

Mining Your Meter for Savings



Putting energy data to work will show up on your company's bottom line. Commercial and industrial energy users can examine electricity usage patterns and make changes that save money on their utility bills, improve local electricity reliability, and reduce emissions to the environment. Usage data is available from utility bills, interval billing meters, energy information systems, and even building automation systems—you can get a mountain of data. You'll need a systematic approach within a total energy management program to sift, identify, analyze, and apply the valuable nuggets that can be found within that data mountain, but it's worth it, because "there's gold in them thar hills."

Sources of Usage Data

Your utility bill (or your account's billing information posted on the utility's Web site) is the simplest and least expensive place to begin, but the usefulness of information from your bill may depend on what kind of meter the utility is using to gather consumption information. (See the sidebar to learn which utility meter can support your goals.)

Energy information systems (EIS) are potentially another source of information. They are contracted and installed for the purpose of measuring and reporting how much energy is used, when it is used, and where it is used. The utility's meter, customer-installed submeters, or even building automation systems provide data to the EIS.

If your company outsources bill processing and payment (BPP), your BPP provider will send both summary and exception reports that can point you to potential facility improvements and practices that will lower energy costs.

Screening Value from Data Streams

Do the math. Every 15 minutes, multiple packets of information may traverse your network or the Internet to a designated

Four Types of Utility Meters Provide Different Levels of Data

- *Standard.* This most basic meter (like a residential meter) counts total kilowatt-hours used and results in one consumption number that's read by the utility once per month.
- *Time-of-use (TOU).* A TOU meter records usage during specific time blocks each day. When the meter is read, each time block is totaled for the entire billing period. For example, one total may be for on-peak hours and a second total would be for the remaining, off-peak, hours.
- *Interval.* An interval meter records consumption in small time blocks, usually 15 minutes, and stores all the data for monthly downloading to the utility's billing system. Interval meters also register the highest electricity demand for an interval during the billing period.
- *Smart or advanced.* An advanced meter is an interval or TOU meter that can communicate with the utility remotely, so that the utility can read the meter on demand, or more frequently than once a month, and can automate its data retrieval. Advanced meters provide more data that can be more immediately accessible than is possible with other meter types.

database, tagged for your account, a particular location, and perhaps even for a particular department of your company. Each 15-minute reading counts the kilowatt-hours of consumption, the highest kilowatt (kW) demand, and perhaps the voltage, reactive power, or some other parameter. That's a minimum of eight data points per hour, 24 hours per day, 365 days per year. Then add weather—one temperature point and one humidity point per hour. Then add calculated cost data, such as dollar values of consumption, peak charge, access

charge, taxes, and delivery charges that correspond to the measured energy usage. Add calculated values for load factor, per-square-foot or per-square-meter use, and heating or cooling degree-day. The single utility meter doesn't determine whether you've used more electricity in lighting or space heating or production, so add submeters (with more data streams) to identify usage points so that you can allocate costs.

Now that you're drowning in data, how do you make use of it? (See **Figure 1.**) Prioritize, mine, correlate, dig deeper with interval meter data, and benchmark.

Prioritize your goals. Which of the following do you want to achieve, and why?

- **Reduce peak demand.** Many utility rates are partly based on the maximum demand the utility expects to meet. The utility may charge a demand rate that is calculated on your highest usage, during a 15- or 30-minute period, at any time during the previous 12 months. Lowering your peak usage can lower your bills for the next year.
- **Reduce your consumption.** The results may not be as

dramatic as those gained from reducing peak demand, but you may achieve a marginal reduction in lighting load, recommission a building control system, or simply turn off what's not being used.

- **Allocate costs for both accounting and accountability.** "Where you have accountability, you have savings," says David Schneider, account manager at Wisconsin Public Service. Arguably, the single most important factor in reducing energy costs is assigning responsibility—even to production line workers or general departmental staff. When usage information is associated with activity, all employees become energy managers. Allocate to departments or cost centers to determine production or operating costs.
- **Save on administrative costs.** Simply having more data can be an administrative burden. However, when data is automatically and systematically collected, sorted, and stored for access by multiple persons across the company, you can speed up bill processing time and reduce requests from employees for energy cost and consumption information needed for internal reports. The paper trail of energy data that was easily hoarded or lost in the past can now be replaced by a hub-and-spoke model of electronically sharing energy information. The great impact of Web portals now provided by EIS vendors and some utilities is that more secondary users of energy information can gain direct access to reports and graphs that are customized to help them do their jobs.
- **Integrate energy data with other data sets.** Raw data has no inherent value. It is only by associating data with production or operation activities that we can take action. Create meaningful benchmarking and efficiency metrics. Automate the integration of energy monitoring and maintenance work orders to reduce equipment downtime.

Mine for nuggets. Once you've prioritized your goals, identify the type of data that you need to reach them.

Figure 1: Mountains of data

Interval usage data comes from meters, production and weather reports, and cost calculations. Starting from the bottom, this diagram shows the steps you need to take to turn that mountain of data into valuable and actionable information.



Source: E SOURCE

For example, to reduce peak demand you'll need to know not only kilowatt-hours—the amount of energy consumed—but also kilowatts—the peak demand during a short time period or a billing period. Utilities frequently charge large commercial and industrial customers a demand component, so start with the utility bill to compare demand across several months. Because the bill only reports the highest kilowatts for the month, you'll need interval data for each time period during that month in order to know when that peak was set. The utility will most likely provide an electronic file of interval readings, either at no cost or for a small fee.

Alternatively, you may install a “shadow meter” and an energy information system to collect interval readings directly. You might be able to identify the cause of peak demand just by knowing when it was set, but if you have multiple buildings or processes, you'll need additional metering to know where consumption was greatest.

Instead of searching through large data files, why not have the data stream itself report peak demand? Most energy information systems have an “alarm” function that notifies a user by e-mail or page when a predefined threshold or set of conditions is reached.

Even without an EIS, you can convert large interval data tables into a 3-D graph in a standard spreadsheet program and visually spot those nuggets of opportunity.

Correlate information with action. First look to the past, by comparing two or three years of monthly bills. Seasonal trends may be obvious, but other events may be hiding within “winter is cold; summer is hot.” Is usage different any particular time of the year, after normalizing for heating degree-days or cooling degree-days?

Dig deeper with interval meter data. For example, Steve Mann owned and operated a tire store in Nova Scotia. After paying his first electricity bill (amounting to about 1 percent of the store's sales), Mann signed up for Nova

Scotia Power's Smart Energy Information Service, a Web-based tool providing 15-minute interval usage and a demand profile graph. After checking his usage daily for a number of days, Mann discovered a pattern: Energy use peaked between 9:00 and 9:15 a.m. He then instructed employees to turn on store lighting in stages, rather than all at once, and immediately saw savings of \$100 and more on his monthly bill.

If real-time monitoring using submetering is an option, set the monitoring system to alert you when usage is greater than 70 or 80 percent of your peak demand. Use submetering to locate the source of peak energy use. Temporary submetering can be moved from one location or process to another to drill down into energy usage patterns and anomalies. Temporary submetering can also provide measurement and verification for calculating actual savings on efficiency or building improvement projects. Install meters at the project scoping phase, monitor improvements to gauge effectiveness of the project plan, and measure the difference before and after project completion.

Benchmark to validate improvement. You can compare your own building's energy usage from one time period to another or to another building that is a similar type. In a large corporation with multiple sites, you may group facilities by climate zone, energy intensity or production, and compare usage profiles to determine your own best practices.

For scoring the energy efficiency of commercial and institutional properties, the U.S. Department of Energy offers the Energy Star Portfolio Manager.

Nitin Manchanda is director of consulting services at Itron, an EIS provider. He notes that, once benchmark reports are available, “All of a sudden, no one [wants] to be the outlier—the worst of the bunch. Immediately, you start seeing improvement” as well as communication among the facilities: “What are you shutting off at night? How are you managing to that profile?”

Data Refining

Finally, look to the future. A comprehensive energy plan should include both immediate and long-range plans, should be flexible enough to change over time, and should be supported by reliable streams of usage data. Your energy management priorities may shift from structural improvements to on-site generation, to reducing contract risk. Your benchmark targets will also change as you learn more about your business's energy intensity and work to optimize productivity while minimizing energy costs. You may also wish to track emissions and improved efficiency for inclusion in corporate environmental responsibility reports.

Here are standard procedures to reduce the heavy digging and secure the nuggets of actionable information:

- *Get a partner.* Partner with your utility account manager (your point of contact with your energy provider), an outside consultant, or a sophisticated software tool for help with knowing what to look

for plus help in defining solutions for the problems you find.

- *Make an energy plan and assign an energy manager.* Give one person within your business the authority and tools to implement specific actions that will reduce energy-related costs. Don't stop at the first easy-pickings, such as changing lightbulbs, but plan for consistent and repeatable improvements through analysis of energy usage data.
- *Provide energy usage data to many employees.* Many employees have energy-related tasks and will mine your energy database for their own unique responsibilities.

Are you looking at a mountain and hoping a gold nugget will turn up at your feet? Understand your goals, take advantage of both technical and human assistance, evaluate progress frequently, and mine data streams persistently. In the end, you'll find the gold at your company's bottom line.