fact sheet

Facilities & Services
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Energy Cost Saving Projects

Central Chilled Water System

Production Plants:
- 5 Plants - VSD Distribution
- 21 Chillers - 37,500 tons

Distribution Piping (Direct Buried)
- Two Pipe (Supply / Return)
- Up to 54 inch diameter pipe
- ~ 5 miles main loop

Building Loads
- 90 Main Campus Buildings
- 30,000 tons (diversified peak)
- Variable Flow (no pumps)
- Load Factor .87 (2010)

Thermal Storage Enhancement
- Insulated Steel Tank (Above Ground)
- 6.5 million gallon (Nominal)
- Stratified Chilled Water
- 50,000 ton hours (@13 F TD)
- VFD pumping (3 @ 600 HP)
- 8.5 MW Peak Demand Reduction

Thermal Energy Storage Summary

The University of Illinois at Urbana-Champaign has integrated Thermal Energy Storage (TES) into our Central Chilled Water System (CCWS) to provide additional cooling for various new campus building loads. Included in these anticipated loads are the New Residence Hall at Ikenberry Commons, Lincoln Hall Renovation, and the NCSA Petascale Computing Facility (5400 tons) for IBM Blue Waters. This enhancement to the CCWS includes a new tank that remains full of chilled water (stratified) that is "charged" by continuing to operate existing chillers at night as the building loads subside and allowing the excess chilled water to flow into the bottom of the tank. Warm water is simultaneously drawn off the top of the tank through new pumps and returned to the chiller plants for cooling. To provide cooling to the buildings (during the afternoon peak cooling periods) the cold supply water will be pumped from the bottom of the tank to the buildings (with warm water returned to the top). This system also allows us to produce the additional chilled water capacity at night to take advantage of our ability to purchase electricity during the low cost off-peak hours through Real Time Pricing (RTP). The energy costs model based on the campus chilled water load profile and calculations of average electrical purchase price difference between the on-peak and off-peak costs from a previous year's actual RTP electrical purchase data estimated annual operational/energy costs avoidance of $860,000 and a peak electrical demand reduction of ~8.5 Mega Watts.

The opportunity to use TES to provide additional capacity of this scale is made possible by the previous work developing the CCWS. The Library Chiller Plant and the Chemical Life Chiller Plant were the most recent conversions integrated into the CCWS that allows their chillers to be shared production assets. These conversions also integrated their respective building loads into the central system to allow diversity and to be served from TES. The central system arrangement allows optimizing chiller sizing, shared "N+1" redundancy, higher reliability, increased operating efficiency, and reduced production assets through system load diversity. It also saves on required mechanical room space and cooling tower installations in central campus buildings.

The TES system capability was optimized by locating the tank adjacent to PCF and designing the maximum tank size the site would allow. This location "close couples" the tank to PCF to take advantage of its large chilled water temperature difference to enhance the thermal capacity of the tank. The "additional" thermal capacity can be utilized by further improving the CCWS "load factor". Improving the load factor is basically achieved by reducing the (night time) off-peak loads by programming set-backs and scheduling building systems off during unoccupied hours. This releases additional off-peak chiller capacity to assist in charging the tank, leveraging further energy conservation work (including Retro-commissioning) and converting additional building cooling to CCWS.

Rapid Payback Projects

Through agreement with the Provost's office, a program to provide a funding source for "quick payback projects" was established in FY09. To qualify for this program, the payback was expected to be quick, typically in the 1-3 year range. This was a onetime funding source. A variety of projects (10-15) have been brought forward and funded at a value of approximately 1 million dollars. These projects have included lighting retrofits, fume hood removals, chiller control upgrades, adding variable frequency drives (VFDs) to HVAC equipment, temperature control upgrades, and hot water control valve replacements. There are several projects that are in progress at this point including temperature control upgrade work at the Digital Computer Lab and at the Main Library.

Electricity Supplier Choice

The Utilities & Energy Services division of F&S is also concerned with the per unit costs of the energy consumed. Under Illinois law, Illinois energy consumers can choose their energy supplier for retail electricity and gas. On the Champaign-Urbana campus, we have approximately 300 locations that are served directly by Ameren, and not by the University Utility system. These locations are small houses and other buildings converted into classroom or office space, or, in the case of Willard, the Airport. Under the Illinois Choice program, we have elected to have Prairieland Electric, as subsidiary of the University, supply these locations with electricity instead of Ameren. The difference in rates is substantial. PEI can supply these buildings with wholesale rates, while Ameren supplied them with retail energy rates. By switching suppliers for these locations and the airport, this campus will save in excess of $400,000 per year in electricity costs. We have enrolled 315 small accounts into the Supplier Choice program, and the realization of these savings will begin June 1, 2011.