Mid-South Synergy Uses DFA Technology to Avoid Outage and Reduce Wildfire Risk

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Mid-South Synergy Electric Cooperative (MSEC) avoided a significant outage and reduced other risks, including potential wildfire ignition, by using Distribution Fault Anticipation (DFA) technology to discover a detached conductor lying directly on a wooden crossarm. Conventional technologies did not alert MSEC to the problem.

MSEC is one of seven utility companies participating in the Texas Power Line-Caused Wildfire Mitigation project, a field demonstration supported by the Texas legislature. As part of that effort, MSEC has instrumented ten circuits, primarily long, rural circuits, with DFA technology. Each is fitted with a single, substation-installed DFA device, which detects faults, failures, and other events along the circuit's length and automatically reports them to a central master station server computer for access by personnel.

Latent power line conditions can cause recurring faults. Some such conditions are influenced by weather conditions, such as wind and moisture, and cause faults only intermittently. Such conditions are difficult to discover with conventional technologies and can exist for days or weeks without notice.

Like most utility companies, MSEC applies automatic circuit reclosers at multiple locations along long circuits. A recloser clears temporary faults by tripping a section of line, waiting a few seconds, and then reclosing to restore service. These momentary interruptions successfully clear most faults and minimize customer outages and unnecessary patrols.

On 15 January 2017, a fault on one of MSEC's DFA-instrumented circuits caused a single momentary trip/close operation of a recloser. A similar fault occurred the next day. No members experienced outages or reported "blinks," and no conventional technology alerted MSEC of a problem requiring attention.

While reviewing events on the central DFA master station, MSEC personnel noted the two events and observed that they appeared unusual and similar to each other. The circuit is a long, rural line with 109 miles of exposure. MSEC used DFA-provided fault parameters, in conjunction with their existing circuit model software and remote polling of line devices, to dispatch a line crew to patrol a specific portion of the circuit. There the crew identified the cause of the problem, a line conductor displaced from its normal position on an insulator and lying on its wooden crossarm. As shown in the photograph above, the crossarm had substantial charring.

An outage at this location would have interrupted 138 members, all of whom would have been out of service for the full time needed to dispatch crews, locate the problem, and make repairs. Other potential consequences would have included a burned off cross arm, a broken conductor, and multiple mechanisms capable of igniting a fire. Key to avoiding the consequences was the DFA-enabled ability for MSEC personnel to learn of the problem, which in turn enabled them to investigate and make proactive repairs.

DFA technology enables a utility to manage its power distribution system better, by providing awareness of line conditions and events not detected by conventional technologies. Each substation-installed DFA device monitors circuit currents and voltages continuously, via conventional CTs and PTs. DFA devices use embedded pattern-matching software to characterize and report electrical events, including events not detected by conventional means. DFA devices report line events to a master station server, which provides access to reports from the system-wide fleet of DFA devices. DFA reports conventional faults and also events that have not yet caused faults or affected customers. Awareness of adverse events and conditions enables preemptive action, directed repairs, and condition-based maintenance. No technology can detect all problems, but DFA provides a quantum step forward in the detection and diagnosis of many failures and incipient failures.

DFA technology was developed by Texas A&M Engineering, in collaboration with the Electric Power Research Institute, Inc. and is offered commercially by Texas-based Power Solutions, LLC.