The Coming Flood of Energy Reporting, Building Sensors and System Meters

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Smart Buildings

While there is an array of things that can make a building greener or smarter, there are three components in particular that will see dramatic increases in utilization and market presence over the next couple years: energy reporting, building sensors and system metering. All are involved with some aspect of information or data on a building's performance. The old adage is "You can't manage what you don't measure". If it's energy you're managing, you'll need a lot of measurements, data and actionable information.

The Prius Factor

Most everyone knows about the popular Toyota Prius automobile. It's special because it's a hybrid. But it's also special because it comes with a gauge in the dashboard that gives the driver real-time data on fuel consumption. When you're driving the Prius and see the real-time miles per gallon of gas starting to decrease, the normal reaction is for the driver to lay off the gas and conserve energy. This is known as the "Prius Factor", a term apparently coined by Harvey Burns with Arizona State University. The underlying theory here is that if people are provided information on their energy consumption they will respond responsibly. The popularity of the real-time gas consumption gauges in the Prius has lead to the gauges being installed in non-hybrid cars.

Now apply the "Prius factor" to a building. Tenants, facility managers, building owners, CFOs, utilities and government entities will act more responsibly if actionable information on the real-time energy consumption of a building is available. Think about moving such information out beyond a software application residing on a Facility Manager's PC, and making it available over a network or the internet, or displayed on a flat panel in the building lobby or the tenant's space.

Oberlin College did just that in conducting one of the most innovative uses of energy reporting. Every year during a two week period, Oberlin College has a competition among their dormitories to see which dorms can reduce their energy use by the largest percentage. The competition has successfully demonstrated that energy use reporting and feedback motivate students to exhibit substantial short-term reductions in energy and water use in dormitories. On average, dorms reduced electricity use by 32% during the competition. The web

page showing real time electrical consumption of the dorms (http://www.oberlin.edu/dormenergy) was the vehicle used for the energy reporting.

There's a lot more to energy consumption information than just having the facility manager "lay off the gas pedal" and reduce consumption. There are many regulatory, business and legal reasons to compile such information. For example, California has mandated (Assembly Bill 1103) that a nonresidential building owner or operator disclose Energy Star Portfolio Manager benchmarking data and ratings for the most recent 12-month period to a prospective buyer, lessee, or lender. In this case, the energy information serves a regulatory and business need. It's not a stretch to see energy information being used in legal matters. If for example, a person bought a building that was advertised as 20% more energy efficient than a DOE standard and later found out the building was only 10% more efficient, it wouldn't take many tenants before one tenant legally disputed such a claim, triggering a need for energy-use information. Building owners will need information on the building's energy metrics to buy or sell energy with the utility grid.

Unlike some government mandated reporting, such as the US's Sarbanes Oxley regulations regarding corporate accounting, energy reporting will apply to millions of buildings and have more interest by the general population than some arcane accounting rules.

Sensors

The highest performing buildings will require more information regarding performance and more accurate data. Sensors in buildings, especially related to HVAC control and lighting, will become more sophisticated and more of them will be deployed in buildings. These will be CO2 sensors, photoelectric cells, thermostats, even micro-sensors embedded in the walls. The result will not only be more data but more accurate data of existing conditions, allowing for more accurate control of the system.

An example of the potential improvement related to sensors is the typical thermostat in a room, which provides information on air temperature. It provides one reading for the room. That reading may not be fully accurate because of the size of the room, the location of the thermostat, and the uneven distribution of heat and air within the room. More sensors, sensors providing surface temperature rather than air temperature or sensors embedded in surfaces would provide for more accurate data. It would not take much effort to calculate the return on investment in more sensors versus the cost of under-heating or over-cooling the space over the lifecycle of a building. Given the vast number of existing buildings and potential problems with cabling and cable pathways in those buildings, we can expect the market for wireless building sensors to be huge and maybe a normal part of system re-commissioning.

Metering

Metering is the way to obtain and measure data regarding energy and utility loads and consumption. Data enables the building owner to better manage the building. It

allows a building owner to identify energy and water being provided to the building or to tenants in a building. Data can be used to minimize the expense of energy and water, thus directly affecting the operating expenses and the overall value of the building. Metering can also be used to pinpoint problems and to enhance occupant satisfaction.

Metering and meter reading, or data gathering, is a well developed tool for utilities. Traditionally it has stopped at the exterior wall of the building, with some sub-metering provided in larger buildings. Use of metering utility usage and quality within buildings will grow significantly.

Building systems will mirror those used in the field by utilities: the use of wired and wireless networks, meters transmitting to a centralized server of collection units, and application software integrated into FMS, ERP and PMS systems.

Metering has other benefits. It can assist in detecting leaks, reverse flows and tampering. Real-time data collection can help ensure timely repairs and add to the building's security. As energy becomes a commodity and an asset traded and provided over the grid, metering will become critical in providing timely, accurate and detailed information.

In order to meet the challenge of energy management within buildings, maintain and increase the performance and asset value, buildings systems will need to dramatically increase devices that can sense, monitor, measure and manage energy loads and consumption, and weave that data into management reports that provide actionable information.

For more information about smart buildings, systems design services or to schedule a Continuing Education program, email me at jsinopoli@smart-buildings.com.