PRIVATE LTE MEETS THE DEMANDS OF CRITICAL INFRASTRUCTURE

FEATURING DATA SPEEDS, TECHNICAL FLEXIBILITY, SIGNAL PRIORITIZATION, AND SECURITY

MOTOROLA SOLUTIONS

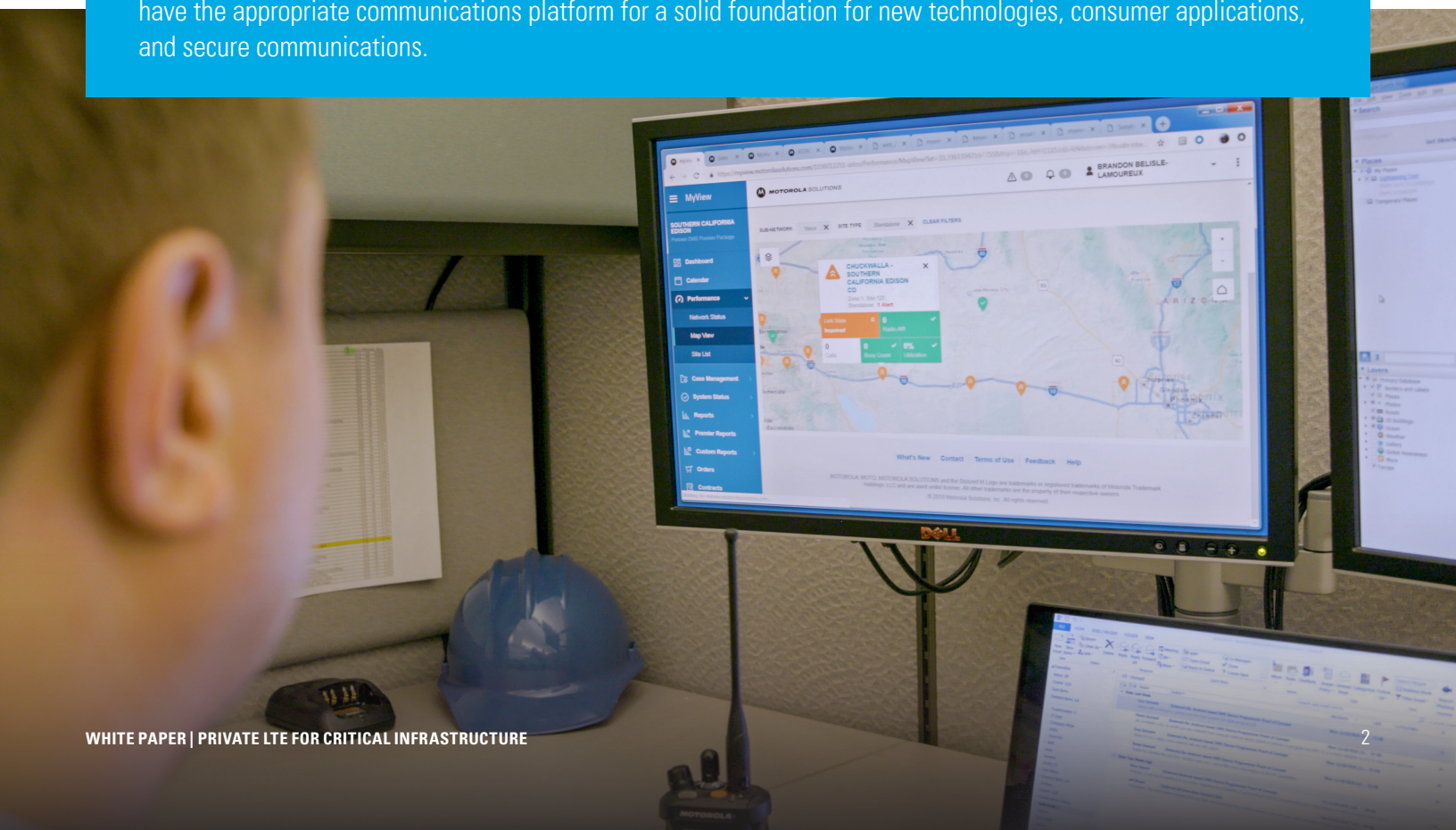
UTILITIES REQUIRE BROADBAND FOR MISSION CRITICAL OPERATIONS

Utility operations in 2020 and beyond will demand more reliable telecommunications infrastructure in order to meet the ever-increasing demands for reliable, secure service delivery, while providing the right data at the right time for process analytics. In one notable critical infrastructure use case example, Volt VAR Optimization (VVO) technology optimizes power factor control in combination with flattening the voltage profile of an electric distribution feeder by applying intelligent controls to capacitors and voltage regulators on the line.

This serves to minimize electrical losses, reduce line and transformer loading, and provide energy savings for both the utility and the customer by lowering the source voltage (Conservation Voltage Reduction – CVR) at the substation and subsequent line regulators, resulting in a lower voltage at the customer meter. This use case requires coordination via broadband communication for monitoring and control, to optimize the use of these devices to respond to system dynamics in near real-time. It is also anticipated with increasing Advanced Metering Infrastructure (AMI) deployments that smart meter data received will be incorporated into the VVO control scheme, providing even more accurate and granular voltage/var control as well as vital feedback for VVO performance. There are many additional use cases for utility operational efficiencies such as asset management, AMI and cybersecurity that are pushing utility telecom managers and CIOs to look beyond narrow band and public networks to consider private LTE networks. Near real-time, secure, control and management of the electric grid is critical to smart communities across the country.

The electric industry is being forced to change its business model by data-driven consumers and smarter technologies. The utility business model is fundamentally more complex today than it was even five years ago; Once primarily the supplier of centrally produced power, the utility is now the master orchestrator of a multitude of Distributed Energy Resources (DER). As more DERs come online with new energy storage assets and advanced inverter controls (i.e., smart inverters), the reactive power capabilities need to be integrated into the overall VVO control scheme to provide greater granularity of control. Such a scheme may also integrate the customer into greater market participation with potential payments available, likely driven by a Distribution Locational Marginal Pricing (DLMP) based Distribution System Platform (DSP).

As more technologies such as electric vehicles, roof-top solar panels, smart meters, and energy storage play a critical role in balancing the load demands. Utility telecommunications networks must secure the energy grid, while maintaining grid resiliency, and reliability. New "Smart Communities" are requiring the modernized energy grid to have the appropriate communications platform for a solid foundation for new technologies, consumer applications, and secure communications.



WHAT'S WRONG WITH THE STATUS QUO?

According to the U.S. Energy Information Administration, through 2018, electric utilities have deployed about 86.8 million AMI meters. With a greater emphasis on the Internet of Things and connected homes, analysts expect the number of connected devices within the average utility to grow by an order of magnitude and the volume of data available from each connected device will also climb.

In 2015, Gartner estimated that there were only 3.8 billion connected devices like smart cars, thermostats, streetlights, smoke detectors, and smart TVs in the U.S. Now it is expected by the end of 2020, there will be upwards of 25 billion smart devices all transmitting over public communication networks, which will put more pressure on the unlicensed networks and cause more interference for any critical communication on the same network.

The growing aspiration for smart cities and connected communities may bring new benefits to utilities like more effective, data-driven decision-making, and enhanced engagement with residents, but it also opens this critical infrastructure up to vulnerabilities from previously unconnected systems, like smart HVAC or lighting. NERC CIP regulations are compliance-based and focused on generation and transmission-level power network assets, leaving room for serious vulnerabilities in the distribution grid. The National Infrastructure Advisory Council (NIAC) report on "SECURING CYBER ASSETS: Addressing Urgent Cyber Threats to Critical Infrastructure" recommends establishing separate, secure communications networks specifically designated for the most critical cyber networks[1]. Surely the nation's electric utilities should be considered 'the most critical' for security measures.

Consumers have begun to expect more from their energy providers; For a few years now, they have asked the utilities about greener, renewable generation sources and demanded improvements in their customer service capabilities. But now these savvy consumers will expect real-time consumption data and proactive programs to help them reduce their energy use. Some forward-thinking utilities have a long history of working hand in hand with municipalities to improve the quality of life for citizens and businesses. Critical to the foundation of new consumer initiatives are smarter mobility, renewable energy, water conservation water and better waste management, all of which are dependent on utilities' telecommunication infrastructure. Utilities have a tremendous opportunity to bring greater value to consumers when it comes to the development and maintenance of the digital transformation of cities. The key to unlocking this opportunity is telecommunications infrastructure.

Unlicensed spectrum options exist and may have intrigued utilities but for the nation's critical infrastructure operations, utilities must continue stringent standards on security, reliability, and resilience and demand a deployment model not offered by public commercial networks. The need for priority access for critical operations dictates that utilities will be best served with a private network model where spectrum, technology and operations are under the management of the utility. The exponential growth and challenges that lie ahead for electric utilities cannot be addressed adequately with public, unlicensed or legacy networks; The risk of interference and increased security threats related to these will grow with the increase in number of devices connected to these networks. Relying on leased public networks does not provide the utility the reliability and resiliency to effectively deploy these advanced systems. Response time to network outages can be days compared to private LTE solutions, which are hours. Installing a private network allows the utility to make capital investments on their own infrastructure and reduce the heavy operational expenses of the leased services. Electric utilities must demand more robust, interoperable, secure and pervasive telecom networking capabilities that they can control and command.

WHY SHOULD ELECTRIC UTILITIES CONSIDER PRIVATE LTE?

Utility-grade broadband for electric utilities is available today using private LTE systems over licensed 900 MHz and other bands. While there are many critical drivers behind utilities' need for licensed, standardized broadband spectrum in the U.S., a secure, reliable modern grid will also provide immense benefits to consumers and communities of all sizes and structures.

How can states like California, Nevada, Hawaii and New Mexico hope to achieve 100% renewable energy without private utility broadband? California's strict renewable portfolio standards (RPS) for power generation require that 33% of retail sales of electricity in California come from eligible renewable resources by 2020 and 50% by 2050. Likewise, in 2019, Nevada's governor signed a bill requiring 100% of the state's power from carbon-free sources by 2050 and requires 50 percent of its supply to come from renewables by 2030. Utilities know that renewables require flexibility of the infrastructure but also greater control and monitoring 24x7. The issue of transmission flexibility is complicated. Landmark studies from the DOE's National Renewable Energy Laboratory (NREL) on integrating renewables into the U.S. identified flexibility characteristics: increased balancing area; increased sub-hourly scheduling; increased transmission use; dispatch of generation over wider regions; state-of-the-art wind and solar forecasting; increased dispatchable generation; more operating reserves; new transmission to renewable sources; demand response programs; all of which require reliable, fast, secure telecommunications. Modernizing the grid continues to require a substantial investment in new technologies including a return on those investments so that utilities can meet their obligations to consumers. This is exactly the kind of investment that regulators and consumers want utilities to make.

PRIVATE LTE IS THE TECHNOLOGY OF CHOICE

A multitude of connectivity choices are available to utilities today, but only one standard can meet all the needs of utilities wishing to deploy a holistic, interoperable, broadband network across their territory for a multitude of applications: Private LTE.

The immediate need for private LTE networks is accelerating by increasing natural disasters such as wildfires, hurricanes, superstorms, and intense blizzards, that are growing in intensity and frequency, escalating the threat posed to the critical utility infrastructure. In the case of recent wildfires in California, the November 2018 Camp Fire consumed approximately 150,000 acres, destroyed 14,000 homes, and caused at least 85 deaths. That same year Pacific Gas and Electric Company (PG&E) filed for bankruptcy after calculating its liability at $30 billion. Disasters like wildfires put a utility and their customers at a tremendous risk financially and more importantly threatens safety and security. Wireless telecom infrastructure to monitor and control systems in near real time is now the minimum requirement for disaster and storm restoration. The secure wireless networks must enable connectivity of fire monitoring cameras, weather sensors and other load control devices that can shut off power to a falling power line and reroute the power to other areas. The NIAC report reminds us that the data systems must be capable to support massive restoration efforts involving multiple utilities following a devastating attack or disaster. This suggests that the networks must be broadband and interoperable among utilities in broad regions. With very few exceptions, utilities simply do not have such networks now.

The Federal Communications Commission (FCC) has recently taken a major step by issuing a Notice of Proposed Rulemaking (NPRM) to repurpose the 900 MHz spectrum band for uses like those discussed above by utility and enterprise private networks. This broadband spectrum is the ideal workhorse of the invisible infrastructure underlying utility applications of all types, not only for protection of critical infrastructure, but also for smart grid systems and other Smart Community applications.

Utility use cases like the ones mentioned above require greater telecom capacity to support latency, data rates, bandwidth and message priority requirements and, at the same time, present a means to evolve technologically and provide utilities with a future-proof, secure, and interoperable platform on which to add new use cases not yet thought of. Ubiquitous, integrated and seamless connectivity will play a fundamental role as the U.S. power industry transforms. To survive, electric utilities will depend upon a vast network of connected devices throughout the grid and at customer premises across their operating territories.

High-capacity broadband is a fundamental part of a smart city. While utilities are developing new private networks and advanced technologies to meet the demands of more distributed energy resources, utilities position themselves for smart city opportunities. The modernized electric utility and smart cities of tomorrow cannot be fully realized without secure, reliable wireless broadband connectivity. LTE offers the data speeds, technical flexibility, signal prioritization, and security necessary for the multitude of endpoints and smarter utility applications. The enormous utility data generated today and, in the future, makes LTE the most economical network to offer flexibility, scalability and resiliency. Private LTE is the most robust wireless solution with security built in and it is available today for mission critical infrastructure.

Motorola Solutions is a recognized leader in private narrowband communications equipment and radios in the 900 MHz band, with years of experience delivering mission-critical private networks. Now our portfolio brings high-power land mobile radio functionality into the LTE space for greater capacity, improved performance and reduced interference. The Motorola solution includes infrastructure, devices, software and service components that can be linked together to create seamless, secure, interoperable communications, supporting voice, data, video and IoT use cases to address the end-to-end needs of utility, oil, gas and other commercial customers. Contact Motorola Solutions today to learn more about how we can solve your utility telecommunications challenges.

1. National Infrastructure Advisory Council's Securing Cyber Assets: Addressing Urgent Cyber Threats to Critical Infrastructure Final Report and the transmittal letter released September 2017 **https://www.cisa.gov/sites/default/files/publications/niac-securing-cyber-assets-final-report-508.pdf**

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