PG&E Tool Lending Library Assists California Companies in Measuring Energy Consumption

Power Metering Case Study

Figure 1: The PG&E Pacific Energy Center building in San Francisco, CA.

The ELITEpro SP Power Meter from DENT Instruments

Most companies want to decrease their energy consumption, either for financial reasons, or to be active in reducing their carbon footprint, or both—but some of them aren't sure where to begin. When the only measure of a facility's energy usage is the bill customers receive at the end of the month, they may feel their facility is more like the proverbial black hole: power goes in, business happens inside, but it's not clear exactly how much energy is used where and when. Factory owners may want to know where the heavy usage is inside their plant—how much consumption is used to operate compressors, chillers, pumps, lighting, etc. Office building owners may want to break out the energy consumed in their HVAC vs. lighting systems.

To get an accurate breakdown of energy consumption, a common method is to conduct a short-term energy audit. In an audit, monitoring devices are installed for a period of time to measure all the circuits that are responsible for the overall energy usage of the facility. The resulting data are recorded, demonstrating what areas are consuming the most power. By comparing the consumption of these with industry averages, it's possible to identify areas where energy can be saved. For example, lighting energy usage that is higher than typical for a business of its size could mean that the facility has unnecessarily high illumination levels or lights in use when not necessary.

PG&E is Helping

Pacific Gas and Electric Company (PG&E) has long understood that businesses may need help with understanding their consumption patterns, and created the Pacific Energy Center (PEC) in San Francisco back in 1991 to provide such assistance. Primarily an educational and consulting resource, the Pacific Energy Center enlists industry experts to communicate best practices in energy conservation and sustainability Its mission is to help customers understand their building's performance in order to reduce energy use and create better indoor environments.

A few years after the PEC opened its doors, it initiated the Tool Lending Library as a service to customers to help them understand and document their building's performance . "The Pacific Energy Center works with engineers, designers, facilities managers, building operators, stationary engineers, consulting agencies, and others to help them save energy or reduce energy demand" said Bill Pottinger, who manages the Center's Tool Lending Library. "For example, a building manager or outside consultant may engage the PEC's services to implement an energy-saving initiative or take advantage of one of PG&E's incentives to reduce energy demand."

The Pacific Energy Center's Tool Lending Library contains an array of measurement tools that are loaned out to California utility customers free of charge for load studies up to 30 days or more in length. "Since customers are mostly industry professionals, many of them have tools of the trade but the Tool Lending Library provides them with additional tools to more fully understand their building's performance," said Pottinger. "Equipment available to loan from

the Tool Lending Library includes ultrasonic flow meters, pressure monitoring equipment, motor status loggers, lighting status loggers, general purpose loggers, sensors for monitoring air pressures (high and low) and hand-held measuring equipment."

"Borrowing the tools from the Tool Lending Library enables our customers to pursue projects that might not otherwise be possible due to equipment costs," continued Pottinger. "The Tool Lending Library also provides support to enable customers to interpret the audit results."

Measurement and Record-Keeping Tools are Key

In selecting tools for the Tool Lending Library, Pacific Energy Center staff look for devices that are accurate, rugged, and reliable, so they can be loaned out many times during their useful life. Flexibility and ease of use are also critical because many users are not measurement experts and have not become familiar with their electrical or mechanical systems.

Figure 2: A wide range of current transformers (CTs) can be used, including (clockwise from top) 1000A Clamp-On, 50A Mini Hinged, 200A Split Core, and 16" RoCoil (Rogowski) CTs.

Among the most highly used tools are instruments that measure the power consumption of particular electrical circuits and record the measurements for future analysis. For this purpose, the library has amassed more than 160 power-logging data meters worth close to $300,000. This often-requested tool is the ELITEpro SP™ portable data-logging power meter manufactured by DENT Instruments of Bend, Oregon. DENT's programmable ELITEpro SP meters are supported by a wide array of CTs (current transformers), ranging from high accuracy, low amperage load sensors to high amperage flexible Rogowski coils (see Figure 2). All DENT CTs, including the Rogowski coils can be applied to a circuit without disconnecting any wiring, which makes them easy to install and remove, ideal characteristics for loaner equipment. Conventional one- or five-amp output CTs require the installer to shut down the circuit to install and uninstall which is quite an inconvenience in most instances.

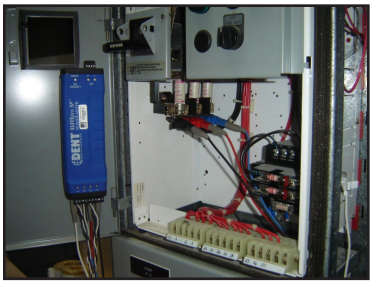

Figure 3: In addition to being rugged and reliable for use by non-expert operators, the ELITEpro SP instruments are compact enough to fit inside most electrical panels.

ELITEpro data logging power meters can capture kWh/kW energy and demand data as well as virtually all relevant energy parameters for diagnostics and monitoring on three-phase or single-phase circuit installations. Unlike other power loggers, ELITEpro SP meters require no external power to operate and are small enough to be installed inside a building's electrical panels (Figure 3). This allows for increased safety, security, and reliability because no wires are exposed during the monitoring period.

The ELITEpro meters are programmed and set up for a monitoring session by plugging in a PC running DENT's Windows-based ELOG™ software. ELOG graphically displays recorded data, performs analysis and facilitates automatic remote data collection. Data from ELOG is also easily exported to popular spreadsheet and database software packages for further examination.

The PEC Walks the Talk

As evidence for the benefit of a detailed breakdown of energy consumption data, PG&E has used its library equipment to measure the specific energy usage at the Pacific Energy Center building itself. PEC staff monitored individual loads, and logged power levels, and cross-checked the results against overall energy usage to verify that the building's energy usage was indeed accounted for in the recordings. Once that was done, PEC staff compared the loads of the building to the common loads for other buildings of similar size and type, looking for consumption patterns that might need to be corrected.

"Through the Pacific Energy Center's own energy audit, we found higher than expected baseline energy usage over the weekend," said Pottinger. "We were able to track the problem down to the amount of safety illumination during unoccupied hours, and the amount of refrigeration needed in our commercial kitchen. To address this issue we reduced the wattage on weekends, and identified more efficient refrigeration equipment when the existing equipment reaches the end of its useful life. We also found a boiler and an exhaust fan that were unnecessarily running constantly during the monitoring period."

Overall Program Results

In 2011, the PG&E Tool Lending Library completed over 1,250 test equipment loans to customers. Borrowers estimate that the monitoring projects supported by these loans helped reduce energy demand by 157 megawatts and save 92.5 million kWh of electrical energy in the year 2011.

"The Pacific Energy Center is proud to work alongside other utilities in California and beyond who have also started their own tool lending libraries," Pottinger noted. "Our instruments are one of the many resources that can help customers better understand and manage their buildings' energy use."

DENT INSTRUMENTS

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