UtahStateUniversity
2012 Campus Energy Conservation Plan

Summary

Utah State University currently spends over $9 million per year on energy utility bills; this is more than 2% of the annual university budget. More than half the average cost of building maintenance goes to pay for energy and other utilities. By far the greatest expense is for heating, cooling and electrical energy for lights and computers. In recent years numerous energy conservation projects with high rates of return have been executed across campus. These have ranged from installing insulation jackets on large steam valves and replacing corroded buried condensate pipes, to replacing fluorescent lamps and ballasts with more efficient T8 tubes, to replacing old pneumatic controllers on heating and ventilating equipment with more precise digital controls.

The campus heating ventilating and air conditioning (HVAC) in most major buildings is controlled by computer systems that operate over the campus fiber optic network. The degree of control varies, depending on the age of the equipment in each building. Central controls enable the economical setting of temperature within buildings, avoiding unnecessary heating and cooling during unoccupied modes. Although night time set back is a campus wide energy saving goal, it is not always possible in all buildings because of research or other important functions.

The design of energy consuming systems in new buildings addresses safety, comfort, energy consumption and long term, or life cycle, value. Large pieces of mechanical equipment are evaluated based on initial cost, estimated annual operating cost, annual energy consumption based on manufacturer's efficiency and project energy costs to arrive at a net "present value".

Each building has meters for steam, chilled water and electricity enabling regular annual energy audits to examine trends in energy consumption. In most laboratories, the exhaust air from fume hoods is passed through energy recovery equipment before being released to the atmosphere; fume hoods are equipped with automatic alarms that send a message through the central controls system to alert the Facilities organization if a particular fume hood sash is left open. This helps not only reduce unnecessary waste but trains the lab users in safe laboratory procedures.

Most university buildings are heated and cooled from the Central Energy Plant where natural gas is burned in large boilers to produce steam which is distributed to buildings through a system of underground tunnels and buried pipes. The university also operates a small 350 kilowatt hydro-electric generator at First Dam, has a 35 kilowatt photovoltaic array of building integrated solar panels on one campus building and has a cogeneration system at the central energy plant that produces 4.8 megawatts of electricity. Approximately half of the campus electrical energy is produced on site, the

other half is purchased from Logan City Light and Power. LCLP buys most of its power from coal fired plants in central Utah. The exhaust heat from the natural gas fired cogeneration system is passed through a heat recovery boiler which produces enough steam to meet the summer load for the campus.

History

Over the past twenty years considerable improvements have been made in energy efficiency. Fifty year old coal fired boilers have been replaced with clean burning natural gas units. Individual chillers on most buildings have been removed and the buildings have been connected to a large central chilled water system that can operate year round and cool buildings in winter without using heavy refrigeration equipment. Computers that require 24/7 cooling have been located where possible into a central data room in the SER building so that the buildings they serve can be on night and weekend set back modes to save energy.

A two million gallon underground storage tank for chilled water enables chilled water to be produced at night when the ambient air temperature is lower and the equipment more efficient. The chilled water storage tank enables the university to avoid running all the Central Energy Plant chillers during the daytime. This saves approximately one megawatt of electricity during the peak time of the day and thereby reduces the monthly power bill by lowering the demand charge.

The campus has two electrical sub stations. They have been upgraded with voltage regulators that provide a high level of power correction which saves the university considerable expense on the monthly utility bill. More than half of the oil filled medium voltage switches in buildings and underground vaults have been replaced with vacuum fault interrupter switches for safety and reliability purposes. There is still more work to do in this area.

Design

Most newer buildings on campus have been designed to make as much use of natural daylight as possible and limit the electrical energy required for lighting to very low national standards such as ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers) 90.1 and LEED (The US Green Building Council) Silver. Since 2011 all state funded buildings are required by law to meet or pass these standards, which apply to all buildings except for residential. Students on campus can learn to become more energy conscious through Residence Life programs that provide feedback regarding the energy consumption in their Residence Halls and compare consumption on a monthly basis with their counterparts in similar dorm buildings.

Funding

Some of the energy improvements have been funded as state Capital projects while others have been either a grant from the federal government or loans from a state energy efficiency revolving loan fund or from a bank. The revolving loan program is small for the size of the state, but USU has been very successful in making use of the money. The funds get paid back out of the energy savings and can then be made available for other state agencies.

Initiatives

The Facilities group has carried out several studies for future energy saving consideration. Two viable projects that simply await funding will be the addition of a second 350 kilowatt hydro-electric turbine in the generator house at First Dam, and the installation of a 1.3 megawatt wind turbine adjacent to the south substation. Both of these would have a reasonable return on investment but will likely require some seed money to leverage a loan in today's market. State funding for capital renewal has been reduced considerably over the past four years and as a result there is a growing need to address maintenance that has been deferred.

Deferred maintenance needs tend to be more urgent than energy saving projects but there are plenty of opportunities across campus. Some initiatives in line to be addressed are as follows:

1. Over the next few years it is intended to replace all remaining medium voltage switches in buildings and high voltage switches and fuses at the two sub stations with safer voltage interruption devices. This will increase redundancy and reliability for the campus as the electrical load grows.
2. Merrill Cazier Library has space planned to accept a green roof as a means to reduce glare at windows, increase thermal insulation and to produce oxygen on campus.
3. There is room at the south electrical substation for a ground mount photovoltaic array of solar panels.
4. More room occupancy sensors and automatic lighting controls can be retro-fitted.
5. Heat pumps could be installed on return chilled water lines to pre-heat domestic hot water in buildings.
6. Investigating steam turbine technology as a means to rotate heavy refrigeration equipment at the central energy plant could reduce day time consumption of electrical energy and save money.
7. Replacing HVAC controls in large buildings with more accurate modern digital controls.

8. Retro-commissioning buildings that have a history of HVAC service calls.
9. Studying opportunities to reduce air changes based on occupancy and carbon dioxide levels.

Outreach

Opportunities exist for each student, staff or faculty member as they move about the campus. The Facilities Customer Service desk is always available to take messages from observant individuals and pass them along to the engineers and technicians who can implement change.

Facilities staff members are actively engaged in the campus Sustainability Council representing not only energy conservation but also campus planning which has an effect on energy consumption. The Facilities organization holds a monthly energy meeting with representatives from the Sustainability Council, Faculty, Housing and Students to have a regular forum to receive input from the campus community.

Climate Accord

Utah State university was an early signatory of the national University Presidents' Climate Accord to reduce our carbon footprint. As the campus grows in student enrollment and the number and complexity of systems in buildings, electrical energy consumption will naturally grow in spite of any energy saving efforts. There is however a number of simple measures that the whole campus community can adopt to reduce waste. On October 9, 2006, President Albrecht sent a letter to all colleges, departments and other units on campus identifying seven simple steps that each employee can adopt that will significantly affect the HVAC and electrical consumption for the university they are as follows:

1. Turning off lights whenever a room is not in use
2. Turning off computer monitors when leaving for a considerable amount of time
3. Closing blinds at the end of the day
4. Discontinuing the use of portable space heaters
5. Turning off printers and copiers when not in use and shortening the wait time for the machines to enter sleep mode
6. Closing fume hoods to minimum levels whenever possible
7. Installing independent cooling systems for computer server rooms to allow the building central HVAC system to operate more efficiently and to be set back at nights and weekends.

These suggestions are still appropriate in 2012 and beyond.