

**Official Proceedings
Seventy-Sixth Annual Conference
of the
International
District
Heating
and Cooling
Association
Held At
Hyatt Regency
Minneapolis, Minnesota
June 3, 4, 5, 1985**

Volume LXXVI

**Published by The
International District Heating Association
1735 "Eye" St. N.W., Washington, D.C.**

FORMATION OF THE ROCHESTER DISTRICT HEATING COOPERATIVE

Armand A. Lartigue
President--Rochester District Heating Cooperative
David W. Wade, P.E.
Resource Development Associates

INTRODUCTION

On November 9, 1984, the Rochester District Heating Cooperative was incorporated in the State of New York, pursuant to Article 2 of the Cooperative Corporations Law. Its stated purposes, as outlined in the Certificate of Incorporation, are as follows:

To assist its members by performing services in connection with the acquisition of steam to be used or consumed by its members by owning, operating or managing a steam facility, including all real estate, fixtures, personal property used in connection therewith, to generate, transmit, distribute and furnish steam for the use of its members;

To the extent that the sale is permitted under Section 501(c)(12) of the Internal Revenue Service Code, to sell excess steam and/or electricity to third parties; and

To do all things necessary and proper in the furtherance of, and in connection with the foregoing purposes to the fullest extent permitted by Section 4 of the Cooperative Corporations Law and by the Business Corporations Law.

Formation of the Cooperative was the result of the concerted efforts of major steam system customers, county, city and state agencies interested in continuing district heating service in Rochester. Through their efforts uninterrupted steam service will continue to customers when transfer of the District System takes place in October of 1985.

HISTORY

The Rochester District Heating System has been operated by Rochester Gas and Electric Corporation since 1889, and was originally developed as an outgrowth of RG&E's expanding centralized electric system in downtown Rochester. The electricity and steam heat supplied by RG&E gradually replaced that produced on-site by existing buildings and industries in downtown and eventually became the accepted source of energy for newly constructed facilities.

In 1963 the RG&E system was the fourth largest in the United States and served 621 customers. Today the downtown system serves fewer than 100 buildings. Because RG&E operated the system as a regulated utility, they had to provide service to all customers on an average cost of service basis and in many cases were forced to continue to operate distribution lines with very few customers, thereby incurring significant line losses and inefficiencies.

Loss of customers was due to the combined results of: aggressive marketing of natural gas, steadily increasing steam prices, and an urban renewal program which eliminated many of the city's older buildings. Because the system operated well below its capacity, it continued to be marginally economical, and the loss of each customer became more critical in recent years.

An unforeseen event that has contributed to the decline of the district heating business was a decision, in the early 1970's, to convert the coal-fired boilers at Bee Bee Station to fire natural gas or oil. The conversion to the cleaner burning oil and natural gas fuels was in direct response to federal air quality and emission regulations for generating facilities.

RG&E concluded that conversion to these cleaner burning fuels was preferable to the installation of stack-gas cleanup equipment. Shortly after the stations were converted from coal to No. 6 oil, the United States was confronted with the 1973 Arab Oil Embargo. The cost of fuel for the district heating system escalated dramatically from approximately \$0.80/million Btu to a recent high over \$9.00/million Btu. The dramatic increase in the price of fuel has resulted in a corresponding increase in the cost of delivered steam.

Finally, in July of 1984 the New York Public Service Commission awarded RG&E significant steam rate increases and further ordered the utility to submit a plan to abandon the steam system by October of 1985.

PURSUIT OF ALTERNATIVES

With the proposed abandonment of the steam system, the Rochester community, and in particular, the existing steam system customers were caught in an increasing pinch of uncertainty. On one hand, the PSC ordered abandonment of the steam system with RG&E's concurrence. On the other hand, a substantial number of the users felt that revitalization of the steam system remained a preferred alternative which would alleviate their need for capital investment in new boiler plant facilities and operators.

In the Spring of 1984, the City of Rochester contracted with the New York State Energy Research and Development Authority (NYSERDA) to conduct a technical and economic assessment of reconfiguring or revitalizing the downtown steam system. The assessment was financed on a cost-sharing basis between NYSERDA and the Rochester community with NYSERDA contributing approximately two-thirds of the cost, and RG&E, the City of Rochester and steam customers providing the remaining one-third.

Subsequently, Resource Development Associates, Inc. was selected to conduct the technical, institutional and financial components of the revitalization assessment. A local work group was formed with representatives from the City, Monroe County, steam system customers, RG&E, and NYSERDA.

During August of 1984, the local working group, which was known as the steam users group, intensified their planning and organizational efforts and began seriously considering alternatives, including the formation of a steam user's cooperative. Importantly, the group began to notify current steam customers that alternatives existed to shutting down or abandoning the steam system. Through this period RG&E continued to work with a steam users group and indicated a willingness to consider alternatives.

Further study, including investigation of a working example of a cooperative district heating and cooling system in Pittsburgh, resulted in the November 9, 1984 incorporation of the Rochester District Heating, Inc.

SYSTEM RECONFIGURATION

Reconfiguration of the steam system in order to eliminate costly line losses to isolated customers, and construction of a new efficient base load boiler plant with new, state-of-the-art metering and control devices became the key to turning the steam system into a profitable operation.

In order to accurately assess the existing system and accumulate a data base from which to assess potential system reconfigurations, an evaluation of the technical condition of the existing system was undertaken. This evaluation was performed on several different fronts. Previous studies regarding conversion of the steam generating stations to the burning of coal and the resulting environmental impact of such conversions were reviewed. Technical information in the form of annual statements, monthly operating reports, and other system operating statistics provided by RG&E were studied in depth. Selected inspections of various steam system physical plant items and review of as-built system plans and design documents were conducted.

Where possible, portions of the underground distribution piping system were visually inspected. Visual inspections were quite limited, so more time was spent on reviewing the maintenance records of RG&E, interviewing maintenance personnel, tracking major piping routes to check for signs of steam leaks or underground water infiltration into the system, and reviewing the operating statistics of the system to calculate line losses. The piping distribution system was found to be in excellent condition and should be capable of providing reliable service into the foreseeable future.

To forecast annual and peak loads, and to optimize selection of heat production equipment, a load duration analysis was performed on the existing system and on all system reconfigurations. This load analysis was based on actual customer billings for the majority of current steam system customers.

The present RG&E system is essentially the same basic piping network which was installed to serve nearly four times the current steam load. Because of sporadic customer losses there are many long piping runs to isolated customers with high energy loss/sales ratios. Primary steam supply is provided by the relatively inefficient and costly Bee Bee Station.

Due to the utility's mandate to continue service to all existing steam customers RG&E has never seriously explored the option of systematically reducing its customer base and building new boiler facilities in its current regulated environment. A new owner-operator, however, can negotiate with customers and secure financing for a new, base-load boiler plant, and could make the decisions necessary for reduction of distribution system lines to a network appropriate to current customer requirements.

To test the viability of scaled down systems with new base-load boiler plants replacing steam supplied from Bee Bee Station, Resource Development Associates examined six reduced customer configurations in the downtown area, each with a new central plant. From the largest contemplated system (Case 1) to the smallest system (Case 6) the configurations were analyzed on a yearly and monthly basis to determine their respective energy consumption profiles. In each case the customer base was orderly and logically reduced to decrease distribution system length and increase the system's overall efficiency. The effects of this reduced system size can be seen in the decreasing percentage of line losses vs. energy sales.

For each of the six cases exhaustive computations were made to determine monthly steam consumption for the prospective customers. Annual load duration curves based on system load factor and annual steam sales, reconfiguration of the distribution system through scaling of the piping network and projected line losses were also estimated.

Throughout the cases, several basic concerns were addressed and considered of extreme importance. These concerns are:

- To ensure continued reliable steam service
- To lower fuel costs
- To increase distribution system efficiency
- To use state-of-the-art monitoring/controls
- To ensure future compatibility with cogeneration/alternate fuels
- To consider system growth

In addition to a new, efficient base load boiler plant and a scaled down, reconfigured distribution system, RDH recognized the need for state-of-the-art metering and controls.

The sale of steam to numerous customers from a district heating utility requires accurate measurement of the energy delivered. This is necessary, both for profitability for the steam utility--since inaccurate metering can result in billings which do not recover the utility's costs--and to avoid disagreements with customers over consumption of energy. Unlike electricity or water

utilities, steam energy is difficult to meter due to the high temperature and pressure conditions of service and the wide variation in flowrates customers typically demand.

Metering problems today can be compounded since most steam utilities' metering systems are over twenty years old and were installed when accuracy of metering was less important. The post 1973 (Energy Crisis) energy industry has developed new metering techniques which incorporate microelectronics and computer technology to greatly increase accuracy and reliability of steam metering systems. Such systems are now being used routinely in large buildings, industrial applications and multi-building complexes for energy monitoring and energy management activities.

State-of-the-art in steam metering technology incorporates temperature, pressure and volumetric measurements in an electronically integrated metering system which can record steam use locally and/or use electronic telemetry to send appropriate signals to a central processing unit. The advantage of such a system is that it provides immediate feedback from customers to a central location for comparison with steam plant output during any specified time period. In this manner, an energy balance between customers and the central plant can be conducted at appropriate time intervals, steam demand information can be incorporated into the operation of the central plant and boiler dispatch in production of steam can be optimized.

Additional information can be used to evaluate overall system performance. Using temperature and pressure signals transmitted to a central location, the performance of selected segments of the steam distribution system can be ascertained, and any trends in performance degradation can be quantified and appropriate maintenance programs scheduled.

In order to estimate capital cost for each case a construction cost estimate was prepared for each new base-load boiler plant. Cost estimating sheets are included for review. Capital cost for each of the cases includes the cost of a new base-load boiler plant consisting of a minimum of two boilers and necessary appurtenances and a low cost building to house the new boilers. A figure of \$500,000 was included for the purchase of a site for the new boiler plant in case the RG&E Station 8 is unavailable. Additionally an allowance was included for engineering fees, piping distribution system modifications (including a small amount of rehabilitation work such as inspection and reinsulation in valve and expansion joint pits, trap replacement and valve repacking) and an allowance for capping of certain distribution runouts no longer in service. Provisions were also made for incorporation of a new centralized steam metering system. To arrive at a total annual capital cost for each of these cases, the sum of these capital improvements was increased by 40% to allow for contingencies, funding of operating costs, etc.

RDH marketing, planning and a analysis today assumes the largest reconfiguration with annual sales below 100% of the market. Although the final configuration may result in a lower capital cost RDH has assumed \$8,500,000; thus a 9 million dollar inducement resolution was passed.

PHASED APPROACH

In proceeding with the delivery of steam to its members, the cooperative developed a phased approach to implementing its revitalization plan. Listed below are the major project milestones identified in the three phases of the Plan.

Phase I System Acquisition and Stabilization

- Acquire downtown steam system
- Purchase/lease Station 8 or purchase alternate site
- Reconfigure steam distribution system
- Interim Period - use temporary boilers or buy steam from RG&E
- New, base load boiler plant (to be on line 9/86)
- Monitoring and control improvements

Phase II Orderly System Improvements

- Implement rigorous, priority maintenance program
- Install condensate lines where appropriate (large customer load lines)
- Improve customer end-use efficiencies

Phase III Additional Customers/Cogeneration/Alternative Fuels

- Add co-op members where appropriate
- Evaluate and implement cogeneration when appropriate
- Evaluate and implement as appropriate alternative solid fuel production facilities

SPECIAL CONSIDERATIONS

In most instances, local, state and federal governments will support efforts to establish or maintain central heating and cooling systems. The important thing to remember is that for these entities to sign long term contracts, may require special legislation and/or special contract amendments. Since this takes valuable time to accomplish, you should start the process early in your project. Be sure that representatives of these entities with whom you are dealing check with their legal counsel and understand what the process entails, and assist them in developing an appropriate and timely action plan.

PROJECT STATUS

The current status of the project looks extremely good. As stated earlier, RDH was incorporated in November of 1984. The initial operating capital was the result of a member assessment in the amount of \$1.00 per Mlb. In addition, the New York State Energy Research and Development Authority has given RDH a preliminary notice of funding in the amount of a \$353,000 grant.

On March 22, 1985, RDH was induced for Nine Million Dollars (\$9,000,000.00) in industrial development bonds by resolution of the County of Monroe Industrial Development Agency (COMIDA). One week later, on March 29, 1985, a letter of intent was signed between RDH and RG&E for transfer of the steam system.

Resource Development Associates, Inc., the cooperative's consultant, is proceeding with system design and procurement.

In addition, RDH has made a proposal to RG&E for the purchase/lease of Station 8 as a site for temporary boilers, as well as the new base load boiler plant. On a parallel course, RDA has evaluated a number of alternative sites and is ready to immediately acquire an alternative site should the negotiations for Station 8 prove unproductive.

Preliminary cooperative member commitments have been received, and RDH is currently firming up its membership base/customer load. Some of the key anchor members are: Monroe County, City of Rochester, Genesee Hospital, Chase-Lincoln Bank, Xerox, First Federal, Rochester Savings Bank, Powers Building, and Rochester Optical.