North America's Largest HVAC Solar Thermal Plant

CASE STUDY: **Central Plant District Cooling and Heating on Los Angeles College Campus**

■ A 350 ton solar thermal air conditioning and space heating project—the largest in the United States—was completed in May 2009 at Los Angeles Valley College. Sister campus Los Angeles Pierce College had a smaller system installed a year later. SunChiller was instrumental in selling the vision to these major college campuses in the Los Angeles area and is now working to outfit more campuses with its latest technology.

Los Angeles Department of Water and Power is the utility that serves electricity to the campus, and thus, time of use electric rates apply. But, because solar thermal energy can be stored in insulated tanks, in combination with the absorption chiller, it can be used to offset peak electric rates and demand charges.

The decision to install the solar thermal driven HVAC system was made in 2005 when the campus was planning to add or replace existing buildings financed by bonds A and AA approved by the voters. Prior to the new construction to meet cooling and heating loads, the campus relied on an existing central plant comprised of two electric chillers and four ice storage boxes. It was estimated that the campus peak cooling load after completion of new construction was going to be 1500 tons. To meet the added cooling and heating loads, the central plant capacity was expanded by replacing one of the electric chillers with a new one capable of ice making, adding one new 350 ton solar thermal driven absorption chiller, and adding two new ice storage boxes.

The absorption chiller is manufactured by Broad and is rated 500 tons. It operates at de-rated capacity of 350 tons. Solar thermal collectors are SUNDA SEIDO 1-16 vacuum tube heat pipe type and are staged over the roofs of the North Gym and Campus Center buildings. Hot water is collected in three insulated vertical tanks (24,000 gallons or 90,840 liters each) staged next to the central plant. The

SunChiller

maximum allowed temperature at the solar hot water tanks is 230° F (110° C). During the summer season the solar hot water is directed to the absorption chiller for space cooling. The solar hot water system has the flexibility to bypass the absorption chiller in the winter for space heating.

The energy management system regulates the operation of the absorption and electric chillers, ice storage tanks, and boilers. The absorption chiller does not rely on boilers for backup heat supply. The ice storage and electric chillers act as backup/ auxiliary to the absorption chiller. However, boilers serve as backup to the solar hot water tanks for space heating.

The peak electric rate and demand charge period at LADWP territory is 1:00 PM-5:00 PM, Monday through Friday in the summer season. The absorption chiller is turned on at 12:30 PM Monday through Friday and turned off at 5:30 PM to save peak electric rates and demand charges. Before 12:30 PM the cooling demand of the campus is met by melting ice. Once the absorption chiller starts operating, if cooling demand exceeds the capacity provided by the absorption chiller, ice is melted to maintain the chilled water supply temperature.

As peak electric rates and demand charges apply during the weekdays in the summer, the absorption chiller normally operates in weekdays only. Thus, during the summer the hot water tanks are charged by the solar thermal collectors for 7 days per week and discharged only in 5 days.

The summary of features of the installation is as follows:

- ***1,500 ton campus peak cooling load***
- ***350 tons absorption chiller capacity***
- ***2 electric chillers and ice storage units (auxiliary to absorption chiller)***
- ***497* SEIDO 1-16 *solar thermal collectors (7,952 tubes)***
- ***3 24,000 gallon (total 72,000 gallons) insulated solar hot water storage tank capacity***
- ***7-day storage cycle - 5-day discharge***
- ***Absorption chiller fired during peak hours***
- ***Solar thermal collectors staged over two buildings – North Gym/Campus Center***