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February 15, 2019

Ms. Marlene H. Dortch, Secretary

Federal Communications Commission

445 12th Street SW

Washington DC 20554

Re: Federal Communications Commission Proposed Rules

Unlicensed Use of the 6 GHz Band

ET Docket No. 18-295, GN Docket No. 17-183; FCC 18-147

Dear Ms. Dortch:

El Paso Electric Company (El Paso Electric) is a regional electric utility providing generation, transmission and distribution services to approximately 424,000 retail and wholesale customers in a 10,000 square mile area of the Rio Grande Valley in west Texas and southern New Mexico. Its service territory extends from Hatch, New Mexico to Van Horn, Texas. El Paso Electric is a member of both the Utilities Technology Council and the Edison Electric Institute and supports the joint comments being filed contemporaneously by both organizations. These supplemental comments serve to underscore and highlight our opposition and concerns with the Federal Communications Commission’s (Commission) proposed rules to share the 5.925-6.425 GHz (U-NII-5) and 6.525-6.875 GHz (U-NII-7) sub-bands with unlicensed operators.

El Paso Electric has a significant investment in the 6 Ghz licensed band and relies on our 6 GHz microwave radio systems to manage and control our electrical grid and, in doing so, protects the lives and safety of employees, contractors, and the general public. El Paso Electric is part of the electric grid in the western interconnection and is also one of the few locations in the country that connects the western grid to the electric grid in the eastern half of the country. The company is required by Reliability Standards developed by the North American Electric Corporation (NERC) and approved by the Federal Energy Regulatory Commission (FERC), the regulatory bodies charged with ensuring grid reliability, to establish and maintain Interpersonal Communication capability with entities internal to our system, as well as entities external or adjacent to our system in the western interconnection. (*see* NERC Reliability Standard COM-001-3 Communications at <https://www.nerc.com/pa/Stand/Reliability%20Standards/COM-001-3.pdf>) The electric grid is highly interconnected and interdependent and degradation of microwave radio systems performance on one utility’s system as a result of unwanted interference could have far-reaching and devastating effects on public health and safety. In addition, the economic impact to industry and the public caused by a wide spread power outage would be serious.

Since we relocated our microwave radio systems to the 6 GHz bands (U-NII-5 and U-NII-7) following the auction, and subsequent clearing, of the 1.9 GHz and 2.1 GHz frequency bands, we have operated and maintained these systems, and have upgraded to advanced digital services. We rely on these microwave radio systems as both backbone and back-up links to provide reliable communications to our generation plants, substations, and control centers. Unlike the earlier auctions, incumbent licensed users of the 6GHz bands have no relocation alternatives under this proposal. It is therefore critical, should the Commission move forward with this proposal, for the Commission to ensure that measures are established to protect the usage by incumbent operators and to enforce and penalize unlicensed operators who violate these measures.

***The current licensing process ensures coordination among users and mitigates interference***

All of El Paso Electric’s microwave systems have been engineered, designed, installed and maintained to provide highly reliable control of our electric grid. The engineering of our radio systems begins with careful frequency coordination to ensure that there are no interference problems among other area users of the band. In addition, we continually monitor prior coordination notices and assess what impact the proposed new links could have on the performance of our systems. This is possible because a properly designed coordination process, based on sound engineering standards and practices, exists to ensure that no new system creates problems for an incumbent radio operating in the same channel (co-channel) or adjacent channels.

Licensing of the U-NII-5 and U-NII-7 Bands, under the Commission’s Rules and Regulations, is intended to protect the licensee from interference and ensure standards are met. No such protection is included in the proposed rules, which raises important questions such as: What recourse will the Commission expect once interference begins to occur in the U-NII-5 and U-NII-7 Bands in the mix of licensed and unlicensed spectrum? Will critical infrastructure companies need to litigate, holding unlicensed system owners and manufactures accountable for real damages and loss of business as the result of such interference?

The current coordination process includes information from radio and antenna equipment that have gone through Commission acceptance testing and which results have been properly documented. In contrast, the proposed rules do not include any process to perform reliable coordination of unlicensed systems that come on the air. This does not appear to be a prudent decision given what we know regarding the engineering and coordination of radio systems. Empirical experience with early point-to-point spread spectrum microwave links have shown that eventually the unlicensed systems will be overwhelmed by the sheer number of random systems installed in metropolitan areas. Today, for example, it is impossible to reliably operate 2.4 GHz and 5.8 GHz unlicensed radio systems in El Paso’s downtown area without withstanding some levels of interference.

Unlicensed Operation in the U-NII-5 and U-NII-7 Bands under the rules consistent with the rules for U-NII-1 and U-NII-3 bands means unlicensed systems may employ 1watt (30dBm) transmitters with 6 dBi gain antennas, i.e. 36dBm Effective Radiated Power (ERP). In addition, this ERP can increase to 53 dBm for unlicensed point-to-point systems. Frequency congestion in many metropolitan areas already prevents the coordination and licensing of new systems operating in the U-NII-5 and U-NII-7 Bands; yet the Commission proposes unlicensed systems to deploy without similar coordination and licensing procedures used by licensed systems. Instead, the Commission proposes the creation of Automated Frequency Control (AFC) systems to determine the location of licensed systems and used channels on an ad hoc basis. We do not believe the simplistic AFC system concept will be able to automatically identify potential interference into licensed systems engineered and coordinated using proven standards and engineering practices.

If adopted, the final rule should address how new licensed systems should be implemented in the proposed regulations. New licensed systems will change the landscape for unlicensed systems installed. Will the unlicensed systems be required to change frequencies if the new system blocks their channel assignments via the proposed exclusion zone? We believe the proposed exclusion zone will reduce the potential for interference but will not eliminate it.

Based on the concerns and questions outlined above, El Paso Electric categorically opposes the sharing of the 6 GHz band with unlicensed users. The comments provided below list what El Paso Electric believes should be the minimum requirements for the sharing of the band. Simply stated, El Paso Electric does not see the possibility of a shared band without a detailed frequency and licensing process applicable to all users.

**Comments to Specific Paragraphs:**

**Paragraph 5** - Any AFC system must include the ability to exclude both Co-Channel and Adjacent Channels as both have a potential impact to the licensed system receiver performance under normal and abnormal (fading) conditions. These are normally included as factors in the engineering process for licensed systems. The implementation of AFC systems must include updates for new licensed systems and the ability to receive real-time updates. This may include the disablement of unlicensed systems due to the lack of available channels. A centralized model will be more manageable on a universal basis while decentralized systems may offer less consistency in deployment and effectiveness.

An important fact to keep in mind is the centralized and decentralized AFC systems will have vulnerabilities to cyber-attacks. The electric utility industry has developed and mandated Reliability Standards which utilities must abide by in order to protect electrical infrastructure from cyber-attacks. The Commission must seriously consider the added attack vectors resulting from the addition of unlicensed radio systems and AFC databases. In this regard, we urge the Commission to coordinate with the FERC and NERC to ensure that the reliability of the electric grid is thoroughly considered before the issuance of a final rule.

**Paragraphs 6 to 7** - El Paso Electric believes that any registration requirement should include a Centralized AFC system operated by a single organization for the sake of consistency and uniformity. In addition, an AFC system must be able to ascertain the Owner, ID, location, and contact information of any unlicensed system to be able to quickly resolve any interference issues. Furthermore, there must be a well-defined mechanism to quickly mitigate interference. Any Centralized or Decentralized system that does not register each operating system and its location makes identification a transmitter hunt and creates ambiguity to the detriment of the licensed systems’ reliability. Registration in the AFC should be done prior to system implementation and notification to all licensees in the area of system implementation. This should be an internet-based system similar to the Universal Licensing System (ULS) and receive real time updates from the ULS.

The AFC system must be designed to ensure that unlicensed operations protect new and modified licensed system operations. Updates should be driven by the Commission ULS database for licensed systems. The AFC systems should update their data in real-time from a centralized database allowing end systems one failed update cycle before ceasing operations. This will ensure that customers and manufactures keep their systems fully operational and do not allow their systems to go rogue.

**Paragraph 10** - Security requirements are necessary for standard-power access points in the U-NII-5 and U-NII-7 bands to ensure that systems are not compromised by users or cyber threats. The AFC system must be fully encrypted and free from external manipulation. Neither end-users nor installers should be able to modify the AFC database to accommodate use of unavailable frequencies as determined by AFC.

**Paragraphs 12 & 13** - El Paso Electric believes that any AFC system should be established by a consortium of First Responders Organization, Critical Infrastructure Companies, equipment manufacturers, and unlicensed operators to ensure that its longevity is maintained. It should also act as the central point of contact for resolving interference issues as they occur and be responsible for resolving issues or shutting down the interfering system. This will give real-time feedback on the system’s operation and enable rapid improvements and conflict resolution.

**Paragraph 14** - El Paso Electric believes that the operator of the AFC system must be permitted to charge a mandatory fee from equipment manufacturers and sellers of these unlicensed systems for providing registration and channel availability functions. This should include an ongoing user fee for maintenance of the AFC on a per-device basis. This will ensure that funding is available for the ongoing operation of the AFC system operator. Manufacturers of unlicensed systems must provide funding for the establishment of the AFC system operator and database, since they are the beneficiaries of the proposed rules.

**Paragraph 15** - Protecting Fixed Service from Harmful Interference must include adequate allowance for mountain top systems that have an extended radio horizon. The simplistic exclusion zone approach will result in harmful interference. Existing licensee utilize technical criteria for avoidance of interference.

**Paragraph 16** - El Paso Electric agrees with the Commission that the AFC system must use data from its ULS to facilitate access by unlicensed devices in the bands that are used for the fixed service as it is the Database of Record. El Paso Electric agrees that this must be the foundation of the AFC system.

**Paragraph 17** - Private microwave engineers utilize precise terrain data to ascertain link viability for the selected frequency; nationwide databases are available for inclusion in AFC systems and would allow the AFC system operator to make better decisions on channel availability. El Paso Electric maintains accurate updates to the ULS system and believes all users should be required to make similar efforts. Corrections to the ULS database should be required to remedy interference issues.

**Paragraph 18** - Operators of temporary fixed and/or stations operating under conditional authority should be required to provide technical details of the systems in operations and have that information entered in to the ULS during the prior coordination activities. Provisions should allow for reporting such details to the AFC to limit mutual system interference. The AFC system must account for filed applications in addition to licensed stations when determining a list of frequencies on which an unlicensed device can operate, other once a license is granted and system commissioned, the unlicensed system will have to be rechanneled, provided spectrum is available.

**Paragraph 19** - The same interference protection criteria in use by licensed systems must be used by the AFC system to determine whether a standard-power access point would cause harmful interference to a fixed link receiver and it must include the effects of all interfering sources in aggregate. This includes the impact to the licensed receivers for existing and new sources.

Manufacturers’ receiver specifications normally include Carrier to Interference (C/I) for Co-channel and Adjacent- channel and are available for inclusion in analysis. One important factor in this analysis is systems that employ Automatic Transmitter Power Control (ATPC) to manage the link and compensate for fading. Marginal interference to the receiver could result in link failure and reduced reliability when the receiver is fooled by an unlicensed system transmitter.

**Paragraph 20** - Over the years, it has been a good practice to include Adjacent and second-Adjacent Channel analysis in reliability criteria, and El Paso Electric believes this continues to be necessary. The Microwave Manufacturers can provide the technical data impact to receiver sensitivity. The detrimental effects from adjacent channel or even second adjacent channels which are in the main antenna path or close proximity to the receiver increase where neither antenna discrimination nor free space loss are adequate to prevent desensitization of the receiver, reducing the link reliability and increasing error rates. Links designed for high reliability (99.99% or 99.999%) will be impacted, placing critical infrastructure systems at risk.

**Paragraph 21** - All of El Paso Electric’s microwave systems are designed for 99.999% propagation reliability. In addition, we deploy space diversity and equipment redundancy to create the highly reliable digital communications links we operate. Fading occurs on all paths and is caused by changes in the atmosphere along unique path from the far end transmitter. During a fade, the receiver is much more susceptible to interference from other sources where the Carrier to Interference (C/I) ratio is reduced or the noise floor increased by multiple sources. Fading is affected by time of day and day of the year and weather conditions. Abnormal propagations are also well documented in scientific literature. Relaxing criteria based on regional areas will not be adequate as most paths fade. The systems are designed for those days with deep fades. Again, with systems deploying automatic transmitter power control, only complicates the matter as these systems are designed to automatically compensate for deeper fades using lower power when near full receive levels are occurring. These systems will have a greater problem from interfering sources.

**Paragraph 23** - The required accuracy of the location of each standard power access point to ensure fixed service protection should be .01 degree. This should be easily a part of the deployed manufacturers’ system using automated GPS coordinates. Accuracy becomes very important when systems are installed in close proximity as antenna discrimination can result in erroneous discrimination calculation, where worst case is when an unlicensed system could be installed in the main path of a licensed system. A separation zone of 1 mile would mitigate coordinate inaccuracies for licensed systems whose coordinates were obtained by using 7 ½ minute USGS maps. There is available literature adequately describing pointing angle errors. (see, e.g., https://nsma.org/wp-content/uploads/2015/04/NSMA-2014-Coordinate-Accuracy-Jim-Wolfson.pdf).

**Paragraph 24** - Metropolitan areas standard power access points may be placed on tower structure and/or tall buildings to increase their effective range. Height Above Average Terrain (HAAT) data will be necessary for all systems. Limits should be set at 15 meters above HAAT, as this will help limit the radio horizon and reduce interfering sources. How does the Commission plan to regulate or enforce this in an unlicensed environment?

**Paragraph 25** - The Commission’s proposal requires that every standard-power access point must be professionally installed. However, the Commission no longer requires licensing from radio equipment installers. It is likely that many of the companies that will purchase these unlicensed systems will not have the expertise to evaluate the professionalism of installers. It will have to fall to the manufacturers to install, maintain and certify these unlicensed systems. Liability must be shared between the Manufacturers, Distributors and owners of all unlicensed systems to certify that the equipment will not be detrimental to the operation of Licensed Systems and will not pose a threat to Critical Infrastructure.

**Paragraph 26** - In order to avoid interference into licensed systems, all unlicensed client devices that operate in the U-NII-5 and U-NII-7 bands to be under the control of a standard-power access point should perform all probe requests outside the licensed bands to ensure probes do not transmit on co-channels prior to synchronization to the master access points. Client device may become numerous and can provide a significant source of Noise/Interference by their sheer number. Probing on co-channels would create a significantly difficult identification process.

**Paragraph 38** - To ensure that low-power access points are restricted to indoor use is difficult, power outlets can be installed as need and extended as well. Monitoring GPS signals would provide marginal results in determining indoor us as GPS coordinate can be obtain near the exterior of buildings and houses. GPS signal level could be used to detect isolation assuming indoor signals are attenuated.

**Paragraph 40** - El Paso Electric is opposed to indoor low-power access point operations in the U-NII-5 and U-NII-7 bands. These can be numerous and overwhelming sources of interference. Licensed systems will aggregate all RF energy which falls within the microwave path.

**Paragraph 42** - Unlicensed devices in the U-NII-5 and U-NII-7 bands should be explicitly prohibited from operating either as a mobile hotspot or as a transportable device as they will create an unmanageable interference environment. Mobile devices create a large uncertainty for existing and future licensed digital communications links. Mitigation techniques will be near impossible as the interference will be transitory in nature and impossible to prevent.

**Paragraph 44** - Many Fixed Microwave Services (FS) systems links are utilized in rural areas because the lack of communications infrastructure alternatives. Higher power users will have a greater interference potential; therefore, El Paso Electric is opposed to the authorization of higher power authorizations. Furthermore, licensed FS radio links in rural areas are most often part of a larger system, where interference with one link will impact data transmission on inter connecting systems, taking several links down at the same time.

**Paragraph 46 -** Antenna gains have a dramatic effect on radiated power and limited ERP and directivity provides control interference potential. Authorized antennas with certified gains will help limit interference potential. Manufacturers must certify antennas for use with their equipment and must be part of their “professional installation” training and certification accountability.

**Paragraph 47** - The RKF study conducted for the benefit Apple Inc., Broadcom Corporation, et. al. contains a number of statistical averages and technical assumptions that have been used to derive the conclusions that no interference will occur by RLAN devices operating in the same frequency bands. (*see* <https://ecfsapi.fcc.gov/file/101261169015803/6%20GHz%20Ex%20Parte%20(Bureaus).pdf>) Normal engineering calculations showing that a 36 dBm emission in the main path of the licensed receiver will impact the link performance, furthermore this impact will be repeated with every link; and microwave systems are routinely used to connect numerous locations.

The assumption that fading occurs generally between midnight and 8:00 AM and therefore fading criteria can be relaxed is not a real-world assumption. The study and simulations use far too much generalization and is not well supported by empirical date. El Paso Electric strongly requests that the Commission have the FS radio manufacturers conduct the studies based on actual measurements necessary for implementing realistic unwanted emission EIRP limits.

**Paragraph 48** - El Paso Electric concurs that unlicensed access points should not be allowed on moving vehicles, trains, aircrafts, or tethered aerial balloons and unmanned systems aircraft or balloons. Such operations will render interference consequences and mitigation techniques useless, while placing FS systems and the critical infrastructure they support at risk.

**Paragraph 49** - Additional mitigation measures may be required to manage interference to FS systems and some may be in the form of significant financial penalties to include a significant fine and actual damages if the interference causes harm to critical infrastructure through the loss of communication over a control link. This will provide an incentive to quickly resolve the issues.

**Paragraph 50** - All standard-power access points and low-power access points and their associated client devices must deploy digital identifying information as in any large-scale deployment units may be installed and used in unanticipated ways. For interference mitigation, much like any wireless device the information can be stored in an unencrypted standardized header and contain location, manufacturers and ownership information. Lower power units should be identified similarly.

**Paragraph 51** - The AFC must keep record of the actual frequency being used by each standard-power access point and will aid in identifying issues for interference problems and help with unlicensed deployments in multiple vendor environments.

**Paragraph 52** – El Paso Electric agrees with the Commission that an interference resolution process ne developed and implemented to resolve operational issues that result in interference. The AFC service provider must be an integral part of this process. This will help Licenses, owners and manufactures out of litigation. The industry consortium which is set up to design and implement the AFC must include this as part of their management plan.

**Paragraph 53** - In the process of establishing the operation of the AFC system manager, a web-based system should be established to allow the Professional Installer, System provider and the RLAN owners to input the management information and automate the record keeping from the individual unlicensed devices, using account information and information directly before operation begins.

**Conclusion**

As discussed, El Paso Electric opposes the Commission’s proposal to expand unlicensed usage of the 6 GHz band with unlicensed users. Critical infrastructure organizations, such as electric utilities, provide services that are vital to the health and safety of the public, as well as the nation’s economy. The proposed rule could detrimentally affect the reliability of the electric grid by increasing the potential for service outages and increase the response times for companies to service issues and protect life. We urge the Commission to reconsider adopting these proposals in a final rule. However, should the Commission move forward with the proposal, we encourage the Commission to adopt the minimum requirements discussed herein for the sharing of the band.

Sincerely,

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