Utilities Look to the Skies for Monitoring the Power Grid

Bernard Cole

Early next year, power utilities across the United States could be looking to the skies to help them collect meter information about electricity use. They'll use satellites to acquire data on a near real-time basis so they can provide users with accurate usage data and model and predict power grid status more accurately. The new system was developed by Hunt Power, which provides metering equipment and services to most power utilities.

A network of 25 commercial satellites in low earth orbit managed by Orbcom will be used to collect data from meters at any location in the country every 15 minutes Daniel Price, vice president of Hunt's MeterSmart services. "We also have the ability to query the meters every six minutes," he says. "However, we are starting out with once a day during the initial pilot phase. During this time utilities will investigate the usefulness of the services, install new meters and build up the measurement and analysis infrastructure to handle the flood of information that they will be able to access in near real time."

How it works

Attached to existing data collection meters, each satellite-linked MeterSmart unit is housed in an 8 x 8 x 8-inch box with an external whip antenna. Inside is a 148-150 MHz UHF transceiver capable of two-way communications with any overhead Orbcom satellite. Designed to fit into existing metering installations, it communicates with the on-premises meter, gathering information from it by any of a number of links—serial, wireless, or
wired. It queries the collection unit on demand, converting home or business power usage information into transmittable form.

Every 15 minutes, the device sends an initial 3.3 ms burst to any overhead satellite. During the handshaking phase, it passes through two levels of password protection. Once a radio frequency identification signal is recognized, a second 56 to 450 ms uplink transmission follows. During this interval the subscriber's transmitter sends encrypted power usage information at a data rate between 4,800 to 9,600 bps.

During that second burst, instructions and data from the power utility via the satellite can be sent back to the subscriber's receiver to ask for further information, to transmit requests to resend, or to make some modification to the subscriber's usage profile.

Data collected by the satellite from diverse subscribers is then sent on a periodic basis—from once every 15 minutes in near real time to once a day—to a gateway earth station and then to the gateway control center, where the messages are processed, sorted, and rerouted over existing broadband ground networks to the contracting utilities for analysis.

With this information, says Price, a utility can do load profiling and forecasting, determine the kind of demand response program needed on the utility side, and determine how customers on the demand side—both individual and corporate—can modify how they consume energy to lower its cost.

**Creating a standard**

For Hunt Power, and for the utilities, the aim is to eliminate the diverse mechanisms by which meter information is collected: human, wired and wireless access by analog phone, cable and DSL, and even the Internet. "In rural areas there often is only analog phone service, and in most areas, that analog service is aging rapidly," Price says. "In others, wireless phones are making it uneconomical for phone companies to continue to invest in new equipment, with the result that collecting meter information is a cost that is escalating.

"In the utility industry, information means power savings in that the models we build to estimate individual power usage and to model area-wide power grid loads is dependent on the amount, timeliness, and quality of the information."

In the past, Price says, the diverse sources used, the collection times, and the data's non-real-
time nature meant that suggestions to companies and individuals on how to save on power were qualified with ifs and maybes. "With the kind of information we can now get from a satellite collection system, power companies can go to their customers and tell them that if they take specific actions at specific times they will have specific results and specific amounts of savings."

On the utility side, one of the most immediate benefits, according to Price, will be the ability to aggregate usage data on one day and with certainty project the next day's demand. Utilities do such projections now, but the degree of accuracy varies widely because of differing time scales of collection and different modes of collection. "Because of the number of variables, the projections left a lot to be desired both on the customer side and on the utility side," he says, adding that with a satellite system and a common mechanism for collection in both rural and urban areas, a lot of guesswork can be eliminated.

**Conclusion**

Long term, Price envisions, the collection of real-time satellite data will do much to allow utilities to manage and avoid overloads and brown- or black-outs. "Many of the problems the utilities have gotten into are because events on the power grid can happen in seconds and minutes, and they must base their actions on information and models that were weeks, days, or hours old," he says. "If power companies eventually are able to collect information every six to 15 minutes from their entire coverage area, they will have much more of a real-time view of what is going on and will be able to take action more quickly, or even anticipate it."

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