

The Energy Efficiency Alphabet & Big Data

By Ben Heraud and Andrew J. Milne, Ph.D.

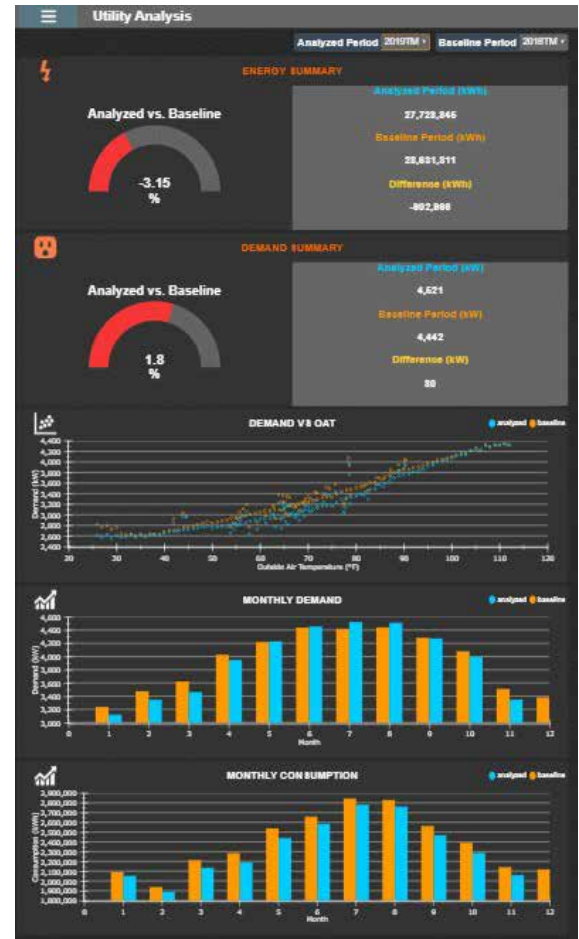
This month's Technology & Trends column features excerpts from a conversation between Ben Heraud of Energenz/NV5 and Andrew Milne of Sextant Group/NV5.

As campuses pay increasing attention to the way that data can be collected and analyzed to transform operations across the varied activities of their institutions, new opportunities are emerging to maximize the efficiency of new system designs and to retroactively evaluate and redesign legacy systems to improve their performance. In this column, Andrew asks Ben to define some key terms and to offer insights as to how campuses can successfully pursue energy commissioning initiatives.

Andrew Milne: *Energy use has long been a concern of campuses. As building systems grow in their capabilities to collect, analyze, and easily disseminate information about their operations, new opportunities for integrating and acting on operational data will emerge, and facilities departments will be able to reconsider how they can use data most effectively. Clearly the evolution of the "smart campus" will incorporate some of this thinking and integrate it with other aspects of campus life, contributing to the productivity, well-being, and fiscal resilience of campus communities.*

However, there remains confusion in the market, so let's start with some basics. What is energy efficiency in general?

Ben Heraud: Energy efficiency is a very broad topic. What it means to me is working out ways to do the same thing more efficiently. I often use an example to help reassure clients that we won't just come into their site and recommend they turn off the lights and air conditioning. To me, turning off the lights in a classroom and having the class in the dark would



be energy conservation. Energy efficiency would be changing those lights out to a higher efficiency type and installing controls to ensure they do not operate when the room is not in use.

Andrew: *What are some of the primary issues you encounter when optimizing energy systems for buildings?*

Ben: Access to information. When we optimize a building, we generally focus on leveraging the existing building infrastructure. To do this we need to know exactly what each component of the building is doing at any moment in time, which is where a true analytics platform comes in. The BMS [building management system] is not designed to look at big data simultaneously and over time, so while the data exists within the BMS, it is often not accessible in an ideal manner. By accessing this data, we pick up on issues across the entire building and determine ways to optimize the way each piece of equipment is programmed to operate.

Andrew: Are there any particular building/facility types on campuses that seem to be worse than others in terms of needing redesign/optimization?

Ben: Not really. Issues generally stem from poor design and commissioning of systems.

Andrew: Are there any particular building/facility systems that warrant special attention?

Ben: The more complex a system is, the more issues we identify and the more opportunities we tend to find. This generally means we focus on the mechanical systems, chillers, boilers, and ventilation systems. This is also where most of the energy is being consumed in a typical building.

Andrew: What are the chief differences between BAS and BMS, and how will they manifest themselves in future IBTs [integrated building technologies]?

Ben: A BAS [building automation system] and a BMS are one and the same, just different terms. What is important to point out is the difference between a BMS and monitoring-based commissioning (MBCx). BMS is designed to support monitoring, control, and automation of equipment and components, identify critical equipment failures, and carry out building function and automation. MBCx is designed to monitor through continuous analysis of data patterns from the BMS, in order to identify issues and problems by analysis of big data. It is designed to optimize building performance and identify complex issues with MEP [mechanical, electrical, and plumbing] systems.

Andrew: What does “monitoring-based commissioning” entail? How is this different from other forms of building system commissioning?

Ben: The chief difference between commissioning initiatives lies in whether they are a one-off activity or an ongoing effort. The two types are complementary. There are actually a number of definitions for commissioning, including:

- **Building Commissioning (Cx)**

Ensures that the new building operates initially as the owner intended and that building staff are prepared to operate and maintain its systems and equipment.

- **Recommissioning (ReCx)**

The decision to recommission, or a repeat of the initial Cx, may be triggered by a change in building use or ownership, the onset of operational

problems, or some other need. Ideally, a plan for recommissioning is established as part of a new building’s original commissioning process or an existing building’s retrocommissioning process.

- **Retrocommissioning (EBCx)**

Similar to ReCx, this approach solves problems that occurred during design or construction, or addresses problems that have developed throughout the building’s life. Retrocommissioning improves a building’s operations and maintenance (O&M) procedures to enhance overall building performance.

- **Monitoring-Based Commissioning (MBCx)**

An ongoing effort to combine building system monitoring with standard retrocommissioning (RCx) practices, with the aim of providing substantial, persistent energy savings. “Ongoing” is the key here.

Andrew: What is the current state of building systems analytics? How will this evolve in the next five years?

Ben: Right now, less than 5 percent of existing building stock uses this type of advanced energy analysis. That number will increase significantly as more awareness builds in the marketplace and buildings continue to become more connected.

Andrew: What do you see as the “big wins” with the increased integration of BAS?

Ben: The big win is the access to big data. The BAS, at a very low cost, can connect to a building and extract a huge amount of valuable information. Prior to the development of highly integrated buildings, accessing this data would require a lot of expensive hardware. With this kind of data in hand, we can identify trends, problems, and opportunities and then work with them to develop plans for upgrading their systems and practices. ☹

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Ed. Note: *The Building Commissioning Handbook*, third edition, is available at www.appa.org/bookstore.