient information that has already been submitted on the record to show that it is underused. Finally, UTC and EEI believe that the 4 GHz band can be effectively shared while at the same time protecting against interference. UTC and EEI believe that it is too early to rely on automated coordination, and that point-to-point operations must be protected from interference. Therefore, UTC and EEI support expanding the use of the 4 GHz band.

Respectfully,

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