

Customer Success Story: Carroll Electric Membership Corporation (EMC)

Market segment
Utility



Eaton helps Carroll EMC reduce annual outage duration by 24 percent with intelligent grid automation

Location:

West Georgia

Segment:

Utility

Challenge:

Accommodate steadily growing customer base with improved service and streamlined grid maintenance

Solution:

Eaton's Yukon™ Feeder Automation software leveraging real-time data to detect distribution system disturbances and automatically reconfigure the system for significant reliability improvements

Results:

Establishment of a dynamic self-healing grid with intelligent automation software and electronic devices supporting a remarkable 25 percent reduction in average outage duration

"One of our primary goals was to implement a feeder automation solution that would provide us with complete management over control schemes so we could easily adjust the system to grow alongside the needs of our infrastructure."

James Layton, Vice President, Engineering and Technology at Carroll EMC

Background

Carroll Electric Membership Corporation (EMC) is a not-for-profit, consumer-owned business that distributes electricity to approximately 51,000 accounts across Carroll, Haralson, Heard, Paulding, Polk, Troup and Floyd counties in western Georgia.

While retaining its rural farm heritage, the utility now serves many of the new residential subdivisions and commercial areas outside of metro Atlanta. The cooperative's vast service area covers more than 5,300 miles of distribution line with 25 distribution substations. Through this infrastructure, Carroll EMC supports ever-increasing electrical demand from its growing rural, urban, suburban and commercial membership base.

Challenge

Carroll EMC's electrical distribution system is designed, constructed, maintained and operated to maximize reliability at a reasonable cost for its customers. However, with a quickly growing membership and expansive service area, it can be a difficult and time-consuming process to manually respond to system outages.

The cooperative determined that faults to three-phase feeder main circuits contributed significantly to the overall outage durations experienced by many customers throughout the year. If Carroll EMC could find a solution to isolate these faults on the three-phase main circuits and quickly restore service to the unfaulted sections of the same feeder, the utility would achieve a dramatic improvement in overall grid reliability.

To address this challenge, the cooperative began to examine the implementation of feeder automation software to isolate impacted circuits, quickly identify outage locations and minimize the impact of grid interruptions. Eaton's Yukon Feeder Automation (YFA) software immediately became a front-runner for the grid modernization project. Carroll EMC found value in the platform's ability to provide a flexible and scalable architecture that would simplify integration to improve system performance in less time than competing solutions.

Additionally, Eaton's YFA software could operate both integrated with or completely independent from the supervisory control and data acquisition (SCADA) system,

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which would allow Carroll EMC to upgrade its legacy SCADA system in the future without impacting its ability to reduce outage times during the transition period.

“One of our primary goals was to implement a feeder automation solution that would provide us with complete management over control schemes so we could easily adjust the system to grow alongside the needs of our infrastructure,” said James Layton, Vice President, Engineering and Technology at Carroll EMC.

“In order to reduce complexity and costs, we also wanted to ensure the new grid automation technology could operate seamlessly with our legacy equipment from many different manufacturers. Eaton’s YFA software was able to meet both of these goals.”

Many of today’s distribution automation solutions have limited functionality or require complex third-party engineering. Following installation, these systems are often difficult to modify as a result of limited configurability or the need to re-contract with the original engineering vendor. As a result, both vendors and utilities tend to approach feeder reconfiguration as a “project” rather than an “integrated process.”

Addressing this issue, Eaton’s YFA software allows users to easily add and remove devices using a standardized interface without reprogramming of reconfiguration algorithms. The number of sources and switching devices that can be automated is only limited by the physical load flows of the power system and communication infrastructure.

Further, virtually any existing control and standard communication protocol can be integrated into automation systems, eliminating the need for additional hardware or protocol converters. The YFA software ensures compatibility with existing legacy controls and the next generation of controls to provide a solution that not only helps utilities meet the demands of today, but also the challenges of tomorrow.

Solution

YFA software is one of Eaton’s grid automation solutions and leverages real-time data to detect distribution system disturbances and automatically reconfigures the system for significant reliability improvement.

The software enables utilities to perform service restorations in as little as 30 seconds in order to significantly reduce customer outage times and system reliability indices such as SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index).

Additionally, a simulator, communications dashboard, and post-event traceability built within the YFA platform allow users to turn distribution automation into an integrated process driven by real-time data. These robust, standardized tools empower utility engineers to easily change automation settings in minutes rather than months by eliminating costly custom programming and “trial and error” debugging.

YFA software also maintains a complete log of each device operation and changes in device status. During any event, the steps are traced through each automation logic decision with supporting preprogrammed logic comments for actions based on available data. All entries are time- and date-stamped and can be synchronized with device sequence of event (SOE) records.

“It is vital that we’re able to fully understand the events that occur across our electrical distribution system in order to continually improve the quality of our service,” explained Layton. “With YFA software’s detailed event logging, we can easily investigate and audit the events that occur across our entire service area from one centralized location, which mitigates the need for our staff to expend valuable time and labor during field investigations.”

Carroll EMC employed a scaled deployment process for its new feeder automation system and the intelligent electronic devices (IEDs) that support real-time monitoring and control; Phase I of the project resulted in 70 installed

Deployment Strategy

-  • 350 consumers or more
-  • 3 miles of line
-  • Schools
-  • High Traffic areas

190 automated devices



devices and Phase II incorporated approximately 120 devices to culminate in a total installed base of 190 devices.

To support efficient training and operation, Carroll EMC created a hands-on training facility that simulates real-time grid conditions and demonstrates how its employees can utilize Eaton’s YFA software to quickly identify isolated circuits in the event of an outage, pinpoint the outage cause and optimize recovery processes.

Results:

With Eaton’s YFA software and more than 190 intelligent electronic devices installed, Carroll EMC has established a modern distribution automation system that can automatically isolate damaged distribution network sections in order to restore power to as many members as possible until repairs can be made.

Carroll EMC calculated that the YFA system saved on average, over 34 minutes of outage time for each customer when major storm are excluded, and over 54 minutes of outage time when major storms are included during calendar year 2018. This represents a reduction in outage time of 24%, both including and excluding major storm events.

With its new YFA software in place, Carroll EMC has not only dramatically advanced its outage response and management capabilities, but is also utilizing Eaton’s grid automation solutions

to improve:

- Fault management:
 - Carroll EMC can now quickly detect and isolate faults so that unaffected load sections can be restored via feeders.
- Voltage management
 - YFA automatically detects loss of voltage situations and can isolate those line sections from the feeder, so that the unaffected sections can be restored.
- Load management
 - The cooperative can continuously monitor and track historical loading on the system to prevent overload events.
- Ease of modification
 - Through scalability features inherent in YFA software, Carroll EMC can easily add and remove devices using a standardized interface without the need to reprogram reconfiguration algorithms.

“In the past, we required an entire crew of personnel to manually isolate an impacted circuit and restore service,” continued Layton. “Thanks to our newly implemented YFA software, all stages of the outage isolation process can be completed automatically and from a central location, which is truly revolutionizing our approach to managing outages and improving service for our members.”

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