

Pulaski Electric System Leverages FTTH Network For Energy Savings

A municipal electric utility achieves efficiencies with a fiber-enabled smart grid.

By Masha Zager ■ *Broadband Properties*

Pulaski Electric System (PES), founded in 1891, is the oldest municipal electric utility in Tennessee. In the 1930s, it became the first utility to receive power from the Tennessee Valley Authority (TVA). The utility continued its tradition of forward thinking when it built a fiber-to-the-home network in 2007, using technology from broadband access supplier Enablence, and again in 2008 when it launched a smart-grid project leveraging the FTTH network. Only a year after the company began deploying the smart grid, there is already evidence of significant energy and cost savings.

PES is one of several electric utilities working on smart-grid projects with the encouragement of TVA, which is responsible for developing and delivering bulk energy to distributors such as PES. Mike Ingram, TVA's senior manager of demand response, says the agency is committed to reducing its peak production by 1,400 megawatts by 2012 and that it sees smart-grid projects as a component of that effort.

FTTH AND PEAK PRODUCTION

Peak production is the load that determines how much generating capacity TVA needs. If consumers shift demand from peak to off-peak periods, TVA can reduce its total generating capacity and shift more electricity generation to less-expensive equipment. Because smart-grid technology enables end-to-end, two-way communication over the grid, it helps consumers understand how



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much electricity their various appliances use and thus helps them shift electricity use to off-peak periods.

FTTH takes smart grids a step further. Because fiber networks don't choke on large data transfers, usage data can be communicated over fiber very frequently and in great detail. This detailed, real-time information will help TVA respond within 15 minutes to unexpected changes. Because gas turbines, the generators that fire up fastest to meet unexpected peaks, are the most expensive to run, turning them down again quickly is crucial. Reducing load quickly, Ingram says, "helps with peak reduction and has positive environmental implications and cost implications for both fuel and water."

Although commercial and industrial electricity users are already knowledgeable and sophisticated about managing their usage, Ingram says the gains from managing residential usage are still

largely untapped. "Residential air conditioning and heating essentially sets the peak for TVA," he says. "It's important to work with distributors to try to shape that load as best we can. ... And in addition to the technology, TVA has to work with distributors to inform the public."

TVA expects eventually to pay its distributors for delivering the real-time residential usage information that will help it respond quickly to demand changes. At present, however, it is working with the distributors on pilot projects to refine its understanding of the technology and its potential.

A FIBER-WIRELESS HYBRID SOLUTION

PES has not yet built out FTTH to its entire service area, though it plans to extend the network into rural areas over time. Of 15,000 electric customers, only about 5,000 are now passed by fiber. So the company needed a smart-grid solu-

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tion that would transmit data over both fiber and wireless connections.

Furthermore, of the 5,000 homes passed by fiber, only 1,600 subscribe to voice, video or data over FTTH. Wes Kelley, the utility's president and CEO, considered attaching optical network terminals (ONTs) to the electric meters on nonsubscribers' homes throughout the FTTH footprint but rejected this approach as being too expensive. Fortunately, he found a smart-grid solution from Tantalus Systems (www.tantalus.com) that achieves the same results more economically.

The Tantalus smart-grid solution features IP collectors that transmit usage data via fiber for every home in the FTTH footprint, whether or not the home is connected to the fiber network.

With the Tantalus solution, IP collectors gather data from meters – about 30 of them per collector – using a 900 MHz wireless connection. Each collector plugs into an ONT on a fiber subscriber's home and transmits data back to the util-

ity over fiber. This solution enables all the electric meters in the FTTH footprint to send data over fiber without requiring an ONT on every home. Outside the FTTH footprint, meters send their data to the utility over a 200 MHz wireless network. (The wireless network can handle the amount of data that the meters are sending today, but it does not have the potential to transmit the data that may be sent over fiber in the future.)

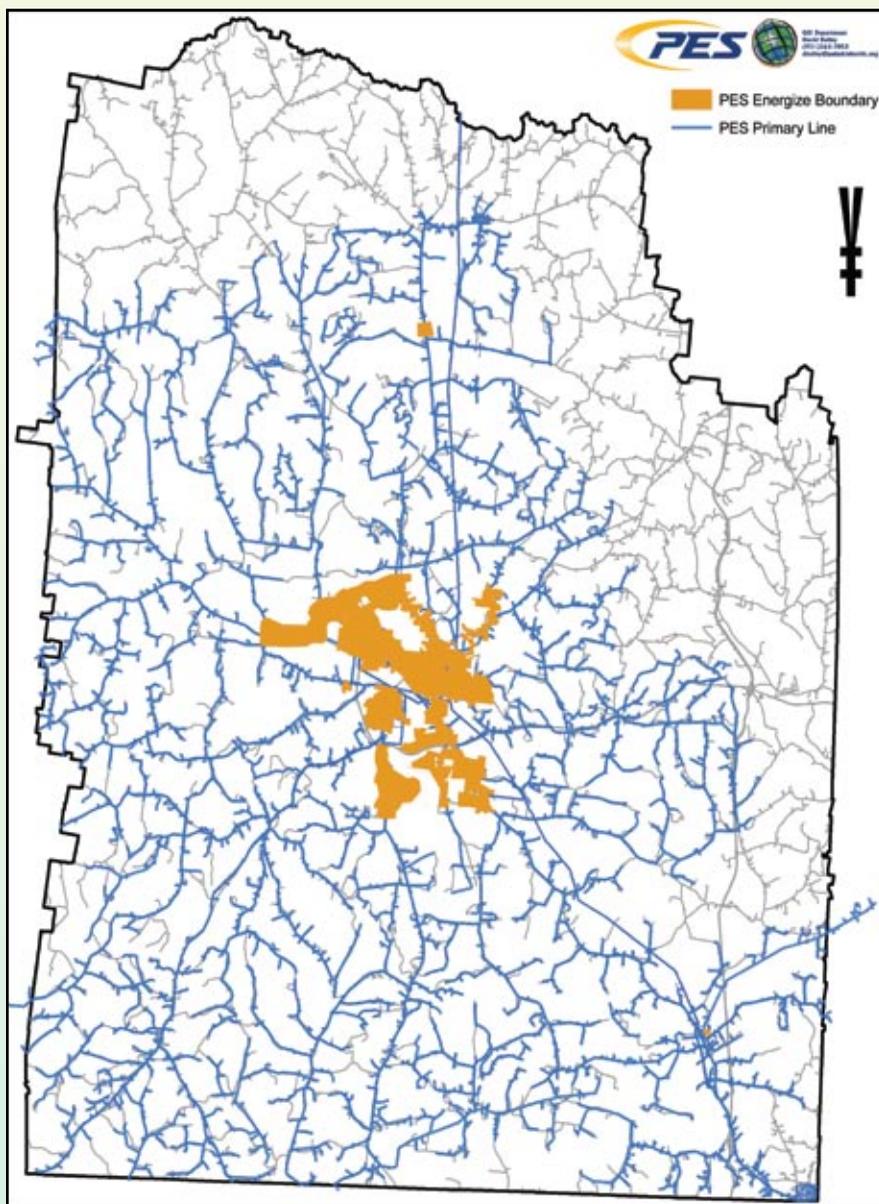
To date, PES has installed smart meters for about one-quarter of its customers, and is preparing to install them for another quarter of the customer base. The timetable for deploying smart meters to the other half of the customers is still being developed.

SMART METERS PROVE THEIR WORTH

PES is discovering that the smart-grid system yields many benefits. The most obvious is outage detection: The utility, which has always depended on customers to report outages by phone, now receives reports of outages as soon as they occur, enabling faster response. The company is developing an interface between the smart grid and the outage-management system so that outage reports from smart meters can dispatch repair crews without human intervention.

A byproduct of outage detection is improved detection of theft and malfunctioning meters. Kelley says, "Since these meters talk, if you unplug one, it looks like a power outage. Or, if it comes right back on, that's a signal that something is wrong. It gives us an opportunity to narrow down theft problems."

The hourly readings that the meters transmit help the utility troubleshoot problems. "If customers complain about high usage, we can give them information hourly," Kelley explains. In one recent incident, a family member taking care of a



PES' fiber-to-the-home footprint (solid-colored area in the center) is still only a small portion of its utility service area, but the entire service area will participate in the smart-grid project.

GREEN TECHNOLOGY



home for a military couple deployed to Iraq complained that the electric bills were too high for an unoccupied building. After examining hourly usage patterns, PES realized that the programmable thermostat must have been set too high. Turning down the thermostat solved the problem.

Smart meters record voltage as well as consumption, and the voltage readings help PES improve its operational efficiency. Electric utilities often oversupply voltage just to make sure that the last house on each line gets enough power. “But if we’re getting real-time voltage information back from customers’ homes, we can see the last house, and then we can lower the voltage to an amount that keeps the last house at an adequate voltage,” Kelley says. “That [offers] a major financial advantage to the electric system.”

Automated meter reading is another source of operational efficiency. On hard-to-read rural routes, dispensing with the meter reader – and the meter reader’s truck – represents a major savings in dollars and fuel. “We started out sending the meter reader as a check [on the automated readings], but now we’ve

stopped doing that,” Kelley says. The automated readings flow directly into the billing system.

PES sells water and gas as well as electricity, and Kelley plans to test some smart water and gas meters in the next six months or so. Eventually, data collection for the water and gas meters will also be automated.

Once the number of smart meters reaches a critical mass, PES plans to institute time-of-day pricing for electricity, rewarding customers who use more power during off-peak hours. As discussed above, hourly usage reports will help customers switch load to off-peak hours. Eventually, PES could even take control of heating and cooling systems for customers who want them to do this. “Both the water heater and the air conditioner can work as energy storage devices,” Kelley explains. “You heat water, and it sits in the tank and slowly cools over time. We could avoid using the most expensive generators by dropping load during the peak periods and making sure those peaks and valleys fall when we need them to. If we can manage the process well, the customer may never know it’s taking place.” **BBP**

