

Shaping the Future

Telecom Transformation

EPRI Initiative Points the Way to New Telecommunications Networks

By Matthew Hirsch

Technology disrupts. Digital publishing software made pen and paintbrush obsolete for many artists and designers. Publications abandoned the printing press for digital networks. As EPRI Technical Executive for Information and Communication Technology, Tim Godfrey says telecommunications services are poised to disrupt systems long used by electric utilities.

Even as utilities rely more than ever on data to integrate distributed energy resources, commercial telecom carriers are phasing out services such as time-division multiplexing (TDM) communication that utilities have used for decades. As telecom providers switch to newer technologies, it becomes more difficult and expensive for utilities to continue using older services, potentially raising costs for consumers.

“We can no longer do what we have always done,” said Godfrey.

In 2015, EPRI launched its Telecommunications Initiative to address such critical telecom issues, including loss of service and development of new network infrastructure.

A Strategy for Modern Telecommunications

Utilities traditionally transmitted data on TDM networks that telecom carriers designed for sending and receiving voice calls. Carriers have changed many of their voice and Internet services to use packet-based communication networks and have announced plans to discontinue by 2020 frame relay service, a type of TDM network that many utilities use to monitor and control substations and other grid assets. Carriers also plan to retire copper loops, the physical infrastructure supporting some frame relay and other TDM circuits. As the old networks diminish and new ones gain subscribers, manufacturers have phased out TDM communications equipment, making its continued use more expensive.

“Over time, it will become impractical to do so,” said Godfrey. “The writing is on the wall.”

The Federal Energy Regulatory Commission (FERC) in 2013 approved new standards for protecting the bulk power system against cybersecurity threats, eliminating an exemption for TDM communications. This requires utilities still using TDM networks to develop action plans to safeguard their communications infrastructure. Such plans may not be worth the effort in light of TDM’s tenuous future.

EPRI is nearing completion of a field project collaborating with utilities to demonstrate various communication networks that could be used for meter reading, distribution management, substation data acquisition and control, and other purposes. Building on this effort, EPRI’s Telecommunications Initiative is investigating approaches for replacing carrier-provided TDM networks.

One option is for utilities to break away from the telecom carriers entirely and form private networks to acquire and share wireless spectrum. Such private networks would give utilities control over development and operation of this critical asset, but they would require a significant commitment of time and capital.

A second option is to move to telecom carriers’ commercial cellular networks and develop ways to help establish reliability, security, and quality of service. In the future, utilities may also consider partnering with a national, high-speed wireless broadband network dedicated to public safety, known as the First Responder Network

Authority (FirstNet). In 2012, Congress allocated a slice of the telecommunications spectrum for FirstNet along with up to \$7 billion in funding. But deployment has been slow, and with the sharing model currently planned by FirstNet, utility users could be completely cut off from network access during a natural disaster, terrorist attack, or other emergency.

“That’s a non-starter for some critical applications,” said Godfrey. “Utilities have to know what’s happening on the grid.”

The third option is the most capable, but also the most expensive: Deploy fiber-optic communications networks. According to Godfrey, fiber has the best reliability, has bandwidth that handles the greatest volume of data, and presents minimal technical challenges.

“It’s the Ferrari of telecom,” said Godfrey. “This initiative will look at the utility business case to invest in fiber and ways to use it to create new revenue streams, such as leasing out bandwidth and offering Internet, telephone, and television service to customers.”

A fourth option: Use Internet service providers’ broadband services—which already connect utility customers—to monitor and control rooftop solar, electric vehicles, and other distributed energy resources.

EPRI’s initiative is looking at telecom technologies for all grid applications, including distribution automation, sensors, and metering. Some options may be appropriate for non-critical field- and customer-sited applications, but not as a TDM replacement for critical energy management and SCADA circuits.

Networking Versatility

EPRI will test, demonstrate, and publish guidance on network strategies and replacement technologies. Godfrey expects that EPRI’s work will identify the value that can be extracted from packet-based networks relative to legacy technologies. Many legacy communications systems were designed to support a single function such as billing data collection, capacitor bank control, and substation SCADA. They are not expandable, scalable, or upgradable. Newer packet-based network devices perform multiple functions, have longer lives, and reduce operations and maintenance costs.

It is likely that no single option will offer utilities a comprehensive telecom solution. “The challenge is to select the right combination of technologies and services, whether it be fiber, commercial cellular, licensed spectrum, or unlicensed spectrum,” said Godfrey.

Key EPRI Technical Experts

Tim Godfrey