



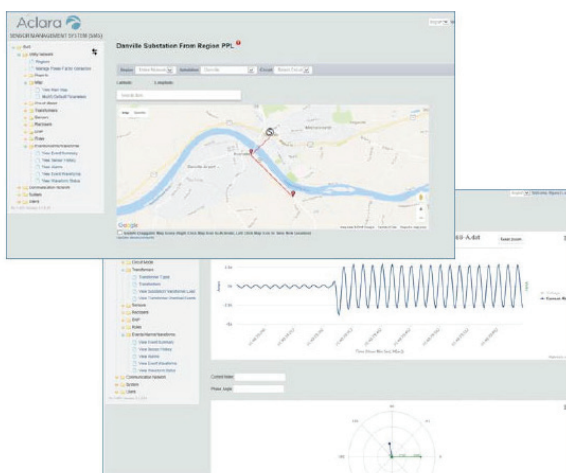
Case Study

Smart Grid Sensors Integration

Detroit, Michigan, U.S.A

Headquartered in Detroit, Michigan, DTE Energy (DTE), is one of the nation's largest diversified energy companies delivering electricity to 2.1 million customers.

Electric utilities often don't monitor their substations, simply because retrofitting with today's Supervisory Control and Data Acquisition (SCADA)-based monitoring solutions is costly and takes years to plan and build. Implementing traditional substation monitoring requires sophisticated engineering, including the use of remote terminal units (RTUs) with new conduits, wiring to relays, potential transformers (PT) and current transformers (CTs). Engineers must schedule outages to de-energize feeders, which also takes time and may only be possible during low usage periods. Once the physical work is complete, the utility has to program and integrate all the equipment into a complex IT architecture, which is a significant and daunting technical challenge for many utilities.



"We needed the ability to modernize and monitor our network in an affordable way and effectively utilize our resources to improve restoration time..."

Richard Mueller
Director of Metering and Conservation for DEP.

BUSINESS CHALLENGE

Over the last few years, DTE proactively worked to modernize its power grid, continually improving systems and process to provide more reliable service to its customers. For instance, to continue development of a cleaner, balanced energy mix, the company recently invested in an industry-leading project to build the largest solar park east of the Mississippi river. In 2014, DTE undertook a project for the Clinton Global Initiative (CGI) with Aclara. Under this collaborative program, the companies aim to evaluate the economic and environmental impact of using Smart Grid Sensors with Predictive Grid® Analytics software to avoid power outages.

SOLUTION REVIEW

The Aclara distribution monitoring platform is made up of software-defined, inductively - powered (battery- free) Medium Voltage (MV) Sensors and Sensor Management System (SMS) software with Predictive Grid® Analytics. Once data is collected by the sensors, it is communicated to the SMS software, allowing the system to classify network events and monitor grid conditions in real-time.

Where deployed, the Aclara solution instantaneously provides SCADA-equivalent visibility to network operators, and provides great flexibility and value during emergency situations. During a heat wave in the summer of 2015, a major fire at one of DTE's substations resulted in the loss of power to more than 10,000 customers. DTE had to perform switching to safely restore power to customers without causing additional faults or damage due to overloads. While engineers reconfigured the system, it was vital for DTE to be able to access load information. Fortunately, DTE had already deployed Aclara's Smart Grid Sensors in a section of the distribution network as part of an on-going project for the CGI program and was able to quickly deploy additional sensors to allow operators to monitor the system's loads and portable distributed energy resources in near real-time.

"Aclara's sensors are fast and flexible enough to deploy in time critical situations, like the one we faced back in the summer of 2015. Within hours, and using only two line crews, we had the situational awareness we needed to make informed decisions on the best way to manage the emergency and restore power to our customers."

Richard Mueller
Director of Metering and Conservation for DEP.

This successful business case prompted the company to deploy additional Aclara sensors for its unmonitored substations. At a fraction of the cost to deploy SCADA, DTE decided to leverage the Aclara sensor data by integrating with its ABB Tropos wireless network architecture across its entire system.

HOW IT WORKS

The DTE Energy system architecture (figure 1) comprises of Aclara's SMS software, the PI System from OSIsoft for capturing and managing grid and sensor data, an ABB DMS/EMS/SCADA system, and an in-house developed mobile map which shows sensor and AMI outage information which can be displayed on mobile data terminals. A corporate enterprise service bus (ESB) simplifies and manages messages and access through the various applications.

ACLARA GRID MONITORING INTEGRATION AT DTE ENERGY

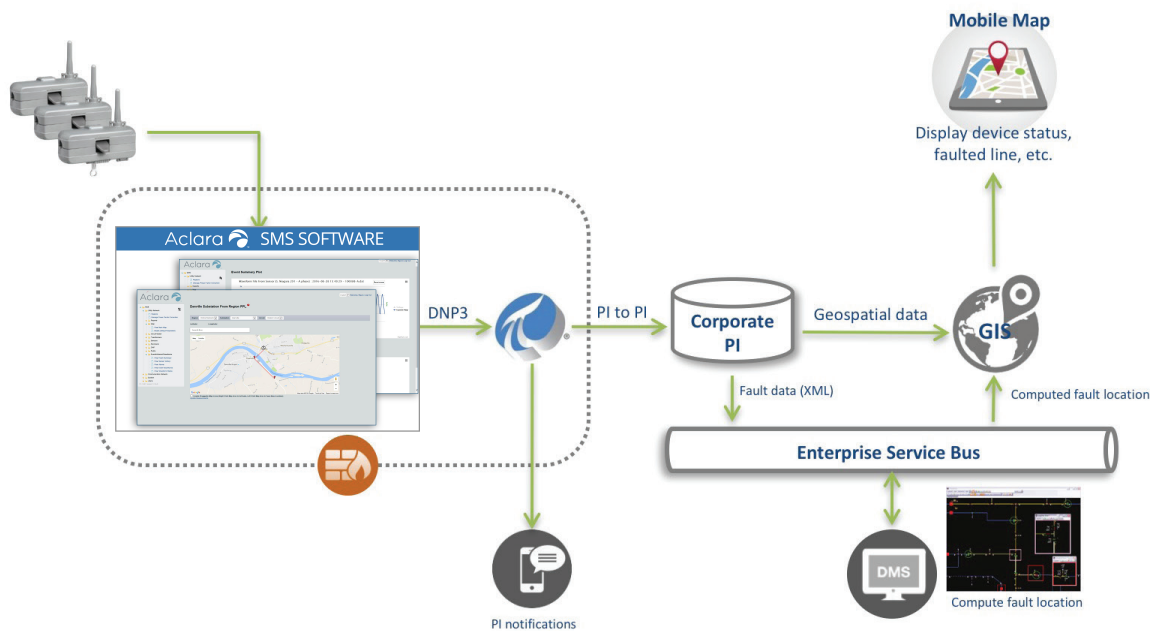


Figure 1 - Aclara Integration

Aclara sensors data transition through three core message delivery paths in the system:

STEP 1:

For capturing the Aclara sensors information, DTE uses a dedicated OSIsoft PI System for the sensor and other smart grid projects. This PI System leverages DNP3 integrity polling and unsolicited messages to extract analog values, status and fault data from the line sensors. The system captures, processes, and stores the data, which enables distribution engineers to review historical circuit loading and events. Other systems, such as OMS, as well as in-house reports and web pages, use the data to analyze power outages.

DTE's PI System implementation provides the operators using the EMS in the system control center with a succinct visualization of the data provided by Aclara sensors, together with information from aggregated devices on different phases (figure 2).

In parallel, it allows DTE's control center, field engineers and electrical workers easy access to the fault data, power status and load, through their mobile devices. The DTE developed Mobile Outage map (figure 3) displays the Smart Grid Sensors' fault and power status and load, through their mobile devices. The map also displays (figure 3) the sensors' fault and power status per phase with a colored icon and also provides detail on the loading data and activity history for the linemen.

This map allows users to easily compare the sensor fault data with the AMI last gasp data. DTE's vision is to fully integrate the Aclara sensors with a future Advanced Distribution Management System ADMS that includes the OMS. The ultimate goal is to be able to communicate fault location and isolation information to crews so that they can isolate and restore customers as quickly as possible, and then provide an accurate estimate of the fault location.

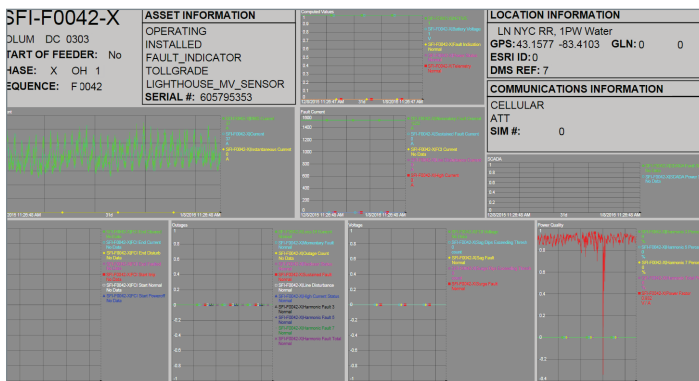


Figure 2 - OSIsolt PI System screens for Aclara sensor data

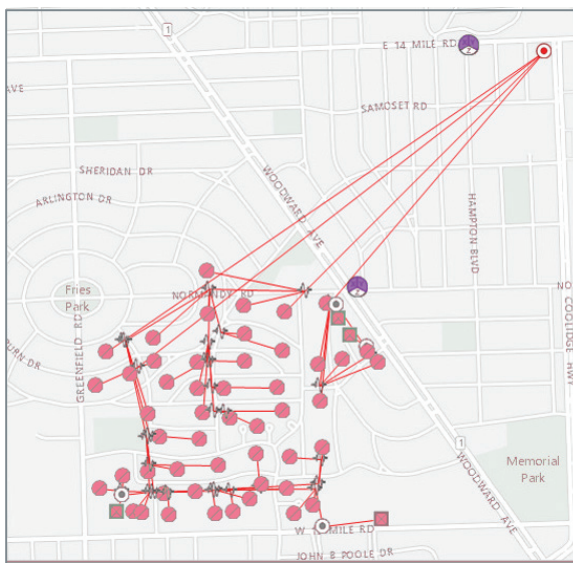


Figure 3 - Aclara's sensors integration into the CMS system

STEP 2

The second interface between the smart grid PI System and the corporate PI System ends loading, fault and power status data to the EMS/SCADA system over ICCC for real-time display in the system control center. This allows control center operators to quickly determine any loading limitations during maintenance or emergency switching. They can also use the sensor data to verify that the correct sections of line are energized/de-energized when initiating remote switching commands over SCADA or communicating with field crews.

STEP 3

The third interface triggers when a fault occurs and the PI System sends data over the enterprise service bus to the DMS fault location program to analyze the data and help identify the particular area of the system impacted by the power outage. Work on developing this capability is under way and expected to be in service by year end.

In addition to this path of the delivery system, DTE is working on the design of a new interface to send detailed fault waveform data to its power quality system. This will allow their distribution engineers to further analyze the specifics of the event and compare this against devices such as relays and reclosers.

BUSINESS JUSTIFICATION

Thanks to its substation monitoring application, the Aclara distribution monitoring platform now allows DTE to accurately predict and resolve problems on its distribution network. Furthermore, the ease of integrating the Aclara platform with other complex systems supports DTE's field engineers, and expands the usefulness of the sensor data for different departments, including:

"When a power outage occurs, the Tollgrade sensor data will be combined with our SCADA information from other substation and pole-top devices to refine the FLISR fault locations and isolation actions."

Richard Mueller
Director of Metering and Conservation for DEP.

BUSINESS JUSTIFICATION

Thanks to its substation monitoring application, the Aclara distribution monitoring platform now allows DTE to accurately predict and resolve problems on its distribution network. Furthermore, the ease of integrating the Aclara platform with other complex systems supports DTE's field engineers, and expands the usefulness of the sensor data for different departments, including:

- **Predictive Grid Analytics** – In a preventative capacity, Aclara's SMS software collects and automatically analyzes fault waveform and momentary information to identify the fault type and potential root cause. This allows engineers to predictively eliminate hazards before they cause outages.
- **Current Load Monitoring** – Provides circuit level monitoring for loading, power status, and fault information. DTE deploys sensors at the start of the circuit allowing receipt of real-time loading data and alarms from non-SCADA circuits.
- **Fault Locating** – Sensors can be deployed at specific locations beyond the start of a circuit, such as disconnects and pole top switches that do not have SCADA control. The line sensors can also be used to determine fault locations and sources of momentaries.
- **Protecting and Monitoring Key Account Customers** – DTE uses Aclara's inductively powered sensors to monitor key customers such as industrial facilities, allowing engineers to immediately respond to power quality concerns or damage complaints.
- **Emergency Deployment of Distributed Generation** – By strategically locating sensors on a circuit and utilizing Aclara's high current alarm settings, DTE can trigger notifications that drive the start/stop and output change decisions needed to operate portable diesel generators. This can reduce outages by preventing overloading conditions on connected equipment.



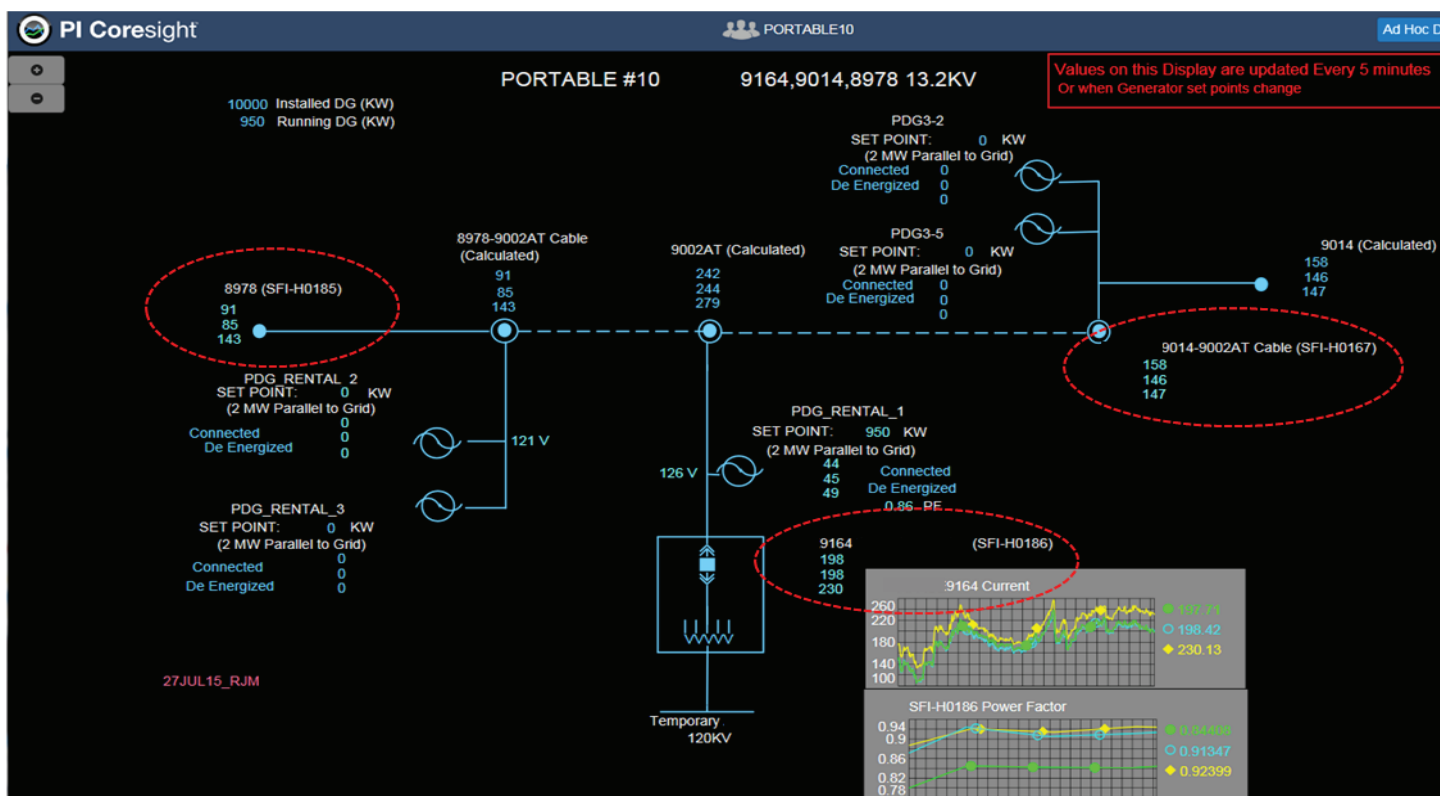


Figure 4- OSIsoft PI System screen for emergency generation

The ability to integrate Aclara's platform with existing control systems provides utilities, such as DTE, with an efficient and cost-effective solution to monitor their grid assets and circuits for loading and fault indications. In addition, it is also a much faster and more economical monitoring solution than traditional SCADA.

This approach will facilitate DTE's move to a condition-based maintenance program giving it the ability to prioritize engineering repair budgets and manpower more efficiently.

"We needed the ability to modernize and monitor our network in an affordable way and effectively utilize our resources to improve restoration time, the Aclara sensors provide a way to quickly deploy monitoring at many locations."

Richard Mueller
Director of Metering and Conservation for DEP.

Aclara Technologies LLC is a world-class supplier of smart infrastructure solutions (SIS) to more than 780 water, gas, and electric utilities globally. Aclara SIS offerings include smart meters and other field devices, advanced metering infrastructure and software and services that enable utilities to predict and respond to conditions, leverage their distribution networks effectively and engage with their customers. Aclara Technologies LLC is owned by an affiliate of Sun Capital Partners.

Visit us at Aclara.com, phone 800 297 2728 or contact us at info@aclara.com and follow us on Twitter @AclaraSolutions.