College of the Desert Campus-wide HVAC/EMS Upgrades

Construction of a new energy-efficient central plant gave College of the Desert an opportunity to overhaul HVAC distribution systems in eight major buildings. Combined with ongoing commissioning with enhanced system controls the project reduced the total campus electrical use by approximately 15 percent.

College of the Desert enrolls 10,400 students in a range of academic and technical fields, and prides itself on a culture of responsible resource use. With increasing challenges to state funding for facilities, energy-efficiency improvements have become a valuable approach for reducing the college’s facility costs.

In 2004, a bond measure approval allowed the college to undertake a number of projects to update and expand the 45-year-old campus. When the central plant was due for replacement, the college used incentives from the California Community College/Investor Owned Utility (CCC/IOU) Partnership program to leverage the plant upgrade into campus-wide HVAC improvements in eight buildings, reducing annual campus electricity use by 1400 MWh, or roughly 15 percent.

Campus-wide HVAC upgrades plus enhanced EMS control generated energy cost savings while reducing maintenance and operational costs and extending equipment life.

Much of the savings came from shifting loads from all major buildings to the new plant, which entailed decommissioning older chillers and boilers in five buildings, and retrofitting less efficient packaged rooftop units in three additional buildings with hot and chilled water coils connected to the central plant.

Five buildings in the campus core also received a major improvements in air distribution efficiency. New variable frequency drives (VFDs) were installed, replacing the constant volume system, zone dampers were replaced with low-leakage ones, and outside air measuring stations with CO₂ monitoring were installed. In buildings outside the core, air handling units larger than 3000 cfm were fitted with new VFDs. Air handling systems and ductwork in all buildings were cleaned and repaired.

Improvements to the campus-wide energy management system (EMS) pushed energy savings well beyond the incremental improvements achieved from the HVAC equipment upgrades. The EMS was enhanced with alternate sequences of operation that give facility managers greater control for responding to critical peak power (CPP) demand charges instituted by Southern California Edison (SCE), the local electric utility. The alternate control sequences reduce lighting power and adjust room air temperature setpoints automatically on critical peak days to greatly reduce costs.

Steve Renew, director of facilities management for the college, remarked that implementing these new control sequences was an “obvious and easy next step.” This year the campus is further revising control algorithms to better control temperatures by using data on outside air temperature, historical temperature patterns, and occupancy. And by integrating data from lighting occupancy controls with the EMS, the campus can control both lighting and HVAC on a room-by-room basis.

However, changes to the buildings’ operation did not come without some resistance from staff. In the early phases of the new control implementation, there were some
unacceptable temperature swings that sparked complaints. Although operators and staff alike understand the benefits of more relaxed temperatures and supported the project in spirit, ongoing discussions continue about how far to push the setpoints. Renew noticed that even allowing the building to float between 70°F and 74°F degrees, rather than maintaining a single setpoint, was something that staff had to become acclimated to.

The installation of new sub-meters in campus buildings and the initiation of a monitoring-based commissioning (MBCx) program have helped the campus community, along with facility managers, to be more involved in proposing operational changes that affect occupants. For example, Steve Renew explains that the campus plans to allow CPP sequences to initiate automatically, with a manual opt-out option where required by specific occupancies. As a general rule, facility managers have been adamant about taking full advantage of the new systems, using automatic response sequences as much as possible and trying to push efficiency goals further. The system now notifies facility managers with text messages if room temperatures get too high or low, or if outside air temperatures change dramatically.

Meeting the demands of a high quality retrofit within the timeline necessary to take advantage of incentives required close coordination between project team members, and a “time is of the essence” mentality. According to Renew, the project demonstrates the benefits of following the CCC/IOU partnership implementation strategy.

The first step in the implementation framework is to set long-range goals and coordinate all stakeholders early in the process, particularly the partnering utility. The framework allows a great deal of flexibility in the selection of contractors and setting deadlines and schedules. At the outset of the project, the campus and SCE established a cost reduction goal of at least 15% annually.

**LESSONS LEARNED**

The project demonstrated the challenges of conducting a fast-track project using CCC/IOU incentives while managing expectations among members of the community. Renew notes that more up-front communication with building users about the planned work and its potential disruptions would have been beneficial. This may be particularly true when making changes to the indoor environment, given that comfort perceptions can be influenced by how individuals value the changes being made.

**Partnering with Southern California Edison and support of implementation guidelines were keys to success.**

One surprise, according to Renew, was the extent and timeliness of SCE’s involvement, and how they took a lead role in project review, documentation, scheduling and issuing incentive checks. Throughout the process, the utility was instrumental in keeping the district informed about the benefits of the planned scope of work, contributions that were critical to the success of the project.