The Importance of Submetering Campus Buildings

By Lona Rerick, AIA, LEED AP BD+C

With energy prices rising and budgets tightening, energy efficiency upgrades are one of few new expenditures being proposed these days. Using energy more efficiently is one of the only ways that schools can save money without scaling back educational programs. Capturing the benefits of this low hanging fruit starts with metering, which provides the backbone of knowledge about where resources are being used.
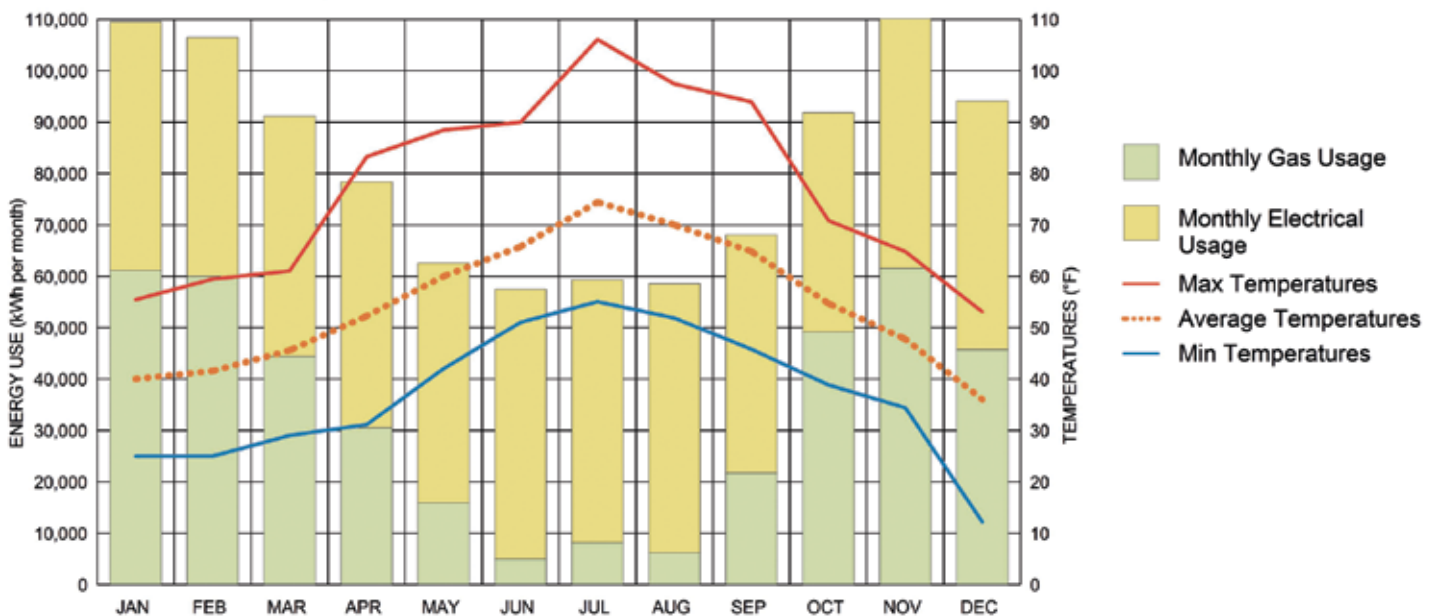
WHY SUBMETERING?

Tracking energy use on campuses, especially higher education facilities, has traditionally been accomplished with only one meter to match large-scale billing arrangements with local utilities. Using a single meter to track a whole group of buildings paid by one organization simpli-fies payments and allows multiple building use ebbs and flows to balance each other out. Unfortunately, the trade-off for this simplified reporting structure is a lack of real usage information. Facilities managers need to know where, when, and how much energy and/or water is being used before any realistic judgments about where improvements can be made. "Without building metering we would be flying blind," states Oregon State University's Sustainable Program Assistant, Greg Smith, who has led campus-wide building metering efforts since 2007. A joint 2009 study by the University of California San Diego and CB Richard Ellis, "Do Green Buildings Make Dollars and Sense?," showed that individually metered tenant spaces averaged 21 percent lower utility bills than those without.

METERING OPTIONS

Building metering options run the gamut from basic whole building meters to submetering of major uses to comprehensive addressable systems that can report back on every light fixture and piece of equipment individually. With the growth of the green building movement, including LEED-rated buildings, and increasing calls for energy efficiency, the market is also being flooded with new and changing options for smart, Web-based reporting. All these options can make adding building meters to a campus seem like an overwhelming and confusing task. It's important to take a step back and analyze what approach fits your campus.

A comprehensive campus metering effort begins with an inventory of existing systems. A list should include

all utilities that serve campus, including electricity, water, and potentially gas and steam, and which buildings on campus already meter these sources. Next, it is important to understand the strengths and constraints of personnel on campus, likely the facilities group, who will be working to gather and analyze the information. Most importantly, take the time to discuss your options as a group to determine what amount of metering makes sense for your campus. Then you can knowledgably assess where and which types of meters need to be added to buildings to set your campus up for metering success.

If your campus is just getting into the metering game, an electric meter on every building is an excellent place to start. Electrical use is typically a large chunk of a campus utility bill, and thus can generate a good return on investment. Electrical meters are also the simplest and least expensive (typically around $2,000 to$3,000) to install. Gas or steam meters will run you two to three times this cost. When you initially install meters, you will also want to add a campus Data Acquisition System (DAS) if you don't already have one. Make sure that your chosen DAS is flexible enough to add future system meters to it.

There is a careful balance in the metering game between gathering enough information to aid in real money-saving campus improvements--and overwhelming your staff with too much data to be useful. Dan Harris, New Buildings Institute's metering expert, recommends starting with collecting data in monthly or four week chunks. Conceptually, building metering has three levels including the building meters themselves, the DAS, which collects all of the building data to one location, and a Web-based analysis program added to aid in the digestion of building data. To be useful, these metrics need to be normalized for time and square footage and plotted against average outdoor dry bulb temperatures for the same reporting period.

REAPING METERING'S INFORMATIONAL REWARDS

Campus metering benefits begin almost immediately according to Hannah Friedman, technical research director at PECI. The first step is to compare the Energy Use Intensity (EUI) in kBtu/sq ft, for your entire portfolio of buildings and against each other and against typical data for your region and building types. Using the U.S. EPA's Portfolio Manager Program can further this cause by putting more real-life data into the pool for future comparison. You may also pursue Energy Star Building ratings for your best performing structures. An initial analysis of detailed daily and hourly data can help facilities note data patterns, abnormal usage spikes and unexpected energy use during unoccupied periods.

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Once you have logged a year or two of building usage metrics, you will have enough information to start noticing when things are off-trend within each building. At Oregon State University, individual building meters have helped identify and fix steam system leaks and wasteful water system problems where water was dumping straight into drains. It is useful to regularly track usage information at some regular interval like every month or four weeks. Your chosen data system should also allow you to delve deeper into daily and hourly data when this monthly snapshot warrants further investigation.

NEXT STEPS

To get the full benefit of the information gathered, there also needs to be an on-campus will to act. Important additional steps should include careful analysis of energy hogs on campus and prioritization of improvements. Recommissioning buildings at regular intervals is an ideal equivalent to regular automobile maintenance. The addition of real-time and Web-based usage information is evolving in the current market at warp speed with the hope that occupant education and influence on user behavior can be achieved more effectively with transparent information.

Building meters are an important basic component to a campus efficiency strategy. Armed with the right information, building meters can help you improve efficiency at all levels from your utility bills to your campus planning. Knowledge is power and knowing your consumption rates will provide the tools and motivation to make the best decisions for your campus. ⑨

ADDITIONAL RESOURCES
1. "Metering Best Practices" by U.S. Dept. of Energy, Office of Energy Efficiency and Renewable Energy, Federal Energy Management Program, *http://www1.eere.energy.gov/femp/pdfs/mbpg.pdf*
2. "Building Energy Information Systems: State of the Technology and User Case Studies" by Ernest Orlando Lawrence Berkeley National Laboratory, *http://eis.lbl.gov/pubs/lbnl-2899e.pdf*
3. "A Retrocommissioning Guide for Building Owners" by Portland Energy Conservation, Inc (PECI) with funding from the U.S. Environmental Protection Agency ENERGY STAR Program, *http://www.peci.org/documents/EPAguide.pdf*
4. "Sub-metering Campus Buildings" by the U.S. Environmental Protection Agency New England Division, *http://www.epa.gov/region1/assistance/univ/pdfs/bmps/*SCSUSubmetering1-8-07.pdf
5. "Do Green Buildings Make Dollars and Sense?" by Burnham-Moores Center for Real Estate at the University of San Diego and CB Richard Ellis, *http://www.cbre.com/USA/Sustainability/Envirometrics.htm*
6. EPA's Green Start Portfolio Manager, *http://www.energystar.gov/*

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