Operational Improvements for Building 77

Fixing building operation to better support science and save energy

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Opportunity

The primary savings opportunities in B77 are to reduce baseline cooling loads and turn off phantom equipment loads during off hours.

- **Reduce Cooling Loads**: The building has had a continuous cooling load that is driven by two facilities: an Undulator Measurement Facility (UMF) and a cleanroom that is used intermittently. To reliably meet these loads, an additional "false" heat load has been operated solely to keep the chiller operating at its minimum setpoint. A technical investigation and conversation with users indicated that these loads are largely waste - that is, not required to required for comfort or to meet the scientific program. Once critical loads are minimized, controls improvements have been identified that could entirely eliminate the need for false loading.

- **Turn off Phantom Equipment**: Electricity metering by circuit has identified unexpected loads for some equipment and processes even when they are not being used overnight. Scheduling of electrical circuits could reduce these loads without impacting service.

Together, the estimated savings amount to about 420,000 kWh/year. This corresponds to an annual savings of $34,000 (at $0.08/kWh) and approximately 4.2 MT of greenhouse gas emissions per person (at 27 full-time equivalent people using the building). As the project completes, savings will be confirmed and monitored to ensure that the savings persist over time.

Solution

The cleanroom can go weeks without use, and the manager of the cleanroom agreed that temperature setbacks were acceptable during unused hours. In addition, many air handlers throughout the building have been operating continuously, and appropriate schedules are being identified and implemented. Faulty air handler operation has also been found to create additional waste through leaky chilled water coil valves and broken outside air economizers. Facilities is fixing these air handlers.

The humidity range for the UMF was mistakenly set to an unattainably tight range. By correcting this back to the design value, there is an opportunity to reduce “battling” heating and cooling. Control of outside air will further reduce loads in the UMF. Controls changes to the chiller are intended to allow it to meet intermittent loads during the night and avoid continuous operation.

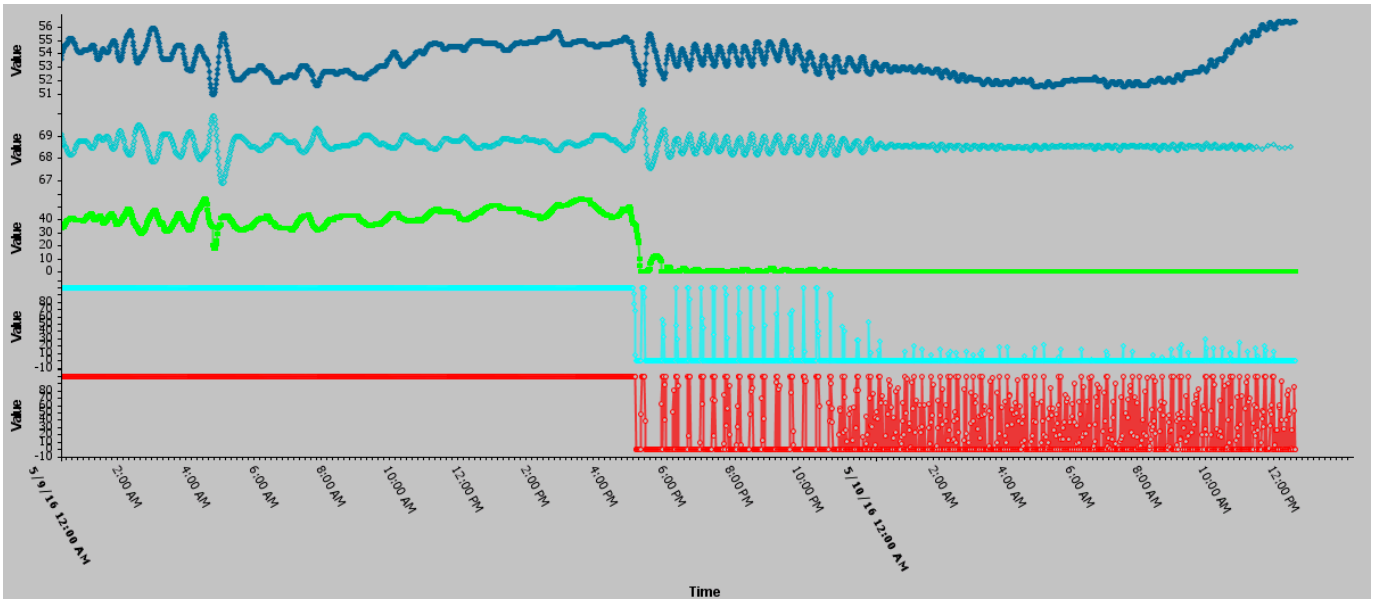
Facilities, SBL, and the building manager are experimenting with specific equipment and process loads to identify which can be turned off overnight.

Insight

Here is one plot that demonstrates how an operational improvement results in both better service to users and reduced energy savings. The UMF has been running with simultaneous heating and cooling to maintain strict humidity and temperature requirements. But the cooling and heating fight each other, and control is difficult to maintain. After deadbands were changed, the temperature is actually much more stable, and significant heating and cooling loads have dropped away.

The plot below shows, from top to bottom:

- **Dark Blue**: Humidity
- **Teal**: Temperature
- **Light Green**: Heating Valve Position (0 to 100%)
- **Light Blue**: Second Stage Cooling Valve Position (0 to 100%)
- **Red**: First Stage Cooling Valve Position (0 to 100%)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