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GRID, HEAL THYSELF

By **John Lowrey**

Electric co-ops are finding distribution system self-healing applications more flexible and affordable than ever

While there's plenty of disagreement about what makes up a smart grid, nearly every definition includes something about it being "self-healing."

However, Mark Stallons, president/CEO of Owen Electric Cooperative, Owenton, Ky., sees the term "self-healing grid" as a bit of a misnomer since an electric system doesn't physically repair itself (lineworkers do that) but, rather, reconfigures to minimize an outage. The co-op is developing three self-healing projects—including one at a substation serving about 2,800 members, 800 of whom live in several large residential subdivisions at the end of a 15-mile feeder.

"Reliability from this substation has been less than desired given the rugged and wooded terrain that our lines must run through," acknowledges Stallons. "Our

self-healing effort there is directed at boosting reliability and delaying more costly improvements."

On two distribution feeders from the substation, the co-op will install Cooper Power Systems (cooperpowereas.com) intelligent vacuum reclosers with fault indication and communication capabilities. "Logic based software will talk with the reclosers and our Supervisory Control and Data Acquisition [SCADA] system to obtain information necessary to fix a circuit by locking out the faulted area and automatically restoring service to members beyond the faulted area,"

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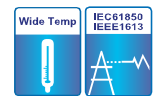


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Stallons reports. “We expect restoration times of less than five minutes—we could improve that by investing a lot more money in faster communications and more sophisticated software. However, if we had to dispatch a line crew to the faulted circuit, it would take them an hour to get there, plus the time needed to locate the fault, correct the problem, and restore power or perform switching.”

Stallons notes that communication links remain a major hurdle, especially in rural areas. The co-op has investigated fiber, microwave, radio, digital subscriber line, and cell carrier options. In this particular region, only cellular service was viable.

Peter Stenborg, project manager-feeder automation for Cooper Power Systems, contends self-healing requires thorough study and likely a mix of communications technologies. “While 60-second restoration times are adequate to satisfy most consumers, in some special cases—like certain industries or medical facilities—equipment-based peer-

to-peer solutions that reconfigure in cycles may be required.”

One drawback to peer-to-peer systems, though, involves use of proprietary protocols and IEDs (intelligent electronic devices) from specific vendors. “Off-the-shelf software packages are available for simple two-source and single-consumer systems,” Stenborg relates. “Cycles reconfiguration for more complex setups may require custom software scripting with a project lead time of four to six months and high labor costs.”

Fortunately, self-healing solutions are easier to use, more flexible, and more affordable than ever. “Improved software, like Cooper Power Systems Yukon Feeder Automation, now allows self-healing automation to become a process, with expansion and modification year to year,” Stenborg remarks.

Chris McCarthy, manager-product management, automation systems division for S&C Electric Company (S&C; sandc.com), argues that self-healing distribution automation doesn’t have to be expensive or complex. “Our IntelliTEAM platform for peer-to-peer grid self-healing has been used in thousands of situations. It can be applied for small deployments or to address specific

reliability concerns and can consist of just a couple of switching devices.”

S&C’s IntelliTEAM SG marks the third generation of the firm’s self-healing software package, which also includes the IntelliRupter PulseCloser. To complete the series, S&C has developed SpeedNet Radio, a secure mesh-based network. “Together, these products lay the foundation for future distribution operations, which will become increasingly dynamic as more small renewable and energy storage systems are brought on-line,” McCarthy mentions.

Dixie Electric Membership Corporation (DEMCo), based in Baton Rouge, La., worked with S&C to bolster reliability for consumers living in nearby Killian. “DEMCo was able to drastically improve its service with an automatic transfer configuration—a system with three SCADA-Mate CX Switches,” explains McCarthy. “Installation of the IntelliTEAM system with SCADA-Mate CX Switches and 5801 Controls at another DEMCo project dubbed ‘FedEx,’ due to the proximity of a FedEx office, greatly improved reliability for a high-profile business district.”

Frank Sublett, director of sales & marketing for Efacec Advanced Control Systems (Efacec ACS, efacec-accs.com), believes electric co-ops should consider a model-driven approach when it comes to grid self-healing. “You can then use any vendor’s switches and devices, multiple feeders and substations can be incorporated, and the system can be expanded to respond to multiple events on the same feeder. The downside, of course, is the need for distribution system modeling and frequent model maintenance and updates.”

To remedy some model-driven difficulties, Efacec ACS developed the Centrix System, which can be shaped like a peer-to-peer solution. “It provides the benefits of a model-based scheme at a much lower cost,” Sublett says. “You can even add other feeder optimization applications to the same platform.”

At Oklahoma Electric Cooperative in Norman, Okla., Engineering Manager Patrick Grace raised reliability for a medical facility with two reclosers, two IEDs, and two radios. The IEDs are located a mile apart and fed by separate feeders. In constant communication through the radios, the system automatically switches in seconds.

“I would recommend integrating this with a SCADA system to make sure everything runs properly,” Grace comments. “However, don’t promise too much to your members. Self-healing will not eliminate blinks or service interruptions. But they will become less frequent and shorter in duration.” ■

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