



Reliable private
wireless network
for smart grid
applications

HITACHI
Inspire the Next



Case study

DTE Energy

 **Hitachi Energy**

DTE ENERGY'S SMARTCURRENTS PROGRAM

- **Project location:** 7,600 square miles in Detroit, Michigan, and surrounding areas
- **Applications:** AMI, DA, substation automation, outage management, SCADA
- **Project scope:** 3.6 million gas and electric meters, 3,000 primary DA devices, 500 automated switches, 70 electric distribution substations, and the largest solar power generation station in Michigan



Background

In 2010, DTE Energy, the energy provider to 2.2 million customers in Southeastern Michigan, received a US Department of Energy Smart Grid Investment Grant to help fund 50% of its \$168 million SmartCurrents program. The program aimed to modernize DTE's electric grid, improve distribution system reliability and efficiency, and empower electric customers with more information about their power usage.

The utility selected solutions from Hitachi Energy and Itron to advance the initiative, and by 2012, DTE had installed 725,000 of Itron's smart meters and a complementary network communications architecture from Hitachi Energy Wireless, covering approximately one-third of DTE's customers. This resulted in almost \$1 million in savings from significant efficiencies, including almost 80,000 fewer truck deployments and a smart meter daily read of 99%. Simple manual meter read errors were now eliminated with the automated remote daily read feature.

Project expansion

Due to the program's initial success, DTE continued smart grid deployment over the next four years, expanding the rollout to include wireless connectivity to more than 70 electric distribution substations and the largest solar power generation station in Michigan.

The expanded smart meter capabilities enable DTE to provide, among other things, automated meter connect/disconnect of 3,000 to 5,000 meters per day. Additionally, DTE implemented advanced distribution applications and Hitachi Energy's Network Manager supervisory control and data acquisition (SCADA) platform, with the goals of reducing outage time and better managing distribution power flow and peak power.

The final phase of the distribution automation efforts across DTE's coverage area – 3.2 million meters in 7,600 square miles – was completed at the end of 2016. Notably, the DTE deployment of Hitachi Energy's Wireless technology is the largest wireless mesh network in the world.

Putting the network to the test

In March of 2017, the effectiveness of the distribution automation (DA) efforts was tested when a storm with 70 mph winds left nearly 800,000 customers without power – more outages than any other time in DTE's history.

By design, the self-healing wireless mesh technology embedded in the communication network was able to work around downed lines and poles to continually read the meters and provide additional data essential in pinpointing outages, making field deployment far more efficient than in previous years.

To determine restoration progress and how many customers remained without power, the electric advanced metering infrastructure (AMI) meters were automatically queried by the system four times per day, providing frequent customer power status updates. These AMI data points were used to analyze, update and refine outage management system (OMS) data to automatically update the OMS-fed outage maps, prioritize restoration activities and align resources. This reduced the average restoration time by an estimated one to two days.

In fact, power was restored to 90% of customers within four days of the storm.

This exceeded DTE's response goals and earning the utility neutral to positive comments in mass media and on social media.

Moreover, after the wind storm, a cold front moved into the service area, and the utility was able to use AMI technology to determine whether self-identified critical medical care customers and those on the senior rate had power. If not, DTE employees performed a "well visit" check and provided information about nearby warming centers. Hundreds of these visits were performed during the course of the storm.

A private network to enable the future

Also in 2017, DTE started the process of moving away from 3G cellular and toward a wholly-owned private network in support of a smarter grid strategy for the next five years, anticipating the installation of thousands of smart grid devices.

Hitachi Energy's private wireless mesh technology currently supports AMI backhaul and distribution automation but has the capacity to support other smart grid applications, such as mobile workforce automation, that the utility will be taking advantage of to continue providing efficient, reliable service to customers. Currently, over 70 electric substations, over 500 automated switches and over 3,000 primary DA devices are connected within the wireless network, and the utility will be adding other types of SCADA applications to the network.

DTE's utilization of Hitachi Energy's private mesh communications network and Itron's solutions are a significant leap in grid modernization and automation innovation – bringing more intelligence to the grid while increasing customer service and satisfaction.

Over the course of the SmartCurrents program rollout, the benefits to DTE and its customers have been evident every step of the way. It's the start of an aggressive investment plan that will develop a modern grid capable of meeting the needs of the 21st century economy and provide a template of success for the power industry as a whole.

Overcoming challenges

While the newly installed smart grid technologies have resulted in many benefits, deploying the new devices and systems has not been without challenges.

Early in the program, the team was challenged by dense urban geography with limited access to poles due primarily to underground rather than overhead electric distribution construction. DTE engineers were able to initiate design innovations using available facilities or partnered facilities to help remedy the issues.

Also, DTE's service territory has a fairly dense tree canopy that negatively impacted RF signal propagation. The combination of using the Hitachi Energy products' multiple frequency bands, alternating network device installation periodically on different sides of the street, and utilizing traffic intersections for device placement created reliable successful communication these areas.

A further early design challenge was the placement of the network device in the exact location as engineered, rather than possibly a few poles away in the general area. Installation triage crews used washable paint to pre-mark the poles chosen by engineering, which reduced the line crew installation time as well as improved the accuracy of the field placement.

DTE and Hitachi Energy worked together on product enhancements, such as the addition of GPS to devices to increase the accuracy of the device placement as well as signal theft or other issues if the devices begin to travel within an area without a corresponding issued work package.

Like most other utilities, initially DTE underestimated the volume of data generated by the new technologies and the impact this data has had on information technology (IT) needs. By 2012, DTE had 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, such as a new bus architecture.

How to achieve proper system integration had been another IT-related challenge that entailed tradeoffs for the utility. DTE decided against comprehensive system integration, keeping the various systems separate in an effort to be able to isolate changes to one part of the system without impacting other affiliated applications.

With extensive planning and phased deployment, DTE has been able to mitigate more critical challenges. While there are always lessons to be learned, DTE's measured approach has offered peace of mind via prevention.

BIG RESULTS

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