# LINE SENSING MAKES SENSE

## BEYOND OUTAGE MANAGEMENT

The archaic expression "trip the light fantastic" is still used today to describe dancing. It also comes to mind when thinking of a tool line crews have used since the Big Band Era to locate faults during an outage.

Faulted Circuit Indicators (FCIs) date back to 1948 and even today most FCIs essentially act as a beacon, lighting up when a fault trips a breaker and serving as a visual cue to line crews trying to locate the problem.

The next generation of line sensors offers an opportunity for utilities to go beyond outage response and gain insights for monitoring power quality and guiding preventive maintenance.

"Intelligent line sensors are a big opportunity for the utility. They more accurately pinpoint faults, and also provide information for analyzing the circuit and assessing distribution grid health," says Anthony Hawkins, Solutions Product Marketing Manager at Landis+Gyr. "As part of a larger distribution automation and grid analytics program, they are a cost-effective way to get great information."

While the first FCIs required visual inspection by utility personal, integrated communication capabilities have been available for many years. What's changed today is the added intelligence that, combined with two-way connection to smart grid networks, provides value to the utility on a daily basis.

Line sensors, like the S610 line sensor from Landis+Gyr, provide measurements of fault current, direction and magnitude of the fault. This allows the utility to pinpoint fault location quickly to significantly reduce outage duration. This benefit is captured in the System Average Interruption Duration Index (SAIDI) performance metric used by utilities to measure reliability performance. SAIDI is calculated in minutes and many utilities report this index to their regulatory agency. A five percent reduction in SAIDI can equate to hundreds of man-hours and associated cost savings for the average utility.

Additionally, these sensors capture high-resolution waveform measurements and offer interval load logging to help diagnose conditions on the line that could cause or contribute to future outages. For instance, if a tree branch occasionally brushes a line without causing a fault, the waveform of this event can be captured and used to locate similar events on all monitored circuits so crews can address the problem before a fault happens. Using analytics to drive this type of preventive maintenance can greatly reduce operating costs as well.

The harmonic and power quality data available from the sensor can essentially replace a power quality meter on critical customer accounts, such as government buildings, data centers and hospitals. What's more, line sensors collect power quality measurements on a circuit serving multiple customers, not just a single critical customer.

These same capabilities make line sensors invaluable for monitoring the impact of residential solar installations on a circuit. The logging capability of the sensor—delivering real-time circuit load, conductor temperature and direction of flow—provides insights into how these distributed resources impact the grid. A large number of renewables on a circuit could have an adverse impact on grid reliability if backflows disrupt protection equipment. The ability to track and analyze this data throughout the day can aid a utility in developing mitigation strategies.

"An intelligent line sensor serves multiple roles in a larger network, in addition to being crucial for outage restoration," says Hawkins. "The information delivered on an ongoing basis can be used in conjunction with sensing data from other points on the system to analyze the circuit in depth and realize immediate benefits in reliability and operational efficiency."

The evolution from yesterday's FCI to today's line sensor showcases another way utilities are modernizing the grid by adding intelligence and connectivity to legacy applications. And the results might even cause a lineman to dance. ■