



GOVT. PUB
PAMPHLET
US
E 6
.2
:L 63

CUSTOMER C&RE TECHNICAL BRIEF

A service of:

Western Area Power Administration

UNIVERSITY OF CALIFORNIA
RIVERSIDE

NOV 07 1990

LIBRARY
GOVERNMENT PUBLICATIONS DEPT.
U. S. DEPOSITORY



The Lancaster County Jail building, under construction in Lincoln, Nebraska, is one of two buildings targeted for district heating/cooling system operation.

Lincoln installs district heating/cooling system

An extensive feasibility study by the Lincoln Electric System (Lincoln Nebraska), resulted in installation of a district heating and cooling system providing hot and chilled water to the County/City and Lancaster County Jail buildings.

The district system, which utilizes well water and heat pumps, offers significant cost savings over conventional single-building heating and cooling systems. The study was funded in part by Western's Conservation and Renewable Energy Cost-Shared Assistance Program.

Lincoln considered several possible applications of the technology. One approach would serve the former "K" Street powerplant which is scheduled for renovation, and the County/City and County Jail Buildings. The option Lincoln chose will initially serve only the County/City and County Jail Buildings, utilizing a 16,000 square-foot district plant on the southwest corner of 9th and "K" streets. However, portions of the central plant are being sized so that future expansion of the district system could include all city government

buildings, according to the study.

Initial plans to provide district heating and cooling services to buildings in a downtown renovation district were abandoned when the developer went out of business.

The Lincoln District Plant, scheduled for completion in the spring of 1991, will house two heat pumps, each rated at 2,300 million British Thermal Unit hours for heating, 150 tons for ice making, and 275 tons for water chilling.

In its winter heating mode, the district system extracts heat from pumped well water. The tempera-

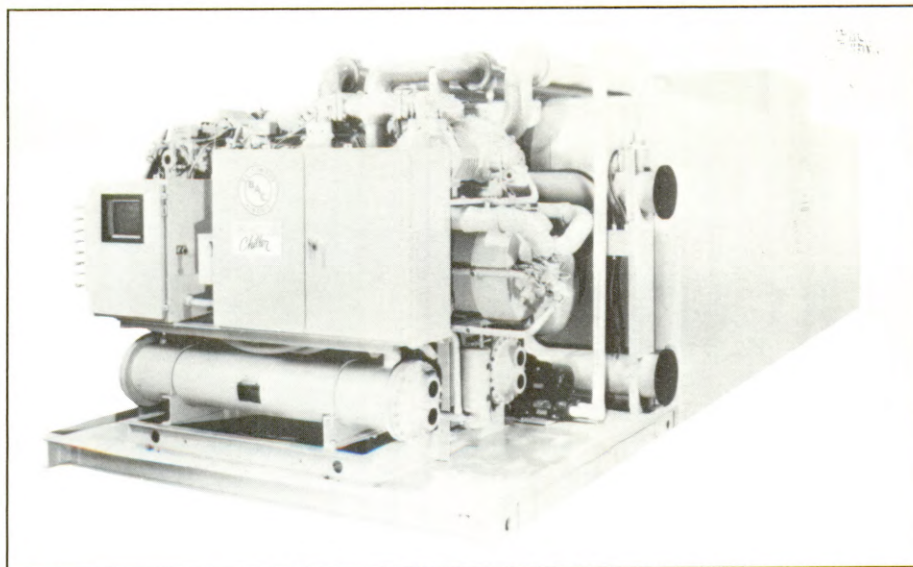
ture of the ground water is lowered from about 56 degrees fahrenheit to 40 degrees fahrenheit through the heat pumps. Hot water supplied from the heat pumps is raised to approximately 130 degrees fahrenheit for distribution to building heating loads. Existing gas-fired boilers will be retained for use as needed during peak load periods.

In the system's summer cooling mode, water passing through the heat exchanger is warmed to 75 degrees fahrenheit and then discharged into Salt Creek near the downtown area. After passing through the heat pump, which is operating in its chiller mode, the water is distributed to space cooling loads. During off-peak hours, the chiller produces ice for use in electrical demand reduction.

By utilizing large, commercial heat pumps and water from new wells, both heating and cooling functions can be provided at a rate at or below the cost of operating individual in-house boilers and chillers. Additionally, by eliminating the boilers, chillers, and accompanying maintenance, building costs can be reduced. Also, the floorspace gained could be used for other purposes.

Enhancing the feasibility of Lincoln's district heating/cooling system is the availability of plentiful, inexpensive electric power from the Lincoln Electric System for heat pump operation. Lincoln's rates are among the nation's lowest, according to the study.

Distribution pipe will be installed to carry the hot and cold water from the plant to the buildings across the street. The distance of the buildings to be supplied from the district plant was a major consideration because of length of distribution pipe and pumping energy needed to move the water. Projected costs are \$200 to \$225 per installed foot for the pipe.



A Baltimore Aircoil Ice Chiller is planned for installation in the new Lancaster County Jail Building in Lincoln, Nebraska. The chiller will supplement heat pump chilling operations in the district heating/cooling system.

Large-scale heat pumps developed

The use of large-scale heat pump technology, proven in European application, has only recently been developed and promoted for use in this country, according to the Lincoln District Heating and Cooling System Study.

However, district heating technology existed in many cities in this country during the first half of the century in the form of downtown steam heating systems. The City of Lincoln had a steam heating system but no condensate return. The system was abandoned due to inefficiency, lack of condensate return, and age of production and distribution facilities.

Heat pumps operate through a vapor-compression cycle, using a working fluid or refrigerant which is circulated through four basic physical processes: Compression, condensation, expansion, and evaporation.

The heat pump has five major components: A compressor; two heat exchangers (one serving as a condenser and the other as an evaporator), a drive motor or tur-

bine, and an expansion device. Whether the pump is heating or cooling depends on which of the two heat exchangers supplies cold vapor to the compressor and which heat exchanger receives hot vapor from it.

Both heating and cooling functions are possible from a single heat pump installation by reversing the thermal source and thermal sink water supplies with the change of heating and cooling seasons.

Study Contacts:

Western C&RE Representative:

Richard E. Sievert, Huron District Office, 200 4th Street, S.W., Huron, SD 57350. Telephone: (605) 353-9208.

Western Customer:

Harold Simmons, Manager of Energy Conservation and Application Division, Lincoln Electric System, P.O. Box 80869, Lincoln, NE 68501. Telephone: (402) 473-3278.