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Case Study

Siemens RUGGEDCOM solutions and training enable utility to install advanced metering system with "total reliability" in Florida's hurricane alley

Case study at-a-glance

Customer: Kissimmee, Florida's Kissimmee Utility Authority (KUA) serves nearly 80,000 customers, with new high-tech customers coming on line and forecasts for residential growth.

Challenge: Design and build an AMI network to better serve customers, improve service reliability and provide capacity for future distribution system applications.

Solution: Build a fiber-based AMI network reviewed by a trusted advisor and long-time partner, which also provided a network management system supported by robust switches and routers.

Results: In less than a year, KUA designed and installed a fiber backbone and AMI system that will serve Kissimmee's current needs and future applications for decades.

Kissimmee is a mid-sized city in central Florida, just south of Orlando and its famed amusement parks. From its ranching roots in the early 1900s, Kissimmee evolved to a more tourism-based economy in the late 20th century.

Today Kissimmee welcomes new high-tech businesses, with a new research park established at Kissimmee Gateway Airport and a microprocessor plant underway. A medical district is being developed. Annual residential growth of two percent is expected to grow its current population of 72,000.

Although Kissimmee is evolving, its location presents perennial challenges. Winters generally are mild and sunny, but summers in this subtropical climate can be extremely hot and humid. Kissimmee is subject to tropical storms and hurricanes from Hurricane Alley in the Atlantic Ocean and Gulf of Mexico. In 2004, the city was hit by three consecutive hurricanes.

Kissimmee Utility Authority (KUA) provides electric power to 80,000 customers across Osceola County's 17 square miles, including the new businesses and facilities dependent on reliable service.

As with many electric utilities across the nation, KUA decided that the installation of interval (aka "smart") meters and advanced metering infrastructure (AMI) would provide several advantages.

Interval meters read electricity consumption in 15-minute intervals, which enables KUA to provide customers with near-real time, online information on their energy use. That improves the utility-customer relationship and creates opportunities for KUA to help customers manage energy use and save money.

AMI also enables automated meter reading, which eliminates labor-intensive meter reading and its transportation costs and pollution. It allows system operators to turn on and off service from a central location, for speed, efficiency and safety. AMI provides end-of-line voltage readings, so KUA can identify problematic feeders on its power network. When a specific customer loses power, interval meters inform KUA of the cause and location, speeding service restoration at lower cost – a real advantage in central Florida.

Challenge: Design and build an AMI network to better serve customers, improve service reliability and provide capacity for future distribution system applications.

KUA's challenge was to design and build a redundant, fiber-optic ring around the county with dual operations centers to support reliable AMI functionality. For cybersecurity, the AMI network had to be "air gapped" (functionally separate) from the Supervisory Control and Data Acquisition (SCADA) system used for KUA's power grid. The AMI system would need an underlying data network foundation based on switches, routers and a network management system with proven reliability and cybersecurity designed in. One key requirement: sufficient capacity for future applications, including distribution automation.

KUA explored technical options and vendors, but too many relied on cellular service, one of the first services to suffer in a storm. KUA's location-based challenges dictated that it rely instead on a fiber optic ring around its service territory.

Though KUA staff designed the desired fiber network, they needed a trusted advisor to review the design, provide both hardware and software to implement the system, test it and train KUA staff to manage it. So KUA sought a relationship with a trusted advisor whose deep expertise in optimal network performance, troubleshooting and training would lead to a successful project.

KUA had worked successfully for more than a dozen years with Siemens on its SCADA communications network that monitored and controlled the utility's power grid, so a trusted advisor was already in place.

"Siemens has supported our original SCADA system for 12 years," said Jim Harnois, KUA's SCADA communications manager. "We've had zero downtime in our 24/7 SCADA operations that entire time, through lightning strikes and storms. We have yet to lose a unit."

Harnois designed a fiber-based AMI network to run independently of his SCADA network for KUA's power grid because the AMI solution "talked" to a cloud service; cybersecurity for the power system dictated an "air gap" between SCADA and AMI. If hackers infiltrated the AMI network, they could not disrupt electric service.

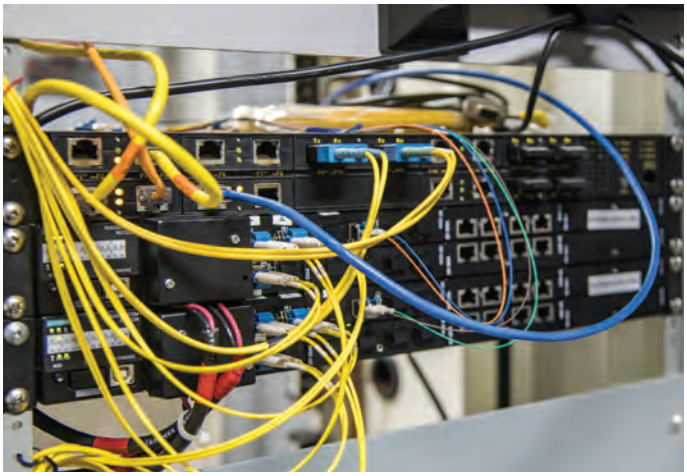
KUA's AMI network design called for a redundant fiber ring with a 10-gigabit capacity – far more than AMI required, but sufficient for two decades of customer growth and future applications such as distribution automation.

Solution: Build a fiber-based AMI network reviewed by a trusted advisor and long-time partner, which also provides a network management system supported by robust switches and routers.

Siemens' Professional Services listened to Harnois' explanation of KUA's needs, reviewed his AMI network design, and provided the latest version of its **RUGGEDCOM Network Management System** (NMS) supported by preconfigured switches and routers.

"I was really impressed with Siemens' Professional Services," Harnois said. "Because we've had such good training from Siemens in the past, we had the foresight to know exactly what we wanted in our AMI communication network. When we sent them our specifications, they were able to preconfigure the switches and routers to our precise needs."

In KUA's AMI system, the interval meters at customer premises communicate via a mesh network and deliver meter data to nearby data collectors that, in turn, transmit data to the network's fiber backbone. The data collectors rely on Siemens **RUGGEDCOM RST2228 switches** with Layer 2 cybersecurity protections, including Virtual Local Area Networks (VLAN). The RST2228s are modular rack switches with 10 GB uplinks.



RUGGEDCOM RS900-GP managed Ethernet switches enable PoE to surveillance cameras that monitor the data collectors. The RS900-GP offers 128-bit data encryption and dual fiber optic gigabit Ethernet ports to redundantly feed the network's fiber backbone and eight fast Ethernet ports to provide PoE to ancillary devices such as the surveillance cameras.

RUGGEDCOM RX5000 integrated switch/routers provide a high-port-density switching and routing platform with Layer 3 features and cybersecurity measures at each of KUA's twin, AMI data centers. The RX5000s route the entire system's data to the RUGGEDCOM NMS to enable human operators to view the network's assets, functions and status. The RX5000s also route AMI data to the cloud provider for analytics.

RUGGEDCOM NMS provides an enterprise-grade solution for monitoring, configuring and maintaining KUA's AMI system, critical to utility operators' visibility into their network, which enables accurate and timely billing for revenue assurance. The RUGGEDCOM NMS improves KUA's operational efficiencies, speeds system provisioning and preserves data validity. And RUGGEDCOM NMS supports multiple VLANs so that AMI, surveillance cameras and, in time, distribution automation applications can all run on separate network paths, providing operational flexibility.

Siemens' RUGGEDCOM switches and routers consistently perform with high Mean Time Before Failure (MTBF) in temperatures ranging from -40 to +85 degrees Centigrade (-40 to 185 degrees Fahrenheit), an unsurpassed level of immunity to electromagnetic interference and heavy electrical surges, vibration, moisture and dust. According to Harnois, temperatures inside field equipment cabinets in central Florida can reach 130 to 140 degrees Fahrenheit, which can render less robust equipment inoperable.

Results: In less than a year, KUA designed and installed a fiber backbone and AMI system that will serve Kissimmee's current needs and future applications for decades.

"Without Siemens Professional Services' training, I would not have been able to deliver the level of detail in our system specifications to their team," Harnois said. "But because of their training classes, I knew exactly what design parameters I needed to deliver. Siemen's onsite training is phenomenal," Harnois said. "I give it ten stars. That enabled me to install the entire 10-GB network in less than two days."

The roles of network consultants and systems integrators – often one of the costliest steps in network implementation – was eliminated, Harnois said.

> "Because we knew Siemens' solution would work for us, and with us, we saved time and money. The fact that we could sole-source all our network equipment also saved us considerable costs."
>
> Harnois

"Professional Services also commissioned the system, including setting up rather complicated firewalls on both the RX5000s and the enterprise side. They did a great job."

"In fact," Harnois added, "the RX5000 will handle 88 gigabits of data per second – that's a phenomenal amount of data."

The 10-GB AMI network backbone was completed in 2018 and the two Area Control Centers are running. The project's meter data management system is being prepared for action: over the next three years, KUA will install 80,000 interval meters at customer premises and its AMI system will handle the next challenge: big data.

Harnois said he expects a financial return-on-investment in five years as KUA's AMI system reduces operating and maintenance costs by cutting man-hours and truck rolls and service restoration is swifter and more efficient. Eventually, when the AMI system's data network enables distribution automation applications, KUA will automate some service restoration, minimize feeder losses and manage distributed energy resources such as solar power, which Kissimmee is promoting for its environmental benefits.

Looking back over the project, Harnois emphasized the value of reliability.

"The fact is, we need reliability," Harnois said. "From a utility and community standpoint, we try to be as cost effective as possible. But cost effective doesn't always mean the lowest-price solution. I advised the KUA Board of Directors to spend a little more money for a solution that provides total reliability and that's what we did here with Siemens."

Kissimmee's residential and commercial growth, including the addition of manufacturing and medical facilities that depend on reliable power, means that the city's future success is closely tied to and supported by a reliable grid and a reliable AMI system. KUA's new AMI system provides traditional revenue assurance and numerous hard and soft benefits. That's a value proposition Kissimmee can bank on.

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