CASE STUDY
AUTOMATION

S&C ELECTRIC COMPANY
Excellence Through Innovation

Automation Without Communications Improves Utility's Reliability

S&C Featured Solution: Overhead Grid Automation

Location: Wisconsin and Iowa

Customer Challenge

Alliant Energy, an investor-owned utility whose territory spans both Wisconsin and Iowa, was dealing with two troublesome areas near the southern border of Wisconsin.

The first was Lake Geneva, a famed lakeside resort destination with Victorian-era mansions tucked into forested hills. While the scenic landscape attracted a steady stream of vacationers, the heavy forestation made tree trimming and system maintenance difficult, often resulting in poor power reliability. One substation was also problematic, with frequent issues causing 1.6 million customer-outage minutes annually. That zone of the city alone totaled more outages than 12 other zones in Alliant's footprint. When the power went out, outages lasted 6.2 hours on average. Alliant considered a new substation as a possible solution. However, the residents and the local government opposed the idea, fearing the additional substation would destroy the town's picturesque reputation. Another option included burying electric lines underground, but that proposed $2 million project was deemed cost-prohibitive.

The other challenging area was Janesville, another older Wisconsin community blanketed with mature trees and residential properties commonly fenced around their perimeters. Power tended to go out a couple of times a year, with each outage debilitating various commercial areas, banks, grocery stores, and a 1,600-student high school. The foliage in the area was so dense that SCADA systems weren't properly communicating, making it difficult to locate and resolve outages. Alliant's team would have to patrol lengthy feeders, a process made difficult by the fenced-in homes obstructing access to backlot lines. On average, restoring power to customers would take four hours.

These two areas' long-duration outages were costing Alliant significant maintenance expenses, and residents were growing frustrated by the power interruptions. Something had to be done.

S&C Solution

For years, Alliant had deployed S&C auto-restoration devices throughout its Wisconsin service territory. When S&C launched the IntelliRupter® PulseCloser® Fault Interrupter, Alliant looked into the three-phase device. It liked that IntelliRupter fault interrupters test for faults using PulseClosing® Technology, which uses 95% less energy than a conventional recloser—so they reduce the impact on the system when testing for faults. Because this technology is so precise, more devices can be placed on a line than with conventional reclosers, resulting in further sectionalized feeders.

"We've set goals at Alliant for improving reliability, and S&C's IntelliRupter PulseCloser Fault Interrupter is a critical tool in our 'grid-modernization toolbox.'"

–Joe McGovern
Director of Electrical Engineering Planning & Services, Alliant Energy

S&C's IntelliRupter® fault interrupters automatically helped segment feeders, hunt down faults, and isolate faulted segments.

If a fault is permanent, fewer Alliant customers would experience an outage. That's because the IntelliRupter fault interrupters would react immediately to locate and isolate the fault within these small sections of line, using the devices' automatic loop-restoration feature to restore power around the outed segment from nearby spare capacity.

IntelliRupter devices can also operate in fault-finding mode, where a small pulse hunts down faults without the need for communications, enabling devices to isolate the faulted segment and restore power to customers around it.

Because this method of distribution automation is not dependent on communications, Alliant viewed it as an attractive solution for areas such as Lake Geneva and Janesville, where dense forests and rolling hills block most SCADA signals and make any form of communications an expensive, unreliable option.

Alliant was particularly drawn to the PulseClosing Technology because it may take multiple pulses to find a fault, but the pulses' impact is minimal enough that even cumulative pulses wouldn't damage its equipment. Upstream customers also wouldn't be affected by the voltage sags common with conventional reclosing.

In Lake Geneva, Alliant ultimately opted to install six IntelliRupter fault interrupters to bring the 2,000-customer circuit down to 400 to 500 customers between each device. In Janesville, Alliant added three IntelliRupter fault interrupters to feeders, sectionalizing lines down from 2,500 customers per segment to roughly 800 to 900.

To prepare both territories, the S&C and Alliant teams met routinely for planning discussions and device training, and the S&C team conducted an overview course for field crews at Alliant's affected service centers.

Valued Outcome

Alliant was pleased with the performance of the solution S&C developed for both communities. In Lake Geneva, the IntelliRupter fault interrupters' first three operations alone saved 1,579 customers from outages and 385,758 outage minutes. To date, the devices have contributed to an overall 90% increase in reliability, dropping the average duration of their outages from 374 minutes to 34.5 minutes.

During Janesville's first event involving the IntelliRupter devices, a sub-breaker went into lockout, and the fault interrupters brought 2 MW of load back to 912 customers briefly left without power. In total, this saved 74,784 outage minutes as well as significant crew time that otherwise would have been spent patrolling lines to restore power. The devices operated again a few months later, bringing power back to another 912-customer segment in less than two minutes.

An IntelliRupter fault interrupter installed in Lake Geneva's wooded territory.

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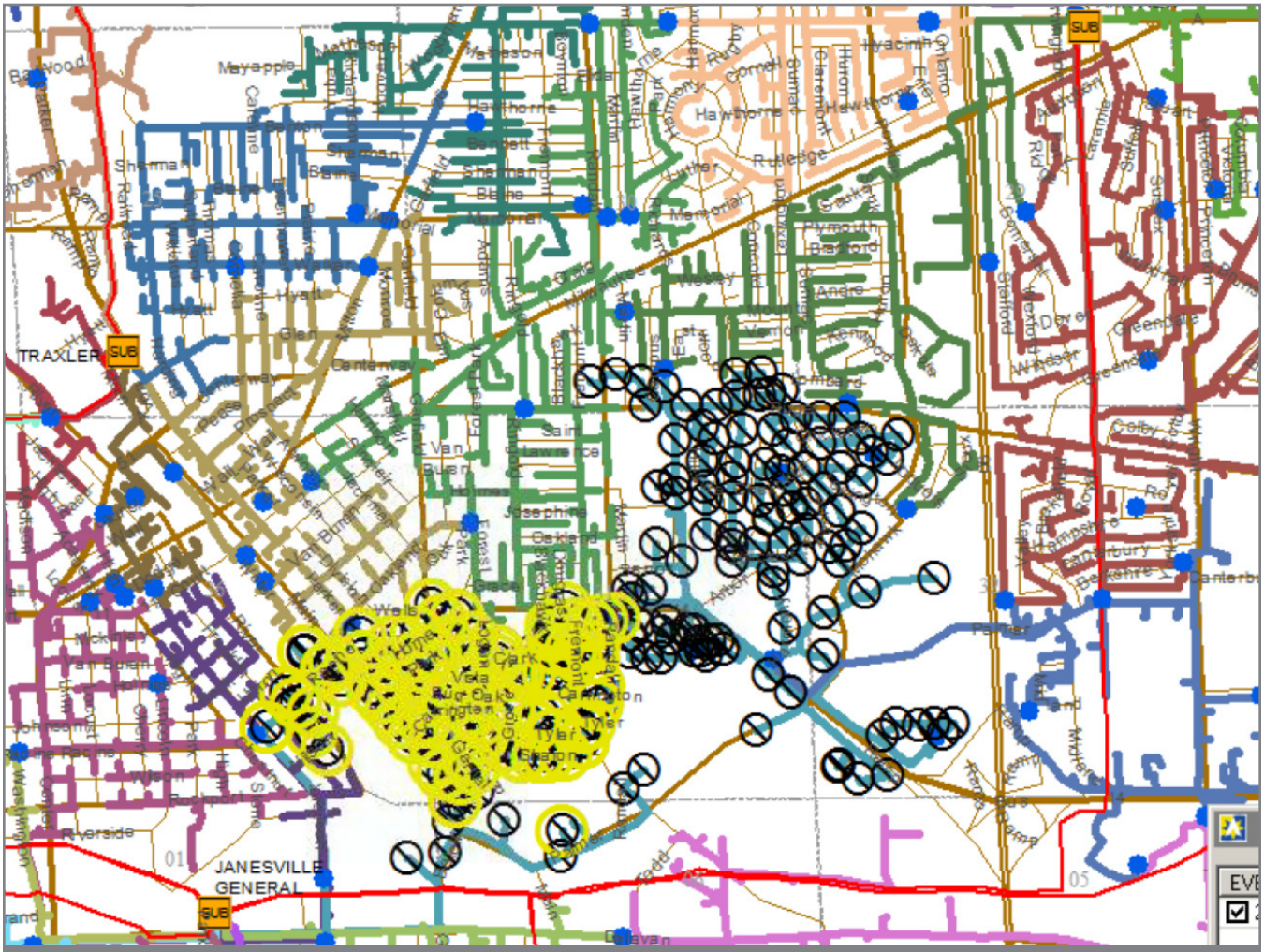
These reliability improvements were possible even without the investment in and complications of a communications network. Alliant successfully coordinated up to six IntelliRupter fault interrupters in a series, and these schemes worked without any of the devices communicating.

This strategy enabled Alliant to defer costs while affording it the flexibility to enhance its system later. As communications offerings improve, Alliant can revisit communications when more advanced platforms can better meet the needs of the challenging terrain and even integrate them with the existing IntelliRupter devices.

Alliant has seen such an immediate and significant impact from the IntelliRupter fault interrupters, the utility plans to install more units throughout its 54,369-square-mile service territory, especially in the Wisconsin Dells, where loads can spike an additional 5 MW in the summertime, when vacationers settle into the area's campgrounds.

Alliant has set companywide goals for continually improving power reliability, and it has identified the IntelliRupter fault interrupter as a critical tool for its grid-modernization objectives.



An outage map showing Janesville customers out of power (in yellow) and where IntelliRupter fault interrupters restored power (noted in black).

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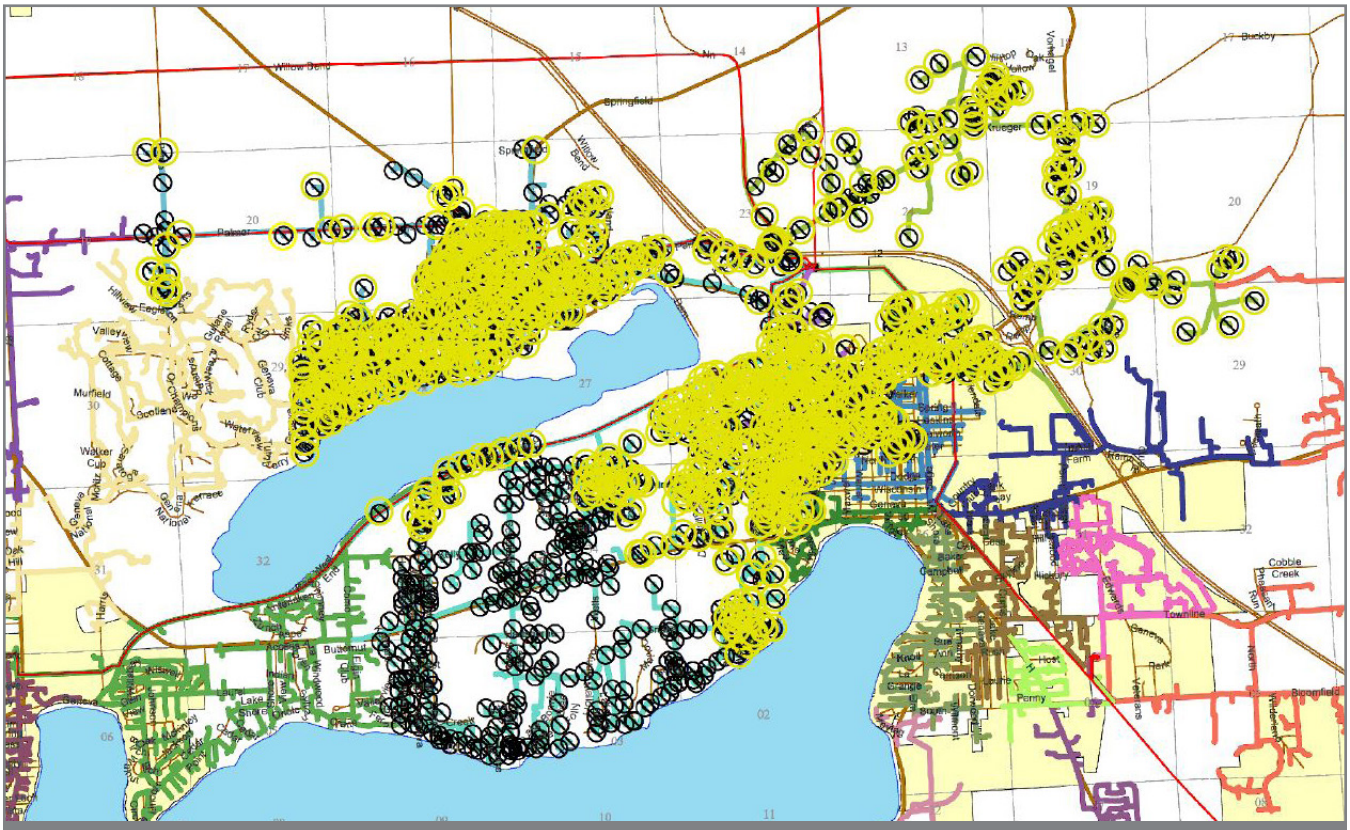

An outage map shows where IntelliRupter fault interrupters returned power to Lake Geneva customers (noted in black).

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