

Michigan Utility Modernizes Electricity Delivery and Provides Improved Service to Customers

With \$83.8 million in funding from the U.S. Department of Energy's (DOE) Smart Grid Investment Grant program (SGIG), Detroit-based DTE Energy (DTE) has been able to significantly increase the scope of its smart grid technology deployment. By July 2012, DTE has installed 725,000 smart meters as well as distribution automation devices at 11 substations and on 55 circuits. DTE is able to provide its customers with better service and enhanced reliability due to the new technologies. Operational efficiencies and savings from smart meters and distribution automation technologies have exceeded DTE's expectations. "Our business model with smart grid technologies is to hold down prices for customers. Thanks to the impressive savings, we have not needed to pass any of the installation costs on to our customers," says Jim Hull, DTE's SGIG Program Manager.

System Operations and Customer Service Taken to a New Level

The installation of 725,000 smart meters—covering approximately one-third of DTE's customers— and their integration with the utility's operations have resulted in significant efficiencies. For example, in the first seven months of 2012, truck rolls were reduced by 76,000, resulting in an estimated \$1 million in operational savings. Meter read success rate has improved from 96% to approximately 99.5%, and smart meter read accuracy has been 100% so far.

DTE's customers are also seeing direct benefits from the new meters and other smart grid devices. Automated meter connect/disconnect capabilities enable the utility to restore electric service to disconnected accounts within minutes of receiving a request to do so. Participants in a pilot project received in-home devices, such as programmable communicating thermostats and in-home energy use displays, which enable customers to be better informed about their energy use and have more control over their utility bills.

In the portions of DTE's service area that have new distribution automation devices, customers are seeing faster system restoration after outages. "This past summer we had a power outage caused by concurrent cable failures. With the new distribution management system analysis capabilities and remotely controlled switches, we were able to restore service within 30 minutes, instead of the eight hours it would have taken with the old technologies," explains Heather Storey, Manager of DTE's Smart Circuits Program.



DTE is deploying triple single reclosers on the overhead circuits to isolate faults and remotely monitor current and voltage. The devices allow system supervisors increased ability to perform remote circuit switching to reduce outage time.

Overcoming Technical and Institutional Challenges

While the newly installed smart grid technologies have resulted in many benefits, deploying the new devices and systems has not been without challenges. Like most other utilities, DTE underestimated the volume of data generated by the new technologies and the impact this data has had on information technology (IT) needs. DTE has partially addressed the challenge by adding to DTE's IT system capacity. In addition, DTE worked with its vendors to improve the speed and performance of their products. For example, a new bus architecture—the systems that transfer data between different IT components—developed by DTE's IT vendor increased speed approximately tenfold compared to the old architecture. "This was a cost-efficient solution for us. At some point in time increasing system capacity by simply adding more hardware becomes cost-prohibitive," explains Tony Melton, DTE's IT Portfolio Manager.



SCADA-enabled meters and relays at the substation feeder positions provide fault location information and real time voltage and current monitoring. The information is used by system supervisors and engineers to keep the system operating within required limits.

How to achieve proper system integration has been another IT-related challenge that has entailed tradeoffs for the utility. Rather than directly integrating the various interfacing systems, DTE connects the different applications in a less comprehensive manner. When the applications are not directly integrated, it is easier to make changes to one part of the system without impacting other affiliated applications. This approach also allows DTE to switch from one application vendor to another if the incumbent's pricing is no longer competitive or its product does not otherwise meet DTE's requirements. The less comprehensive integration of applications, however, can affect system performance.

Rolling out new technologies has created institutional challenges as well. Equipment inventories need to be in place for both old and new technologies, and extensive training is needed to ensure that utility personnel at all levels understand both the new and old technologies. Change management has been particularly difficult in the distribution system operations area. Because the new technologies are deployed in a small portion of the distribution system, only a limited number of operators are able to gain first-hand experience with the new devices and systems.

DTE has learned some practical lessons along the way. "If you are implementing a cellular network for smart meters, you should involve your telecommunication company early on and make sure they understand your system and what your requirements are. When our telecommunications network

provider took cell towers down for maintenance during our meter reading window, not having accurate and timely billing data wreaked havoc for us,” Melton says.

Security Is Paramount

Cybersecurity has been among the fundamental considerations for DTE when deploying the new smart grid devices. Early smart meters and other devices did not always meet DTE’s security standards. This has been an industry-wide issue, and DTE and other utilities have worked with vendors to provide devices that meet industry specifications for cybersecurity.

Determining how the various in-home devices connect to home area networks (HANs) and smart meters was among the early important decisions that needed to be made. DTE determined that it would not allow just any device to connect directly to the HAN. Instead, the utility chose a gateway solution to enable in-home devices. The gateway is a separate piece of equipment that facilitates and controls the connection between an in-home device and the HAN. This method of connecting devices provides the utility with better security and control, but it makes device installation more complicated and requires a broadband connection in the home.

Melton points out that security is an ongoing issue: “In the real world, threat models are continuously evolving. When you have over a million end-points out in the field, making sure your system is secure is not an easy task.”

SGIG Project Lays Foundation for Additional Capabilities

DTE completed the installation of smart grid devices under its SGIG funding by the end of July 2012. Due to the project’s success, DTE will continue smart grid deployment over its entire service territory. The utility plans to install smart meters for all of its 2.1 million residential and small commercial customers in the next four to five years. In the distribution system, DTE will determine on a case-by-case basis what level of automation is appropriate for each area. DTE also intends to build a global data warehouse to enable data mining and analysis to improve its business operations.

The new devices also offer capabilities DTE has not yet fully utilized. In the future, DTE expects to take advantage of the voltage monitoring capabilities of its smart meters. There are some engineering challenges to using this capability, but DTE has an incentive to finding solutions because many of its small industrial customers want information about their own power quality. In the distribution system, DTE is using the new devices for Volt/VAR optimization. Down the road, DTE will look at implementing voltage reduction schemes, which can be used to offset generation.

Learn More

The American Recovery and Reinvestment Act of 2009 (Recovery Act) provided DOE with \$4.5 billion to fund projects that modernize the Nation’s energy infrastructure and enhance energy independence. For

more information about the status of other Recovery Act projects, visit www.smartgrid.gov. To learn about DOE's Office of Electricity Delivery and Energy Reliability's national efforts to modernize the electric grid, visit www.oe.energy.gov.



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