

The background of the top section is a photograph of industrial equipment, likely a radio tower or antenna, with a white spherical antenna at the top. The Siemens logo is in the top left corner. An orange square with the word 'Reference' is on the right side of the image.

SIEMENS

Reference

Industrial Communication

Tri-County Electric Cooperative

RUGGEDCOM WIN base stations and subscriber units enable SCADA connectivity for rural substations and a mobile workforce.

The Oklahoma Panhandle is a sparsely settled region at 5,000 feet elevation, home to far-flung communities of ranchers and farmers who wrest a living from the high plains – if they have reliable electricity.

Like cooperative utilities elsewhere in the United States, the panhandle's Tri-County Electric Cooperative (TCEC) first energized its lines in the mid-20th century. Today, TCEC serves Oklahoma's Cimarron, Texas and Beaver counties, as well as adjacent parts of New Mexico, Colorado, Kansas and Texas states. Headquartered in Hooker, Oklahoma, TCEC serves 23,000 households and businesses in its approximately 5,500-square mile service territory.

Extreme weather and long distances pose a challenge to the provision of electric power on the high plains. TCEC manages nearly 5,500 miles of transmission and distribution lines in an area that routinely sees winter and summer temperatures range from below zero to well above 100° F. Ice build-up in winter and lightning strikes in summer can wreak havoc on TCEC's distribution system. Though Tornado Alley runs east of TCEC's service territory, the Oklahoma Panhandle still sees its share of potentially damaging twisters.

"Thunderstorms cause our most frequent outages, year to year," said Zac Perkins, TCEC's chief operating officer. "We get lightning hits and wind. Straight-line winds of 60-70 miles an hour can do a lot of damage to our equipment."

"Our biggest destructive threat is ice," Perkins added. "Ice causes catastrophic line sag and can snap poles for miles. Two of the most crippling storms in our history have been ice-related. In 2007 we lost 1,100 poles at a cost of \$15 million. Some of our members lost power for 30 days."

Apart from periodic, destructive storms, the daily operational challenge is distance. The region's 14 rural communities, outlying farms and ranches are spread far and wide. To serve its territory, TCEC sought a cost-effective, future-oriented solution to monitor and control SCADA networks in about 50 substations, spread over thousands of square miles (about 20 substations still lack SCADA.) In the SCADA-equipped substations, a legacy, two-way communication system delivered data inconsistently. It made little sense to invest further in it.

Challenge: For reliability, resiliency and efficiency, TCEC sought fixed and mobile wireless broadband connectivity to SCADA data at its widely scattered distribution substations and mobile workforce capabilities for operational efficiencies.

"We wanted a system that worked today and could be scaled for the future," Perkins said. "So we embarked

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on a one-time investment that would pay dividends over the years.”

Siemens partner Alpha Omega Wireless of Austin, Texas, advised TCEC that 2.5 GHz radio-frequency spectrum for the region could enable a WiMAX coverage zone thousands of square miles in size. The spectrum, owned by a major telecom carrier, was unlikely to be exploited commercially in the sparsely populated Oklahoma Panhandle. The carrier agreed to a 20-year, renewable lease.

Alpha Omega Wireless principal Joe Wargo envisioned that, with 2.5 GHz spectrum in hand, TCEC could strategically, cost-effectively position WiMAX 802.16e-compliant wireless base stations across its service territory. Each base station location, tied into TCEC’s microwave backbone could provide bi-directional communication between fleet vehicles and substations. WiMAX-enabled subscriber units, installed in TCEC’s service vehicles, could provide the wireless connectivity between field technicians and TCEC operations center. The resulting system would also accommodate TCEC’s advanced metering infrastructure (AMI) and be scalable for future functionalities, including substation surveillance video and distribution automation.

Alpha Omega Wireless’ favorable experience with the RUGGEDCOM WIN solution led it to recommend its implementation. TCEC’s success in obtaining 2.5 GHz spectrum enabled it to select RUGGEDCOM base stations and subscriber units, such as WIN7225, WIN7025, WIN5225-5-DC and WIN5125-5-DC for its substations and mobile workforce. Deciding factors included equipment’s robustness, reliability, range, security, standards compliance and future functionality.

Solution: The Siemens solution enabled a secure WiMAX hotspot across the Oklahoma Panhandle, connecting operators with dozens of SCADA-equipped substations, as well as empowering a mobile workforce and laying the foundation for future functionalities.

RUGGEDCOM WIN7025 and WIN7225 base stations, and RUGGEDCOM WIN5225-5-DC and WIN5125-5-DC subscriber units provide reliable wireless connectivity for mission critical SCADA networks in harsh environments. In fact, RUGGEDCOM WIN7025 and WIN7225 base stations meet global standards for reliability in harsh and challenging environments, including IEC 61850-3, which addresses electromagnetic interference (EMI), extreme temperature ranges and resistance to shock and vibration. The substation-based RUGGEDCOM WIN5225-5-DC and WIN5125-5-DC subscriber units meet the IEEE 1613 standard for error-free devices. This innovation is known as Zero Packet Loss™ technology, designed to provide the same level of EMI immunity, performance and reliability as mission-critical protective relaying devices.

“The robust nature of the [RUGGEDCOM] WIN base stations and the CPEs for our utility fleet was in fact one of the key drivers,” Perkins said. “We looked at other options as well. Other products had a lot of fancy stuff. But we needed a product that could ‘talk,’ reliably. It really came down to the fact that [RUGGEDCOM] equipment will last in adverse environments. It’s got to be resilient to be outdoors. RUGGEDCOM gear does what it’s supposed to do, when it’s supposed to do it. It doesn’t fail. It was a good fit for us.”

“The reason I chose the RUGGEDCOM solution over others was its robustness,” said Joe Wargo, principal at Alpha Omega Wireless.

“Unlike competing products, RUGGEDCOM base stations are built to withstand the harsh environment found in the Oklahoma Panhandle. And the RUGGEDCOM solution is the only one out there that can withstand the EMI endemic to electric power substations.”

“These base stations are out in blowing dirt, heat, cold and moisture,” added Travis Holdeman, TCEC’s metering and SCADA manager. “The reliability of the base stations means we don’t lose data. This must be one of the hardest places to build a system like ours, considering the environmental factors.”

A RUGGEDCOM WIN based WiMAX network enables leaps in efficiency for a sprawling, rural cooperative. The RUGGEDCOM WIN network composed of dozens of RUGGEDCOM WIN7025 and RUGGEDCOM WIN7225 base stations, with dozens of substations and a vehicle fleet equipped with RUGGEDCOM WIN5225-5-DC and WIN5125-5-DC subscriber units create myriad efficiencies.

“Our number one priority is to eliminate duplicate, unnecessary truck rolls, which represent a huge cost,” Perkins said. “Number two, tied to truck rolls, is the efficiency of time spent. The ability to process real-time data on the fly means that crews can address multiple work tickets in the field, instead of having to hand



off paper. Number three, by entering data in the field, it's digital and error-free. Now we have two-way communications between our corporate network, our operations center and our field crews."

"We're just seeing the tip of the iceberg on efficiencies," Perkins added. "The blanket connectivity enabled by the RUGGEDCOM solution is going to lead to unbelievable efficiencies. We didn't even have to run the numbers because you could see the advantages."

RUGGEDCOM WIN7025 and RUGGEDCOM WIN7225 base stations allow utilities to establish quality of service (QoS) by prioritizing mission-critical data traffic. RUGGEDCOM WIN gives the user the ability to separate traffic and application types over the air and guarantee latency, minimum bandwidth and jitter according to application needs.

"SCADA controls take the highest priority because operators are trying to open and close protection equipment," said Gina Horner, SCADA technician at TCEC. "Without a reliable communication network, you can't implement your controls, you can't talk to your protective relays and other devices. If your communication network is down, you're behind what's really happening in the field. So a reliable communication network is key."

"We've been relying on landlines to monitor SCADA," added Holdeman. "The reliability that results from being able to prioritize traffic is a big advantage. Now we get SCADA data 24/7 with prioritized traffic over the RUGGEDCOM network. This system is faster and more reliable than our prior system and data is pretty instantaneous now."

The RUGGEDCOM WIN solution is the leading utility-grade communication solution designed specifically for 2.5 GHz and it is scalable, laying the foundation for future functionalities such as distribution automation.

Though 3.65 GHz spectrum was considered for TCEC, radio signal propagation increases at lower frequencies such as 2.5 GHz, and TCEC wanted dedicated, licensed spectrum for reasons of security and noninterference from competing uses.

"We chose to use licensed, 2.5 GHz spectrum – dedicated spectrum being the 'holy grail' of utilities – and RUGGEDCOM specializes in making [utility-grade] solutions for that frequency band," Wargo said. "Other companies don't."

"The RUGGEDCOM solution is the only one truly designed for the utility space because of its ruggedized specifications, its design for use on licensed [and other] radio frequencies and its EMI protection," Wargo said.

Results: A reliable, secure, scalable, cost-effective broadband network for SCADA, AMI and future functionalities, including distribution automation, with a mobile workforce for efficient operations.

"Our philosophy is to be an affordable energy provider," Perkins said. "The cost we're trying to manage is the delta between what we know costs are today and where we think they're going tomorrow. We're trying to make that delta as small as we possibly can. And that requires investment today, instead of waiting. If we waited to make those investments, those projects will only get more expensive."

"We're starting to get quite a few enquiries from our peers," Perkins said. "I think the industry is starting to understand that the more real-time data we can get, the better decisions we make. We've talked about tying our system together with our neighbors."

"We want to move from being a reactive business to being as proactive as we possibly can," Perkins concluded. "We don't want to follow a fix-on-fail approach – if a member is out, we go fix it. There's a lot of data out there and if we can collect it, we can prevent most outages. It all comes back to the reliable provision of power. That's what our job is."

Case Study At-A-Glance

Customer: Tri-County Electric Cooperative (TCEC) serves about 23,000 businesses and residences in a three-county area of the Oklahoma Panhandle, as well as adjacent areas of Colorado, New Mexico, Kansas and Texas.

Challenge: For reliability, resiliency and efficiency, TCEC sought fixed and mobile wireless broadband connectivity to SCADA data at its widely scattered distribution substations and mobile workforce capabilities for operational efficiencies.

Solution: The RUGGEDCOM WIN solution enabled a secure WiMAX hotspot across the Oklahoma Panhandle, connecting operators with dozens of SCADA-equipped substations, as well as empowering a mobile workforce and laying the foundation for future functionalities.

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