BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement	)	
Electric Utility Wildfire Mitigation Plans	)	R. 18-10-007
Pursuant to Senate Bill 901 (2018)	)	(filed October 25, 2018)

Comments of Anterix on

Proposed Strategic Roadmap of Wildfire Safety Division

Robert Schwartz
President & CEO
Anterix Inc.
3 Garret Mountain Plaza, Suite 401
Woodland Park, NJ 07424
Tel. (973) 337-1293
Email: rschwartz@anterix.com

Rachelle Chong
Law Offices of Rachelle Chong
345 West Portal Avenue, Ste. 110
San Francisco, CA 94127
Tel. (415) 735-0378
Email: rachelle@chonglaw.net
Consultant to Anterix Inc.

June 30, 2020

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement	)	
Electric Utility Wildfire Mitigation Plans	)	R. 18-10-007
Pursuant to Senate Bill 901 (2018)	)	(filed October 25, 2018)

Comments of Anterix on

Proposed Strategic Roadmap of Wildfire Safety Division

Pursuant to a May 11, 2020 letter, the Wildfire Safety Division ("WSD") of the California Public Utilities Commission ("CPUC") requested input from stakeholders on the WSD's Proposed Strategic Roadmap, "Reducing Utility Related Wildfire Risk: Strategy and Roadmap for the Wildfire Safety Division" ("Roadmap"). In response, Anterix Inc. ("Anterix") is pleased to provide the following stakeholder comments focusing on a critical element for utility deployment: a secure resilient private wireless broadband platform to enable applications and devices that support wildfire prevention as well as smart grid management.

Anterix empowers the modernization of critical infrastructure by enabling private broadband connectivity. Its foundational spectrum enables risk mitigation and meets evolving business needs of electric utilities, with greater cybersecurity, resiliency, and control. As explained in these comments, utility-controlled, private wireless broadband networks such as those enabled by Anterix are critical to meeting the wildfire challenge described in the Wildfire Safety Division's proposed Roadmap.

I. Background

In the Roadmap, the WSD appropriately focuses on the importance of leveraging new technologies, specifying among the Roadmap's four proposed areas of collaboration: "Applied science, technology, and data: Leverage advancements in science, technology, and data and analytics to support more informed decision-making and create a shared understanding of utility-related wildfire risk."[1] The technology discussion in the Roadmap overwhelmingly focuses on the important capabilities of data

[1] Roadmap, at 8.

interoperability and analytics for utilities as they face substantial challenges to forecast and prevent utility-caused wildfires.

Before data can be shared and analyzed, however, it must be generated and collected, which requires an often overlooked yet critical and immensely beneficial capability for this and other utility functions that should be a key item on the Roadmap: the deployment by utilities of secure, resilient, private wireless broadband platforms to enable applications and devices that support both wildfire prevention as well as smart grid management. In these comments, Anterix highlights the essential, cybersecure utility-controlled wireless broadband platform that should underpin California's technological approach to wildfire prevention and mitigation—and the very recent federal development that make this platform achievable statewide.

II. 900 MHz Private LTE Is Foundational Technology in Addressing California Wildfires

On May 14, 2020, the Federal Communications Commission ("FCC") issued a ground-breaking Report and Order[2] making available an important new tool for fighting wildfires by utilities—6 MHz of spectrum in the 900 megahertz (MHz) band specifically designated for wireless broadband services. Prior to the FCC Report & Order, it was next to impossible for utilities to obtain dedicated access to such "beachfront" radio spectrum[3] that is appropriate for critical-industry-grade, utility-controlled, private wireless broadband networks. In its Report and Order making this spectrum available, the FCC explained why utilities need broadband:

> The record demonstrates that there is an ever-growing need by utilities and other industries for increased access to reliable broadband services. (Report and Order at ¶ 23)

[2] Report and Order, Order of Proposed Modification, and Orders, In the Matter of Review of the Commission's Rules Governing 896-901/935-940 MHz Band, WT Docket No. 17-200, FCC 20-67, Rel. May 14, 2020 ("FCC Report and Order"). The FCC's *Report & Order* and five FCC Commissioners' statements are available at https://www.fcc.gov/document/fcc-enables-broadband-deployment-900-mhz-band.

[3] By beachfront spectrum, Anterix refers to the propagation characteristics of lower bands of radio spectrum which includes the 900 MHz spectrum. As a matter of the physics of radio waves, the propagation characteristics of lower bands make them most suited for broad rural coverage and penetration into buildings where most mobile data are consumed.

In his separate statement accompanying the Report and Order,[4] FCC Chairman Ajit Pai specifically called out how this 900 MHz spectrum can help electric utilities address wildfire mitigation and grid modernization:

> Broadband access will enable industries to leverage technologies for applications like private LTE networks–next-generation networks that can enable Voice over LTE, grid resiliency and monitoring, wildfire mitigation, enhanced cybersecurity, and more. Utilities are eager to use broadband to modernize the electric grid. Southern California Edison, a utility in a state hard-hit by fires in recent years, predicts that broadband will enable innovative monitoring technologies that will help utilities detect and extinguish fires caused by downed power lines.

Anterix is filing these comments to make this Commission and the WSD aware of this very important recent development by the FCC,[5] and the many benefits it may bring to California utilities. Critical-industry-grade, utility-controlled, private wireless broadband networks serve as the essential platform for collecting the vital data necessary to meet Roadmap goals while implementing the most advanced cybersecurity capabilities. Where real-time action based on current data is critical, private wireless broadband networks enable informed decisions. Wireless LTE (Long-Term Evolution) technology brings the most advanced cybersecurity capabilities and a well-defined path for growth well into the future.

Private LTE technology can help prevent wildfires in California by addressing their three major causes—vegetation touching lines, dropped conductors, and pole or equipment failure. Specifically, private LTE in the 900 MHz band will provide the broadband connectivity necessary to enable the following cutting-edge applications and capabilities:

- *Falling-conductor applications*, which sense and can de-energize a falling conductor wire before it reaches the ground and starts a fire. "[E]lectric utilities are required to provide service in high fire threat areas, where downed power lines may come into contact with dry

[4] Report and Order, Separate Statement of Chairman Ajit Pai, at p. 112.
[5] The FCC Report and Order was considered so significant that Public Utilities Fortnightly devoted an entire special issue to it, with articles authored by FCC Chairman Pai, Senator Warner, NARUC President Presley, Southern Company CEO Fanning, and more. See Attachment B.

forest fuel, or foreign objects, such as trees, may come into contact with energized wires, potentially generating sparks that can ignite wildfires."[6]

- *Wildfire camera pan-tilt-zoom control systems* for video applications to detect smoke or fire.[7] Utilities are "deepen[ing] utility collaboration with communities and other stakeholders as part of their prevention and mitigation strategies [by d]eploying new technologies and building capabilities to both identify ignition precursors and to detect actual ignitions earlier, all in support of emergency response actions."[8]
- *Grid monitoring tools* to provide visibility of anomalies before, during, and after wildfires;
- *Information sharing in the field* to enable field utility workers and supervisors to consult about dangerous conditions and expedite repairs;
- *Smart connected water pumps* to dampen endangered properties and even quickly put out fires at key substations or utility facilities;
- *Weather sensors* to provide real-time data on current weather conditions, helping utilities share "weather information (*e.g.* real time access to camera and weather station feeds) with public safety partners, as well as researchers and the general public, taking all confidentiality and security precautions due."[9]

Many of these applications will provide input to help utilities mitigate wildfires without imposing Public Safety Power Shutoffs ("PSPS") as frequently or broadly as in 2019. "[T]he CPUC has explicitly directed utilities to expand their 2020 Wildfire Mitigation Plans to reduce the need for PSPS events and state leadership and residents across California view the magnitude of previous PSPS events as unacceptable." (Roadmap at 29). Less Public Safety Power Shutoffs will have fewer negative impacts on

[6] Roadmap at 6.
[7] ALERTWildfire is a consortium of three universities, University of Nevada, Reno, UC San Diego, and University of Oregon, providing state-of-the-art Pan-Tilt-Zoom fire cameras and associated tools (1) to help firefighters and first responders discover/locate/confirm fire ignition, (2) quickly scale fire resources up and down appropriately; (3) monitor fire behavior through containment, (4) during firestorms, help evacuations through enhanced situational awareness, and (5) ensure contained fires are monitored appropriately during their demise. ALERTWildfire works in partnership with others including San Diego Gas & Electric, Southern California Edison, Pacific Gas & Electric, NVEnergy, CalFire, California Office of Emergency Services (OES), WIFIRE, Technosylva, GeoLinks and other partners. See these links: http://www.alertwildfire.org/about.html http://www.alertwildfire.org/about.html
[8] Roadmap at 21.
[9] Roadmap at 21.

local economies, in itself a huge economic and public benefit to the state.[10]

III. 900 MHz Private LTE Addresses Other Key Aspects of the Broader WSD Vision

The value private LTE offers utility ratepayers is not limited to the wildfire season—it provides benefits every single day. Private LTE provides the coverage, resiliency, and performance utility applications require along with the cyber security defenses necessary to protect the grid. It is foundational, providing a 21st Century platform to support a utility's critical operational requirements today and into the future.

The Roadmap stresses the importance of solutions that go beyond the primary need to address wildfires. The Roadmap's proposed vision statement for the WSD and utilities eloquently captures this commonality of purpose: "A sustainable California, with no catastrophic utility-related wildfires, that has access to safe, affordable, and reliable electricity."[11] Specifically, two of the vision's objectives underscore the broader applicability and value of private utility-controlled wireless broadband networks for California utilities:

- "Reliability: Limit planned and unplanned outages due to utility-related wildfires and mitigation activities"[12]
- "Climate Action: Ensure utility wildfire mitigation activities also advance climate change goals"[13]

Private LTE networks provide an essential platform supporting myriad interconnected goals in addition to wildfire prevention and mitigation. As the foundational network enabling grid

---

[10] Impacts of last year's California PSPS outages was estimated to be $2.5 billion. https://www.cnbc.com/2019/10/10/pge-power-outage-could-cost-the-california-economy-more-than-2-billion.html#:~:text=The%20economic%20impact%20of%20PG%26E,billion%2C%20according%20to%20some%20estimates.&text=%E2%80%9CIf%20one%20sums%20residential%20and,%242.5%20billion%20in%20outage%20costs.

[11] Roadmap at 26.

[12] Roadmap at 27.

[13] Roadmap at 27.

modernization capabilities, utility-controlled private LTE supports systems and applications that help to safely and efficiently integrate distributed energy resources ("DER") such as wind and solar facilities into the grid, thereby facilitating energy sustainability and combating climate change. Private LTE also supports grid improvement technologies specifically focused on electricity reliability and safety, such as "volt/VAR" controls and Fault Location Isolation and Service Restoration ("FLISR") systems.

Cybersecurity is also of tremendous importance in both wildfire and non-wildfire applications—for example, the Roadmap's Data Strategy (Appendix 3) focuses on data security, particularly with regard to the envisioned file repository. But data must be secured both at rest as well as in transit, and among cellular technologies, LTE—the first iteration of the 3GPP standard developed at the outset to address security—is the hands-down cybersecurity leader. A short utility-focused description of the security benefits of private LTE by the Utility Broadband Alliance is attached to these comments as Attachment A.

IV. Additional Data on the Many Benefits of 900 MHz Private LTE

Utilities are increasingly looking to private LTE in the 900 MHz band to support their grid modernization efforts, providing secure, low-latency connectivity to the thousands of remote sensors and other smart devices installed throughout the modern grid. Examples include automated metering infrastructure ("AMI"), volt / var controls, FLISR systems, DER integration, and other use cases necessary for utilities to provide safe, reliable, and cost-efficient energy to their customers.

A. Why LTE?

LTE is the widely available, state-of-the-art standard from the worldwide 3GPP standards body. LTE's key characteristics include its advanced cybersecurity features, an existing worldwide device ecosystem, and years of worldwide operator experience, making it a mature, reliable technology on the evolutionary path to 5G.[14] As the most-deployed advanced cellular technology in the U.S., a private LTE

[14] The introduction of 5G into the utility ecosystem will occur over time, but at present, its deployment is in progress. 5G is more suited for densely-populated urban environments due to the high band spectrum that will be used and the need for many cell sites/towers, and not as well suited for large rural utility footprints.

network will provide a utility interoperability and ease of roaming with other LTE systems, including other California utility networks.

B. Why 900 MH

The 900 MHz band is optimal for a utility-controlled private LTE network for a range of reasons. As a newly available broadband allocation pursuant to the FCC's ground-breaking decision in May 2020, it is widely available for coverage throughout the California (and the nation). Virtually alone among spectrum bands available for private utility-controlled LTE networks, the 900 MHz band includes low-band (sub-1 GHz) frequencies with superior propagation than higher bands: signals can travel greater distances (which is especially important in rough terrain) and can penetrate obstructions like foliage and buildings. Accordingly, 900 MHz band private LTE networks need fewer cell sites (i.e. towers) than higher-band systems to provide comparable coverage, resulting in markedly lower total cost of ownership for the utility and its customers. Because LTE has already been widely deployed in the 900 MHz band in other countries, manufacturers have produced a vast array of 900 MHz LTE equipment and devices that can be available to the U.S. market upon FCC approval.

The regulatory treatment of the 900 MHz band is important, as well. As licensed spectrum, the 900 MHz broadband allocation is legally protected spectrum that can be used only by the licensee (or lessee) authorized to use the spectrum; there is no competing with other users for use of spectrum capacity. The utility enjoys increased network security and control not possible with unlicensed spectrum. This spectrum is a finite resource in great demand, so delays in adopting could result in a lost opportunity for the electric utility.

C. Why Private?

Utilities provide an essential utility service, so they must be certain of the security and reliability of their systems. Critical grid-control communications networks are integral to the safe, reliable provision of that essential service. As a result, utilities cannot rely on outside vendors to provide the critical communications network for them—especially if the vendor's network decisions might be influenced by the vendor's need to accommodate other customers or by its own corporate interests. One unfortunate example is the throttling of Internet speeds by a commercial wireless carrier to the Santa Clara Fire Department as its firefighters mobilized to combat the Mendocino Complex Fire in

2018. In the best case scenario, utilities should control the spectrum and the infrastructure to ensure capacity, reliability, and cybersecurity.

An additional key benefit of private LTE is that it can be designed and built for mission critical reliability for the entire network (including the dedicated Radio Access Network, Core and redundant backhaul elements), with a focus on resiliency and redundancy. A utility can provide a secure, trusted "end-to-end" system dedicated solely to critical infrastructure operations and can facilitate situational awareness and response capabilities to public safety partners, such as CalFire, CalOES, local fire authorities, local law enforcement and others. With private LTE, utilities will have network performance that consistently and reliably exceeds the "commercial best efforts" service offered by commercial carriers, which have repeatedly failed to perform during the deadly fires California faced in recent years.

These dedicated and resilient broadband networks would enable a comprehensive suite of wildfire mitigation technologies (including infrared and heat sensing, conductor intervention, weather stations, remote video) that can be directly and securely integrated to utility and other critical infrastructure Network Operation Centers, as well as CalFire Emergency Operations Centers. The ability to provide this mission critical information—without having to compete with consumers and commercial users for commercial carrier network capacity—would enable utilities and public safety entities to fully optimize emerging artificial intelligence applications that can more accurately model and predict key conditions that contribute to fire initiation and growth, threatening citizens' lives and property. Only a private network can be configured to meet the true needs and mission critical requirements of both utilities and their public safety partners to meet growing threats head on.

V. Anterix Urges the CPUC to Prioritize a Private LTE Pilot for Wildfire Prevention

The Roadmap wisely provides that the "WSD and utilities pilot technology and data tools" in the "shorter-term (2020)."[15] Anterix urges the WSD, CPUC, California Natural Resources Agency, and Office of Energy Infrastructure Safety to ensure that at least one of those pilots include a deployment of private LTE with associated sensors and devices (see, for example, the bulleted list of applications in

[15] Roadmap at 48.

Section II above) to generate and collect data for the prevention and mitigation of wildfires. The pilot should also evaluate the extent to which the network enables improved/increased data generation and collection—and direct mitigation actions—to support reductions in utilities' decisions to implement Public Safety Power Shutoffs. Should such a pilot be ordered, Anterix will be an enthusiastic partner to demonstrate the many benefits of 900 MHz to wildfire prevention and other grid benefits.

VI. Conclusion

For all the reasons set forth above, Anterix recommends that the WSD specifically set forth in the Roadmap the importance of electric utilities having foundational, private wireless broadband networks in order to effectively gather and use data to address the wildfire challenge in California. Beginning with a pilot implementation of private LTE technology in the "shorter-term," as proposed in these comments, the IOUs, its public safety partners, and WSD will have a cybersecure, essential communications platform upon which to design an integrated, data-driven approach to wildfire safety. The FCC has provided an important new tool that electric utilities may access in their fight to prevent wildfires. Anterix urges the CPUC ensure that utilities examine and adopt this 900 MHz spectrum opportunity in California, with all the benefits set forth above.

Respectfully submitted,

/s/ Robert Schwartz

Robert Schwartz
President & CEO
Anterix
3 Garret Mountain Plaza, Suite 401
Woodland Park, NJ 07424
Tel. (973) 337 1293
Email: rschwartz@anterix.com

/s/ Rachelle Chong

Rachelle Chong
Law Offices of Rachelle Chong
345 West Portal Avenue, Ste. 110
San Francisco, CA 94127
Tel. (415) 735-0378
Email: rachelle@chonglaw.net
Consultant to Anterix

June 30, 2020

Attachments

Attachment A: Utility Broadband Alliance, *Cybersecurity Benefits of a Private LTE Network,* available online at
https://www.ubba.com/cybersecurity-benefits-of-a-private-lte-network/

Attachment B: Public Utilities Fortnightly Extra Edition, May 14, 2020, available online at
https://www.fortnightly.com/fortnightly/2020/05-0

CYBERSECURITY BENEFITS OF A PRIVATE LTE NETWORK

UBBA
Utility Broadband Alliance

UBBA CYBERSECURITY WORKING GROUP

Jeff Tufts – Cisco - Chairman
Gary Johnson – Evergy – Co-Chairman
Dan Bayouth – Burns & McDonnell
Mike Brozek – Anterix
Scott Burk – Encore Networks
Vicki Carleton – Southern Company
Mark Eaton – Ericsson
Robert Escalle – Sonim Technologies
Jairo Hernandez Guzman – Council-Rock
Bobbi Harris – UBBA
Patrik Ringqvist – Ericsson
Gary Vondrasek – JEA
Aaron Wright – GE
John Yaldwyn – 4RF

UBBA
Utility Broadband Alliance

INTRODUCTION:
UBBA WHITE PAPERS

Utilities and their customers have been focused on electric service reliability since the first systems were installed. The electric grid was complex when built, and it is getting even more complex as we add electrical loads and generation in places not anticipated in the original grid designs. Across the country, homes and businesses that once only consumed electricity are now producing it with the help of solar panels, microturbines, combined heat and power, as well as other sources that now make it possible to reverse the power flow. Reliability standards will be increasingly difficult to meet as the grid changes to comply with modern state and federal regulations focused on service to the consumer.

Complex systems are famously more susceptible to disruption and service degradation than simple systems. Though utilities are redesigning distribution systems and deploying new technology to meet modern demands, the challenge is exponentially increased by the risk of cyber attack exacerbated by greater reliance on data-dependent technologies. There is no single approach or solution to these reliability challenges.

Forward-looking utilities, technology providers, and service companies have come together to form the Utility Broadband Alliance (UBBA), offering members the opportunity to collaborate and share best practices in the deployment and operation of modern multipurpose communications networks. As utilities increasingly need to monitor and control devices on the grid extending all the way to the electricity consumer, they are focusing on wireless communications systems as the most economical and highest performing option to connect those devices. Running fiber to every home and every device on the grid is neither economically feasible nor achievable in the desired short time frame. UBBA members have focused on private wireless systems based on the global LTE standard, finding them an ideal future-proof solution. UBBA working groups will periodically publish papers focused on various aspects of improving electric service reliability.

The following paper focuses on the number one concern and threat all critical infrastructure providers face: cybersecurity.

CYBERSECURITY BENEFITS OF A PRIVATE LTE NETWORK

Electric utilities increasingly rely upon data-dependent technologies to ensure safe, reliable, and efficient operations. Sensors placed throughout the modern power grid collect data about grid conditions, and centralized industrial control systems analyze and act upon that data, sending commands to smart devices in the field to perform physical grid management tasks.

Transporting this data between sensors, control systems, and smart devices requires secure, reliable, resilient, utility-grade communications networks. Selecting a network technology and deployment approach is a critical decision. Where fiber or metro ethernet deployment is not a good fit for financial or logistical reasons, many utilities are looking to wireless broadband networks to extend their ability carry their increasingly voluminous control data. Wireless broadband solutions require radio spectrum appropriate for broadband, a critical input the utility industry has—with just one significant exception—failed to obtain from the federal agency that licenses radio frequencies. Among the many wireless broadband solutions, private LTE, which brings with it an existing ecosystem of LTE products, is the leading option for secure modern grid data communications.

With the increasing reliance upon data for grid control, security of the new data communications network is of critical importance. The utility's Chief Information Security Officer (CISO), chief risk officer, and others will be deeply involved in the selection of the network technology and deployment approach, including evaluation of inherent security features and the security implications of deploying a private, utility-controlled LTE network.

NIST FIVE FUNCTIONS OF CYBERSECURITY FRAMEWORK

IDENTIFY: Develop an organizational understanding to manage cybersecurity risk to systems, people, assets, data, and capabilities. The activities in the Identify Function are foundational for effective use of the Framework. Understanding the business context, the resources that support critical functions, and the related cybersecurity risks enables an organization to focus and prioritize its efforts, consistent with its risk management strategy and business needs. Examples of outcome Categories within this Function include: Asset Management; Business Environment; Governance; Risk Assessment; and Risk Management Strategy.

PROTECT: Develop and implement appropriate safeguards to ensure delivery of critical services. The Protect Function supports the ability to limit or contain the impact of a potential cybersecurity event. Examples of outcome Categories within this Function include: Identity Management and Access Control; Awareness and Training; Data Security; Information Protection Processes and Procedures; Maintenance; and Protective Technology.

DETECT: Develop and implement appropriate activities to identify the occurrence of a cybersecurity event. The Detect Function enables timely discovery of cybersecurity events. Examples of outcome Categories within this Function include: Anomalies and Events; Security Continuous Monitoring; and Detection Processes.

RESPOND: Develop and implement appropriate activities to take action regarding a detected cybersecurity incident. The Respond Function supports the ability to contain the impact of a potential cybersecurity incident. Examples of outcome Categories within this Function include: Response Planning; Communications; Analysis; Mitigation; and Improvements.

RECOVER: Develop and implement appropriate activities to maintain plans for resilience and to restore any capabilities or services that were impaired due to a cybersecurity incident. The Recover Function supports timely recovery to normal operations to reduce the impact from a cybersecurity incident. Examples of outcome Categories within this Function include: Recovery Planning; Improvements; and Communications

No single wireless broadband data communications solution will fit the needs of all critical infrastructure entities and their industrial control systems. Options range from public carrier services to public/private hybrid networks to fully private deployments. This first paper in the UBBA white paper series provides detail about private LTE networks to help utility decision-makers understand the best-in-class security features of LTE and the value to a utility of possessing complete control over its own data network. The first section describes LTE's security features, and the second section addresses the significant security benefits of controlling a private network. As the paper explains, a private deployment of LTE is a strong choice for improving utility cybersecurity protections.

Many cybersecurity practitioners are familiar with the National Institute of Standards and Technology (NIST) Cybersecurity Framework[1] which is designed to help organizations better manage and reduce cybersecurity risk. The Department of Homeland Security's Critical Infrastructure Cyber Community C³ Voluntary Program supports critical infrastructure owners and operators like utilities in their use of the NIST Cybersecurity Framework, which defines five Core Functions for cyber risk management.

As suggested in this paper, private LTE deployments offer substantial benefits of these Core Functions.

LTE OFFERS A PARTICULARLY ROBUST SET OF CYBERSECURITY FEATURES

As cyber attackers grow more sophisticated, defenders are developing ever-more powerful and effective mechanisms to prevent, discover, and recover from security incidents. As the newest among mature, proven wireless technologies, LTE not surprisingly offers a particularly robust, up-to-date set of security features. And in a private deployment, the operator has the control to implement any or all of LTE's advanced security features (as well as any additional utility-specific cyber management functionalities), as described in more detail in the second section of this paper.

LTE is focused on security by design. The 3rd Generation Partnership Project (3GPP) constructed the standard with five distinct security feature groups:

1. Network access security
2. Network domain security
3. User domain security
4. Application domain security
5. Visibility and configurability of security

3GPP and the other global standards development organizations are constantly reviewing LTE security and providing updates. 3GPP's Systems Architecture Security (SA3) group is chartered to maintain system security and meets over a dozen times a year to continually address these issues. In response to a recent paper identifying newly discovered vulnerabilities (none of which was exposed in over a decade of commercial LTE deployment), the 3GPP security steering group committed to address the vulnerabilities in the upcoming 3GPP Release 16 for both LTE and 5G networks. Utilities that adopt LTE are "future proofed" through this continual, global 3GPP process.

A core tenet in LTE's creation and evident in many of these feature groups is the idea of allowing more granular control of the network, enabling stand-alone security measures for connections between discrete network elements, each with a different configuration, rather than a single security measure for the entire system. As a result, an attacker wishing to penetrate an LTE network will need to hack discrete protections for multiple elements; in utility legacy networks, security measures typically apply to the entire network end-to-end.

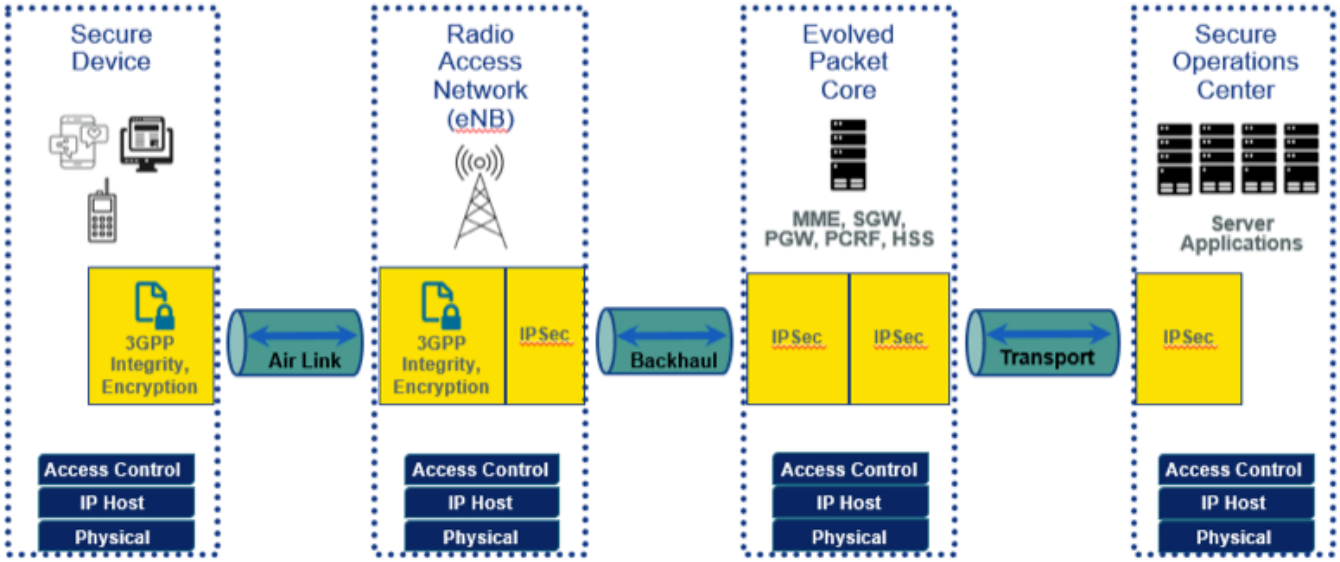
LTE's more granular approach to security is an example of the "defense in depth" practice recommended in 2016 by the Industrial Control Systems Cyber Emergency Response Team of the Department of Homeland Security.[2] In a major step forward, LTE is the only mature wireless technology to enable protection of session set-up and administration signals (the "control plane") separately from the data payload itself (the "user plane"). Regarding the control plane, through its Authentication and Key Agreement protocol LTE separately protects, for example, the links between the SIM in the user's device and three different network elements, two in the core network and one in the radio access network. LTE's adherence to this granular approach results in a many-layered series of barriers to cyberattack on the wireless system.[3]

[1] https://www.nist.gov/cyberframework.

[2] U.S. Department of Homeland Security, Industrial Control Systems Cyber Emergency Response Team, Recommended Practice: Improving Industrial Control System Cybersecurity with Defense-in-Depth Strategies (Sept. 2016) ("ICS-CERT Recommended Practice").

[3] Specifically, 3GPP Technical Specification 33.401 defines five security feature groups for LTE (see above diagram). Each of these feature groups addresses certain threats and accomplishes specific security objectives, representing a significant step forward in wireless network security.

LEVERAGE 3GPP SECURITY



This is one way in which LTE represents a strong iterative improvement over its predecessor technologies. Importantly, because of LTE's widespread global adoption, substantial security investment is sure to continue as it evolves into 5G and beyond.

None of this should be surprising; as concern over cyber threats has increased, so too has the degree of cyber protection designed into data communications technologies. The security offered by earlier systems may have been adequate in the past, but newer technologies by design and necessity include stronger cyber protection features. As the most advanced of the proven technologies, LTE should—and does—raise the security bar.

The following review of LTE security features includes both mandatory and optional configurations within the LTE standard. As described in more detail in the second section of this paper, the owner of a private LTE deployment—one that is controlled by the utility—can decide to incorporate any and all of LTE's optional security features, thus strengthening the utility's cybersecurity posture and customizing the network to meet the utility's particular security and operational needs.

CONTROL PLANE PROTECTIONS

As noted above, LTE uses its Authentication and Key Agreement protocol to secure control plane communications separately from user plane data—a major advance. In a good illustration of defense in depth, LTE includes cryptographic protections for control plane communications between the device and three different network elements to prevent attackers from spoofing devices and/or network elements to compromise the system.

To protect control plane communications between the device and the Home Subscriber Service (HSS) core network element, LTE uses an application called "USIM" that typically runs on the Universal Integrated Circuit Card (UICC, which has replaced the SIM card used in older systems). Through USIM, LTE supports not just authentication of the user to the device but also authentication of the device to the HSS, which manages customer information and authorizes the device's access to the network.

The Mobile Management Entity (MME) is also a core network element; it manages device mobility on the network. Using a feature called Non-Access Stratum (NAS) security, LTE verifies, encrypts, and protects the integrity of control plane signaling between the device and the MME separately from other interfaces.

For protection of the device's control plane communications with the radio access network (RAN), LTE employs Access Stratum (AS) security, which provides verification and integrity protection as well as encryption for control plane signaling between the device and the LTE base station, called the eNode-B.

USER PLANE PROTECTIONS

To secure the payload of the communication—the data the user is trying to communicate—LTE enables protections at the IP layer. For the user plane, LTE supports integrity verification and encryption of data sent between the device and the packet gateway, as well as network layer VPN security.

LTE AUTHENTICATION FOR OLDER TECHNOLOGIES

LTE isn't just more secure than legacy systems—it also can help make those older technologies more secure. Private LTE networks can use the full capabilities of the Interworking Function (IWF) that allows for mutual authentication of LTE and Wi-Fi users. Legacy enterprise Wi-Fi users can seamlessly use the same secure authentication protocols and procedures of LTE users in the network. In this way, a private LTE system can help extend the value of some legacy deployments.

PRIVATE NETWORKS GIVE THE UTILITY CONTROL TO IMPROVE SECURITY—TO UTILITY STANDARDS

The LTE standard described above includes certain security measures that are mandatory; it also provides the ability to implement other, optional security features. But whatever communications technology a utility adopts, at least one result is certain: if the utility controls the network, the cyber protections implemented in the network will more likely meet the security goals of the utility—and only the utility. Almost axiomatic, this statement presents a powerful fact that will benefit private network operators addressing today's well-known challenges as well as tomorrow's less certain developments. In short, a utility that controls its own private network can implement all the security features of LTE that it desires—including the optional ones—regardless of a carrier's or other controlling provider's business or operational considerations.

PRIVATE NETWORKS CAN MAXIMIZE LTE SECURITY FEATURE IMPLEMENTATION

A simple example: LTE can be set up to require a PIN to authenticate the user (rather than just the device) to the network. Though this functionality is broadly implemented in Europe, US carriers have rejected it (the PIN option on US devices is a local operating system function only). A utility implementing its own private LTE network can adopt this feature and thereby improve its security posture.

Another simple example: a utility with its own private network will likely use its own internal domain name system (DNS) to assign IP addresses to elements of its core network as a protection against an attacker spoofing a network element and gaining the ability to re-route traffic. A private network provides that control; DNS protection in a commercial carrier network is left to the system operator.

Consider the NAS security feature described above—the additional protections it offers will accrue only to those network operators who choose to implement them. A utility controlling its own LTE network will be able to configure security for the control plane separately from the security of the user plane and thus improve its cyber posture. A utility depending upon a shared, commercial carrier service will almost certainly not realize these benefits, because carriers as a rule do not implement control plane/user plane separation, deeming that measure unnecessary to meet their business requirements.

Similarly, LTE's AS security features, also described above, include the ability to encrypt the transmission set-up information (the actual radio frames at the physical layer) sent over the air interface between the user device and the eNode-B.

One last example: LTE also enables the use of IPSec to secure connections between elements of the RAN and the Evolved Packed Core (EPC) network. This is an optional feature for commercial carriers whereas a utility operating a private LTE network would be able to decide for itself what security measures are appropriate.

Every utility CISO is highly sensitized to the risk of attack from bad actors reaching a utility system via the public Internet. Complete separation from the Internet is a widely recognized best practice that utilities have long implemented for critical control systems.[4] Commercial carrier networks, of course, are connected to the Internet, enabling attackers to launch exploits from anywhere on the globe against utility systems that use those networks. But a utility that deploys a private LTE network controls the extent to which its network will be accessible from the Internet, establishing and enforcing specific measures tightly limiting and securing that connectivity—even to the point of completely "air gapping" its critical control systems, permitting no connection whatsoever outside the network's defined boundaries. A commercial carrier network cannot provide a CISO that level of control and security.

[4] See, e.g., ICS-CERT Recommended Practice at 1 ("Physical separation between corporate and control domains has, traditionally, provided the primary means of protecting" industrial control systems).

PRIVATE NETWORKS OFFER FULL NETWORK VISIBILITY

Despite all the cyber benefits a utility would realize from controlling the architecture and configuration of its own network, perhaps the single most valuable aspect of network control for the CISO is the ability to know, in detail, what is happening on the network. Network visibility can be the difference between knowing the network is under attack and being oblivious to the threat; it can quickly provide information that helps the CISO identify, contain, mitigate, and recover from an attack.

In commercial carrier networks, security issues are by design hidden from the customer, greatly complicating efforts to analyze a security breach. The owner of a private network can deploy sophisticated network monitoring solutions that reduce the critical "time to detect" (TDD) metric. A private network operator can know, for example, if a device on the grid is reporting more frequently than expected, or if each report consists of more data than it should. Though there may be an innocent explanation for the device's unusual behavior, the utility relying on a public carrier network likely would not be aware of that behavior at all. But with a private network, the utility would have full access to security logs, traffic alerts, and network interfaces and analytics. A carrier can be expected to monitor for billing purposes the overall amount of traffic a customer utility sends over the network; the CISO of a utility with a private network can monitor traffic patterns and behavior for cybersecurity purposes.

As demonstrated here, private networks offer control a utility cannot hope to enjoy in a non-private, commercial carrier network environment. And for cybersecurity, control is key. As Southern California Edison wrote this year, "High level security of the network against outside manipulation is essential to reliable operations, and that level of security can only be achieved by a closely owned, controlled and protected network structure."[5]

CONCLUSION

A utility considering a proposal to deploy a private LTE network can be confident that such a network would improve the cybersecurity of the utility's wireless data communications capabilities, based upon two simple, intuitive propositions. The first is that as the newest, most advanced mature wireless technology, LTE includes newer, more advanced security features, and with its vast global market the investment and enhancement of LTE security will continue. The second is that a utility can better protect a private network under its control than it can a public network operated by a carrier where the utility is only a purchaser of a commercial service. A utility implementing a private LTE network for its critical data communications is adopting the latest, most secure mature wireless technology with the greatest degree of utility control to deploy and operate the network in a way that meets its own, specific cybersecurity needs.

[5] Comments of Southern California Edison Before the Federal Communications Commission, In the Matter of Review of the Commission's Rules Governing the 896-901/935-940 MHz Band, WT Docket No. 17-200 (June 3, 2019) at 2.

UBBA
Utility Broadband Alliance

ABOUT UBBA

The Utility Broadband Alliance (UBBA) is a collaboration of utilities and ecosystem partners dedicated to championing the advancement and development of private broadband networks for America's critical infrastructure industries.Members will have access to resources that accelerate theirjourney towards a secure, resilient and future-proof grid.

CONNECT WITH UBBA

Created with utilities for utilities, we're driving the industry toward the next level of connectivity with customers, innovative technology, utility experts and policymakers.

Connect with us today!

(888) 303-7389 | info@ubba.com | www.ubba.com

EXTRA EDITION

MAY 14, 2020

PUBLIC UTILITIES FORTNIGHTLY

Impact the Debate

FCC Allows Utilities Private LTE Broadband

Landmark May 13 Order

By PUF Staff

Washington, DC, May 13 – The Federal Communications Commission today made a key segment of spectrum available for electric utilities to use for the broadband data platforms that will support the modern electric grid.

"For decades, this band has been allocated for narrowband communications like two-way dispatch radios used by business, industrial, and land transportation licensees," wrote FCC Chairman Ajit Pai in advance of today's action. "The new regulatory framework would allow 900 MHz licensees, like utilities, to obtain broadband licenses."

The FCC's action caps a five-year process to reconsider how it regulates a block of spectrum in the 900 megahertz band previously restricted to narrowband uses. Though some of that spectrum has been put to use by utilities and other industries over the years, it remains largely underutilized in most parts of the country. The spectrum is unused in about eighty percent of counties nationwide.

Because the frequencies are low-band, that is, below one gigahertz, the wireless industry considers them highly desirable, "beachfront" spectrum. It is also particularly attractive because it is one of the bands in which LTE, the leading mobile broadband technology worldwide, can operate. A number of progressive electric utilities, including Ameren and Southern Company, did not wait for the FCC's final decision and have been running LTE trials in the band using experimental licenses.

In 2014, the Enterprise Wireless Association and the largest holder of 900 megahertz licenses, Anterix, petitioned the FCC to reconfigure the spectrum. The goal, to accommodate broadband-sized channels and the modern applications broadband networks can support.

Then, in a March 2019 Notice of Proposed Rulemaking, FCC 19-18 in Wireless Telecommunications Docket 17-200, the FCC proposed to grant the petition. Setting out a new broadband channel plan, the technical rules for operating in those channels, and a

(Continued on page 2)

Extra. Extra. Read All About It

We Stopped the Presses

By Steve Mitnick, Editor-in-Chief

From the dawn of the electric utility industry, when Nikola Tesla and George Westinghouse built the first major hydroelectric power plant – Adams Station at Niagara Falls – and electrified Buffalo twenty-two miles away, through World War Two, "extra extra read all about it" was how paperboys alerted the public that news of such great importance had just taken place, monumental enough that their paper published an extra

(Continued on page 3)

Inside: Click to View

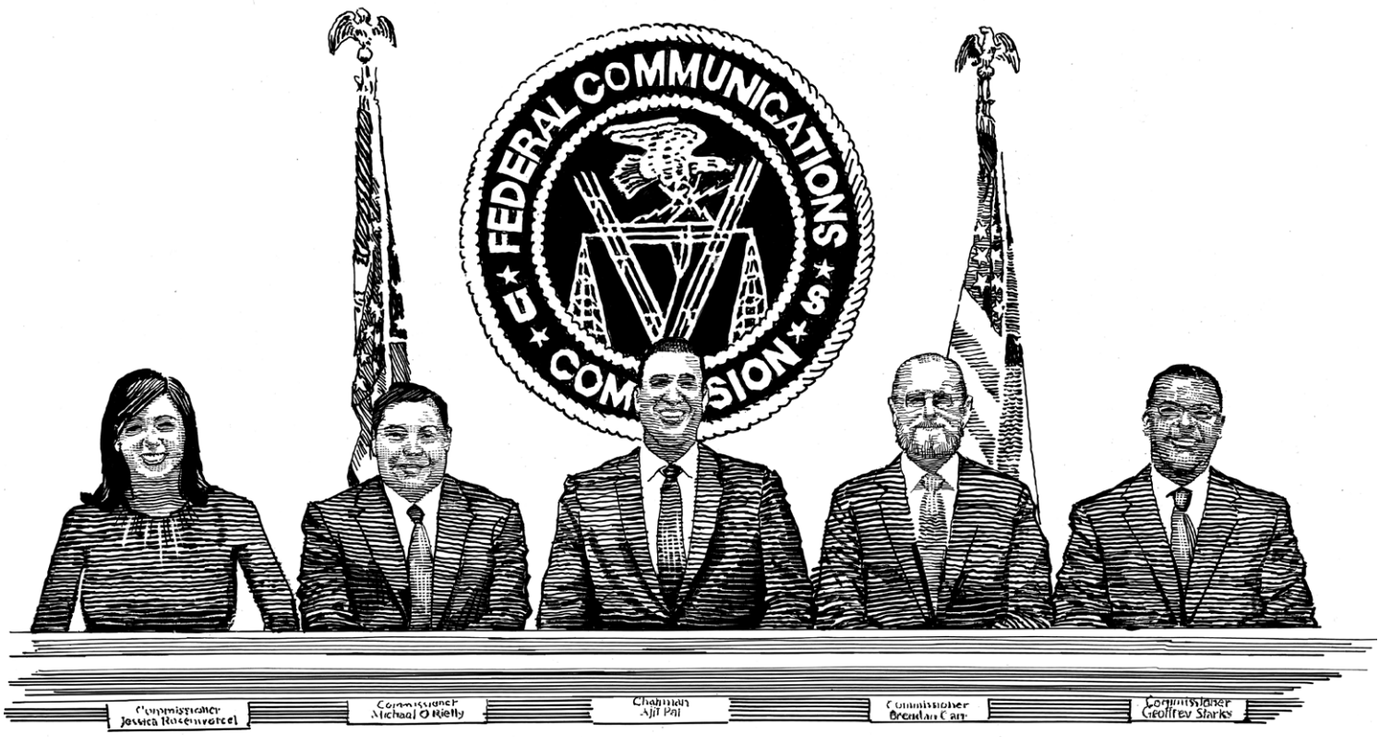
Chair of the FCC, Ajit Pai

U.S. Senator Mark Warner

NARUC President Brandon Presley

Southern Company CEO Tom Fanning

Commissioner Rachelle Chong



FCC Allows Utilities Private LTE Broadband

Continued from page 1

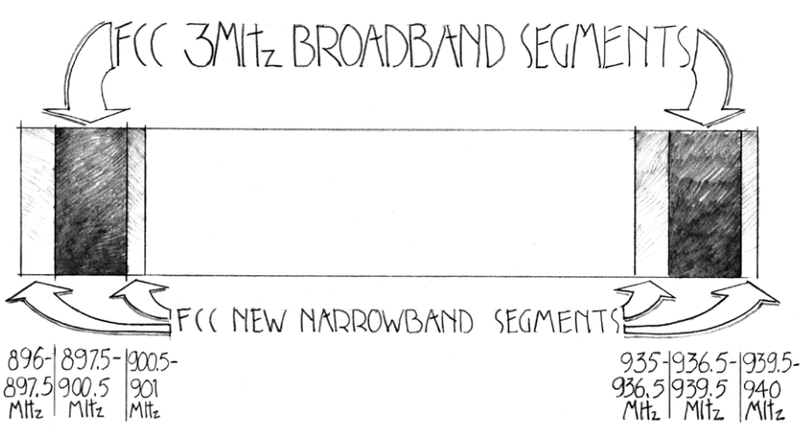
process for transitioning to the new plan. The FCC established a sixty-day period for comments on its proposal, followed by thirty days for reply comments.

The commenters responding to the NPRM generally favored the proposal. Many highlighted the shortage of appropriate spectrum options for utilities seeking to operate broadband networks to support their operations. "That shortage is particularly acute in the rural areas," commented the National Rural Electric Cooperative Association. "Broadband spectrum is necessary to support deployment of smart grid technologies in rural areas, such as digital supervisory control and data acquisition systems ('SCADA') to remotely monitor and control substation and field devices, teleprotection to guard against potentially hazardous faults, distribution automation to intelligently route power through the grid, metering, video, security, and other applications."

Others, such as Duke Energy, stressed the importance of the spectrum for private networks, stating that "energy utilities have been forced to rely heavily on the broadband wireless services offer (sic) by commercial carriers. However, these commercial networks have not been designed and implemented to provide the robust and highly reliable mission critical communications services required by energy utilities. A private LTE system owned, operated and maintained by energy utilities for their exclusive use would improve both capacity and connectivity, and would provide such utilities with a wireless network that is inherently more reliable, more secure, and less susceptible to disruptions or other malicious activity than are the commercial services and other private network systems currently available."

In its final Report and Order, the FCC generally adopted its earlier proposal by creating two broadband channels of three megahertz each and making them available for use by critical infrastructure industries, including electric utilities. The FCC also adopted its proposed technical rules and process for implementing the new band plan.

With this action, "we provide a variety of 900 MHz users a new opportunity to leverage broadband capacity for more robust communication networks, especially for industries that provide crucial services »



to the American public," the Commission wrote in its Report and Order. "The record demonstrates that there is an ever-growing need by utilities and other industries for increased access to reliable broadband services [and that] businesses need wireless capacity that can accommodate a variety of applications to secure their operations against cyber security threats and natural disasters."

"The telecommunications methods, equipment, and networks of the 20th century are no longer up to the task of meeting 21st century climate conditions and security threats, not to mention the increasing complexity of administering the interconnected grids that make up the nation's electrical infrastructure," wrote Southern California Edison in comments to the FCC last spring. "SCE views the current proceeding as holding nothing less than the potential to have a defining, once-in-a-generation impact on the ability of utilities to continue to deliver safe and reliable power to their customers for decades to come." ❍

Extra. Extra. Read All About It

Continued from page 1

edition. Indeed, if the breaking news was so important, such as death of a president or declaration of war, the extra edition was devoted entirely to this development.

And that's exactly why Public Utilities Fortnightly is publishing its very first extra edition on these pages. The breaking news that is the subject of this extra edition will have such an enormous impact on utilities that this edition's immediacy and singular focus is, in our opinion, well-deserved.

The Federal Communications Commission, a federal regulatory body most readers of PUF follow far less closely than the Federal Energy Regulatory Commission and other federal and state regulators, shook our industry on a Wednesday in mid-May. In a single order, the FCC carved out of the radio spectrum ample "beachfront property" for utilities particularly to deploy private broadband LTE.

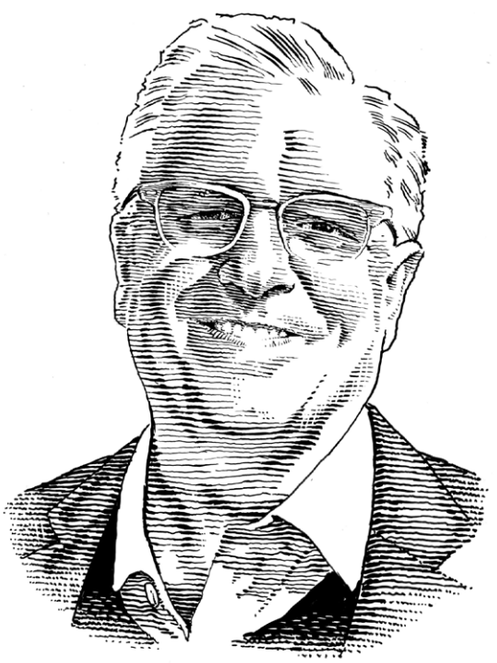
Wow! This means utilities can secure their communications separate from the Internet where everything from the loading of cat videos to the unloading of cyber-security attacks from hostile nation states resides.

This is what the FCC accomplished on May 13. Enabling utilities to migrate their critical communications, like for the bulk transmission system, from open public networks to closed private networks. And enabling utilities to create protected communications links with customers as the grid becomes two-way and more customer-centric.

When it appeared that the FCC's Chair would talk with the PUF team about the broadband order's implications, and a U.S. Senator as well, we realized this might really be big stuff. Then the question became, could our team actually publish an extra edition of PUF in the tradition of those papers of the early twentieth century with their shouting newsies?

So, we stopped the presses and put together the publication before you. If we could be on the streets in front of your office building, you can be sure that we'd shout to the top of our lungs, extra extra read all about it. Followed by, FCC allows utilities private LTE.

If you happened to be passing by, you can be sure our shouting and the magnitude of this development would grab your attention. And you'd likely say, hey kid, here's a dime, hand me a copy. ❍

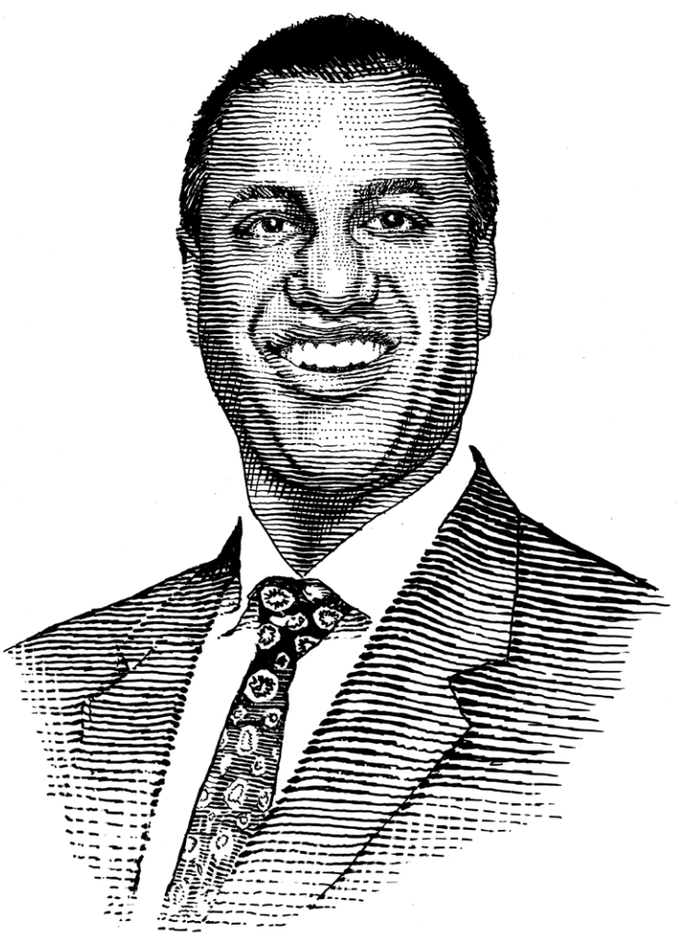


The breaking news that is the subject of this extra edition will have such an enormous impact on utilities that this edition's immediacy and singular focus is, in our opinion, well-deserved.

Chair Pai's View

Why the FCC Acted

There are many heroes in this drama, that ends with utilities getting the spectrum they need to build private LTE broadband networks, air-gapped from the very public Internet. But if we had to choose only one, it would be the Chair of the Federal Communications Commission, Ajit Pai, who ushered the 900 megahertz proposal along an arduous path all the way to a final order. It's an understatement that the PUF team was delighted when Chair Pai agreed to talk with us about this achievement and the implications for the resilience of electric utility service, a conversation that makes for a fascinating read as you shall see below.



I'm excited to see what innovators in the electric industry are able to do with this new 900 megahertz broadband spectrum.

PUF's Steve Mitnick: This is big news. There's this 900 megahertz proceeding, and it has tremendous beneficial potential for utilities, so why should CEOs at electric utilities pay attention to this FCC proceeding and this action that you all are taking?

Chair Pai: I appreciate the question. Certainly, the FCC may not historically have been the normal place where utilities would look for initiatives that could benefit their businesses, but this is a very special case.

We think the 900 megahertz band can be a source of innovation for electric utilities. The reason is that technology has progressed to the point where, and the needs of utilities have progressed to the point where, this band in particular can help them accomplish their goals, which are to modernize their operations, improve the resiliency of the power grid, and otherwise use the airwaves to set up private networks that can help them do what they do best, and that's to deliver power in an efficient, effective way across the country.

PUF: What's the technicality? Some utilities have gone ahead and have really progressed like Southern Company, but you can't touch this spectrum, so how will they use it and leverage this action?

Chair Pai: We were wondering about that too, and that's one of the reasons why, when we kicked off this proceeding with a notice of proposed rulemaking, we asked utilities: how do you anticipate using the spectrum? The factual record that we compiled in response to the notice of proposed rulemaking suggests that there's a large appetite among utilities to use the spectrum for private LTE, or Long Term Evolution, wireless networks. Many parties have suggested that private LTE broadband is the key to the maintenance and improvement of the electric grid.

In addition to the use cases we've seen identified in that record of our proceeding, we've also granted six FCC experimental licenses in this band representing eleven utilities, the Department of Energy's National Renewable Energy Lab in Colorado, and one large enterprise company. Collectively, those experimental licensees have taken a look at a wide range of 900 megahertz private LTE use cases such as wildfire mitigation,

cybersecurity, grid modernization, and resiliency.

I know that for some, in either the electric or the telecom industry, when they hear 900 megahertz, they might think of 900 megahertz from a generation or two ago when it was essentially specialized mobile radio, things like two-way dispatch and the like. But now because of the evolution of technology, we have the ability to conceive a full range of use cases based on broadband.

I'm excited to see what innovators in the electric industry are able to do with this new 900 megahertz broadband spectrum.

PUF: Electric industry CEOs are concerned about resilience and cybersecurity, and a private LTE network can be air gapped away from the regular internet so the cybersecurity impacts could be impressive. Talk about that.

Chair Pai: An important aspect of this 900 megahertz proceeding is the potential to enhance the security of this critical infrastructure. I have learned the importance of that over the course of my time at the FCC, and in part I've been educated by some of the leaders in the electric industry, including some who just a couple of months ago sat down with me and talked about the need to better secure this critical infrastructure. That's one of the reasons why I'm so excited about the 900 megahertz proceeding.

By creating a private LTE network, an electric utility is able to rely not on the public internet, which may have a vulnerability here or there, but rather a purpose-built private LTE network that can avoid those vulnerabilities.

That's one of the things that's going to ensure that our electric grid is going to be there at all times, reliable as every consumer expects it to be. I'm excited to see how the electric industry uses this 900 megahertz spectrum in order to boost cybersecurity efforts.

PUF: Where does this 900 megahertz action fit into your overall plan for U.S. leadership in 5G and in technology and innovation?

Chair Pai: The 900 MHz proceeding is an important component of our comprehensive strategy. We've called that strategy the 5G FAST Plan, a plan to Facilitate America's Superiority in 5G Technology.

That plan has three basic components. Number one is to push more spectrum into the commercial marketplace.

Number two is to update our wireless infrastructure policy to make it easier to deploy the small cells and other components of wireless networks going forward.

Number three, modernizing outdated regulations to promote fiber deployment.

The 900 megahertz proceeding is an important part of that first component, pushing more spectrum into the commercial marketplace. About two years ago, we originally identified this as one of the bands where we wanted to make progress back and we are now poised to bring to fruition that vision. And I'm pleased about not just what it will mean for the electric industry, but what it will mean for consumers overall.

> We want to make sure these airways benefit the American public, and having an electric grid that is more secure, more resilient, will mean better, more reliable, cheaper electricity.

At the end of the day, we want to make sure that these airways benefit the American public, and having an electric grid that is much more secure, much more resilient, that allows electric operators to protect against everything from public safety threats to enhancing the efficiency of their operations – those are things that ultimately will mean better, more reliable, cheaper electricity for American consumers. That's a message that is very consistent with the goals of the 5G FAST plan.

PUF: There's a certain amount of spectrum, and in the order there's a lot about protecting incumbents, including utilities in different spectrum. There was discussion about the 6 gigahertz. Talk about how you balance, move innovation, but also protect incumbents.

Chair Pai: That's a great question. We always want to balance interests that might be involved in a particular spectrum band in order to maximize the value of that band for everybody.

For example, in the 900 megahertz proceeding, we've relied on a system of privately negotiated agreements for those electric utilities that want to pursue broadband, so they're able to do that. For those that want to continue to use the band for narrowband operations, there will be an opportunity for them to do that as well. It's essentially the best of both worlds.

And that's the kind of approach we have to have when it comes to spectrum policy. The same applies in the 6 gigahertz band. We've seen a tremendous increase in consumer demand for Wi-Fi, which is why we looked at the 6 gigahertz band as an opportunity to make more spectrum available from licensed operations.

But I also recognize, and I mentioned this to the Edison Electric Institute when I spoke to them a couple of months ago, that electric utilities, among others, have important incumbent needs for that band.

That's part of the reason why we sat down with the

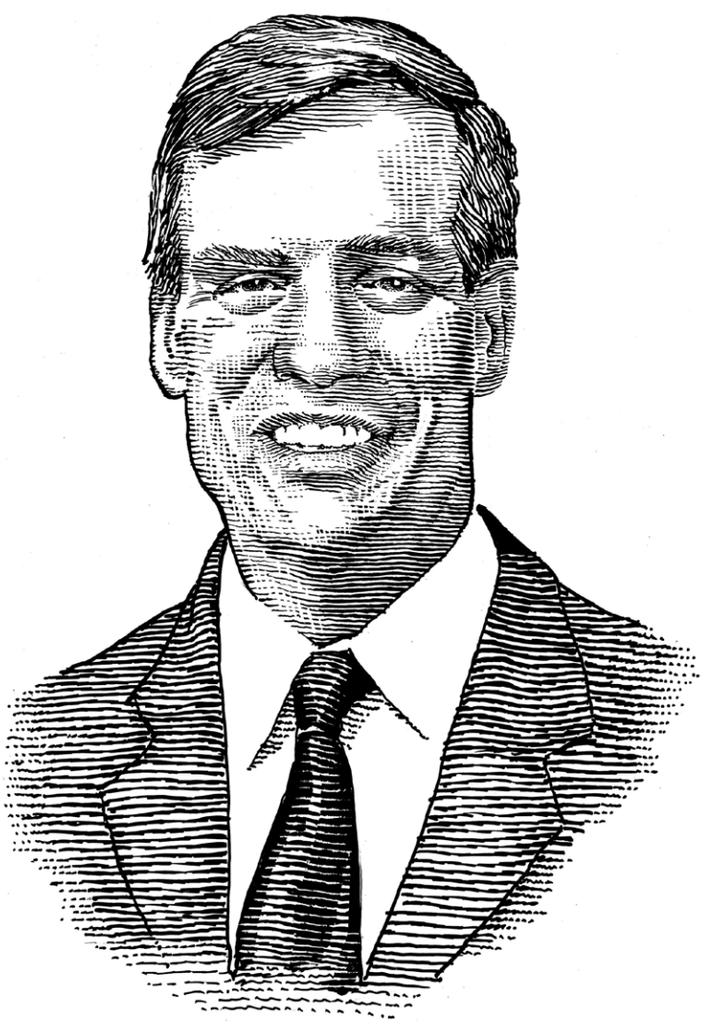
(Continued on page 16)

For more, see the brief video interview with FCC Chair Ajit Pai.

Senator Warner's View

National Security Strengthened

United States Senator Mark Warner has represented Virginia since he was elected a dozen years ago. Prior to his career in Washington, and his term as Governor of the Commonwealth, he helped found or was an early investor in several tech companies including telecom giant Nextel. So, the Senator knows his telecom and remains passionate about what progress in that field can mean for the economy, and as Vice Chair of the Senate Intelligence Committee, what it can mean for improved cybersecurity. And he wanted to wax poetic about this new initiative at the Federal Communications Commission to make 900 megahertz spectrum available, to utilities in particular, for private LTE broadband networks. The PUF team was more than happy to accommodate the Senator as you can see below.



PUF's Steve Mitnick: In addition to being the U.S. Senate's leading expert on preparing a tuna melt, you're arguably its most knowledgeable member on wireless tech. So why is the new FCC action on 900 megahertz broadband important for the utilities industry?

Senator Warner: Oh, so you saw the tuna melt video! I do hope you enjoy that classic recipe – and don't forget to wash your hands before making it!

As you mentioned, I did get my start in wireless. In fact, my earlier business successes came because of the enormous potential we saw in the 900 megahertz band.

The FCC's action is important for utilities because it finally provides an opportunity for them to access a spectrum that can be used for the modern broadband communications they will need to keep the grid safe and reliable and resilient. I know a wide range of utilities supported this proceeding at the FCC and multiple utilities participated in FCC experimental licenses investigating different 900 megahertz broadband use cases.

If you think about it, the power grid was built over a century ago. Just about every other industry has taken advantage of the huge advances in digital technology and wireless communications to improve their products and processes, but electric utilities have been left behind because, for security and reliability reasons, they've felt they needed to have their own private networks.

A key barrier to that has been the lack of spectrum availability to support those specialized networks.

Now, thanks to this new FCC order, utilities can get access to that spectrum.

When I worked in the wireless industry, we called 900 megahertz "beachfront spectrum" to describe how desirable it is.

So, a big congratulations to the FCC for an important – and bipartisan – decision.

PUF: You were instrumental in launching the Senate Cybersecurity Caucus, so if utilities could use this spectrum for private networks separated from the Internet, how could that improve cybersecurity?

Senator Warner: Actually, this spectrum is good from a cybersecurity perspective for a number of reasons. Yes, it could be used for a private network that is not connected to the Internet, and that's important to protect against attacks launched from abroad by hostile states and other foreign actors.

We are seeing more and more cyberattacks across a wide range of our infrastructure. If you have a truly private network that you own and control, you can have more control in managing the network security of those communications.

A second great thing about a private network is that you can ensure that the most critical applications are treated accordingly. If you have an application that needs super-fast communications – like one that senses when a power line breaks and kills the power before it hits the ground – you really focus on developing specialized end-to-end solutions tailored to those use cases.

PUF: Is it helpful that this spectrum would be in the 900 megahertz band?

Senator Warner: It's very helpful. When I worked in the wireless industry, we called this "beachfront spectrum" to describe how desirable it is. The reason is that radio waves in low-band frequencies like 900 megahertz are better able to carry over large distances and to penetrate obstacles like foliage and buildings.

And those great characteristics mean the network doesn't require as many cell towers to provide coverage – which results in far lower construction and maintenance costs. 900 megahertz spectrum is also good because it's one of the bands included in the LTE standard, which is the state of the art for mobile wireless technology. And that means relying on commercial grade capabilities rather than more brittle and opaque proprietary interface standards.

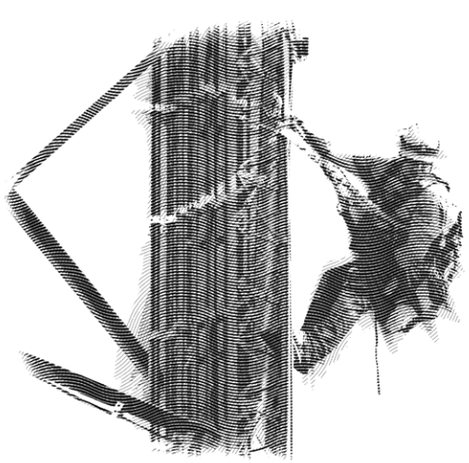
And last, it's important that this spectrum in the 900 megahertz band is licensed by the FCC. We've heard utilities express a desire for exclusive use spectrum rather than a shared or unlicensed model. That makes it more reliable for the utility – it can control all of the spectrum's capacity, because nobody else is using it for potentially incompatible operations.

A key barrier has been the lack of spectrum availability to support those specialized networks. Now, thanks to this new FCC order, utilities can get access to that spectrum.

PUF: Could utilities' build-out of their private networks help advance Internet service for under-served rural areas in Virginia and elsewhere nationally?

Senator Warner: Yes, and I'm proud to say Virginia is a leader in this area. We have a law currently being implemented by state utilities and regulators that encourages utilities that build grid communications infrastructure to share that infrastructure with projects, bringing Internet access to rural parts of the state that don't have it.

The federal government has provided funding to subsidize the cost of deploying service, but there still are areas that lack service. Now that utilities will build out new private networks for grid communications using this 900 megahertz spectrum, the towers and fiber they install could also be used to support rural broadband. The infrastructure, once deployed, can be used to close the digital divide that exists in some of our rural communities. ❍



Inspired by 151529024 | © Tzogia Kappatou | Dreamstime.com

The Federal Communications Commission order of May 13 may spark a boom among utilities building out private LTE broadband networks of their own. The aim, to improve their grid's cybersecurity with non-Internet telecommunications and increase their capacity to support a smarter grid for customers and operational efficiency.

President Presley's View

NARUC on Broadband

NARUC President Brandon Presley hails from the great state of Mississippi, where he promoted broadband access and bridging the divide aimed at closing the gap in access to utility services, prior to announcing his platform as NARUC's President. Call him prescient, as his platform was thrust front and center not only by the pandemic, but by the FCC's May 13 order presenting unprecedented opportunities for electric utilities, making a key segment of spectrum available to use for broadband data platforms to support the modern electric grid.

PUF's Steve Mitnick: If someone didn't know rural broadband was one of the top priorities for our industry before, doesn't this current crisis show how important a priority this is?

President Presley: Some of us have been talking about the need for broadband access, particularly in rural communities, but even in urban and suburban communities. The pandemic has shown how not only that the digital divide exists, but how deep it is, and even how it's growing in this time.

Much of America today, as far as commerce and day-to-day life, is held together by the broadband network.

I say it's growing because more and more people are relying on broadband and connectivity in some form to conduct their daily lives, their business or their schoolwork. There are obviously strains on the system and it's not only exposed the digital divide, but it's maybe even gotten deeper simply because of the utilization of infrastructure.

This has shown, in stark terms, up close and personal, why I consider this an issue of not only national security, but economic security. Much of America today, as far as commerce and day-to-day life, is held together by the broadband network.

PUF: I've heard stories of teachers and families where their internet went out and they had to stop working.

President Presley: As an elected Commissioner, I represent counties in which school teachers are having to drive a county over to sit in a parking lot of a fast food restaurant, or libraries, to be able to do Zoom calls with their students to keep them in line.

That has exposed this, and I feel firmly that we have to come out of this with a response that is rock-solid and are going to get this fixed once and for all. There are roles for everyone to play in this and there are models around the country that show where partnerships can exist with electric utilities, for instance. Many of our electric cooperatives are taking up this challenge and then fixing it in many places in rural America.

We've got to have an all hands-on deck approach going forward. We've got a broadband expansion task force that I created. This is a bipartisan issue. It's a bipartisan problem. We've got to get it fixed.

PUF: The FCC Chair put this on the agenda so it looks like there's a chance that they're going to carve out some broadband for utilities, which might be a growth spurt for them. Have you seen that and what do you think?

President Presley: Of course, I support any efforts to increase our capability. I know that the six megahertz is there, and I have supported that. I think that we can walk and chew gum at the same time.

While we're not only taking care of utility needs, there are other ways that the FCC is working now in rural digital opportunities funds. States are being collaborative in finding ways to solve this problem.

Mississippi has been a leader in that and now we've done it. You're seeing throughout the nation an emphasis on this. It's important for utilities to have access as well, and there are multiple ways in which to do that.

PUF: What got me excited is it seems as if with the 900 megahertz, a number of the utilities are going to invest in sending crews out and spending money. We want them to hook up everybody at the same time, right?

President Presley: It's important right now for us to look at shovel ready projects and things that can happen. There's no doubt electric utilities have a major role to play.

The practical aspects are that they have electricity to their homes. Second, they are drivers of investment. As we're going forward, it's important that we

look at that through both those lenses.

Again, I go back to an all hands-on deck approach. There's a role for electric utilities. There's going to be a need for fiber throughout the entire utility spectrum.

We need to face the reality that you have a need for fiber in the utility space, at the same time that you look at the needs of the people. How can those be combined? We try to get the maximum benefit out of investment projects as we go forward.

As a Mississippi Commissioner, I've supported and advocated for grid modernization projects that couple smart grid investments and the investment for broadband in rural areas by fiber. We just formalized fiber investment for smart grid/broadband partnerships as a priority in our integrated resource plan with the ability for our utilities to spend up to ten million dollars per year on fiber optic format to meet the utilities' needs, obviously also looking for ways to leverage that investment with broadband expansion where possible.

One of the tests in there is, are we also meeting the broadband needs of the state? We're in a new world and part of that new world is the fact that we've got to view, clearly, broadband access as part of it.

That's where we're going, and that's for the American people. They want to see this fixed, and we all want to see this corrected. It's a part of what we've got to do.

PUF: What can the regulator, your fellow Commissioners and their Staffs throughout the states, do to push this forward, especially at this unique time when the FCC is acting?

President Presley: We should be encouraging our utilities to look at this in a new sense. Are we scooping up every advantage of this view pushed by the FCC? How do we meet the holistic needs of our people?

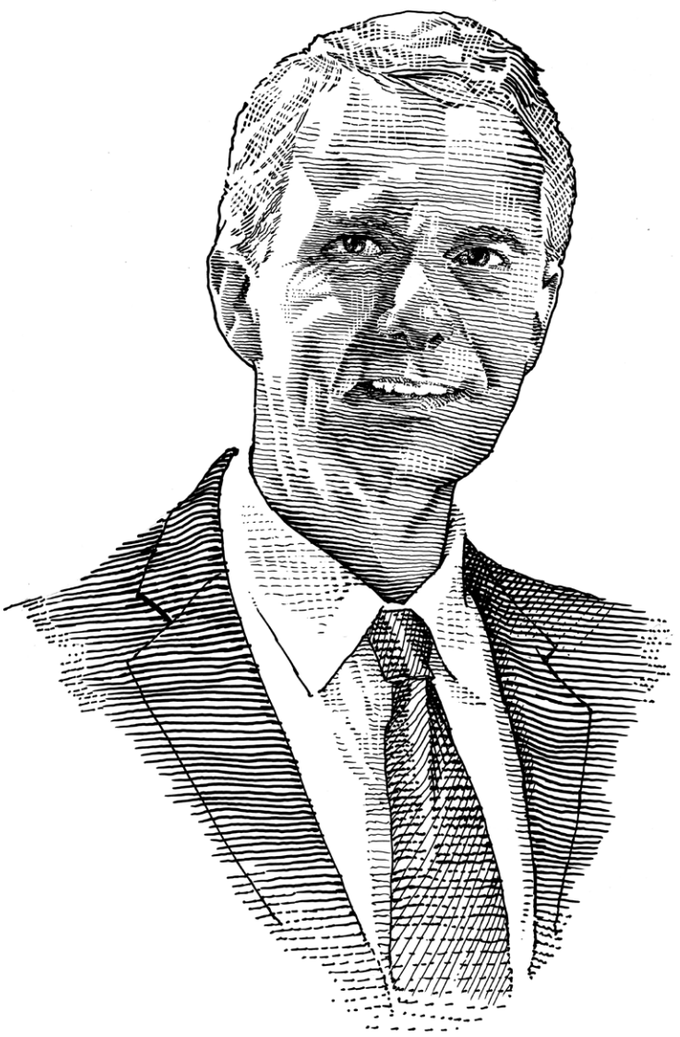
Are there smart grid projects that come with broadband access that could help across the spectrum? Again, we have to somewhat do away with the old preconceived notions of looking at things in a silo and move to looking at them holistically as ways in which to meet these needs, because they're all interconnected. They're all intertwined.

The need for broadband is commensurate with the need that utilities have for smart grid and grid modernization. How do those two intersect? What are the benefits?

I'm not saying that we have all the answers, but this is a question we all should be asking. If we're deploying smart grid technology into an area in which you are passing a home with the smart grid project, is there a way to stop off at that home and provide broadband?

There is a mutual interest between the utilities and

Are we scooping up every advantage of this view pushed by the FCC? Are there smart grid projects that come with broadband access that could help across the spectrum?



meeting the needs of their customers in a non-traditional sense. Those opportunities exist. Monopoly utilities, those who were in a regulated market, must have economic growth within their specific service territory for the health of the utilities, and for the good of the customers.

We know in Mississippi that if you're able to get fiber to the home, that increases the value of that home around seven percent. Well, you have just grown the value of your area. Number two, we know that it increases economic development.

People are able to connect more, or there is a self-interest for the utilities if you're looking from a pure business side. From their perspective, there is a self-interest to see their service territory grow. One of the ways we know we do that is to increase

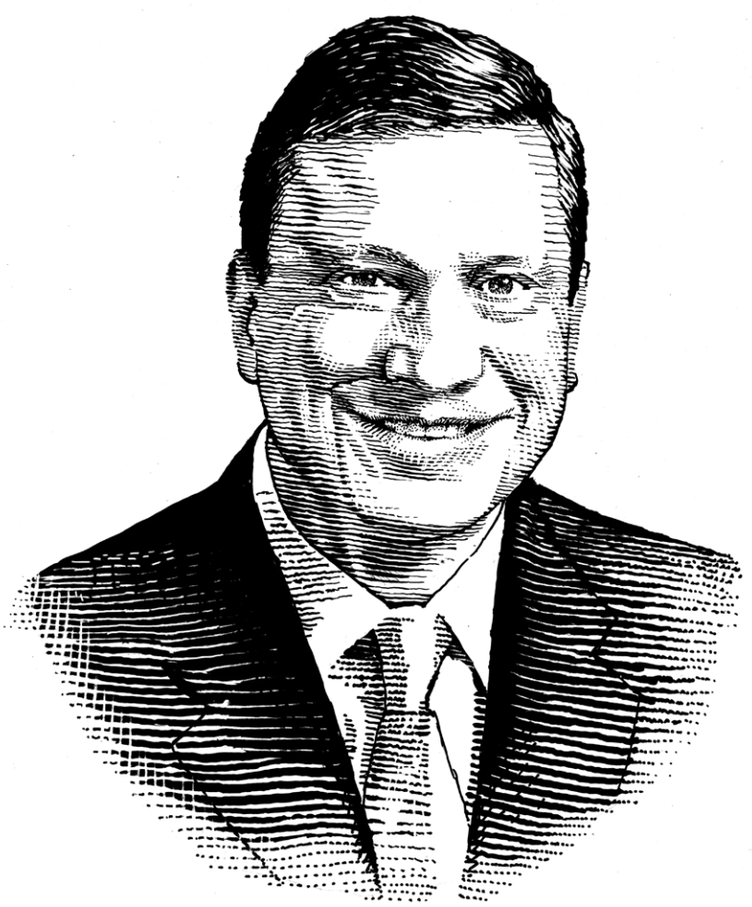
(Continued on page 17)

CEO Fanning's View

Cybersecurity Implications

Don't let Tom Fanning's title of CEO of Southern Company deceive you. He has a long history with telecommunications too, with subsidiaries Southern Telecom and Southern Linc, making him especially knowledgeable on cybersecurity issues facing our nation's electric grid operators.

PUF's Steve Mitnick: Due to your national leadership on the Electricity Subsector Coordinating Council, or ESCC, you're a believer in the importance of upping the game on secure networks for utility operations and all the sectors. Talk about how important it is to be air gapped with the internet and have private LTE networks.



My sense is as we progress into this new telecom environment, it will open up a whole new level of security and resilience for this industry.

Tom Fanning: This principle of operation way precedes me. If you go back to the eighties, Southern Company made a practice of developing our own fiber networks. We never relied on the public networks in order to run our system. I believe we had over three thousand miles of fiber that we were putting in place to operate our system effectively.

With our enormous investment in this kind of technology, we felt it made sense because it was unique. We cover corn fields. We don't operate our system just based on dense population areas. We literally have coverage all over the Southeast and it's dense coverage.

We wondered if there is a way to spread the fixed cost over a bigger base. That gave rise to the formation of what became Southern Telecom and ultimately Southern Linc. When I was still a junior employee in the company, I became the first chairman of the board of Southern Telecom. We went through some iterations, but it has worked so well.

Our system is four function. It's phone, data, packet data, and push to talk. It is especially suitable for public safety that has to get off the highways and go on the back roads and be able to serve customers. As that strategy evolved, we did that for the pristine nature that we required in order to operate our systems better than even the standards of AT&T and others.

We also started to see the emerging threats of cyber and physical national security issues. All of a sudden, we started to say two plus two. That is, with the benefit we have in operating a private network the way we do, we also now create the added benefit of having a more secure system.

The operational aspect of this predated the secure aspect of other outside threats. We have added to the value of the system in that way. Now as we progress from the old iDEN Motorola system, we're moving to the 5G world, and we're excited about its promise for the system.

All four of the operating company presidents, which are the three electrics – Georgia, Alabama, and Mississippi – as well as Southern Company Gas, are tied in with our marketing people and also our

technology organization in helping maximize the potential of this system.

PUF: With what the FCC is doing on May thirteenth, it may cause a gold rush of other utilities to do what Southern has been doing for a while. How's that good for the industry, the country, and even for Southern?

Tom Fanning: This is one of the things that we have been talking about relentlessly lately. Whether this is through my leadership role at the ESCC or my role on the Cyberspace Solarium Commission, we know there are billions of threats against the infrastructure of America every day. Big electric companies get hit millions of times a day.

What we've got to do is not only understand how to design a system that operates well during normal times. I call that reliability metrics. We also have to design systems that are resilient, and will operate well under unusual times, whether that's a hurricane, snowstorm, or cyberattack.

My sense is as we progress into this new telecom environment, it will open up a whole new level of security and resilience for this industry. It may also open up unintended business opportunities as technology changes, and customer requirements change. The nature of our product and its offering to customers may likewise change. This may prove to be a gateway to new businesses and help our current system.

PUF: We talked with NARUC President Brandon Presley. He's a real believer in rural broadband. He figures utilities can move the ball on that important national priority of rural broadband.

Tom Fanning: All of our operating electric utilities are thinking that way. Alabama in particular has made some big inroads in thinking about how to deliver that service to underserved communities.

This may be an old statistic, but something like forty percent of our customers make less than forty thousand dollars a year as household wages. I guarantee you they don't have the access to the kind of infrastructure that most Americans have. This notion of bringing this kind of infrastructure development to underserved communities will make America better for decades to come.

Am I going to let other people innovate around me, or am I going to participate in shaping the innovation that affects my product offering to customers?

PUF: The resilience and breadth of utilities service is demonstrated in the current crisis with so many people at home. Imagine if we have to deal with cybersecurity and weather events simultaneously.

Tom Fanning: That's a hundred percent right. As Southern Company has moved into this environment, we have about thirty thousand employees, sixteen thousand of which are telecommuting.

Imagine trying to do your work at home, and if you're spread over a variety of locations, the challenge becomes much more complex. This kind of power in that environment is something that America needs.

PUF: You talk to other CEOs across the country often, and what would you tell them about what you've learned and the importance of this for them, their communities, and companies?

Tom Fanning: It's a broad message, and it's the message that the waves of technology innovation are hitting the beach relentlessly. We can't keep the waves off the beach. You have to make a simple choice.

Am I going to let other people innovate around me, or am I going to participate in shaping the innovation that affects my product offering to customers? There are two choices. The passive choice isn't a bad choice, but it is a choice that limits your opportunity to grow. ❍

For more, see the brief video interview with Southern Company's executive vice president for operations, Stan Connally.

The Federal Communications Commission met on the morning of May 13. On the agenda was: Transitioning the 900 MHz Band to Enable Broadband Deployment. This item, WT Docket No. 17-200, was considered and in a landmark decision approved by the Commission.

Commissioner Chong's View

Utilities' Next Steps

When Commissioner Rachelle Chong speaks, everyone listens, being that rare double Commissioner, having served at the federal and state levels, at the FCC and the California PUC. Her experience says a lot, and here she explains why the FCC's 900 megahertz spectrum order is a game-changer, and what forward-looking utilities might do next.

PUF's Steve Mitnick: You're a rare person who's had experience in regulation from both telecom and energy. How did you become a double Commissioner?

Rachelle Chong: Double Commissioners have double the fun! I started out as a Commissioner on the Federal Communications Commission at the tender age of thirty-four and then moved to the state level as a Commissioner for the California Public Utilities Commission at age forty-seven. I'm a career telecom regulatory lawyer, but I painfully learned energy regulation as a Cal PUC Commissioner mid-career.

> This FCC order impacts every electric utility in the nation.

Here's the story. I started out as a young FCC practice lawyer in '84. I represented broadcasters and some of the early cellular pioneers in the nation. I was drawn to D.C. for my first law job because the FCC was working to license the first cellular phones. I was fascinated by the idea of a mobile wireless phone. I pictured in my mind a Star Trek communicator; you know the one that Captain Kirk wears on his uniform. That's what I thought a mobile phone was going to look like. It took a while, but smartphones are small now. In fact, I am wearing one on my wrist. I've got an Apple watch that I can speak into just like Captain Kirk.

At the FCC, we held the first spectrum auctions, launched many new wireless services, and implemented the 1996 Telecom Act, which brought new local competition to the telephone marketplace.

After the FCC, I served on the California PUC. I was brought in because of my deep telecom and Internet expertise. But when I arrived in 2006 under Governor Arnold Schwarzenegger, I was thrust into this forward-looking energy regulatory world. At that time, the California PUC was leading the nation in terms of climate change work, integration of renewable energy, and encouraging electric vehicles.

It was hard work to learn a whole new industry quickly – especially with all these difficult energy acronyms. I was drinking from a firehose but learning from some of the nation's best minds on how to combat climate change for the energy sector. Due to my communications technology background, I was given – as the assigned Commissioner – the nation's first electric vehicle docket and the nation's first smart grid docket. I also had the broadband over power line dockets, which was a complete waste of time, in retrospect.

But being a double Commissioner – at the federal and state levels with both communications and energy expertise – has given me a unique perspective on how advanced communications and technology can assist with revolutionizing the twenty-first century electric grid. Technology enables grid modernization, integrating renewable energy, and other innovations.

Wireless communications spectrum can make the grid more resilient, efficient, smarter, and provide a forward path for innovations that are happening across the globe.

PUF: The FCC is making big headlines with this new order. Is that going to make a difference for the utilities and customers in California, or anywhere?

Rachelle Chong: Absolutely. This FCC order impacts every electric utility in the nation. I see the FCC's order as nothing short of a game changer for energy utilities. What the FCC order did is to allow 900 megahertz spectrum to be converted from a voice-only service to a private, licensed wireless broadband service and, best yet, it's reserved for critical infrastructure and other private enterprise industries.

This FCC initiative launches electric utilities into the twenty-first century communications and broadband (fast Internet) era to build the foundation they'll need for the next several decades to modernize their electric grid. Utilities and regulators should move fast to take advantage of the FCC's order.

There are so many benefits. Private licensed wireless networks will improve the reliability of the

electric grid. Customers will have a more reliable network underlying their electricity delivery, instead of the mishmash of various fleet dispatch voice networks, unlicensed Wi-Fi spectrum, and leasing commercial mobile spectrum. The latter is attached to the public internet and thus at risk of hacking.

The FCC order also will provide tools to improve grid resilience. By that, I mean guarding against the almost daily cyberattacks that electric utilities suffer. This is a real threat – one that keeps C-Suite folks up at night. Because the 900 megahertz spectrum is private and licensed, it is more cybersecure.

Finally, 900 megahertz spectrum will improve efficiency – utility workers can do their work easier and faster on an integrated broadband network. For example, safety is enhanced using a wireless broadband network.

A field operator can take a picture or video of a safety incident out on a remote power line and immediately text or email that picture or video back to the headquarters over the wireless network. The headquarters supervisor can take a look and say, oh, this is serious, and immediately send a repair truck to the exact location to fix the problem before the issue worsens. That's what I mean by efficient.

You can see how this will improve the safety of our electric networks. And right now, safety is at the top of mind in California because of over a decade of terrible wildfires we've been suffering, some of which have been caused by electric utility facilities. Wildfire liability has put our largest California utility into Chapter 11 bankruptcy.

If electric utilities adopt licensed wireless broadband, it will help them be more effective in fighting fires, preventing fires, and reducing long lasting public safety power shut offs. Much of California suffered a two- to eight-day public safety power shut off last year in the fall. It was devastating to the economy as electricity is the lifeblood of our economy and our community life.

PUF: How will it do that? How will it help to have this special broadband communications? How will that help keep down the wildfire problem?

Rachelle Chong: The idea that I've had, I call it, The Big Idea, is to stand up a public-private partnership of government, utilities, and private tech companies for the express purpose of a wireless broadband network devoted to California wildfire prevention.

I serve on the board of a company called Anterix, a company that will help make private wireless broadband available for electric utilities nationwide. We have been speaking with the leadership of the state of California government agencies about The Big Idea, including CAL FIRE, Office of Emergency Services,

The FCC order allows 900 megahertz spectrum to be converted from a voice-only service to a private, licensed wireless broadband service and it's reserved for critical infrastructure and other private enterprise industries.

the Controller's office, and the Governor's office.

This public-private partnership will enable some of the following applications.

Utilities can deploy mountain top cameras that will be able to watch their vast, rural high fire risk areas at all times. The camera network can use artificial intelligence to spot a fire quickly, identify the location quickly, and alert senior executives. Then senior executives can alert the fire authorities of the fire location to send out an aircraft to dump water on the fire.

Another use of a wireless broadband network is to deploy a comprehensive network of wireless sensors throughout the high fire risk areas to detect dangerous weather conditions. Sensors can detect moisture, rainfall, and wind continually. All that data can flow back to the network brain and then be crunched to produce an accurate weather forecast for the high fire risk areas, and again alert senior utility executives in

advance if there's a weather situation that's conducive to sparking a wildfire. This enables readiness.

Finally, I want to mention San Diego Gas & Electric. This California utility has developed an amazing technology where, using a wireless broadband network, it can sense when an electric line is falling, like when a tree falls on a powerline in a windstorm. San Diego Gas & Electric can detect that, and then can, in 1.4 seconds, send back a signal to turn the electricity off on that line. By the time the power line falls and hits the dry brush on the ground, there's no electricity in the line to spark a wildfire.

This technology works in the lab, but it could be deployed widely in the high fire risk areas of California. These are just some of the public benefits of a private licensed wireless broadband network using advanced technology.

A key aspect about this particular 900 megahertz radio spectrum is that it has good propagation qualities, which means the radio waves travel very far. That characteristic is a positive, because most utilities have large service territories, and this spectrum will serve large areas effectively.

PUF: You know your colleagues across NARUC. Is there a role for state regulators? Is there some way they can get involved and make sure the potential benefits of this decision by the FCC in broadband can be used for the customers' benefit?

Rachelle Chong: Absolutely. In fact, state regulators have an important role at this moment. The FCC made this 900 megahertz spectrum available, but critical infrastructure industries other than electric utilities will also be vying for it.

Those are examples of how an enlightened state regulator could make regulatory procedures available to help utilities move more quickly to build new foundational broadband networks.

Time is of the essence for electric utility action to secure the spectrum for their service areas. As a result, some forward looking electric utilities will want to immediately enter into long-term leases to obtain the benefits of the spectrum. One problem from a regulatory point of view is that electric utilities usually get funded in a three-or four-year rate case cycle.

Due to that, utilities might feel like they have to wait until their next rate case comes up before they propose a new private licensed wireless broadband network for initiatives. One issue I've been talking to regulators about at the NARUC meetings, is the need to make some type of regulatory procedure available to the electric utilities, so they could file out of cycle with their rate case, and obtain the benefits of getting this type of foundational network for their operations without having to wait for their rate case cycle.

There are several ways you can do that. I'm familiar with mechanisms that you can use to take up expenditures that are out of rate case cycle. For example, in California, we have a mechanism that allows utilities to put certain expenses in "memorandum accounts." Those expenses in the memo accounts are subject to further scrutiny by the Commission before they're recoverable in rate base. But if the underlying facilities are approved in the rate base, then those expenses in the memo accounts are allowed to be placed in the rate base.

Another recent example is the Florida Public Service Commission has put in new rules that break out resilience services from the traditional ratemaking process. The resilience project can be financed through a specific authorized customer surcharge. That would help streamline the process and let the utilities move ahead with critical resilience projects that would benefit consumers and make the electric grid system safer.

Another issue is regulatory treatment of a wireless spectrum lease. Regulators will want to make sure utilities know that a long-term spectrum lease is allowed into rate base, so that accounting issue does not stand in the way of quickly deploying a wireless network.

Those are examples of how an enlightened state regulator could make regulatory procedures available to help utilities move more quickly to build new foundational broadband networks.

PUF: What should utility leaderships be looking at? It's unusual for our industry to say the FCC did something that's monumental. What should a CEO be saying to the teams? What should we be doing in reaction to this to grasp the potential?

Rachelle Chong: Typically, utilities have left telecommunications systems to the IT department. This FCC order presents much bigger strategic opportunities for the utility. It's clear to me that the C-Suite should study this development immediately and decide whether this unique spectrum opportunity is one in which they will immediately invest.

A foundational wireless broadband network will change and enhance the entire company's operations in significant ways. It's sort of like how smart meters revolutionized how utilities gathered customer usage data, and empowered things like demand response and time of use rates. A smart network for electric utilities is the future, and that future is here.

I haven't even talked about how 900 megahertz will enhance ongoing grid modernization by utilities. If you're going to go from a one-way grid to a two-way grid integrating distributed renewables, you have to have a network that can manage two-way flows of energy coming in and out of the grid. This requires secure advanced technology.

The CEOs and the C-suite need to examine closely this rare spectrum opportunity and decide how it could enhance their grid modernization, disaster recovery, efficiency, resiliency, and cybersecurity concerns, all of those things.

They need to decide right now on whether this is something that they would want to approach regulatory Commissioners about to say, "Hey, we want to take advantage of this spectrum opportunity. How can you help us do it quickly before we lose the spectrum to other critical infrastructure players who may snap it up in our service territory?"

I should preface that remark by again noting that the FCC did not reserve this spectrum only for electric utilities. The FCC is allowing any critical infrastructure player or major enterprise entity to deploy systems on this spectrum. That could include airports, manufacturing facilities, and package delivery companies. It could include well-heeled national companies like Amazon and UPS.

The 900 megahertz spectrum is not something that the FCC only reserved for electric utilities. That's why electric utilities need to seize upon the opportunity and evaluate it for their company and get right on it with their regulator if they think this is something they need in the coming decades.

PUF: Yes, because it could get used up by somebody else.

Rachelle Chong: That's right. Suppose you're UPS, with nationwide operations. UPS could go in and lease the spectrum from Anterix in a number of states or major metro areas for its operations. Then the electric utilities in those areas would miss out on this spectrum opportunity for the benefit of their customers.

There are a million things an electric utility could do with the spectrum. This is sort of like the iPhone when it was invented. We had no idea what the apps would do when it was invented, but just twelve years later, there's two million plus iPhone apps and the variety of things they can do to enhance our lives is mind boggling.

Similarly, we're at that moment with the electric utilities. They're now going to be looking at this beautiful swath of beachfront broadband wireless spectrum and say, holy cow, what can I do with this and make my operations more resilient, safe, and efficient?

I want to emphasize that in my view, it's a once-in-a-lifetime opportunity, similar to the FirstNet emergency responder spectrum after 9/11, which was the result of legislation. I'm excited for the electric utilities and the possibilities this 900 spectrum will bring them.

PUF: Assume our industry, regulators, policymakers, and utilities seize upon this. What's this going to look like in five to seven years as far as use of this specialized broadband? In particular, the benefit for the public, what could it look like?

The 900 megahertz spectrum is not something that the FCC only reserved for electric utilities. That's why electric utilities need to seize upon the opportunity.

Rachelle Chong: We will see the largest most forward-looking electric utilities using the foundational wireless broadband networks to play many roles in their grid modernization. For example, we will see rooftop solar, electric vehicle charging, and storage going into their systems. These wireless systems will be supporting fast broadband data exchange.

They will be using the private licensed network to send their most sensitive signals controlling the grid, and to protect the grid from hacking and other cybersecurity attacks by the bad guys.

They will be using a large sensor system distributed across their electric grid to predict weather conditions to prevent damage from natural disasters such as wildfires, hurricanes or tornadoes. In major disasters, the wireless broadband network will help efforts to find and repair the damage.

They will be using these systems to have more efficient safety inspections of all of their lines, particularly out in the field. The wireless systems will enable faster repairs and help utilities prioritize the repairs by delivering photos or videos by email or text of the anomalies found in the field equipment.

In the future, utility leaders will be meeting up at UBBA, the Utility Broadband Alliance, which is a new utility run association that has just formed. At UBBA conferences, utility leaders will be comparing notes about various new applications on these wireless broadband systems and challenging each other to develop more innovative applications to solve the knotty energy issues of the twenty-first century. They will be giving each other awards for the innovations that best improved grid operation. The FCC's order was the spark that lit this storm of activity. ❍

Chair Pai's View

Continued from page 5

engineers and carefully went over some of the technical analysis for how the 6 gigahertz band could be used for unlicensed operations, essentially for Wi-Fi, consistent with protecting incumbents.

For example, in our 6 gigahertz order, we said that outdoor use of the 6 gigahertz band for Wi-Fi would be permissible, but only if there was what was called an AFC, automated frequency control, to ensure that if there's an electric utility in the area using that spectrum, then essentially that Wi-Fi channel would be off-limits.

By creating a private LTE network, an electric utility is able to rely not on the public internet, which may have a vulnerability here or there, but rather a purpose-built private LTE network that can avoid those vulnerabilities.

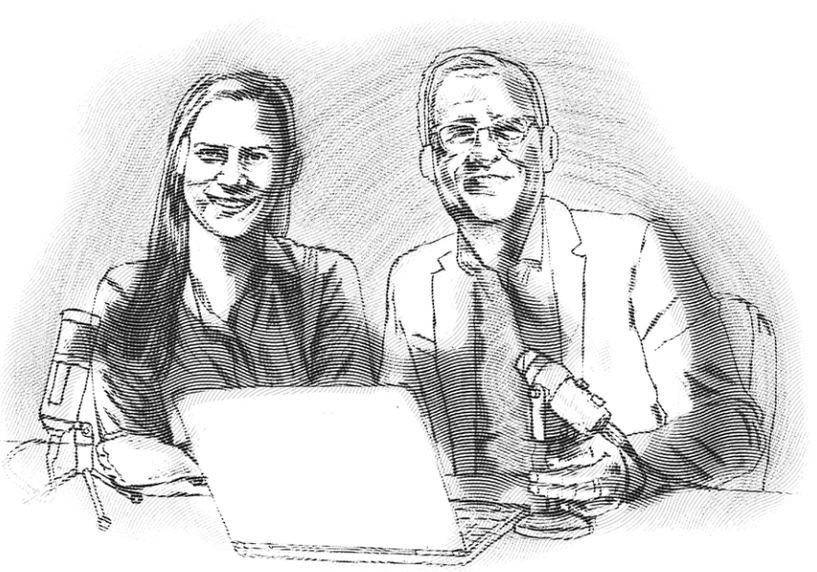
Same thing with indoor uses for consumers – Wi-Fi routers and the like. We authorized the use of that indoors, but at a lower power level than some Wi-Fi advocates wanted, because we wanted to make sure that the routers didn't emit too much energy that would ultimately bleed out of windows and potentially interfere with electric utilities.

We always have to strike that balance and we are always, of course, open to getting sophisticated engineers from any industry who want to give us more wisdom on these topics.

PUF: You're a lawyer by training but you have to understand all these engineering technicalities.

Chair Pai: It's a challenge and luckily we've been blessed with a fantastic career staff at the FCC and the Office of Engineering and Technology, as well as those from a variety of industries, from the electric industry, from the telecom sector, and others, who are always willing to come to the table in good faith and put data and calculations and facts and figures before us that we can meld them together in a thoughtful way to form a better policy.

In the 900 megahertz proceeding, in the 6 gigahertz proceeding and others, I've been grateful to those who, while they may not agree with each other on the final policy outcome, at least want to focus on the facts as opposed to pounding the table. That to me speaks to the best of public policymaking in this country. ❍



Podcast Utilities Fortnightly

Six ten-minute editions are free
and waiting for you
to check out:

History of Residential Electric Rates part 1

History of Residential Electric Rates part 2

History of Residential Electric Rates part 3

Coal's Market Share of Electricity Supply

Fortnightly Electricity Report, April 1-14

Fortnightly Electricity Report, April 28

Simply search Apple Podcasts for
Podcasts Utilities Fortnightly,
or click on Podcasts at fortnightly.com.

President Presley's View

Continued from page 9

connectivity. Public utilities of all nature, of all deliverables, of all service types – gas, water, and electricity – are all opportunities to some degree that are possible.

I surely don't seek to dictate how that would look in other states. But it's important that we ask ourselves this question. We need a rock-solid determination that we will do everything we can.

I'm not talking about specific Commissioners, I'm talking about as a country, that as the American people, we knew there was a problem, and yet we let opportunities pass us by. I don't want to be in that position.

In Mississippi, we're going to push hard to understand that better.

We just created a neighborhood task force on emergency preparedness, response, and resiliency. I have a subcommittee in that task force dealing solely with lessons learned from COVID-19.

We're going to put together a real comprehensive look. I'm proposing that would be a two-year task force that will come out and make these reports that we will be able to learn from. I want to see us lead in all of these areas, and one of the facts is that we've got to look at this broadband issue.

Let me be clear. This is the issue of our day that affects everybody and every business, and it affects every sector of public utilities, period.

Let me be clear. This is the issue of our day that affects everybody and every business, and it affects every sector of public utilities, period. It just does. Even if you're a water utility, there are issues related to broadband that affect your business, and it's certainly applicable if you're an electric utility.

Broadband is a common denominator that is something that is one of those very few issues in today's political climate that everyone on both sides of the aisle can agree is a problem.

Maybe we have disagreements on how to fix it, but we all recognize that this is an issue. Going past COVID-19, you're never going to have to spend a minute debating with somebody whether or not broadband access is needed and the fact that an internet service is not electric. ❍

For more, see the brief video interview with NARUC President Brandon Presley.

Glossary of Telecom Terms

4G and 5G: Evolutions of the 3rd Generation Partnership Project cellular communications technology standards. The 4G standard deployed worldwide is known as LTE. 5G networks build on 4G and are in the early stages of deployment.

Broadband: High-capacity transmission capability. Modern applications that depend upon rapid communication of large quantities of data require networks with a greater transmission capacity. To provide that capacity, wireless broadband channels typically have bandwidths larger than one megahertz, while narrowband channels are usually two hundred kilohertz or less in bandwidth.

LTE: Long Term Evolution is today's leading mobile wireless technology, deployed in commercial carrier and private enterprise networks worldwide. LTE, which adheres to the 4G evolution of the 3rd Generation Partnership Project standards is a mature technology benefiting from an extensive ecosystem of available devices that can operate in the range of spectrum bands specified in the 4G standard.

Private Network: Closed communications network operated by an entity such as an electric utility for its own internal purposes. Private network owners control every aspect of the system, including for example the rigor of cybersecurity measures (such as separation from the public Internet), the number and type of user devices, and the priority of traffic types competing for bandwidth. As a key aspect of the system infrastructure, the spectrum used for private networks must be controlled, dedicated, and licensed to the network operator.

Spectrum: Electromagnetic frequencies or channels used for wireless communications. Broadband networks typically require wider bands of spectrum (that is, a wider range of consecutive frequencies) to provide higher transmission capacity than narrowband networks. Radio transmissions using spectrum comprised of lower frequencies below one gigahertz (called low-band, measured in cycles per second or hertz) are generally better able to carry across long distances and penetrate obstacles such as foliage and buildings.

Coolest Thing FCC Has Done in Decades

Continued from page 20

than a carnival booth on the Internet, bad guys can't get at it from their cozy easy chairs. They'd have to take "The Russians are Coming, The Russians are Coming," a step further, sail a submarine over to the states, step up to a utility's telecom equipment, and then plug in. Now, I totally like that, how much more difficult it would be for the bad guys.

So for the first time in the years since the cybersecurity crisis first confronted our country and our utilities, I've become optimistic we can come out on top. I've sometimes daydreamed that someone would develop a new super duper Internet – air-gapped from the wide-open carnival of an Internet we're stuck with – where utilities and other vital institutions could locate securely from the Blue Meanies and other fiends. As it turns out, that's what private broadband LTE does.

A real big thanks, therefore, to the FCC. This rededication of three megahertz segments of radio frequencies for broadband looks like the coolest thing the FCC has done since giving me my general amateur radio license decades ago. ❍

I've sometimes daydreamed that someone would develop a new super duper Internet where utilities and other vital institutions could locate securely from the Blue Meanies and other fiends.

EXTRA EDITION

PUBLIC UTILITIES FORTNIGHTLY

Impact the Debate

EDITOR-IN-CHIEF
Steve Mitnick
mitnick@fortnightly.com

VICE PRESIDENT
Joseph D. Paparello
paparello@fortnightly.com

MANAGING EDITOR
Lori Burkhart
burkhart@fortnightly.com

EDITOR
Angela Hawkinson
hawkinson@fortnightly.com

MEMBER SERVICES MANAGER
Alexandra Revel
arevel@fortnightly.com

MANAGER, ANALYTICS & RESEARCH
Kevaghn Hinckley
hinckley@fortnightly.com

ART DIRECTOR
Michael Eacott
eacott@fortnightly.com

 Public Utilities Fortnightly (ISSN 1078-5892) is published monthly with additional issues published in February, June and November by **Lines Up, Inc.** Executive and editorial offices at 3033 Wilson Blvd., Suite 700, Arlington, VA 22201. Tel: 703-842-3758, Email: info@fortnightly.com

POSTMASTER: Send address changes to Public Utilities Fortnightly, 3033 Wilson Blvd., Suite 700, Arlington, VA 22201. Periodicals postage paid at Arlington, VA and additional mailing offices.

SUBSCRIPTIONS: $500 per year, except for employees of organizations with a hundred or more employees, whose organization must have a PUF organization-wide membership. Copies not delivered due to subscriber's failure to send change of address six weeks in advance cannot be replaced. Replacement copies must be claimed within 30 days of cover date for free replacement.

CHANGE OF ADDRESS: Notices should provide old mailing label as well as new address including Zip or Postal Code to: Lines Up, Inc., 3033 Wilson Blvd., Suite 700, Arlington, VA 22201 or call 703-842-3758. Please allow 4 to 6 weeks for changes.

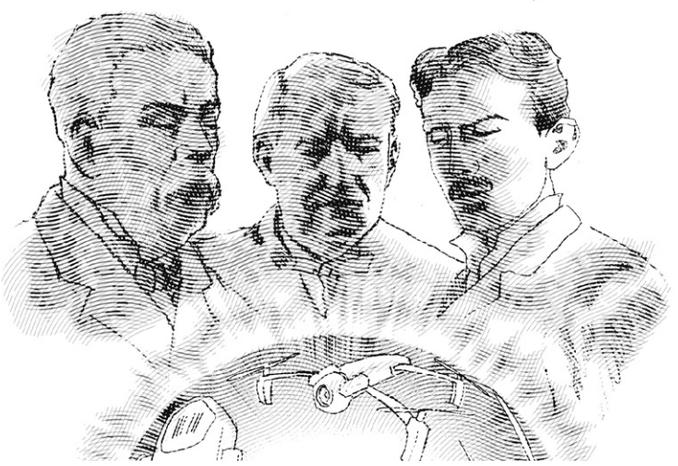
www.fortnightly.com

Reprints: Call 703-842-3758.

Coming June 1

June's Regular Issue of Public Utilities Fortnightly

A Day at the Wisconsin PSC, Virtually
Fortnightly Under Forty Annual Feature
How the Industry is Coping with Coronavirus Crisis



Coming June 15

in PUF's Special Issue on State and Future of Electric Power

Change Agents, on the State and Future of Power
Experts Show Us Their Crystal Balls on Power's Future
Our Panel of Veteran Leaders on Electric Trends
PUF Annual Pulse of Power Survey

Illustration by Dennis Auth

PUF's Take

Coolest Thing FCC Has Done in Decades

By Steve Mitnick, Editor-in-Chief

Everybody in the telecom world calls it the 900 megahertz band. Though, as this energy guy sees it, that's a little odd since the 900 megahertz band extends from 896 megahertz at its lower boundary to 940 megahertz at its upper boundary. I guess the name 900 megahertz band stuck because the alternatives such as the 896 to 940 megahertz band is too much of a mouthful.

It took me awhile to really get what this is all about – this rededication by the feds of three megahertz segments of radio frequencies for broadband – until I recalled my teenage years fiddling with ham radio. Which did seem at the time to be a religious violation of some sort given ham was off limits in our Jewish family. After testing at twenty words per minute in Morse Code, at the Brooklyn offices of an obscure government agency called the Federal Communications Commission, this FCC officially assigned me my own call number, WB2IXU. Proud as a fifteen year old could be in the nineteen sixties, I purchased a set of QST postcards – QST is like yo in ham radio circles – with my call number imprinted on them to mail to folks I reached on the allowed radio frequencies in far off and exotic lands like Ohio, Texas, and once, Australia.

Something I learned in the process, and then soon forgot for decades until now, was that the FCC rules radio frequencies and determines who can use what intervals of hertz. Worth mentioning here that it was Heinrich Hertz who, in the late nineteenth century, was the first to prove the existence of electromagnetic waves that James Maxwell's famous equations had predicted. What did Heinrich Hertz get for his trouble and his brilliance? Not much of anything. He tragically died at the age of thirty-six and aside from a medal or two, he was little lauded in life, but was eternally so in death since frequencies ever since are referred to as some number of hertz, kilohertz, megahertz, or gigahertz. For instance, anytime your favorite classic rock station announcer shouts out, stay tuned to ninety-nine point-five megahertz on your FM dial, they're honoring Heinrich, albeit unintentionally I suppose.

It took me awhile to really get what this is all about – this rededication by the feds of three megahertz segments of radio frequencies for broadband – until I recalled my teenage years fiddling with ham radio.

I said the FCC rules radio frequencies, which is true. But since the most desirable frequencies are limited in number given the constraints of telecom technology and the physics of radio signal transmission – including the need to sufficiently separate uses of the airwaves to minimize interference with one another – there can be pretty intense clamoring and battling over this or that spectrum. So the FCC seems to me to be as much as a referee as a ruler, or more so I think.

About a year after the FCC issued a Notice of Proposed Rulemaking on broadband in the 900 megahertz band, and after nearly as many filings from the parties to rival a good-sized FERC proceeding, the FCC has gone and done it. From 897.5 megahertz to 900.5 megahertz and from 936.5 megahertz to 939.5 megahertz, each segment being three megahertz from end to end, utilities in particular can put their stakes in the ground, within these segments of the airwaves, and have their very own private broadband LTE telecommunications networks.

LTE? Other than the three tiny letters that oftentimes appear in an upper corner of your smart phone, what's that stand for?

You learn something every day. I've now learned that LTE, which strangely stands for Long Term Evolution (sounds like what happens at the climax of 2001: A Space Odyssey), has built-in cybersecurity defenses. I like it. Cybersecurity geeks say LTE is more granular. Huh? What's that mean? Well, different electronic components within a utility's telecom system that's granular can have different cybersecurity defenses. Which makes it very tricky for bad stuff from bad guys to get around in there – in telecom systems – and do bad things.

Then I found out that broadband LTE has extra room – because it's broad, duh – to add even more cybersecurity defenses. I really like that. Plus, the FCC went with three megahertz spaces on the spectrum, one channel that's three megahertz wide for transmitting and one for receiving, so the broadband could be super broad. Now that's a soft pitch right down Broadway!

And that's not all. Then I found out that private broadband LTE is, well, private. As opposed to the very public Internet that is a wide-open carnival of cat videos, news that is fake and otherwise, and bad guys trying to steal your personal info or screw-up your democracy. Those bad guys in Russia for example have plenty of handy ways at their disposal to compromise a utility's operations through the Internet. But if a utility's telecommunications are private rather

(Continued on page 18)