Opportunity
Tucson is home to the University of Arizona and ranks as the second-largest city in the state. The City of Tucson’s population in 2006 was 534,685 and it continues to swell. Including its surrounding area, Tucson recently exceeded 1,000,000 people. Along with its new inhabitants comes higher demand for affordable housing. Consequently, Tucson is being developed very quickly. Jim Taylor, metering services supervisor for Tucson Electric Power (TEP), has witnessed this growth firsthand. His day-to-day involvement in ensuring new homes have access to electricity and are metered accordingly, gives him a front row seat to Tucson’s rapid development. This continual expansion, in addition to TEP’s innovative culture, is what ultimately led TEP to begin automating its meter reading in early 2001.

Over the last six years, of its 400,000 mass market meters, TEP has deployed over 80,000 new and replacement ERT-enabled CENTRON® meters. However, during deployment, a new business requirement emerged. TEP and other investor-owned utilities (IOUs) in the state with existing time-based, or TOU rate structures, began working with their regulatory body, the Arizona Corporation Commission (ACC), to expand upon the programs. The ultimate goal was to shift energy demand to off-peak hours, thus deferring the cost of new generation. For this strategy to succeed, TEP would need to expand the number of customers who use time-based rates, which incorporate higher fees for peak energy consumption and lower fees for power used during off-peak periods. Ideally, such programs provide customers with tools to manage their energy consumption and costs.

Implementing an advanced metering infrastructure (AMI) system with two-way communication to every meter would support time-based rates, but advanced metering meant additional associated costs for TEP including replacing existing meters with ones that can store TOU data, as well as an increase in the monthly meter reading costs due to extra registers.

These costs were deterrents to the strategic implementation of more time-based rates. So TEP’s innovative spirit led Taylor and his team to work with Itron to implement a “smart network” that meets TEP’s core requirements for advanced metering at a substantially lower cost than a new AMI system.

“We can have all the benefits of a two way communications system without remote connect/disconnect, at a significantly reduced cost. The extra expense of providing this capability for every customer is not warranted since a large percent of our customers never require a connect or disconnect of service.”

Jim Taylor
Metering Services Supervisor
Tucson Electric Power
Solution
Taylor’s team envisioned a solution that would integrate with their existing deployment of ERT-enabled meters by collecting interval data. It would then utilize their Itron Enterprise Edition™ (IEE) Meter Data Management (MDM) software application to aggregate the intervals for the time-based rates and serve the data up to their customer information system. They sought a system solution that would allow them to build in redundancy from the meter to the collection engine with exceptional system reliability, energy diversion notification and also help improve their outage response. The Itron Fixed Network, a technology immediately available to the utility, satisfied these requirements while still helping them to control their operational costs.

Today, Itron Fixed Network technology is using wireless communication to automate meter data collection for TEP. The network collects interval data to support TOU pricing, and also provides positive outage and restoration notification to improve outage response and system reliability.

To achieve network reliability while also optimizing data backhaul costs, TEP utilizes an innovative approach to take advantage of the flexibility that the Itron cell control unit (CCU) provides. Within a separate box, adjacent to the Itron CCU, TEP mounts three items: an Ethernet router, a Motorola Canopy WiFi radio and a cellular modem. All three of the devices are Ethernet-enabled and are connected to the IP-addressed CCU via an Ethernet port off the router. The utility’s IT department installed several configuration settings on the router that enable either backhaul method to use the same IP address for both the WiFi and cellular connection when active. This way the Fixed Network head-end software always knows the correct IP address for the CCU and its security settings can be maintained. The router within the external box to the CCU has the intelligence to choose a primary path (in this case the most cost-effective – Canopy WiFi). It also has the logic to switch paths if the primary is down for some reason. TEP also employed its considerable expertise in solar technology to power CCUs and accompanying communications located where power is too costly or does not exist. Solar panels satisfy 100 percent of the power requirements at these locations, including seven-day battery backup capabilities.

To gather the data, the Itron radio-based endpoints transmit consumption and meter tamper data at regular intervals to the network of CCUs.

Overhead repeaters are used to fill holes in endpoint-to-collector coverage, further optimizing the cost effectiveness of the network. The collectors then backhaul the meter data to the Fixed Network application software. The application software processes and will then pass the data to the IEE platform, which in turn will manage and distribute the meter data to billing systems, direct-customer access programs and advanced analysis applications.
Benefits
TEP and Itron’s collaboration on the project has resulted in 3,000 meters being read every 10 minutes at 100 percent reliability by the fixed network.

“We have developed a modular approach to the sighting of CCUs and repeaters to achieve the desired redundancy. We believe this redundancy will closely match what we will see with a mass deployment. Our continual efforts to break the pilot network and find its flaws have failed,” says Taylor.

With an average of 115,000 off-cycle reads annually, the utility is looking forward to reducing the cost of its service reads, and also its on-cycle reads; both by an estimated 90 percent or more per meter. In terms of overall expense for the utility, their integrated meter provides the most critical AMI functionality they were seeking—interval data, on-demand reads and outage detection—at less cost than a new AMI system. The meter data in the meter data management database will also be leveraged for other business functions by utilizing the knowledge-based applications that Itron offers.

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Not only were these benefits attractive to the TEP team; they also caught the attention of their regulatory commission. The ACC has incorporated a ‘smart networking’ initiative, in addition to an already-existing ‘smart metering’ initiative, and has recommended that other IOUs look into a similar strategy for their TOU rates. Tucson Electric Power realized that although AMI is likely the technology of the future, Itron’s field-proven Fixed Network solutions are meeting the challenges of the present at a reasonable cost.