

# OG&E'S SMART GRID REVOLUTIONIZES NETWORK CONTROL

AN ALCATEL-LUCENT MULTI-TIERED IP/MPLS COMMUNICATIONS NETWORK  
ENABLES OG&E AND ITS CUSTOMERS ACROSS OKLAHOMA AND ARKANSAS  
TO MODULATE POWER DEMAND WHILE INCREASING EFFICIENCY AND SAVINGS.



CASE STUDY

MARKET: **POWER UTILITY**

REGION: **NORTH AMERICA**

**OG&E**

OG&E, Oklahoma's OGE Energy Corp., based in Oklahoma City, Oklahoma, is the parent company of Oklahoma Gas & Electric Company (OG&E). OGE Energy Corp. and its subsidiaries have approximately 3400 employees.

## CHALLENGES

- Growing customer base; increased demand
- Fossil fuel generating investment deferred until 2020
- Rising fuel costs
- Tower siting, leveraging existing infrastructure as much as possible

## SOLUTIONS

- Multi-tiered IP/MPLS communications network
- 6.0 GHz, point-to-point microwave backbone system
- 3.65 GHz point-to-multipoint layer
- Full WiMAX and point-to-point microwave integration
- Advanced tools for monitoring and control
- Installation and maintenance service

## BENEFITS

- Grid efficiency improvements through distribution automation
- Reduction in peak demand (interim results of two-year study of 6,000 customers)
- Reduction in overall customer demand by additional 2 percent, each year for next three years
- Demand response savings of 280 MW by 2017
- Operational efficiencies through advanced metering infrastructure
- Savings of at least \$22 million by 2013
- Defer fossil fuel generating investment to 2020

## "I'M IN CONTROL EVEN WHEN I'M GONE."

OG&E Customer

OG&E, Oklahoma's largest regulated electric utility, serves 789,000 customers over a territory of 30,000 square miles in Oklahoma and western Arkansas with 23,000 miles of overhead distribution lines and 500 substations. Founded in 1902, it has been an industry pioneer on the forefront of innovation. In 1949, OG&E became the first power company to use gas and steam turbines together to generate electricity. It subsequently built the world's largest combined-cycle power plant (235 MW) at Horseshoe Lake Station in 1963, implemented one of the industry's earliest supervisory control and data acquisition interfaces for plant operators in 1977, introduced computerized meter reading in 1983, and in 2003 became the first electric utility in Oklahoma to offer wind power as a choice for its retail customers.



Given this history, it's not surprising that OG&E pressed forward with its Positive Energy® Smart Grid program after assessing its long-term operation strategy in 2008.

### USING INNOVATION TO GENERATE RESULTS

"We started down the path of this latest deployment when our CEO challenged us to defer the need for any additional fossil fuel capacity until 2020," says Ken Grant, managing director of customer solutions. "To meet that goal, we realized that we were going to somehow have to create additional capacity."

Grant and his team realized that optimal efficiencies would come from a combination of a highly efficient transmission network, demand response systems and wind investment.

They also knew that the only way OG&E could achieve those goals would be with a technology-enabled program that not only monitored the entire system in real-time, but reached system endpoints in the residential market.

OG&E's new smart grid would encompass sophisticated tools that monitor and control the distribution network to locate and isolate faults, prepare switching orders, regulate voltage and optimize the flow of reactive power to reduce losses and reduce energy demand during peak demand periods — all benefits that would make the new system a win-win from control room to consumer.

"We wanted to make the grid as efficient as possible, so we knew there were some projects we could do on the distribution automation side, including a capacitor project that would allow us to better control voltage on the grid, increase efficiency and reduce losses on the system," Grant said. "We also built the smart grid platform to enable technology so we could provide energy use and cost information to our customers, allowing them to make informed decisions about their energy use."

OG&E's executive team was fully aware at the project's genesis that some utilities had already put automated metering systems in place during the last 10 years — something they had not yet deployed — and they understood the powerful benefits of moving forward with such a plan. "In addition to demand response, we knew that there was a strong business case around our ability to read meters remotely, connect/disconnect meters remotely, and avoid the truck rolls associated with those activities," Grant said.



### Perspectives from Michael Thompson, Smart Grid WAN Program Lead OG&E

#### Reasons for choosing Alcatel-Lucent

- State-of-art communication network solution
- Mature and proven product
- Skilled resources to manage and execute
- Flexibility

#### Single most important contribution

- Ability to deliver

## **“IT’S A CONCRETE WAY TO BE GREEN AND FISCALLY RESPONSIBLE.”**

OG&E Customer

### **WHY ALCATEL-LUCENT?**

The selection of Alcatel-Lucent as the primary partner and project integrator was largely due to its breadth of technical and logistic expertise, its overall value and its dependability in providing the required performance guarantees, which included prioritizing traffic on the backbone, overall system reliability, a quality of service guarantee that included installation and network performance, as well as, full-time on-site engineering and project management.

### **REVOLUTIONIZING CONTROL AND EFFICIENCY**

Composed of a two-layered WAN, utilizing WiMAX for the intermediate layer and microwave for the backhaul, OG&E’s smart grid deployment already is revolutionizing the utility’s control over its network while providing efficiency and customer choice.

The project is complex, with an aggressive schedule and rigorous technical specifications. For example, OG&E required strict latency and bandwidth requirements for the automatic reclosers and capacitor controllers out on the grid — the distribution automation piece of the project — and those switches had to operate quickly enough to send information back and forth to the distribution management system to optimally enable the remote switching needs.



### **INTELLIGENCE YIELDS TRANSFORMATIONAL BENEFITS**

Smart grid technology is already enabling the company to make better use of its existing infrastructure while helping its customers use their power more wisely. The new system features advanced control room tools to monitor, control and greatly improve its effectiveness, locating and isolating faults, preparing switching orders, regulating voltage and optimizing the flow of reactive power to reduce losses and reduce energy demand during peak demand periods.

OG&E’s distribution automation deployment included a test of four primarily residential circuits in August and September 2010 with a Volt/VAR optimization module. Results showed the greatest peak demand reduction on circuits that were in poorer

condition and demonstrated that power factor improvement can be attained during shoulder and off-peak hours while maintaining voltage at acceptable levels. OG&E plans to add 42 circuits for a total of 46 being tested in the summer of 2011, with a goal of voltage reductions in the one to two percent range. The utility says that a two percent voltage reduction could save an average of 75 MW of generation capacity during peak hours.



## "IT MAKES ME FEEL LIKE A KNOWLEDGEABLE CONSUMER AND NOT A VICTIM."

OG&E Customer

### CREATING SAVINGS AND SATISFACTION

Real-time reporting and support for the local area network of smart meters in customer homes and businesses is projected to save the utility at least \$22 million by 2013, thanks to fewer and more focused truck rolls, as well as, a significant reduction in fraud.

OG&E's smart meters were first deployed in 2008 to about 6,600 customers, serving as a successful technology demonstration. That was followed in 2009 with approval by the Oklahoma Corporation Commission for recovery on the deployment of 42,000 meters in Norman, Oklahoma, south of Oklahoma City. A \$130 million smart grid investment grant from the Department of Energy followed along with approval from the OCC for full deployment. OG&E subsequently began its rollout to all customers in February of 2010, an initiative that the company expects to complete by the end of 2012, utilizing over 789,000 meters.

Currently the network is transporting data traffic from more than 500,000 smart meters on the utility's power delivery distribution system and on a limited number of capacitor banks for study purposes, enabling real-time automation for the remote meters. "Our requirements included getting 15-minute interval data from our meters and then providing that information to our customers so they can use it to better manage their energy usage," says Grant. "Customers can sign up for the energy information website myOGEpower to view their energy use and costs. Armed with that information, customers can see how making small changes can impact their bill."

### PARTNERS FOR POSITIVE ENERGY

OG&E offered demand response pricing to 3,000 customers in the summer of 2010 and expanded that program to 6,000 in 2011, all volunteers in a study. The company is testing a variable peak pricing tariff and a time-of-use tariff, both with a critical price element and in 2012 will roll out a larger demand response program based on successful results from those studies. OG&E also has tested a programmable communicating thermostat that receives a price signal and will automatically respond to higher (peak) and lower (off peak) prices based on customer programming.

OG&E believes that technology makes a huge difference in customers' positive reaction to demand response. "One thing that makes our program pretty unique is that we're not doing any direct load control," Grant explains. "We've really tried to take an approach of creating a partnership with our customers. We tell them that together we can avoid building any additional fossil fuel capacity between now and 2020, by educating them and working hand-in-hand, helping them to find ways to shift usage. They seem to be pretty receptive to the way we're rolling this out and moving it forward."

Indeed, nine out of ten customers achieved savings compared to a standard rate plan and told OG&E in focus groups as well as in quantitative research that they like being aware of their usage and costs, even if they didn't feel that their savings were huge. OG&E has even set up a well-received Facebook page for program participants, where customers can exchange information on ways to further increase savings through small



#### OG&E distribution automation

##### Reclosers

- Continuously improve reliability, reduce outage footprint and improve outage management
- 500 devices for 200 circuits

##### Capacitor controllers/monitors (IVVC Concept)

- Reduce losses and demand reduction at peak load
- 2400 devices for 400 circuits

##### Fault Circuit Indicators (FCIs)

- Verify performance, locations and ultimate deployment
- To improve fault location – improve reliability, crew management and outage management
- 7200 specific sites may be selected

changes in their lifestyles. The changes mentioned most often include:

- Delaying laundry or – for a few – switching to the clothes line or washing (only) in cold water
- Waiting to turn on the dishwasher
- Delaying dinner until after the peak period
- More use of ceiling fans
- Changing thermostat settings
- Turning off lights
- Cooking on weekends for the entire week
- “It’s an excuse to eat out.”
- Reheating or grilling more, plus more salads
- Reducing use of swimming pool pumps
- Leaving the house during peak hours – malls, movies, relatives, errands
- Changing infrastructure, including window upgrades, weather stripping, awnings, shower spigots, etc.

OG&E’s goal is for 20 percent of its residential customers to voluntarily participate in a demand-response, time-based rate by 2014, aided by smart technology and dynamic pricing. “We believe that if we put the right information, the right pricing and the right tools in customers’ hands, they’ll see the ability to save and will respond as they see fit,” Grant notes. By 2017 OG&E plans to complete all demand response rollouts and distribution automation will be ongoing.

## FULL ENGAGEMENT BRINGS VALUE AND FLEXIBILITY

Alcatel-Lucent has addressed every aspect of the project, from conducting validity assessments on tower sites to ensure optimal location, structural and technical integrity, so that the deployment process fully meets the company’s service and financial goals.



“Our working relationship with Alcatel-Lucent has been great, as they have been very reliable in getting the technical design in place, making adjustments as we go along,” Grant said. “The deployment has been going well and we haven’t had any issues from a schedule or scope perspective but flexibility is key. For example, as we optimize the local area network, it changes the technical design of the wide area network to some degree, so it’s really important that we have a close working relationship with partners that are fully engaged in the project and working with our team.”

Grant said that OG&E’s smart grid project has been bringing important new skill sets into the company, as well as, to other players in the power generation and distribution space. “Learning from our partners is an important part of project, adding skills to our organization,” he said. “It’s an interesting

evolution for the utility industry — allowing us to become more data-intensive, more high-tech, having better information from which to make business decisions. It’s opening a new age for utilities and how they manage their business.”

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