HEADLINE: DOE Pursues Automation in West Virginia Lab

By Elizabeth McGowan

Hakan Inan can envision a day in the near future when electric utilities will be able to find and isolate faults, then restore service—in record time and without human intervention.

His goal is to create a model for automating the process of locating a fault and reconfiguring the feeder. And in utility circles, it's considered very tricky because nobody has yet perfected the process, even though the hardware and software have become available during the last several years.

Hakan Inan, is an electrical engineer for Science Applications International Corporation, providing support to the NETL Modern Grid Strategy Program through Research and Development Solutions, LLC, is experimenting with this technology in Morgantown, W.V., as part of a Developmental Field Test initiated by the Modern Grid Strategy team. It's a collaborative effort between the Department of Energy's National Energy Technology Laboratory and Allegheny Energy, an investor-owned utility with electrical generating facilities in the Mid-Atlantic.

As it stands now, line crews can spend hours tracking down, diagnosing, and repairing faults on distribution systems. But movement toward a Smart Grid on the automatic fault location and remote feeder configuration front could change that dynamic.

"By installing a distribution automation system, this could all be done in under a minute," Inan notes. "It will be a huge improvement in reliability of the circuit."

"This technology is out there for transmission and distribution lines," Inan continues. "It's not rocket science. The focus was always on the transmission network. Nobody was looking at distribution-level technologies because they didn't think that was the main issue."

What Inan is describing is what the Modern Grid Strategy describes as the "self-healing" part of the Smart Grid. That is one of seven attributes Department of Energy officials have assigned to their definition of a Smart Grid.

So, what exactly does this Smart Grid distribution automation system look like? As always, interoperability is a factor. First, it's vital for a utility to select a communications system capable of retrieving data from the distribution automation system as well as other technologies installed, i.e., Advanced Metering Infrastructure (AMI). That way, the system can "read" the fault locator device and deploy fault location technology on the distribution system.

This Smart Grid system also requires three other steps:

- Putting automation hardware called a remote terminal unit (RTU) into each substation where the recloser or circuit breaker is located and at each switch location

- Installing automated switches that can be remotely controlled, so each circuit can be split into any number of zones
- Making sure every switch location has a fault sensor that can detect a fault

Ideally, when a fault occurs, the automation hardware will send the fault detection to the RTU in the substation. The RTU then “processes” all of that data and determines in which zone the fault is located. Once the problem is pinpointed, the new technology is able to restore power by “deciding” what action to take.

“Everything the system does is sent to the control center, so the operator can see what’s going on, and they can override the action if they want to,” Inan explains. He adds that this method is much faster than the current practice that requires field crews to manually isolate a fault by opening the switches around it, and then restoring power by switching to another circuit.

Testing at the West Virginia demonstration project thus far shows that three switches per feeder is optimal for those circuits, Inan says.

“I don’t think there is a generic number of automated switches to be installed,” Inan says. “For every circuit, the needs will be different. But, there probably is an optimum number of zones and switches based on the feeder characteristics (load type, feeder length, customer per mile)”