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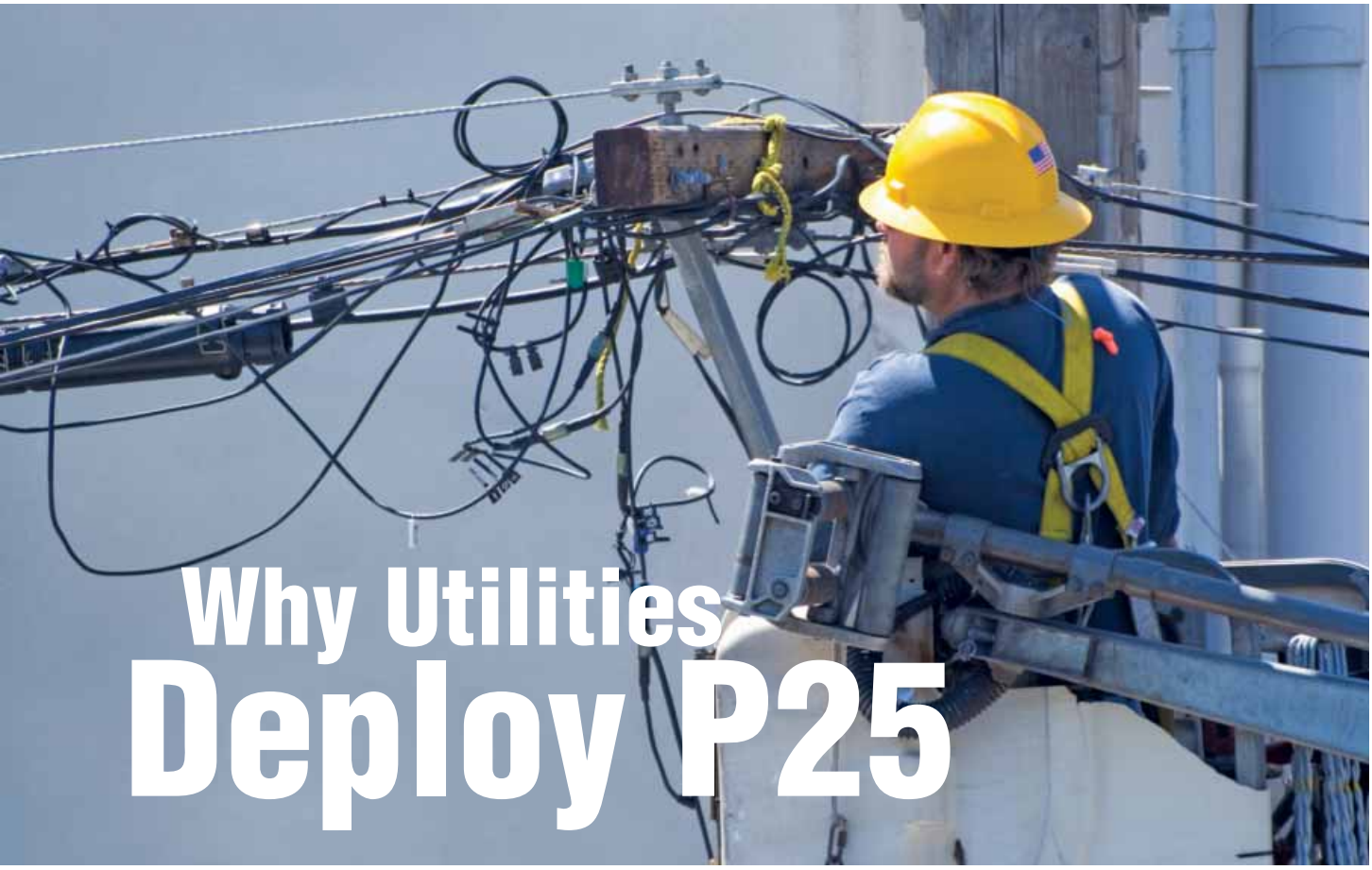

# Why Utilities Deploy P25

## The digital standard, originally designed for public safety, is making inroads with North American utilities.

**By David Deacon**

With the transition from analog radio systems to digital now fully under way, utilities face a growing number of competing digital radio standard choices in the market, including Project 25 (P25), Digital Mobile Radio (DMR), TETRA and NXDN.

Many electric utilities are integrating P25-compliant technology into their radio systems. P25, a mature digital radio standard in use for 25 years, has not remained static. As the session initiation protocol (SIP) and real-time transport protocol (RTP) world of IP signaling evolved, P25 followed suit with the introduction of the Inter RF Subsystem Interface (ISSI), a network-to-network interface, and the Console Subsystem Interface (CSSI), a standard interface for connecting third-party consoles to the radio network. These interfaces offer customer choice and competition among multiple P25 suppliers.

### Operational Procedures

A common initial decision for utilities is how to reuse existing consoles and maintain the same operating procedures to avoid costly console replacement and retraining staff. The widespread adoption of the P25 CSSI by console vendors has made this decision easier for North American utilities because most major

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console suppliers in the utilities market provide IP-based CSSI upgrade paths to their deployed console platforms. Early adopters of the CSSI standard include InterTalk Critical Information Systems, CSS-Mindshare, Zetron and Avtec.

"Our choice of P25 when deciding to migrate to digital was definitely impacted by our large installed base of Pantel (now called InterTalk) consoles," says Brian Krest of ATCO Electric in Alberta, Canada. "Pantel offered a CSSI upgrade to their existing systems, and this certainly was a contributing factor in our decision."

ATCO deployed a P25 trunked network in southeastern Alberta and is expanding the network into another region. Once the decision to go with P25 was made, dual-mode analog and P25 digital radios were installed in vehicles, allowing a cost-effective transition to digital with little to no disruption in the organization's daily operations.

"The influence that transparent operations command when migrating from one network to another is very significant for our electric utility client base," says Doug Chapman, Etherstack's vice president, North America.

## Spectrum and Coverage

Multiple propagation studies have shown the P25 Phase 1 coverage footprint is identical to that of existing analog sites in terms of frequency and effective radiated power. Utilities have had confidence migrating to P25 from analog because their existing spectrum licenses and tower sites provide identical coverage post migration. Furthermore, P25 is available in more frequency bands than competing digital standards.

FirstEnergy subsidiary Jersey Central Power & Light (JCP&L) operated for years at 900 MHz across a 13-county service area. A 900 MHz P25 trunked radio network was delivered in New Jersey in late 2016. Site commissioning started in January and will run through 2017 to cover the utility's complete service area. JCP&L was able to achieve substantial cost savings by reusing its existing sites and spectrum.

"The choice to go to P25 was mostly driven by the knowledge that they could reuse their existing spectrum and towers without the need for any change in frequency plans and transmission points by remaining within their 900 MHz frequencies," says Chapman.

## Supplementary Features

After 25 years of evolution, P25's array of supplementary services and features is extensive. P25 is flexible and versatile, allowing manufacturers to add features such as man-down emergency call, transmit-and-receive cycling and request-to-talk (RTT) callback, a feature commonly used in the utility industry.

While RTT is not defined within the P25 standard, both the CSSI and Common Air Interface (CAI) are flexible enough to introduce the signaling required to support it in both the consoles and radio terminals without breaking third-party interoperability. This operation is performed using a P25 status update message on the CAI and the CSSI, and that message is interpreted within the console application.

A 31-site P25 trunked radio network spanning FirstEnergy's Allegheny Energy subsidiary operations in Pennsylvania, Maryland and West Virginia was deployed in 2011 using VHF repeaters from JVCKENWOOD. One real-world problem that affected the utility was co-channel interference from radio transmission sites beyond its service area coverage and operated by other license holders.

The utility integrated a co-channel interference detector within the P25 trunked site solution that temporarily removes a traffic channel from operation when interference from a distant site affects operation of that channel. By automatically removing the affected channel from the traffic channel pool until the system detects that interference has gone away, the network is able to provide continuous high-quality service for radios within the site's operational area. The ability to implement innovative solutions within the framework of P25 without compromising interoperability is a major benefit.

## Network Resilience and Interoperability

Because P25 evolved from public-safety user requirements, reliability, high availability and fault tolerance through fallback modes and redundancy are focuses of the technology. Network resilience during disasters and other calamities is key to successful radio communications. Disasters happen, and P25 has dozens of success stories on the scoreboard.

"The Fort McMurray fires raged through one of our key operational service areas," ATCO's Krest says. "Cellular communications systems either failed or were overloaded, yet our own radio network kept going, allowing us to serve the community in managing and restoring critical power operations during the disaster."

The P25 ISSI standard allows operators of different networks to communicate with one another and allows radio subscribers to roam from one network to another if authorized — another key differentiator between P25 and other digital standards. Utilities often need to interoperate with public safety during emergencies.

Some other digital radio standards are deficient in this particular aspect, because of a lack of implementation within the relevant standard and few real-world deployments. These issues should improve in time with further effort by the relevant standards

bodies and improved vendor-to-vendor testing. By comparison, some new P25 networks are deployed with ISSIs that can provide communications between dispatchers and radio users in neighboring and co-located radio networks in the event of an emergency.

## Cost and Spectral Efficiency

P25 has an unfair reputation in terms of network infrastructure and radio expenditures when compared with other digital standards. Many advanced P25 networks are competitive with other digital radio standards in terms of cost, a direct result of the maturity and widespread use of the standard. In North America, there are more interoperable P25 network, subscriber radio, console and other peripheral vendors than any of the other competing digital mobile radio standards.

Spectral efficiency is regularly raised as an argument against P25. Phase 2 supports a 6.25-kilohertz channel efficiency, which matches other digital standards.

Many utilities continue to go down the P25 path because the number of service personnel and the associated spectrum requirements remain unchanged during the migration from an existing analog spectrum allocation to digital. Few utilities have a pressing need to increase their traffic channel efficiency at the expense of reconsidering their coverage, site assets and frequency assets. The migration to P25 provides benefits in these areas.

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## Where Next?

In many disaster situations, cellular communications is not always available after the event. Clearly, convergence with cellular technologies will provide many benefits, but the near- to mid-term primary benefits will be mainly confined to normal day-to-day operations of the utility as opposed to those after a significant event.

New in-vehicle P25 mobiles under development are capable of tunneling native P25 calls from the vehicle through 3G and 4G services to appear back on the P25 console systems within the network with all of the user and supplementary services available. This can occur when the vehicle is outside the LMR coverage, but the unit can still see a commercial network. The units can optionally tunnel P25 calls back to the network via satellite links if the vehicle is out of LMR and cellular range.

With the richest range of interoperable equipment vendors of any of the digital radio standards, P25 provides utilities with the widest range of choice in consoles, digital voice recorders, mobiles, portables, frequency bands and networks. Ease of public-safety interoperability adds further merit to the decision for many operators. Cost and spectrum issues should be considered carefully in terms of what the utility has and what the utility really needs as a result of the migration to digital. ■

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