USING HIGH-SPEED COMMUNICATIONS TECHNOLOGY TO IMPROVE SUBSTATION PHYSICAL SECURITY

There has been a lot of discussion this past year on substation physical security, especially in light of the coordinated attack on PG&E's Metcalf substation early in 2013.

While there are numerous strategies that can be effective in improving substation physical security (see Finley's earlier white paper on "Substation Security"), one that utilities should not overlook is tying physical security into high-speed, higher-bandwidth technologies.

"Doing so can kill two birds with one stone," said John P. Ham, P.E., a senior engineer with Finley Engineering. "For one, of course, you can improve your substation physical security."

The other is that doing so will help with NERC-CIP(V5) compliance. On November 22, 2013, FERC issued Order No. 791, Version 5 Critical Infrastructure Protection Reliability Standard (NERC-CIP(V5)). FERC directed NERC to submit new or modified standards responding to the directives related to the "identify, assess, and correct" language and communication networks by February 3, 2015, one year from the effective date of Order No. 791.

According to NERC, CIP(V5) represents a significant improvement over the current CIP(V3) standards. CIP(V5) adopts new cybersecurity controls and extends the scope of the systems that the CIP standards protect. The transition program will be in place through the enforcement date of the CIP(V5) standards.

How Can Utilities Utilize High-Speed Higher-Bandwidth Technologies to Improve Substation Physical Security?

One option is fiber, which offers two possibilities.

One involves optical ground wire (OPGW) on the static wire of the transmission line. OPGW is a cable that combines the functions of grounding and communications. It contains a tubular structure with one or more optical fibers in it, surrounded by layers of steel and aluminum wire. The optical fibers can be used for high-speed transmission of data, such as for the utility's protection and control of the transmission line, and/or for its voice and data communications.

The other is to run an all-dielectric self-supporting (ADSS) cable under the transmission line. This is an optical fiber cable that is strong enough to support itself between structures without using conductive metal elements and is used by utilities as a communications medium, installed along existing overhead transmission lines. An alternative to OPGW, ADSS cable is lightweight enough and small enough in diameter to reduce the load on tower structures due to cable weight, wind and ice.

"Another option is to build a microwave tower and get a link in," said Ham. "In addition, there are also some newer radio technologies coming out that involve 2.4 and 5.8 gigahertz, which can help you design a wireless network."

Which is better - fiber or wireless/microwave? "The gold standard is the fiber," he said. "Certainly, there is a cost to it. However, there is also a 'sweet spot' with it in the short to medium runs that can justify the cost."

With longer runs, though, Ham suggests that utilities should probably look at the microwave options, which are a cost efficient way to get high-speed communications to the substations.

How should a utility get started using these technologies to improve substation physical security? Ham suggests three steps. "The first step is to review your current Operations & Maintenance (O&M) costs," he said.

Next, define the business and technical requirements for your communication systems up-front, to make sure you design and install a system that is sized properly for your requirements and budget. "You don't want to have to go back and redo everything five or ten years later," he said.

Third, put together a capital project for the technology, which, ultimately, should be able to help you reduce your O&M costs.

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