According to Don Horne of *Electricity Today*, copper theft increased 1,150 percent from 2005 to 2006. Unfortunately, things only got worse from there. In 2007, the U.S. Department of Energy called copper theft a $1 billion problem that was growing larger. From January 2006 to March 2007, electric utility companies in 42 states reported 270 copper thefts (many more remained unreported), causing millions in maintenance repairs within the United States.

Duke Energy Battles Copper Theft

In 2006, Jim Mehring, Duke Energy Kentucky's general manager of substation engineering, said, "We are seeing a marked increase in the number of break-ins at our substations. In addition to financial impacts, this has created safety and reliability concerns for Duke Energy." In Greenville, S.C., in July 2006 a man trying to steal copper from a Duke substation was electrocuted with tools and wire still lying near the body.

Background

Duke Energy takes copper theft seriously and has become a leader in preventing copper bandits from impacting the company's operations. Prevention begins on Duke's website on a page titled "Copper Theft: It's Dangerous and It's Illegal," which informs people of the problem and asks for help in reporting the crime. Duke has invested heavily to find solutions to deter copper theft, including projects in closed-circuit television (CCTV), access control and guard services. While various approaches helped, they were too cumbersome and expensive to deploy beyond a few critical locations. In addition, traditional surveillance using CCTV and DVRs were not as effective as expected. Clayton Kemp of USA Security Group explains: "CCTV enabled Duke to watch re-runs of the crimes committed the previous day. We watched hours of videos of intruders and never had what we needed to identify and prosecute perpetrators."

Installing CCTV cameras means running wire—lots of it—for most installations, pushing installation costs higher than the equipment itself. In an effort to reduce installation costs and simplify deployment, Duke considered wireless solutions, but they wouldn't work in the noisy substation environment.

Duke Finds a Solution

Duke had been working with Clayton Kemp and USA Security Group based in Charlotte, N.C., to help design an affordable solution. USA Security has protected commercial and residential construction sites for more than seven years. Protecting construction sites involves securing remote locations, outdoor infrastructure and porous perimeters while still allowing multiple contractors the access they need—situations similar to Duke's substation environment. In summer 2007, as USA Security considered how to resolve Duke's substation security needs, Kemp discovered Videofied, a wireless video security system that had just won "Best of Show" for new products

at the largest security show in the U.S. Developed by RSI Video Technologies, Videofied is a wireless video system that reports video alarms over the cell network, requires no AC power and runs for months on a set of batteries.

Kemp explains how it works: "When an intruder trips the motion sensor, the integrated night vision camera takes a 10-second video and sends it over the cell network to our monitoring station where we immediately see what is happening and dispatch police."

Because the system is completely wireless, it could be installed anywhere in minutes instead of days. In its first

Go to http://uae.hotims.com for more information.

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install, USA Security was documenting cameras transmitting over 1,000 feet to the communicator panel which sent the video alarm over the cell network back to the station. According to Kemp, the solution worked because of superior wireless technology: 915 MHz and true spread spectrum, which is used in the U.S. military to deter jamming and give maximum range in hostile environments.

Duke ran into a problem, however, because its security problems were primarily outdoors and the Videofied camera was not weatherproof. Kemp describes how his company customized the cameras in an attempt to solve that problem: "We added silicone seals and a plastic hood and began experimenting with our 'outdoor' cameras in a few substations close to Charlotte."

A wireless video camera system keeps constant watch over a substation.

He soon found that the solution was more complicated than adding seals. Outdoor sensors need special filtering and electronics for immunity against sun and temperature extremes. The rising and setting sun caused false trips that sent unnecessary videos to the monitoring station.

"We simply had too many videos and false trips for this to be scalable with a large deployment," Kemp said.

USA Security discussed its field experience with RSI and learned that a new outdoor camera designed for harsh environments was being developed. Except for the harsh environment issues they identified, Duke was encouraged by the technology and installed several systems

to better understand the solution. The utility was convinced wireless was the way to go, and a 43-camera system was fully operational at a major substation less than six hours after the installers arrived. USA Security and Duke Energy then became one of the first test sites for the new outdoor cameras to prove whether they would perform as promised.

"We put the first outdoor cameras in the field in early December and knew that we finally had it—the solution that we all were looking for," Kemp said. USA Security Group worked to upgrade the existing systems with the outdoor cameras, and the results have been better than they had even hoped: no false trips and operation down to minus 20 degrees Fahrenheit.

Results

Has it worked? The short answer is, "Yes." Instead of crime reruns on DVRs, Duke now has apprehensions.

Clayton Kemp elaborates: "Within a few seconds from the time the intruder trips the camera, our operators are dispatching police and describing what they are seeing—virtual eyewitnesses. This is no longer 'just an alarm' but a crime-in-progress, and police are very motivated to apprehend criminals. We have videos of actual apprehensions on our website where you can see the thief carrying armloads of copper and then the police after they have apprehended him"

Local law enforcement is just as pleased with the system. Over the past several years they have been dispatched to numerous false alarms by blind security systems. Visual verification at the substations changed that because the dispatcher describes a crime-in-progress and what the police should be looking for. This kind of call has a higher priority than a standard alarm. Since installing the camera system, Duke has four apprehensions and the system has proved to have a significant deterrent effect. The word has hit the street that Duke substations with the Videofied solution are no longer an easy target. The results are so significant that Kemp is now busy designing several standard kits for various sized substations and facilities.

System Enhancements

Utility companies each have developed processes and systems that are unique to them. USA Security is now busy creating options to adapt the Videofied solution so that existing processes don't need to change. This primarily is focused on two issues: arming/disarming the system and monitoring.

Because utility facilities are so varied, often there is no universal access control system. A proximity card may be used to enter distribution centers, while a lock and chain may be all that is required to access a remote substation. The

traditional keypad arming station is often too cumbersome to implement. Simply distributing and managing the disarm codes can be difficult. Kemp and Duke Energy developed a custom disarming station that provides security but doesn't impact existing processes. USA Security places a small call box near the entrance of a substation or distribution center. Inside the box is a camera and instructions. The employee or contractor simply opens the box, triggering the camera to take a video of his face, and then dials the phone number listed inside the call box. This rings at the dispatch center where the contractor gives his name, employee number and the reason for his visit. All this is logged at the monitoring station. Based on the access rules for that site, the dispatcher can disarm the system and allow the contractor or employee to enter. Another option is installing the outdoor wireless proximity card reader on the chain link fence near the gate that arms and

A disarming system allows entry for utility personnel and approved contractors, but keeps copper thieves out.

disarms the system using standard MiFare cards or keychain fobs.

Kemp has also developed several ways to monitor the camera system. Duke Energy has outsourced the entire process to USA Security and their 24x7 monitoring center. The staff is trained to monitor utility environments and dispatch according to rules and processes set up by the client. Other utilities prefer to have the monitoring

done in-house. Kemp has responded by creating a "virtual monitoring station" in which the utility is given the ability to access USA's monitoring station via virtual private network (VPN) and be a remote operator at its own facility. A third solution is to actually duplicate the USA Security monitoring station within the utility. These options allow a utility to begin small and choose the way they wish to grow.

Conclusion

Duke Energy has found a security solution that it can quickly deploy to address copper theft and the risk it brings to Duke's infrastructure, especially its substations. The system delivers apprehensions, is affordable, is a proven deterrent and installs anywhere in a few hours. For more information and to view videos of actual incidents, see **www.usasecuritygroup.com** and **www.coppertheft.info.** «