CAMPUS RESEARCH SAVES ENERGY

This case study highlights how the myPower program can complement existing work to reduce energy on our campus. Many individuals and groups regularly contribute to permanently reducing the amount of energy we use—below is one example of how students have worked with others to do so.

LoCal – AUTOMATED BUILDING MONITORING AND OPTIMIZATION

In an institution of learning, finally the buildings are starting to learn back. Using an innovative software approach, campus researchers have dramatically increased energy efficiency in Sutardja Dai Hall. Using previously installed metering, Andrew Krioukov (computer science PhD student at UC Berkeley), Stephen Dawson-Haggerty (computer science PhD student at UC Berkeley), and Abe Othman (computer science PhD student at Carnegie Mellon) created software in a matter of months that is estimated to save $50,000 per year.

The project goals -- simplifying building management, increasing occupant comfort, and reducing energy use —are achieved by optimizing building configurations. According to the team they "pull real-time data from existing building controls, combined with occupant preferences, and automatically construct a model of building operation." Then they "perform an optimization on the model to determine the most efficient building configuration." The modeling and optimization are then refined and updated continuously. Using the massive pool of data from the meters, the system optimizes the building every minute of every day, and is capable of getting real time comfort improvements and energy savings in five second intervals.

Kriokov states that this software is "not a tool to replace the building manager, but it is a tool that helps them do their job better." Now a manager is able to see live updates on heating, ventilation, and cooling (HVAC) throughout building on an html java site with about a one percent error for an entire building.

Using an online interface, the building manager can now adjust any room's temperature easily, and is also able to see which rooms are not meeting optimal temperatures. This way managers can identify problems before receiving a complaint and reduce the time occupants are uncomfortable.

One especially interesting feature is the ability to deliver a blast of air. If a room is too hot or cold, a quick burst of air can be sent into the targeted room. Within a minute the room has new cold or hot air flow, quickly changing the temperature before returning to its optimized routine.

The software manages energy use by letting the temperature "float." Instead of trying to maintain a constant arbitrary temperature, the software creates a temperature range for the room. This float allows the system to work efficiently by decreasing the amount of time the heating and ventilation system starts and stops. During normal working hours, the software will maintain a standard temperature range, but on nights and weekends it will widen the acceptable range of temperatures and allow the HVAC equipment to work even less.

Kriokov says, "To some extent this project was like flipping a switch, the program started and it started saving energy from the start." No walls had to be torn up, and the building was still open throughout the design and implementation process. With 17% energy savings, 13% steam savings, and an estimated combined steam and energy savings of $50,000 per year, the results speak for themselves. With office buildings representing 30-40% of total energy used globally, this software has the potential to make a huge impact, and the students are working with campus staff to identify additional buildings for the next phase of the project.