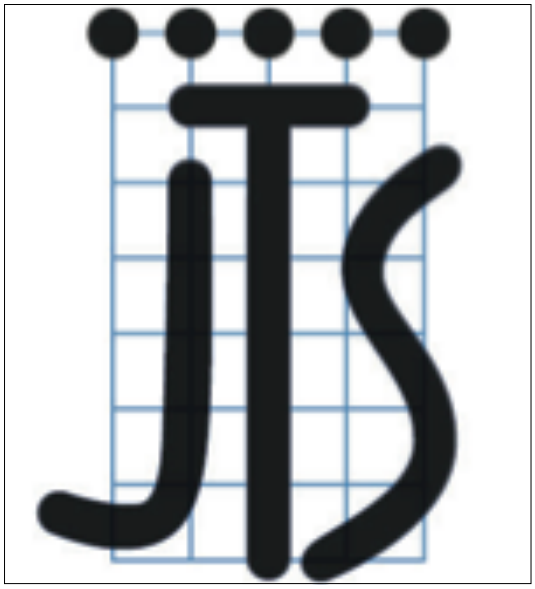

Lea County Electric Cooperative

SYSTEM WIDE COMMUNICATIONS UPGRADE

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ABOUT LEA COUNTY ELECTRIC COOPERATIVE (LCEC)

Lea County Electric Cooperative, Inc. (LCEC) was incorporated in 1949. LCEC currently serves 6,836 customers and powering 15,104 meters in areas of Southeastern New Mexico and West Texas. This service area includes portions of six (6) counties: Chaves, Eddy and Lea Counties in New Mexico and Cochran, Gaines and Yoakum counties in Texas connected with 4,227 miles of distribution line.

In 2012, LCEC built a 47-megawatt natural gas-based generation facility in Lovington, New Mexico with the flexibility to utilize approximately 27 MW of energy from an interconnected wind project. This LCEC Generation facility was recognized as a “TOP Plant” by POWER Magazine.

PROJECT SYNOPSIS

LCEC faced the same issue other utilities are facing; aging infrastructure with limited upgrade capabilities. LCEC’s existing SCADA communications between the main hub and substations consisted of 450MHz and 900MHz SCADA radios. Backhaul communications consisted of 2.4GHz, 5.8GHz unlicensed radios. LCEC has many new applications that require digital connectivity in addition to legacy analog systems. Through progressive thinking and eye towards the digital age, LCEC decided a system wide communications upgrade would be the only way to get their network up to date and scalable for the future.

KEY ISSUES

The main issue was limited bandwidth to all sites. TWACS, cameras, relay monitoring and other applications needed more bandwidth and digital IP connectivity to prepare LCEC for the future.

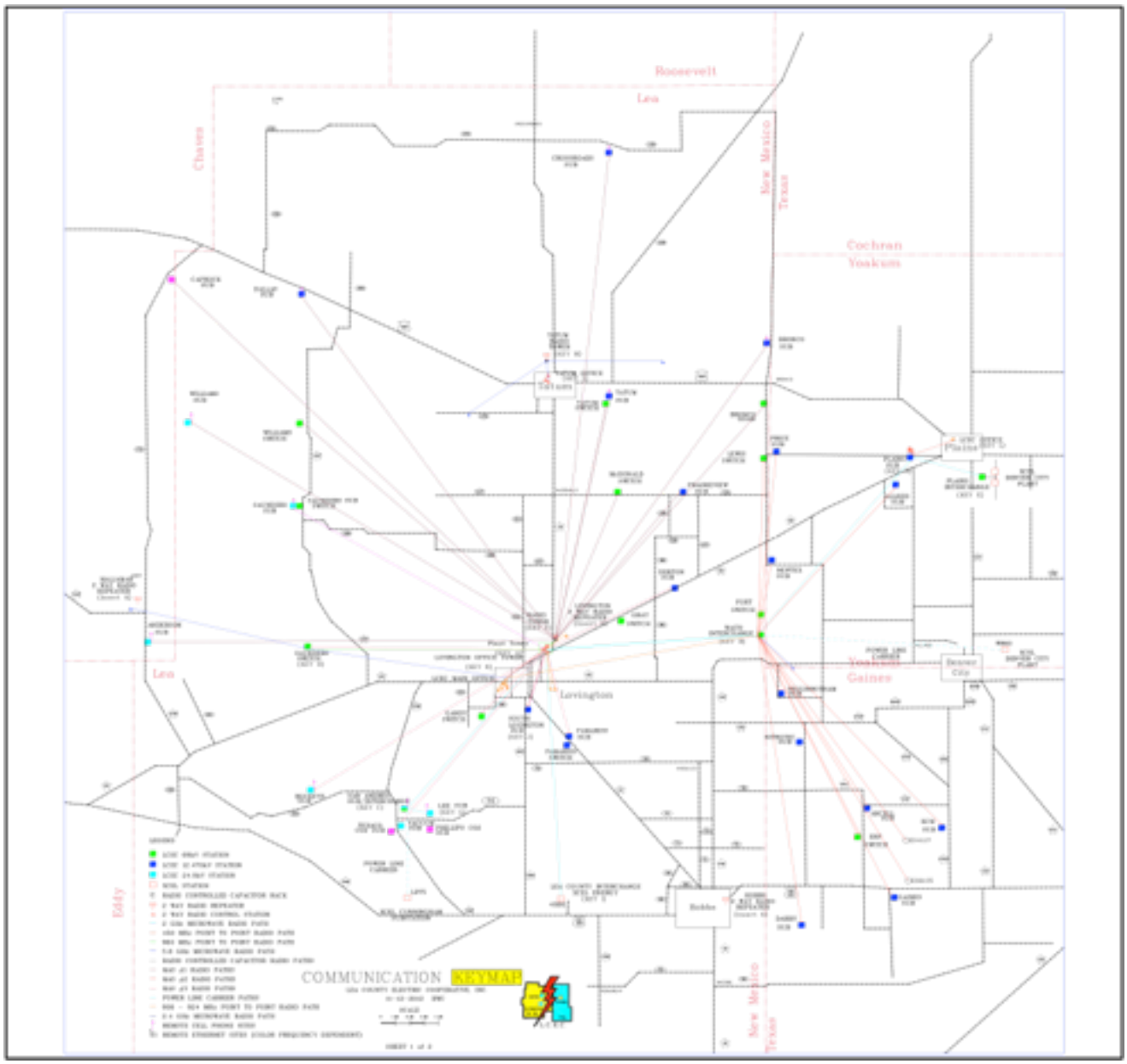
The existing communication system was unable to be monitored, causing LCEC crews to mobilize for every outage. Often a simple power cycling to reboot the system fixed the issues. Man-hours, resources and loss of productivity impacted the economics of their operations.

Interference with their existing systems was becoming more prevalent due to an oil and gas boom using unlicensed radio bands for communications. Thus interference was causing packet loss and increased latency between sites, leading to outages.

Remote monitoring would also help to catch any loss in signal level and watch trends of each link. This is costly and could be prevented with digital communication.

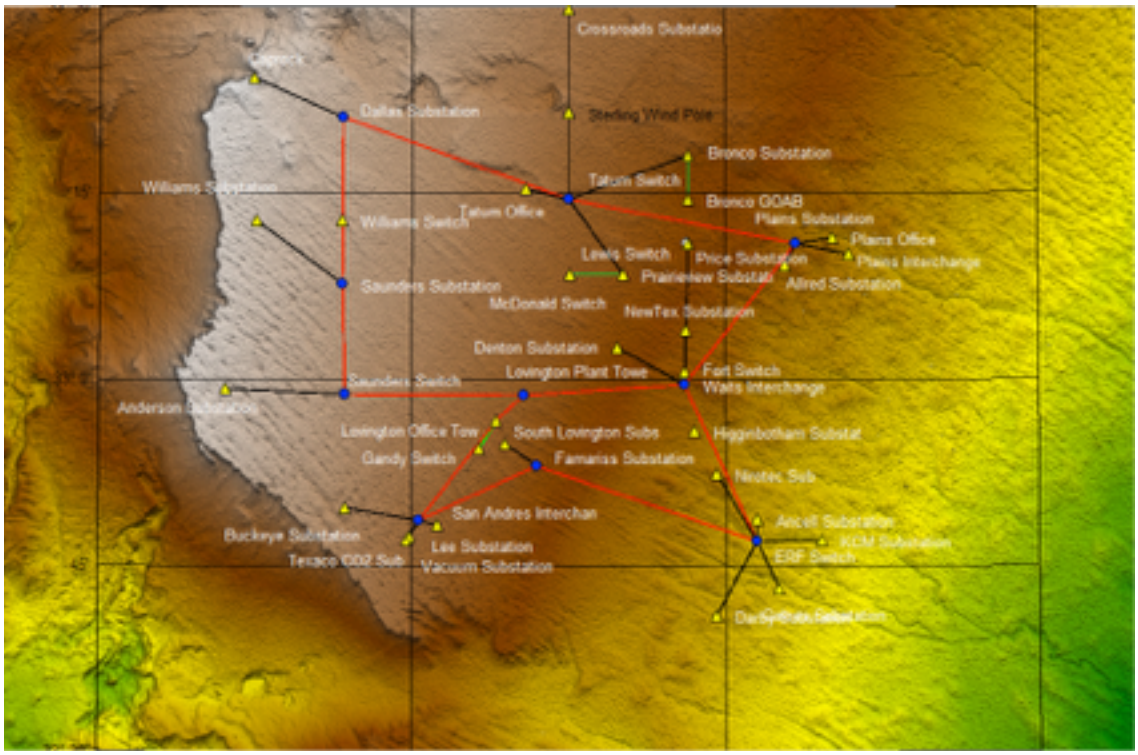
In order to implement any microwave system, vertical assets are paramount. LCEC did not have many substations with any asset that could be used to gain connectivity. Most of the existing infrastructure was mounted on station steel or wood poles that were deteriorating.

LCEC Existing Network



THE COMMUNICATION SOLUTION

Microwave Backhaul Network Design



JTS was hired to formulate a solution for a highly reliable system with little to no downtime, alleviating key issues faced, both today and in the future. LCEC identified 36 sites of key importance for communication for which a ring topology solution was identified, connecting 11 hub sites in a ring formation with the remaining 25 sites being connected via spur links.

Licensed Microwave

Providing a highly reliable microwave backhaul starts with Licensed Microwave. 11GHz delivered optimum bandwidth between sites. A radio propagation application was used to perform path studies for each of the licensed microwave links, RSL, bandwidth, and reliability of these links. JTS's recommended solution would also enable LCEC to double bandwidth based on future needs by adding a radio to the existing system, with no additional cables or antennas needed.

Vertical Assets

While towers were present at 3 locations, in compliance with TIA/ANSI 222-G standards the towers were not strong enough to take the additional wind loading. Nine 195' towers were identified requiring additional height, and path studies were conducted to assure operability and quality. The remote sites needed mounting apparatuses along with additional height for the microwave system. 35' concrete poles were chosen for the affordability and durability. One 90' steel pole was needed to gain connectivity for a site with tough terrain parameters.

Networking and Monitoring

Networking and monitoring was designed for connectivity to each site. The customer opted for Cisco switches with the capability to support future functionality, as well as the microwave backhaul. JTS planned the network configuration and coordinated the implementation with LCEC. JTS chose a monitoring system that could view all SNMP capabilities for the microwave backbone as well as all switches.

PROJECT PLANNING

Project Schedule

JTS implemented an online project schedule platform, utilizing real time information and collaborative tools, capitalizing on ease of use and multi-parameter KPI tracking. This tool was used for project updates in all meetings with board members. The project schedule used Gantt Chart functionality to track project milestones. Any changes were automatically sent to the customer with custom alerts to all stakeholders.

FCC Licensing

The microwave path designs performed by JTS were used to submit the information needed for the prior coordination and licensing of all microwave links. JTS worked with the prior coordination company to start the FCC licensing process.

Microwave Pre Tests

Prior to installation, all microwave equipment was delivered to JTS and set up for back to back testing using the RFC-2544 Test in JTS' in-house lab. All links were assembled and

FCC, ACM, software, and capacity licenses installed to assure all parts were correct and operability was achieved. Variable attenuators were placed inline for back-to-back radio testing. Thermal fade margin was simulated to show the performance of adaptive code modulation as well as radio recovery. All results were cataloged and back-ups made for the configuration of all links. Each link was labeled with relevant information for installation prior to deployment.

Deployment

All microwave radio, antennas, and installation materials were inventoried and staged at JTS, then transported and staged by site location in a secure storage area in Lea County for centralized deployment and quality assurance.

Preliminary Tower Planning

JTS managed all tower permitting, utility locates, soil tests, and tower engineering. All foundations were designed as mat foundations due to very dense soil conditions. Efficient planning allowed foundation and erection crews to complete one site at a time, optimizing resources and ensuring the project remained ahead of schedule and under budget.

Switch Configuration

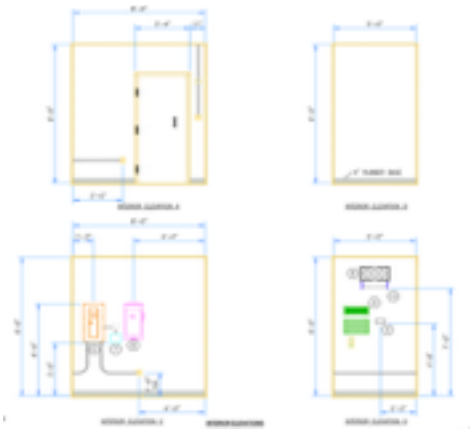
All switches were delivered to the JTS Lab and set up to simulate the LCEC's communication network architecture. Configuration and routing tables were checked for operability. Fail over testing on each switch was performed; ensuring routing tables were configured correctly. All testing was cataloged and back-up files created for each switch's configuration. These were shared with customer for future use as needed. After programing and testing all switches were specifically labeled and carefully packaged for efficient deployment.

PROJECT INSTALLATIONS

Tower Installations

All tower foundations were engineered for mat foundations. Each foundation had to be excavated to achieve the depth needed per design specification. All foundation materials were delivered to a central hub and distributed between the foundation sites. All towers were assembled by JTS on location and erected using a crane. OSHA electrical line safety was stringently followed for crane and elevated heights use. R-56 standards were followed for all grounding. Due to soil conditions chemical grounding was needed to obtain correct design specification Ohm readings for the grounding system. All tower grounding systems were attached to the grounding grid of the substation that was grounded to the water table.

Building Installations



Three key hub sites did not have communication or relay buildings to house the microwave or network equipment. JTS procured and coordinated building installations at these sites. The ground was made ready and communication buildings were lowered into place using a crane.

NEMA Enclosure Installations

The remote sites at 17 of the sub stations were without any communication shelter. NEMA enclosures were chosen as the most cost effective option to house the equipment connecting back to the hub sites. The NEMA Enclosures were mounted onto 4” poles that were buried 4’ into the ground with 6’ of the mast exposed. The NEMA enclosure was installed close to the port opening on the concrete pole for the ease of routing the cable to the enclosure.

Microwave Installations

All microwave radio and dish assembly were preassembled on the ground and mounted to tower as single unit. All hub site installations were performed by site instead of by link to speed up installation. All radio units were set to designed azimuth for the alignment process. Once the hub installation was complete, the remote installations took place and alignment was performed. All coaxial cables were tested to design specification prior to alignment. RFC-2544 tests were performed in the field for the final results for the bandwidth achieved at each site and compared to the preliminary testing conducted at JTS.

Switch Installations

Switches were installed at the same time of the microwave radio installations. Once all microwave had been installed all tests were ran through the switches to assure visibility across the network from link to link.

Monitoring Installation

The monitoring system application was installed on an existing server at LCEC. JTS and LCEC worked with a monitoring company to assure all LCEC staff were trained on system capabilities. Once the system was installed the entire network could be monitored and parameters changed from a central hub location.

PROJECT COMPLETION

JTS was able to complete this project in 8 months from design to a fully operational network, 4 months ahead of schedule and under budget. LCEC has a fully functional digital network that addressed all their key issues. The system is future-proofed for their digital applications. LCEC and JTS worked on future network expansion, as well as a migration plan for scalability or replacement of radios over the life of the network. Through a great relationship built with the customer and efficient project management JTS was able to satisfy all LCEC network needs.

ABOUT JTS

Johnston Technical Services, Inc. (d.b.a. JTS) is a one-stop shop for the design, planning, project management, installation, maintenance, and monitoring of network infrastructure to support your voice, video, and data needs. We specialize in unlicensed and licensed microwave radio installation services. With over 26 years of experience in electronic systems integration, we provide services to help you quickly and economically reach your networking and systems goals. We pride ourselves on our flexibility and rapid deployment. www.jts.net