In The Field

Storming Back When the Poles Are Down

EPRI and Exelon Investigate Sensors to Speed Up Storm Restoration

By Chris Warren

Electric utility customers who have experienced a power outage during a storm are familiar with the scene that unfolds when the winds, rain, and snow subside. Fleets of bucket trucks and crews of linemen fan out to repair damaged poles and power lines to get the lights back on as quickly as possible.

While utilities typically have detailed storm response plans, a lack of knowledge about grid conditions can slow restoration.

“We first send out damage assessment crews, and they drive around to find and record damage,” said Alexandra Ryder, an engineer with PECO, a division of Exelon that serves more than 1.5 million electric customers in southeastern Pennsylvania. “It’s time consuming, but after a bad storm, it’s one of the few ways to find out where we have downed poles.”

To reduce such delays, EPRI is developing and testing pole-top sensors that can quickly alert utilities to downed or damaged equipment in distribution systems.

“We want to develop a sensor that could be attached to distribution poles, crossarms, and power lines that can report back damage information immediately,” said EPRI Engineer Jason Anderson. “This can enable quick damage assessments and guide where to stage crews and locate spare parts for repairs.”

Adapting Technology Used in Smartphones

In recent years, utilities have increasingly deployed sensors on distribution systems to monitor various parameters. In 2015, EPRI’s Distribution Research Program began to modify sensors developed by EPRI’s Transmission and Substations Programs to monitor pole movement.

EPRI researchers adapted accelerometer technology used in mobile phones to detect changes in orientation and rotate the screen as necessary. “In our sensor, the accelerometer can detect a change in the orientation of a pole, crossarm, or conductor,” said Anderson.

EPRI is designing the device to integrate with a utility’s communications system and alert operators when a pole, crossarm, or conductor falls. The sensor is designed for easy installation and a 15- to 20-year lifetime. Laboratory tests have demonstrated that the sensors can reliably detect downed poles and conductors.

Field Testing at 3 Exelon Utilities

In 2016, Exelon installed 80 sensors at sites at PECO, ComEd, and Baltimore Gas and Electric. They are being monitored continuously for 15 months to get a better idea of how the sensors can be used in the field.

Ryder wants to learn more about optimizing the sensors’ configurations, which may vary depending on their location.

“The threshold for when the pole sensor sends an alert will be different from the threshold for the conductor sensor, because the conductor sensor may have times during a windy day when it moves but is not damaged or downed,” she said. “The pole will not move much on a windy day unless it has been downed.”

Ryder also wants to assess how often the sensors send false alerts.

After 15 months, Exelon and EPRI will examine the data and evaluate the sensor's benefits and capabilities. EPRI will continue to refine the sensor's design to reduce its cost—which remains a big hurdle to widespread deployment.

Ryder believes that the sensor could make a big difference in how quickly PECO can get the power back on. "For a large-scale storm, we think that this could help shave significant time off of restoration," she said.

Field tests of similar sensors are beginning at Ameren's Technology Applications Center and Pepco Holdings, Inc.

Key EPRI Technical Experts

Jason Anderson