Sam Houston EC Uses DFA Technology to Detect and Locate Failed Arrester

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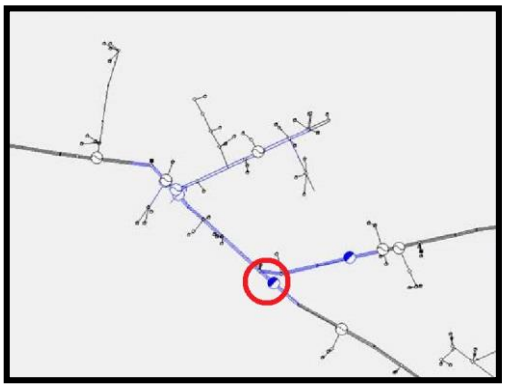
May 2016

Sam Houston Electric Cooperative recently used Distribution Fault Anticipation (DFA) technology to detect and efficiently locate a failed lightning arrester, enabling its replacement. Failed arresters can reduce a line's surge suppression capability, affect service reliability, cause future short circuits, and create a risk of wildfire ignition. The Cooperative learned of the failure only from DFA, not from any conventional technology.

Sam Houston EC is one of six utility companies participating in the Texas Power Line-Caused Wildfire Mitigation project, a field demonstration effort supported by the Texas legislature. As part of that effort, Sam Houston is instrumenting ten distribution circuits, primarily long, rural circuits, with DFA technology. DFA instrumentation of a circuit consists of a single, substation-installed DFA device, which detects and warns of faults, failures, and other events along the length of the circuit.

During a storm on 30 March 2016, one of Sam Houston EC's DFA-instrumented circuits experienced a short-circuit fault. The Cooperative's conventional circuit protection properly detected the fault, tripped the circuit, and then reclosed two seconds later to restore service. Like most utility companies, Sam Houston utilizes automatic circuit reclosing to clear most faults without sustained outages for their customers.

Conventional systems detected and cleared the subject fault and notified the Co-op's dispatch center that the event had occurred, but indicated nothing more serious than a temporary fault. Temporary faults are common during storms and often require no utility follow-up, so system operators ordinarily would have had no reason to take action based on this fault and reclose. DFA recorded the electrical signature of the fault and the response of the protection system, but it also enabled diagnosis of the likely cause of the fault: a failed lightning arrester.



DFA technology enabled detection and efficient location of a failed arrester not detected by conventional systems.

Knowing of arrester failures is important because a failing arrester can expel superheated fragments capable of igniting combustibles. A failed arrester also can leave detached pole-top components energized and free to swing and contact other pole-top apparatus, resulting in future faults and potential ignition events.

The circuit in question is a long, rural circuit with multiple branches and 120 total miles of primary line. Upon receiving DFA-based notification that the likely cause of the fault was catastrophic failure of a lightning arrester, the Co-op used DFA-generated parameters, along with their electronic circuit model to predict the location of the failed arrester. A Sam Houston EC crew was dispatched with instructions to target a specific portion of the circuit, looking for a failed arrester, which they found with minimal time and effort. Absent DFA-based notification, there would have been no compelling reason to investigate the temporary fault, and consequently the failed arrester would have remained undiscovered.

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 systemwide 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.

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

Headquartered in Livingston, Texas, Sam Houston Electric Cooperative serves more than 71,000 consumers in ten counties. Sam Houston is installing DFA technology on ten distribution lines in conjunction with the Texas Power Line-Caused Wildfire Mitigation project.