Hartford—One of the World's Most Modern DHC Systems

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Hartford—A Modern DHC System

The first city to have district cooling service utilizes cogeneration & European piping to expand and modernize its system.

by Anthony C. Mirabella

Hartford, capital city of the state of Connecticut, has long been known in the district heating and cooling industry as the first city in the world to have district cooling service. The inauguration of service from the Hartford Steam Company's central heating and cooling plant in 1962 fulfilled Dr. Willis Carrier's prophecy at the World's Fair in 1940 that within two or three decades air conditioning would be available as a utility service.

It is quite natural then to expect innovation in the field of district heating and cooling to originate in Hartford. The development of the Capitol District Energy Center (CDEC) in Hartford represents the design and construction of one of the most modern district heating and cooling systems in the world.

CDEC is being developed by Energy Networks Incorporated (ENI), a subsidiary of Affiliated Resources Corporation (ARC), which is a subsidiary of Connecticut Natural Gas Corporation (CNG). CNG is also the parent company of the Hartford Steam Company (HSCO). ENI was formed in 1985 to use the experience of HSCO to develop district heating and cooling systems in other cities nationwide.

New Building Construction & Cogeneration Plant are Major Factors in Development

Several factors have combined to make CDEC a reality. First is the continued growth and development of Hartford as a major commercial center in the northeast. Hartford has sustained a record of new-building construction second to none in the country. Over the past six years, HSCO has added more than 4 million square feet of new-building office space serviced by the downtown loop. This downtown growth rate has rapidly depleted the available sites for more building development, and pushed developers to consider sites beyond the normal downtown area.

In 1985, two such developments were announced in an area west of the downtown Hartford area. One involved the ten-acre site of the former Underwood typewriter manufacturing plant, which was demolished several years ago. Mr. Nicholas Carbone, former Deputy Mayor of Hartford, successfully organized the development of the site to include two major high-rise residential apartment towers and a 450,000 square foot commercial office tower. The second project to be announced was the long awaited new home for the State Legislature, the Legislative Office Building, a 250,000 square foot building adjacent to the State Capitol Building. These two projects combined offered the opportunity to link them as anchor customers in a new district heating and cooling system.

Another factor which contributed to the formation of the CDEC was the interest in cogeneration shown by the Aetna Life and Casualty Company. The Aetna's home office location is in an area between the Underwood site and the Legislative Office Building site. Aetna is a large user of electric and thermal energy and has been studying alternatives to utility electric service and heat-only boilers for several years. Early in the project's conception stage, Aetna was approached to serve as the initial thermal energy source, using the excess capacity of their existing heating and cooling plant. Aetna soon became interested in hosting a 53 MW gas-turbine cogeneration plant, which would serve as the long-term thermal energy source for the CDEC heating and cooling customers.

The cogeneration plant is being constructed by the Capitol District Energy Center Cogeneration Associates (CDECCA), a joint venture of ANR Venture Management Company (ANR) and Aetna Life and Casualty. Both will share equally in the ownership of the cogeneration portion of the project. ANR is a subsidiary of American Natural Resources Corporation, which was recently acquired by the Coastal Corporation. ANR, continued on next page
owner and operator of a major natural gas pipeline, ultimately plans to supply the natural gas requirements of the cogeneration plant through its family of producing companies and pipeline distribution companies. Figure I illustrates the functional relationships among the various companies involved in the CDEC project.

**Organizational Structure**

Energy Networks Incorporated (ENI) was created to bring the experience gained through the operation of the Hartford Steam Company (HSCO) to other potential district heating and cooling market areas. ENI's goals include developing, owning and operating new DHC systems. Since new systems are usually developed around cogeneration or resource recovery thermal sources, ENI expects to combine its resources with these developers to market their thermal energy products. This is the scenario being utilized for the CDEC project and for the new Springfield DHC system which is in the cogeneration development stage.

The Vice President and General Manager of ENI is Anthony C. Mirabella, who is also the 1983–84 Past President of the IDHCA. The Project Manager for the CDEC project is James A. Tuller. Jim heads a group of three engineers—George Grunbeck, Jeffrey Tribble, and Mitchell Cameron—assigned to assist him in the design and construction of the DHC system. The detail design and engineering of the system was contracted out to Resource Development Associates of Dayton, Ohio and Atlanta, Georgia. David Wade of Atlanta is the principal responsible for the project design.

**European Pipe Technology, Hot & Chilled Water Systems**

In keeping with other projects designed by RDA, the CDEC project relies heavily on European pipe technology. The hot water distribution system operates at temperatures up to 250°F. The chilled water system has a design temperature range of 42° to 60°F. Both the hot water system and the chilled water system use the same type of preinsulated pipe. As a result of a procurement bid competition in early 1986, both Ecopipe and I. C. Moller pipe systems have been used in the construction of this system. More than 20,000 feet of pipe are involved in this first phase of pipeline construction.

**Project Description; Plans for Expansion**

The CDEC project will provide DHC service to the western part of Hartford, a section of the city comprised mainly of State-owned government buildings and the home office buildings of the Aetna Life and Casualty Company. The anchor buildings for the project are the State Legislative Office Building, the Xerox Center, and the Underwood residential apartments, known as the Towers at Park Place. Thermal energy for these initial customers is provided from excess
capacity in Aetna's central heating and cooling plant. ENI and Aetna have entered into a short-term contract for this service. The contract also provides for ENI to sell computer-cooling chilled water to the Aetna during the winter months. ENI will receive this chilled water from HSCO through a system interconnect. HSCO produces chilled water in the winter time by means of a river-water/chilled-water heat exchanger at very low cost.

In the long term, ENI will obtain its thermal energy from the ANR/Aetna cogeneration plant. This plant is scheduled to be operational in the summer of 1988 and will provide 5400 tons of chilled water capacity and 70,000 pounds per hour equivalent of hot water capacity. The thermal output of the plant can be doubled as demand increases. Electrically, the plant produces more than 50 MWs which is fed directly into Northwest Utilities' grid. Aetna, however, can claim up to 11 MWs for use in its home office buildings. Aetna will also purchase all of its cooling requirements during this phase from ENI. The existing Aetna central plant will remain as a back-up plant and a source of peak-hour heating and cooling energy.

ENI is currently negotiating with the State of Connecticut to connect up to twenty State-owned buildings to the system. Several million dollars have been included in the State’s fiscal '87 budget to connect the first of these buildings to the system. Since most of the State’s buildings are old and use steam heating systems, the buildings must first be converted to hot water heating systems. The economy and control of a hot water heating system over a steam system have gained the full support of the State’s engineers. Conversion and connection of the State buildings is expected to be accomplished over the next five years.

Project Financing
With Tax Exempt IDB's

The CDEC project is being financed with tax-exempt industrial revenue bonds through the Connecticut Development Authority. A financing of $11 million is expected to be completed before December 31, 1986. The CDEC project was also accorded special treatment in the recently enacted tax code revision and retains ITC and ACRS provisions.

Further developments on the Capitol District Energy Center Project in Hartford and other new DHC systems will be reported as they are available. Technical papers are being prepared for presentation at future IDHCA meetings.