

## Glossary of Terms

The following is a list of terms commonly used in the electric utility industry regarding utility communications systems and emergency response. The purpose of this document is to provide a base-level understanding of these terms.



**Black Sky Event:** A catastrophic event or events compromising electric reliability and the country's collective effort to respond and restore service. This could be a devastating natural disaster, cyber-attack, physical attack, act of war, or a combination of incidences. The resulting impact could mean a utility is unable to restore service safely for numerous reasons, including the failure of utility ICT networks.



**Blue Sky Operations:** A normal, routine operating day for an energy utility. This generally means moderate temperatures resulting in manageable load expectations, no weather, cyber, or physical incidents or emergencies.



**Federal Communications Commission (FCC):** The federal agency with regulatory oversight over wireless and wireline communications networks, including commercial spectrum allocation and pole attachments. The FCC consists of five presidentially appointed, Senate-confirmed commissioners who serve staggered, five-year terms. The FCC sets rules on how spectrum is allocated, assigned and operated for non-federal entities, and establishes protections for licensed spectrum holders to protect them against interference from unlicensed operations and other licensed services.



**Grey Sky Operations:** An operating day or days in which a utility faces severe weather or other incident which causes reliability concerns. For example, a natural disaster that causes temporary power disruptions, but does not impact utility private ICT networks, allowing restoration and recovery to proceed as safely and quickly as possible.




**Information and Communications Technology (ICT) Networks:** Telecommunications networks that carry data, video, and other services. Utilities provision these networks to underpin their transmission and distribution infrastructure for daily reliability needs, situational awareness, grid modernization, cyber and physical protection, Supervisory Control and Data Acquisition (SCADA) communications, storm response and recovery, and much more.




**Interference:** Interference occurs when reception of communications through a spectrum band is blocked, temporarily disrupted, or the quality of the communication is diminished. There are a variety of reasons for interference, including co- and adjacent-channel interference that can come from other users within the same spectrum band. In addition, different signals sometimes can intermix with each other to cause interference. Finally, some interference can simply overpower the reception of a signal by its proximity and power in relation to the radio receiver (near/far). No matter the cause of the interference, the practical effect is the same in that communications reliability is diminished. In a utility's communications network, diminished communications ability can in turn threaten the safety and security of utility personnel or infrastructure, as well as the safety of the general public.

**IP Transition:** The creation of the Internet and advent of new voice and data technologies has created a need to modernize the telecommunications system. Most old, voice-only telecommunications networks relied on copper-wire lines to deliver telephony services. Copper systems were built to serve voice only; they are more reliable but have limited ability ("bandwidth") to carry anything but voice services. As Internet usage has grown, telecommunications carriers began offering fiber optics wireline networks, which are faster and have higher bandwidth to carry both voice, Internet, and data services.

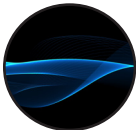
Nearly all new wireline telecommunications services now have a fiber-based backbone (even when wireless telecommunications are used off of that backbone). As a result, the FCC in 2013 began a process to oversee the transition from copper to fiber/IP-based networks.



This is particularly vexing for utilities, several of whom still rely on copper-based networks for their wired communications systems. Some utilities, mostly those located in rural areas, have contracted with traditional telecommunications carriers to provide portions of their communications networks. As these carriers transition to IP-based communications systems, this process must be managed carefully to ensure that this transition does not negatively impact utility networks. Although new fiber networks can deliver more data at faster rates, these networks are more costly than the traditional copper systems and may create some reliability issues. In addition, if a telecommunications carrier serving a utility begins replacing its older networks with an IP-based system, this could cause reliability concerns if not managed correctly and communicated to the utility customers in a timely manner.



**Land-Mobile Radio System (LMRS):** A push-to-talk wireless communications system usually used in vehicles or in the hands of users such as a two-way radio system or walkie-talkies. These systems allow utility employees to communicate with each other to perform routine maintenance on equipment and restore service after a natural or manmade disaster.



**Licensed Spectrum:** Licensed spectrum is assigned by the FCC to a particular licensee. Licensed spectrum can be assigned to an applicant by auctioning it to the highest bidder or it can be assigned by the FCC's granting of an application. In any event, having a license provides the licensee with authorization to operate on a frequency or a frequency block over a period of time, typically 10 years for private (non-federal) wireless licenses. The licensee has rights to complain about interference from other licensed and unlicensed operations. Depending on the frequency band, the license also prevents other operations from being coordinated within a given distance from the coordinates of the licensee's operations. Generally, having a license provides greater protection against interference than is extended to unlicensed operations. In addition, licensed systems are permitted to operate at higher power than unlicensed operations, which provides better coverage than unlicensed operations.

Ever since Congress gave the FCC auction authority in 1994, the agency has increasingly



allocated new spectrum or reallocated existing licensed spectrum for commercial communications services and has assigned licenses through such auctions. Because of the costs of the licensed spectrum and the size of the geographic areas involved, utilities (even very large utilities) have typically been unable to successfully compete against commercial communications service providers in spectrum auctions.



**Microwave Communications:** Microwave communications are wireless communications delivered in narrow beams from antennae devices pointed directly at each other (point-to-point). Microwave communications can carry large amounts of data, but are limited to line-of-sight communications (i.e.; the antennae must be pointed directly at each other to communicate, as microwave transmissions cannot pass through or around hills or mountains). Utilities use microwave communications for outage management, energy management, teleprotection, smart metering, among other functions.



**National Telecommunications and Information Administration (NTIA):** Among other responsibilities, NTIA is the federal agency responsible for managing federal use of spectrum. For example, the 406-420 MHz band is reserved exclusively for federal use.

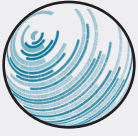


**Radio Frequency Spectrum:** Referred often only as “spectrum,” radio frequency spectrum refers generally to the multiple bands of naturally occurring airwaves used to send wireless communications between transmitters and receivers. A finite commodity, spectrum is essential for all wireless communications, such as cellular phones, Wi-Fi, radio, over-the-air television, and utility private telecommunications networks. Spectrum access for non-federal use is regulated by the Federal Communications Commission, and spectrum for federal use is managed by the National Telecommunications and Information Administration.



**Resilience: Resilience can mean many things to many audiences.** For this particular issue, we prefer the definition offered by the National Association of Regulatory Utility Commissioners: “Resilience is the robustness and recovery characteristics of utility infrastructure and operations, which avoid or minimize interruptions of service during an extraordinary and hazardous event.”<sup>1</sup>

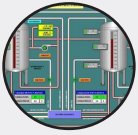
<sup>1</sup> “Resilience in Regulated Utilities,” National Association of Regulatory Utility Commissioners, November 2013 <https://pubs.naruc.org/pub/536F07E4-2354-D714-5153-7A80198A436D>



**Resilient Communications:** The ability of a utility's ICT network to prepare for, withstand, and recover from natural or manmade disasters. Utility ICT networks are essential for daily reliability along with the ability to safely restore service after an event. These networks are intended to be, and are, more reliable than those operated by traditional telecommunications providers.



**Spectrum Bands:** Spectrum is allocated in bands, measured in hertz, which have their own unique propagation (strength across distance) characteristics. Generally, high frequency bands are in the 3-30 MHz ranges, the very high frequency bands (VHF) are in the 30-300 MHz range. The ultra-high frequency bands (UHF) are in the 300MHz to 3 GHz range. Utility land-mobile radio operations tend to be in the VHF and UHF bands between 150-512 MHz and the 800/900 MHz bands. Utilities also use bands such as the 900 MHz, 3.5 GHz, and 6 GHz for mission-critical communications services.



**Supervisory Control and Data Acquisition (SCADA) System:** Often referred to only as its acronym, Supervisory Control and Data Acquisition (SCADA) Systems are computerized industrial control systems that connect large industrial pieces of equipment with centralized facilities to transmit data. For utilities, SCADA systems refer to the data networks that connect remote pieces of infrastructure to control centers, providing utilities with real-time situational awareness on the status of their systems. Utilities deploy ICT networks to run these SCADA systems. SCADA systems can include Energy Management Systems which optimize generation and high-voltage transmission of energy, for example.



**Traditional Telecommunications Carriers:** Private companies that sell voice, data, and cellular communications services, including but not limited to the following companies: AT&T, Verizon, T-Mobile, and Sprint.



**Unlicensed Spectrum:** Unlicensed spectrum is available in certain designated bands, including the 902-928 MHz band, the 2.4 GHz band and the 5.8 GHz band. FCC rules permit unlicensed operations in licensed spectrum bands on a non-interference basis – which means that unlicensed operations must not cause interference to licensed systems and they must accept interference from licensed systems. Generally, unlicensed spectrum bands provide an easy way for entities to deploy networks and operate with flexibility at lower cost, compared to licensed spectrum, which can entail auctions that are costly and time consuming. The drawback to unlicensed spectrum is that operations are not protected from interference and users must comply with FCC requirements prohibiting them from causing harmful interference to licensed systems. Any entity interested in building or supplying wireless communications can acquire



unlicensed spectrum. Unlicensed spectrum can be used for household devices such as baby monitors, garage door openers, Wi-Fi, and for larger entrepreneurial uses as well.

Utilities operate communications in both licensed and unlicensed bands, depending on the need and costs involved.

**Utility Private Telecommunications Networks:** These are telecommunications networks built, owned, and operated by electric, water, and natural gas utilities and are not made available for use by the public at large. Long ago, utilities began building out their communications networks for two-way voice communications with personnel in the field. Over time, utilities used their networks for data communications to monitor and control devices and other critical assets on transmission and distribution networks. Because of the critical nature of the communications to support infrastructure repair, maintenance, and incident recovery, utilities require high levels of reliability for their telecommunications networks to support the safety, reliability and security of their own electricity, water, and natural gas services. Many telecommunications carriers were and are unable or unwilling to meet utility standards for reliability -- and today utilities continue to primarily rely on their private telecommunications networks, even though they use commercial telecommunications networks where necessary for non-mission critical communications.



These systems consist of both wireline and wireless communications. Wireline communications systems are necessary to ensure reliable delivery of data over shorter distances into control centers or other mission-critical facilities. These systems consist of either copper or fiber-based—not unlike a landline phone or cable television service--wireline networks connecting points together. Wireless systems are necessary for communications over long distances. These private wireless telecommunications networks include both land-mobile radio systems and fixed microwave communications systems.



**Wireline communications:** Wireline communications refers to voice and data services transmitted through wire-based technologies. Local landline phone, Internet, and cable services are wireline communications because a physical cable or wire is used to deliver these services. Because of this direct connection, these services are generally more reliable than wireless communications. New wireline services tend to be fiber based, as opposed to the traditional copper networks (see “IP transition” definition above).



**Wireless communications:** As its name suggest, wireless communications refers to any communications between two points that are not connected by a wire. Wireless communications use radio frequency spectrum to travel from point to point (see “Radio Frequency Spectrum” definition above). For utilities, wireless communications are essential for connecting remote pieces of infrastructure.