1992 National Census

for

District Heating, Cooling and Cogeneration

July 1993

MASTER

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EXECUTIVE SUMMARY

Major Findings

District energy systems are a major part of the energy use and delivery infrastructure of the United States. With nearly 6,000 operating systems currently in place, district energy represents approximately 800 billion BTU per hour of installed thermal production capacity, and provides over 1.1 quadrillion BTU of energy annually — about 1.3% of all energy used in the U.S. each year. Delivered through more than 20,000 miles of pipe, this energy is used to heat and cool almost 12 billion square feet of enclosed space in buildings that serve a diverse range of office, education, health care, military, industrial and residential needs.

Purpose and Conduct

This *Census* is intended to provide a better understanding of the character and extent of district heating, cooling and cogeneration in the United States. It defines a district energy system as:

Any system that provides thermal energy (steam, hot water, or chilled water) for space heating, space cooling, or process uses from a central plant, and that distributes the energy to two or more buildings through a network of pipes. If electricity is produced, the system is a cogenerating facility.

The *Census* was conducted through surveys administered to the memberships of eleven national associations and agencies that collectively represent the great majority of the nation's district energy system operators. Responses received from these surveys account for about 11% of all district systems in the United States.

Data in this report is organized and presented within six user sectors selected to illustrate the significance of district energy in institutional,

community and utility settings. Projections estimate the full extent of district energy systems in each sector.

Characteristics of the Industry

Survey data and projections show that the vast majority of U.S. district energy systems are located in institutional settings to serve customers on college and university campuses, hospitals, and military installations. Surveyed systems ranged in age from over 100 years to three years or less. The average surveyed system served between 11 and 50 buildings with a combined area of 2.6 million square feet.

Steam is the predominant type of energy produced and distributed by the surveyed systems, accounting for about three-quarters of combined production capacity and annual sendout. Chilled water represented about 15% of both capacity and sendout, with hot water and electricity accounting for less than 5% each. Systems serving college and university campuses, hospitals, and military installations account for about 60% of all estimated production capacity and annual energy sendout, while community and utility systems represent about 16% of these totals.

Survey respondents indicated that upgrades to distribution networks and maintenance improvements were the highest priorities to aid their individual system operations. They felt that increased public awareness and supportive financial incentives were the most significant needs to aid the growth of the district energy industry.

General Conclusions

The *Census* highlights the penetration and impact of district energy systems within each user sector, and presents the general characteristics of systems that serve each sector. Findings strongly

emphasize the diverse nature of the industry and its orientation to the local community or institution that each individual system serves. Four general conclusions associated with these findings follow.

- ***Institutional Presence.*** Projections indicate that campus and institutional networks serving colleges and universities, hospitals and military installations account for about three-quarters of all U.S. district energy systems. They represent the great majority of total production capacity and annual energy sendout.
- ***Local Orientation and Impact.*** District energy networks are physically and fiscally linked to specific customer locations. Their efficiency, economic development and infrastructure benefits are most visible and most significantly felt at the local level. This local perspective can easily allow district energy to be underemphasized as a key element of national energy policy.
- ***Measurement Standards.*** The diverse ownership patterns, system sizes, and customer bases for district energy systems make it difficult to establish standard formats for data collection and reporting. This difficulty is especially evident for information needed to develop valid performance and efficiency measures that allow useful comparisons among systems serving distinctly different user sectors.
- ***Common Interests and Problems.*** Despite the local orientation and the diverse nature of the industry, all district energy systems have common technical features, economic characteristics, and operational concerns.

Recommendations

It is recommended that the work begun with this *Census* be continued and refined to complete the characterization of all district energy systems in the United States. Future activities should build on information contained in this initial *Census*, with data development

and collection efforts designed to address the uncertainties identified here. More specific recommendations for future work include:

- ***Definition and Identification.*** The working definition of a "district energy system" that is included in this report should be reviewed, revised and formally confirmed by appropriate industry representatives. All systems in each user sector that meet this definition should be identified.
- ***Measurement Standards.*** Standard criteria and units of measurement should be established for data development, collection and reporting. Such standards are especially needed to allow the valid assessment of individual system and industry-wide performance and efficiency.
- ***Sectoral Emphasis.*** A user sector approach similar to that taken in this *Census* should be maintained in future data collection efforts. This approach appropriately recognizes the local orientation that is vital to the continuing health of the district energy industry in the United States.
- ***Longitudinal Consistency.*** All recommendations above should be carried out in a consistent and regularly scheduled manner to assure comparability of data over time. Such consistency will allow reliable assessments of the long term growth and performance of the nation's district energy resources.
- ***Access and Maintenance.*** Means to maintain and assure wide access to data collected in all future inventory activities must be defined. A central organization with the resources and responsibility to act as this repository should be selected or established.

INTRODUCTION

In October, 1991, more than sixty executives and experts met in Alexandria, Virginia, to outline a ten year *Action Plan* for District Heating, Cooling and Cogeneration (DHC/C). Attendees represented industry, government, non-profit associations, and academia. Together, they developed a series of goals and actions to "*Make DHC/C a major contributor to the energy security, environmental quality, and economy of the United States within the next decade.*" The Action Plan that emerged from the meeting charted an aggressive long-term strategy for the achievement of four primary goals:

- 1) ***A Credible Foundation*** -- To compile and maintain information that characterizes the DHC/C community and its installed facility base, and to develop tools that quantify its range of comparative benefits and costs.
- 2) ***A Competitive Position*** -- To better understand customer needs, while strengthening industry capacity and developing the research and technical support essential to meet those needs in a price-competitive manner.
- 3) ***An Effective Presence*** -- To provide leadership that can build public awareness, influence decision makers, and assure that DHC/C will be a significant part of America's energy future.
- 4) ***A Fair Policy Climate*** -- To ensure that national and state policy and legislation recognizes the value of DHC/C, and to address financial and regulatory barriers to its vitality.

The first of these goals recognized the high priority need for a better understanding of the DHC/C industry in the United States. It suggested near-term actions to both characterize the U.S. DHC/C community, and quantify its installed systems base in terms of facility locations, sizes, types, age, and other important factors. The 1992

National Census for District Heating, Cooling and Cogeneration was conducted to carry out these near-term action items.

The *Action Plan* and this *Census* were supported by the United States Department of Energy and the Oak Ridge National Laboratory, in cooperation with the International District Heating and Cooling Association and other national associations that represent commercial, institutional, government, and industrial system operators throughout the United States. A technical committee composed of representatives from these organizations assisted in the development of the survey instrument for the *Census*. The *Census* was administered on behalf of these sponsors by the Association of Physical Plant Administrators of Universities and Colleges.

Background

District Heating, Cooling and Cogeneration systems in the United States support urban areas, college and university campuses, hospitals, airports, military installations, and industrial complexes. These systems are characterized by a wide variety of ownership patterns, operating responsibilities, age, and technologies. For the 1992 *National Census*, a DHC/C system was defined as:

Any system that provides thermal energy (steam, hot water, or chilled water) for space heating, space cooling, or process uses from a central plant, and that distributes the energy to two or more buildings through a network of pipes. If electricity is produced, the system is a cogenerating facility.

To obtain information about these systems, a technical committee composed of representatives from selected national associations was formed to: (1) identify DHC/C systems and principal contacts within their constituencies; and (2) assist in the development and

distribution of a survey instrument for the Census. Members of the technical committee were also requested to assist in the review of Census results, and in the dissemination of those results. The membership of the Technical Committee and the survey instrument are presented in Appendices A and C, respectively.

Approximately 10,000 mailings of the survey instrument were made in Fall 1991 to organizations, institutions and firms that could potentially be operators of DHC/C systems. The survey requested a return whether or not the organization operated a district energy system. A list of the associations and agencies to whose memberships surveys were mailed is included in Appendix A.

Slightly more than 1,000 responses were returned. Of this number, about 350 indicated they did not operate a district energy system. The remaining 640 respondents said they did operate a system, or (in one case) expected to have a system operating within the next two years. These positive responses are the primary information base for this report. A listing of the inventoried systems included in the *Census* is presented in Appendix B.

Purpose and Organization

The *Census* is intended to provide a better understanding of the character and extent of district heating, cooling and cogeneration in the United States. While its results represent a major step toward the full analysis of this DHC/C community, the Census is far from an entirely comprehensive assessment. Data from the approximately 650 district energy systems surveyed during the Census represent only 11% of the total number of currently operating systems. Further, complete information for production capacity, annual energy sendout, and input fuel consumption was not provided by all survey respondents. A fully complete inventory will require that the data presented here be used as a base for future expansion by advocates, interest groups, and system operators within the DHC/C community in the United States.

The majority of this report focuses on information collected from respondents to the Census survey. All information in the report has been organized by "Total" and "Sector" categories. "Total" presentations summarize data for all surveyed systems, while "Sector" presentations summarize data for each of six general types of organizations that operate district energy systems.

Tables and figures included in the major sections of the report illustrate summary information of special interest for both the total and sector categories. All data from the surveys have been stored in electronic form, and may be requested from the Oak Ridge National Laboratory. Major sections and appendices of the report address the following topics:

- **Summary Characteristics** -- Full data presentations and summaries cover: (a) descriptive information about the surveyed systems; (b) performance and technical information about the surveyed systems; and (c) projections for the total extent of DHC/C in the United States.
- **Sector Characteristics** -- Selected data presentations and summaries cover important descriptive and performance data about the surveyed systems within each of the six using sectors. Summaries also present suggestions made by respondents for actions that would most help both the operations of their individual systems, and the growth of the DHC/C industry in the United States.
- **Definitions, Methods, and Data Limitations** -- Appendices define important data elements, user sector categories, and energy units used in the report. Also included are discussions of data verification and analysis methods, and limitations associated with data omissions and interpretations.
- **System Identification** -- A register of all respondents who said they operated a district energy system contains the name

of the operating organization and its location, as well as its energy production capacity, annual energy sendout, and forms of energy produced.

Major findings and conclusions from the *Census*, as well as general recommendations for future action, are presented following this section of the report.

Statistics Reported

Descriptive Characteristics

The number of surveyed systems are presented by type of output energy produced for both the total of the surveyed systems, and for systems within each user sector. Presentations show that many systems produce more than one type of energy for delivery to customers; e.g., steam and chilled water. Buildings and building area served are presented by the number of buildings served per sector, and by the total square feet of building area served within each sector.

Statistics are included to cover start-of-service dates, age of major system components (boiler, chiller, and distribution network), and the date of last major system upgrade. Operating and financial data include the number of employees, value of installed plant, and annual capital budget. A summary assessment of the quality of reported data is provided.

Performance and Technical Characteristics

Energy production capacity and annual energy sendout are presented by type of output energy for both the total of the surveyed systems, and for surveyed systems within each user sector. Input energy is identified by type and amount of fuel used annually. Line length for distribution network piping is presented for both supply and return mains, and is further subdivided into line lengths for steam, hot

water and chilled water. A summary assessment of the quality of the reported data is provided.

Projections and Estimates

Projections are made to estimate the total extent of district heating, cooling and cogeneration in the United States. Data is presented for number of systems, building area served, distribution line length, production capacity and annual energy sendout. The estimates are shown for each user sector, and are compared with the information gathered from this *Census*. Methods and data sources used to make the projections are described.

Assistance Needs

General needs for assistance are identified to indicate "what would most help" both a respondent's individual system, and the growth of the DHC/C industry in the United States. Data are presented by the percent of respondents within each sector who noted each of eight general types of assistance need.

FINDINGS AND RECOMMENDATIONS

District energy systems are a major part of the energy use and delivery infrastructure of the United States. With nearly 6,000 operating systems currently in place, district energy represents approximately 800 billion BTU per hour of installed thermal production capacity, and provides over 1.1 quadrillion BTU of energy annually -- about 1.3% of all energy used in the U.S. each year. Delivered through more than 20,000 miles of pipe, this energy is used to heat and cool almost 12 billion square feet of enclosed space in buildings that serve a diverse range of office, education, health care, military, industrial and residential needs.

This section summarizes major findings from district energy systems surveyed in the *1992 National Census*, and from projections made to estimate the full extent of these systems in the United States. It presents major assistance needs voiced by survey respondents, and briefly discusses uncertainties of the data and projections. Recommendations for future action are suggested.

Descriptive Characteristics

Survey data and projections show that the vast majority of U.S. district energy systems are located in institutional settings to serve customers on college and university campuses, hospitals, and military installations. The surveyed systems ranged in age from over 100 years to three years or less, with one respondent indicating a scheduled start-up date of 1995. Several important descriptive characteristics found from the Census are described below.

- **Form of Energy.** Steam was the predominant form of energy produced and distributed by the surveyed systems, accounting for 44% of all systems. Chilled water was produced and distributed by 33%, hot water by 14%, and cogenerated electricity by slightly less than 10%.

- **Buildings and Area Served.** The average surveyed system served between 11 and 50 buildings with a combined area of 2.6 million square feet. 65% of all surveyed systems served over 11 buildings, with 22% of the surveyed systems serving more than 51 buildings. Community and utility systems were generally larger than systems in the other sectors. 46% of these systems served more than 51 buildings, with the largest serving a total building area of 54 million square feet.

- **System Ages and Upgrades.** The median dates for system start-up and most recent upgrade for all surveyed systems were 1958 and 1987, respectively. Community and utility systems were generally older than systems in the other user sectors, with a median start date of 1943. While the oldest surveyed system began operations in 1888 on a college campus, each of the six user sectors also had systems that began operations very recently (1989 through 1992).

- **Age of Major Components.** The median age of major system components showed relatively little variation among all six user sectors, and also illustrated the more recent attention to chilled water as a district energy service. Median ages for these components were: 31 years for distribution systems; 23 years for primary boilers, and 15 years for chillers.

- **Plant Value and Employees.** The total value of installed plant and facilities for all surveyed systems was given as \$24 billion, with a combined annual capital improvements budget of \$749 million. Total full-time-equivalent employment for all surveyed systems was 157,000 persons.

Number of U.S. DHC Systems Projected Number by Sector

Number of U.S. DHC Systems Projected Percent by Sector

Annual Energy Sendout by Sector Projected Sendout by Sector

Energy Sendout for U.S. DHC Projected Percent by Sector

Projections estimate that the surveyed systems represent about 11% of the total of nearly 6,000 district energy systems in the United States. Systems that serve college and university campuses and hospitals account for 68% of this total, while larger capacity community and utility systems represent about 2% of all systems.

Technical Characteristics

Survey data were requested to measure production capacity and annual energy sendout by type and amount of output energy, and annual fuel use by type and amount of input energy. Information on distribution piping was requested to measure length of supply and return mains. Projections were made to estimate total U.S. district energy production capacity, annual energy sendout, and distribution line length for each user sector. Findings from the survey responses and projections are described below.

- **Types of Output Energy.** Survey data show that steam is the predominant type of energy produced and distributed. Steam accounted for about three-quarters of combined production capacity and annual sendout for all surveyed systems. Chilled water represented about 15%, with hot water and electricity both less than 5%.
- **Total Capacity and Sendout.** Projections estimate total U.S. district energy production capacity at nearly 800 billion BTU per hour, and total annual energy sendout at over 1.1 quadrillion BTU per year. A preliminary analysis of systems missed in the survey, and comparisons of these projections with DOE Commercial Buildings Energy Consumption data indicate that this estimate is conservative.
- **Annual Fuel Use.** Survey data show a variety of input fuels used in district energy systems. Natural gas was the most used fuel, providing 46% of all input energy, followed by

coal, providing 22% of all input energy. Other types of input energy were: electricity (21%); fuel oil (9%); and renewables and purchased thermal (1% each).

- **Distribution Line Length.** Surveys and projections estimate a combined length of distribution piping of over 20,000 miles for all U.S. district energy systems.

Projections estimate that the surveyed systems represent about 15% of production capacity, and 18% of annual energy sendout for all district energy systems in the United States. Systems serving college and university campuses, hospitals, and military installations account for about 60% of these totals, while community and utility systems represent about 16% of total production capacity and sendout.

Needs for Assistance and Comments

The census requested respondents to indicate general assistance needs for "What would most help" both their individual systems, and the growth of the U.S. district energy industry. Each respondent was also offered the opportunity to include general comments. A summary of responses to assistance needs, and examples of general comments follows.

- **Individual Systems.** Survey respondents indicated upgrades to distribution networks (34%), and maintenance improvements (29%) as their highest priorities to aid their individual system operations. The need for central plant upgrade was mentioned as a priority by 21% of respondents.
- **District Energy Industry.** Survey respondents indicated increased public awareness (38%), and supportive financial incentives (38%) as high priorities to aid the growth of the district energy industry. Revised government policy and regulation was a priority for 11% of respondents.

- **General Comments.** Comments included by survey respondents ranged from short explanations of priority assistance needs to brief descriptions of major system problems, or plans for system enhancements. Many respondents mentioned plans to add or expand chilled water production capacity. Several indicated work in progress to add electricity cogeneration capabilities.

Uncertainties in the Census

This *Census* was initiated to provide a better understanding of the character and extent of district heating, cooling and cogeneration in the United States. While its results represent a major step toward the full assessment of these district energy systems, the *Census* is far from an entirely comprehensive analysis. Three major concerns should be addressed to improve its results.

- **Missing Systems.** Data from the 652 district energy systems surveyed represent only 11% of the total number of currently operating systems in the United States. User sectors that were particularly underrepresented in survey responses were military installations, commercial hospitals, residential and public housing complexes, state capital complexes, and federal civilian systems.
- **Data Quality and Completeness.** Complete information for production capacity, annual energy sendout, and input fuel consumption was not provided by all survey respondents, and some information was provided in incorrect units. These omissions do not allow the calculation of valid survey-wide system efficiencies, load factors or other similar performance benchmarks.
- **Projections and Estimates.** Projections and estimates for the total extent of U.S. district energy systems, capacity and sendout were made by user sector using information available

from relevant trade associations, Department of Defense data, and existing Department of Energy consumption studies. While the estimates are reasonable, conservative and consistent with data found in these sources, they should be considered as a general picture of the total U.S. district energy industry, rather than a precise quantification of it.

A more complete discussion of data quality, and methods used for data verification is contained in Appendix A. A fully complete inventory will require that the data presented here be used as a base for future expansion by advocates, interest groups, and system operators within the DHC/C community in the United States.

General Conclusions

This report presents a sound overview of the extent of district energy systems in the United States to serve as an initial *Census* of the industry. With well over one quad of annual energy sendout, district energy makes a significant contribution to the nation's total energy use and distribution infrastructure. Survey responses also show clearly that new and enhanced systems are under development, especially for applications in institutional and campus settings.

The structure of the *Census* highlights for the first time, the penetration and impact of district energy systems within various user sectors, and presents the general characteristics of systems that serve each sector. Findings strongly emphasize the diverse nature of the industry and its orientation to the local community or institution that each individual system serves. Four general conclusions associated with these findings follow.

- **Institutional Presence.** Projections indicate that institutional networks serving college campuses, hospitals and military installations account for about three-quarters of all U.S. district energy systems. These systems represent the great majority of production capacity and annual energy sendout

from district systems. Increased attention to these institutional systems is a strong need to assure their continuing efficiency and vitality.

- **Local Orientation and Impact.** Unlike electric, natural gas and communications utilities that have interstate conduits for transmission and distribution, district energy networks are physically and fiscally linked to specific customer locations. Their efficiency, economic development and infrastructure benefits are most visible and most significantly felt at the local level. This local perspective can easily allow district energy to be underemphasized as a key element of national energy policy.
- **Measurement Standards.** The diverse ownership patterns, system sizes, and customer bases for district energy systems make it difficult to establish standard formats for data collection and reporting. This difficulty is especially evident for information needed to develop valid performance and efficiency measures that allow direct comparisons among systems serving distinctly different user sectors.
- **Common Interests and Problems.** Despite the local orientation and the diverse nature of the industry, all district energy systems have common technical features, economic characteristics, and operational concerns. With appropriate attention, these commonalities can serve well as the basis for both a strengthened national perspective and the development of standard measurement factors.

Recommendations

It is recommended that the work begun with this *Census* be continued and refined to complete the characterization of all district energy systems in the United States. Future activities should build on information contained in this initial *Census*, with data development

and collection efforts designed to address the uncertainties identified here. More specific recommendations for future work include:

- **Definition and Identification.** The working definition of a "district energy system" that is included in this report should be reviewed, revised and formally confirmed by appropriate industry representatives. All systems in each user sector that meet this definition should be identified.
- **Measurement Standards.** Standard criteria and units of measurement should be established for data development, collection and reporting. Such standards are especially needed to allow the valid assessment of individual system and industry-wide performance and efficiency.
- **Sectoral Emphasis.** A user sector approach similar to that taken in this *Census* should be maintained in future data collection efforts. This approach appropriately recognizes the local orientation that is vital to the continuing health of the district energy industry in the United States.
- **Longitudinal Consistency.** All recommendations above should be carried out in a consistent and regularly scheduled manner to assure comparability of data over time. Such consistency will allow reliable data to assess the long term growth and performance of the nation's district energy resources.
- **Access and Maintenance.** Means to maintain and assure wide access to data collected in all future inventory activities must be defined. A central organization with the resources and responsibility to act as this repository should be selected or established.

SUMMARY CHARACTERISTICS

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DESCRIPTIVE CHARACTERISTICS – OVERVIEW

Information Presented

Information presented in this section provides a general description of the 652 district energy systems surveyed for the *1992 National Census*. Totals are presented for all surveyed systems, and for all systems within each user sector. The following data are included:

- Number of surveyed systems by type of output energy produced. Since many systems produce more than one type of energy (e.g., steam and chilled water) the sum of systems by type of energy produced is greater than are the totals shown for "Number of Systems in Survey."
- Numbers of buildings and building area served. Totals are presented by size ranges indicating the number of buildings served per system, and the total building area served.
- Age of systems, components and most recent major upgrade. Statistics cover the start-of-service dates, age of major system components (boiler, chiller, and distribution network), and the dates of most recent system upgrade.
- Employees, value of installed plant and annual capital budget. This operating and financial data totals the number of full-time-equivalent employees, the dollar value of installed plants and facilities, and annual capital budgets.

Illustrations

Illustrations on pages 14 and 15 show comparisons by user sector of the number of systems, and of the number of buildings served. Illustrations on pages 16 and 17 show comparisons by user sector of the median system and component age, years since last major system upgrade, and forms of energy sendout. Illustrations on pages 18 and

19 compare systems by sector for numbers of buildings served and forms of energy sendout.

Data Quality and Limitations

The quality of descriptive data provided on survey forms by respondents appeared complete and credible with the following three major exceptions. The omissions and errors described below were evident particularly in the college, hospital, and industrial sectors:

- Number of Employees (FTE). 126 respondents (19.6%) provided no employee data. 114 respondents (17.5%) provided employment figures that appear to include all employees of the organization, or all maintenance and physical plant personnel, rather than just those directly associated with their district energy system.
- Value of Installed Plant (mm \$). 214 respondents (32.8%) provided no value for their installed plant. 120 respondents (18.4%) provided dollar figures that appear to include the value of the organization's entire physical plant, rather than just the value of the district energy system's central plant, controls and distribution system.
- Annual Capital Budget (mm \$). 357 respondents (54.8%) provided no information for annual capital budgets. 26 respondents (4.0%) provided dollar figures that appear to include the organization's entire annual capital budget, rather than just that budget directly associated with their district energy system.

DESCRIPTIVE CHARACTERISTICS

<u>Information Categories</u>	<u>Total</u>	<u>College</u>	<u>Community</u>	<u>Hospital</u>	<u>Industrial</u>	<u>Military</u>	<u>Other</u>
<i>Number of Systems in Survey</i>	652	401	54	124	36	26	11
Steam	444	246	39	107	26	19	7
Hot Water	132	95	9	9	7	6	6
Chilled Water	333	219	11	74	16	9	4
Electricity	99	63	13	8	11	3	1
<i>Systems by Buildings Served</i>							
2 to 10 Bldgs	199	107	5	44	28	13	2
11 to 50 Bldgs	275	187	7	65	5	4	7
51(+) Bldgs	146	96	25	14	1	9	1
No Response	32	11	17	1	2	0	1
<i>Total Buildings and Area Served</i>							
Minimum No. of Bldgs Served	10,903	7,167	1,362	1,517	196	529	132
Total Area Served (mm Sq. Ft.)	1,727	1,142	268	146	87	59	26
<i>System Age and Upgrades (Date)</i>							
Oldest System	1888	1888	1893	1903	1907	1954	1894
Newest System	1995	1992	1991	1992	1995	1989	1989
Median Date of System Start	1958	1957	1943	1964	1968	1966	1959
Median Date of Last Upgrade	1987	1987	1988	1987	1987	1984	1988
<i>Median Age of Major Components (Years)</i>							
Primary Boiler	23	23	29	24	20	21	21
Primary Chiller	15	16	14	12	15	18	11
Distribution System	31	31	39	26	24	30	41
<i>Employees, Value & Budget</i>							
Number of Employees (FTE)	156,689	74,366	1,121	63,811	15,450	504	1,437
Value of Installed Plant (mm \$)	23,908	18,289	379	4,558	490	148	44
Annual Capital Budget (mm \$)	750	622	52	56	19	1	0

Number of Systems by Sector

All Surveyed Systems

Building Area Served by Sector

All Surveyed Systems

Number of Buildings Served by System All Surveyed Systems

Number of Systems by Buildings Served All Surveyed Systems and Sectors

Median System Age and Last Upgrade All Systems and Sectors

Median Age of Major System Components All Surveyed Systems and Sectors

Form of Energy Sendout All Surveyed Systems

Form of Energy Sendout by System All Surveyed Systems and Sectors

Systems by Number of Buildings Served

Percent of Systems in Each Sector

Systems by Form of Energy Sendout

Percent of Systems in Each Sector

PERFORMANCE AND TECHNICAL CHARACTERISTICS -- OVERVIEW

Information Presented

Information presented in this section provides performance and technical data about the 652 district energy systems surveyed for the *1992 National Census*. Totals are presented for all surveyed systems, and for all systems within each user sector. The following data are included:

- Energy production capacity (million BTU per hour). Totals are presented for hourly production capacity for all forms of energy produced by the surveyed systems.
- Annual energy sendout (million BTU per year). Totals are presented for annual energy sendout for all forms of energy produced by the surveyed systems.
- Annual fuel use (million BTU per year). Totals are presented for all forms of annual input energy consumed by the surveyed systems.
- Distribution line length (miles). Totals are presented for the length of distribution system supply and return piping for all forms of thermal energy distributed.

Illustrations

Illustrations on pages 22 and 23 show energy production capacity and annual energy sendout by sector for the surveyed systems. Illustrations on pages 24 and 25 show annual input fuel consumption, distribution system piping lengths by sector for the surveyed systems. Annual energy sendout and fuel use by type for each surveyed sector are compared on pages 26 and 27.

Data Quality and Limitations

Performance and technical information provided on survey forms by respondents often omitted one or more data points for production capacity, annual energy sendout, or input fuel use. These omissions occurred in relatively even proportions within each user sector of the inventory. A brief discussion of the extent of this missing data and their major effects on findings and analyses from the Census follows:

- Extent of Missing Data. The number and percent of all surveys with missing data were: (a) 77 or 11.8% for production capacity; (b) 165 or 25.3% for annual energy sendout; and (c) 109 or 16.7% for annual input fuel use.
- Effects on Capacity and Sendout Totals. The missing data indicate that summations of both the total survey and the sectoral estimates for production capacity and annual energy sendout are conservative. True figures may be 10% to 25% greater than those contained in this report.
- Effects on Efficiency Calculations. The missing data does not allow the calculation of valid survey-wide or sectoral-wide system efficiencies that are based on the division of annual sendout by annual fuel use totals shown in this report.
- Effects on Comparisons among Sectors. Since missing data was distributed in a relatively even proportion among all user sectors, comparisons of the relative strengths of each surveyed sector appear generally valid. As discussed in Appendix A, true sectoral comparisons are affected much more significantly by entirely missed systems than by the missing data described above.

PERFORMANCE AND TECHNICAL CHARACTERISTICS

<u>Information Categories</u>	<u>Total</u>	<u>College</u>	<u>Community</u>	<u>Hospital</u>	<u>Industrial</u>	<u>Military</u>	<u>Other</u>
<i>Production Capacity (mmBTU/Hr)</i>	120,463	59,404	48,712	7,432	2,636	975	1,304
Steam	88,524	40,300	41,094	5,079	1,586	304	159
Hot Water	10,535	3,864	4,930	37	335	264	1,105
Chilled Water	18,394	12,769	2,278	2,263	644	405	34
Electricity	3,009	2,471	409	53	70	2	4
<i>Annual Energy Sendout (mmBTU)</i>	204,850,294	94,738,886	91,955,621	11,515,158	3,938,602	980,479	1,721,547
Steam	158,572,522	62,661,927	85,894,602	7,056,885	2,341,399	337,211	280,497
Hot Water	7,991,716	4,841,455	1,519,274	37,763	653,344	477,507	462,373
Chilled Water	29,871,923	20,197,286	3,274,730	4,402,355	869,324	159,386	968,841
Electricity	8,414,134	7,038,218	1,267,015	18,155	74,535	6,375	9,836
<i>Annual Fuel Use (mmBTU)</i>	396,453,416	234,371,544	114,951,670	35,147,245	9,508,022	874,328	1,600,606
Coal	86,957,088	49,089,009	16,760,553	18,278,348	2,829,178	0	0
Fuel Oil	37,267,476	7,337,465	29,264,023	302,269	35,623	45,569	282,528
Natural Gas	182,619,951	95,767,660	64,378,363	15,086,197	5,554,563	566,286	1,266,882
Purchased Thermal	3,322,638	2,115,926	1,206,701	11	0	0	0
Electricity	82,481,360	79,426,814	391,030	1,478,587	871,259	262,473	51,197
Renewables	3,804,904	634,671	2,951,000	1,833	217,400	0	0
<i>Distribution Line Length (miles)</i>	3,824	2,201	525	829	96	144	29
<i>Supply Lines (miles)</i>							
Steam Supply	1,516	725	376	1	24	41	9
Hot Water Supply	234	145	29	25	10	21	4
Chilled Water Supply	418	306	26	46	19	18	1
<i>Return Lines (miles)</i>							
Condensate Return	1,035	588	38	348	20	31	9
Hot Water Return	221	140	31	19	9	19	3
Chilled Water Return	401	298	25	49	13	15	1

Production Capacity by Type

All Surveyed Systems

Annual Energy Sendout by Type

All Surveyed Systems

Production Capacity (mmBTU/Hr)
Surveyed Systems and Sectors

Annual Energy Sendout (mmBTU)
Surveyed Systems and Sectors

Fuel Use by Type All Surveyed Systems

Piping Length by Sector All Surveyed Systems

Annual Energy Sendout by Type

Percent of Sendout by Sector

Annual Fuel Use by Type

Percent of Fuel Used by Sector

PROJECTIONS AND ESTIMATES – OVERVIEW

Information Presented

Information in this section provides projections of the total extent of district heating, cooling and cogeneration in the United States, and compares that total with data developed through the *1992 National Census*. Estimated totals are presented for all systems and for systems within each user sector. The following data are included:

- Number of systems and building area served (million square feet). Totals are presented to estimate the number of district energy systems and the building area they serve by sector.
- Distribution line length (miles). Single-number totals that represent both supply and return distribution piping lines are presented for each user sector.
- Energy production capacity and annual energy sendout (million BTU). Single-number totals that represent capacity and sendout for all forms of output energy are presented for each user sector.

Illustrations

Illustrations on page 30 show the estimated total number of district energy systems and distribution pipe length by sector. Illustrations on page 31 provide similar information for energy production capacity and annual energy sendout.

Quality and Limitations of the Projections

Projections presented in this section provide a reasonable and conservative estimate of the total use of district heating, cooling and cogeneration in the United States. These estimates are presented to allow a broad assessment of how much of the U.S. DHC/C

community is represented in this Census, rather than as a sophisticated market analysis for the industry. Several important findings and limitations of the projections follow.

- The projections indicate a total annual district energy sendout of about 1.12 quads, and a total distribution line length of almost 21,000 miles. While there is significant variation by user sector, systems inventoried for this *Census* account collectively for about 15% to 18% of these projected totals.
- Information upon which the projections are based was drawn from a variety of existing industry, association and federal studies. The projections are generally consistent with data and estimates contained in the USDOE's 1989 "Commercial Buildings Energy Consumption" report.
- As an overall check for reasonableness, projections for total and sectoral estimates of district energy use were checked against benchmarks for expected load factors, energy use intensity, and line length per system.
- Based on the projected estimates, a "typical" U.S. district energy system serves 11 to 50 buildings, with a total building area of two million square feet in an institutional or campus setting. It has a total production capacity of about 140 mmBTU per hour, an annual energy sendout of almost 200 thousand mmBTU, and an annual load factor of 0.163. It delivers energy through 3.6 miles of distribution mains.

The total estimated annual energy sendout of 1.12 quads appears conservative. Appendix A describes the projection methods, data sources and uncertainties for these estimates.

PROJECTIONS AND ESTIMATES -- U.S. TOTALS

<u>Information Categories</u>	<u>Total</u>	<u>College</u>	<u>Community</u>	<u>Hospital</u>	<u>Industrial</u>	<u>Military</u>	<u>Other</u>
<i>Number of DHC/C Systems</i>							
Totals from Census Survey	652	401	54	124	36	26	11
Projection -- Total U.S. Systems	5,793	1,900	110	2,026	432	310	1,015
<i>Estimated % in Census Survey</i>	<i>11%</i>	<i>21%</i>	<i>49%</i>	<i>6%</i>	<i>8%</i>	<i>8%</i>	<i>1%</i>
<i>Building Area Served (mm Sq. Ft.)</i>							
Totals from Census Survey	1,727	1,142	268	146	87	59	26
Projection -- Total U.S. Systems	11,728	3,000	2,018	1,394	1,045	1,871	2,400
<i>Estimated % in Census Survey</i>	<i>15%</i>	<i>38%</i>	<i>13%</i>	<i>10%</i>	<i>8%</i>	<i>3%</i>	<i>1%</i>
<i>Distribution Line Length (miles)</i>							
Totals from Census Survey	3,824	2,201	525	829	96	144	29
Projection -- Total U.S. Systems	20,869	6,203	1,025	3,763	2,267	4,013	3,598
<i>Estimated % in Census Survey</i>	<i>18%</i>	<i>35%</i>	<i>51%</i>	<i>22%</i>	<i>4%</i>	<i>4%</i>	<i>1%</i>
<i>Production Capacity (mmBTU/Hr)</i>							
Totals from Census Survey	120,463	59,404	48,712	7,432	2,636	975	1,304
Projection -- Total U.S. Systems	786,382	167,417	95,133	121,425	62,258	178,356	161,793
<i>Estimated % in Census Survey</i>	<i>15%</i>	<i>35%</i>	<i>51%</i>	<i>6%</i>	<i>4%</i>	<i>1%</i>	<i>1%</i>
<i>Annual Energy Sendout (mmBTU)</i>							
Totals from Census Survey	204,850,294	94,738,886	91,955,621	11,515,158	3,938,602	980,479	1,721,547
Projection -- Total U.S. Systems	1,121,896,267	267,000,000	179,585,980	188,136,000	93,022,800	180,551,487	213,600,000
<i>Estimated % in Census Survey</i>	<i>18%</i>	<i>35%</i>	<i>51%</i>	<i>6%</i>	<i>4%</i>	<i>1%</i>	<i>1%</i>
<i>Annual Energy Sendout (Quads)</i>							
Totals from Census Survey	0.205	0.095	0.092	0.012	0.004	0.001	0.002
Projection -- Total U.S. Systems	1.122	0.267	0.180	0.188	0.093	0.181	0.214
<i>Estimated % in Census Survey</i>	<i>18%</i>	<i>35%</i>	<i>51%</i>	<i>6%</i>	<i>4%</i>	<i>1%</i>	<i>1%</i>

**Number of U.S. DHC Systems
Projected Number by Sector**

**Number of U.S. DHC Systems
Projected Percent by Sector**

**Length of U.S. DHC Pipe Mains
Projected Miles by Sector**

**Length of U.S DHC Pipe Mains
Projected Percent by Sector**

Production Capacity for U.S. DHC Projected Capacity by Sector

Production Capacity for U.S. DHC Projected Percent by Sector

Annual Energy Sendout by Sector Projected Sendout by Sector

Energy Sendout for U.S. DHC Projected Percent by Sector

SECTOR CHARACTERISTICS

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SECTOR CHARACTERISTICS -- OVERVIEW

Information Presented

Information in this section provides one-page summaries of selected survey data and projections made for each of the six user sectors in the *Census*. Discussions ending each sector summary page provide a general description of relative sample sizes and projection estimates for that sector.

Assistance needs voiced by respondents for both the improvement of individual district systems, and the growth of the DHC/C industry are shown graphically at the end of this section. Data is organized to allow comparisons between information from all systems, and information specific to each user sector. The following survey data are presented:

- **Production Capacity** (million BTU per hour). Listings contrast total production capacity and production capacity by form of energy produced for each sector against totals for all surveyed systems.
- **Building Area Served and Piping Lengths**. Listings again contrast information for each surveyed sector against totals for all surveyed systems.
- **Employees, Value and Budget**. Listings again contrast information for each surveyed sector against totals for all surveyed systems.
- **Desired Help for Systems and DHC/C Growth**. Information is presented to indicate the relative importance of assistance needs felt by respondents to the *Census*. Percentage figures show the proportions of all respondents who noted each named assistance need.

Illustrations

Illustrations on each sector summary page show the proportion of total projected annual energy sendout for each user sector in comparison to the total projected energy sendout for all user sectors. Each page also shows the proportion of production capacity by type of output energy for systems surveyed within each sector. Illustrations on pages 41 and 42 show assistance needs voiced by all respondents and by sector to both improve their individual systems, and to help the growth of the entire U.S. DHC/C industry.

CHARACTERISTICS -- COLLEGE AND UNIVERSITY SYSTEMS

<u>Surveyed Characteristics</u>	<u>All Systems</u>	<u>College</u>	<u>% College</u>
Production Capacity (mmBTU/hr)	120,463	59,404	49.31%
Steam	88,524	40,300	45.52%
Hot water	10,535	3,864	36.68%
Chilled Water	18,394	12,769	69.42%
Electricity	3,009	2,471	82.10%
Desired Help For Systems			
Central Plant Upgrade	21%	23%	
Distribution Upgrade	34%	35%	
Maintenance	29%	29%	
Other	15%	23%	
Desired Help for DHC/C Growth			
Government Policy	11%	11%	
Financial Incentives	38%	39%	
Public Awareness	38%	39%	
Other	13%	11%	
<u>Projected Characteristics</u>	<u>All Systems</u>	<u>College</u>	<u>% College</u>
Systems, Area and Piping			
Number of Systems	5,793	1,900	32.80%
Building Area Served (mm Sq. Ft.)	11,728	3,000	25.58%
Distribution Line Length (Mi)	20,869	6,203	29.72%
Production and Sendout			
Production Capacity (mmBTU/Hr)	786,382	167,417	21.29%
Energy Sendout (mmBTU/Yr)	1,121,896,267	267,000,000	23.80%

Annual Energy Sendout
Projected College vs. All Projected

Production Capacity by Type
All Surveyed College Systems

Discussion

The university and college community composes the largest single sector for DHC/C in the United States. The systems responding to the survey for this National Census accounted for nearly one-half of the energy production capacity found in all surveyed systems. Projections estimate that the 401 college and university systems included in this Census represent about 21% of the estimated 1,900 district energy systems on campuses throughout the United States. These 1,900 systems distribute over 250 trillion BTU of energy annually, accounting for over one-quarter of all energy sent out by the nation's district systems each year.

Individual system assistance needs voiced by survey respondents indicated upgrades to distribution networks as their highest priority, while financial incentives and stronger public awareness were felt most important to improve the growth and vitality of the entire DHC/C industry.

CHARACTERISTICS -- COMMUNITY AND UTILITY SYSTEMS

<u>Surveyed Characteristics</u>	<u>All Systems</u>	<u>Community</u>	<u>% Community</u>
Production Capacity (mmBTU/hr)	120,463	48,712	40.44%
Steam	88,524	41,094	46.42%
Hot water	10,535	4,930	46.79%
Chilled Water	18,394	2,278	12.39%
Electricity	3,009	409	13.61%

Desired Help For Systems

Central Plant Upgrade	21%	18%
Distribution Upgrade	34%	34%
Maintenance	29%	27%
Other	15%	18%

Desired Help for DHC/C Growth

Government Policy	11%	16%
Financial Incentives	38%	24%
Public Awareness	38%	32%
Other	13%	27%

<u>Projected Characteristics</u>	<u>All Systems</u>	<u>Community</u>	<u>% Community</u>
Systems, Area and Piping			
Number of Systems	5,793	110	1.90%
Building Area Served (mm Sq. Ft.)	11,728	2,018	17.21%
Distribution Line Length (Mi)	20,869	1,025	4.91%

Production and Sendout

Production Capacity (mmBTU/Hr)	786,382	95,133	12.10%
Energy Sendout (mmBTU/Yr)	1,121,896,267	179,585,980	16.01%

Annual Energy Sendout

Projected Community vs. All Projected

Production Capacity by Type

All Surveyed Community Systems

Discussion

Community and utility systems composed the second largest sector of DHC/C respondents included in this National Census. Systems responding to the survey, or included from alternate sources, accounted for more than 40% of the energy production capacity found in all the inventoried systems. As the best represented sector in the Census, the 54 systems included in this report account for about 50% of all community and utility systems currently operating in the United States. While the estimated total number of systems in this sector number just over 100, individual plants, distribution networks, and building areas served are generally larger than most campus or institutional systems. Although community and utility facilities represent only about 2% of the estimated total number of district systems in the United States, they account collectively for over 16% of total annual energy sendout.

Individual system assistance needs voiced by survey respondents indicated upgrades to distribution networks as their highest priority, while stronger public awareness and a mix of "other" needs were felt most important to improve the growth and vitality of the entire DHC/C industry.

CHARACTERISTICS -- HOSPITAL SYSTEMS

<u>Surveyed Characteristics</u>	<u>All Systems</u>	<u>Hospital</u>	<u>% Hospital</u>
Production Capacity (mmBTU/hr)	120,463	7,432	6.17%
Steam	88,524	5,079	5.74%
Hot water	10,535	37	0.35%
Chilled Water	18,394	2,263	12.31%
Electricity	3,009	53	1.76%
Desired Help For Systems			
Central Plant Upgrade	21%	21%	
Distribution Upgrade	34%	34%	
Maintenance	29%	30%	
Other	15%	21%	
Desired Help for DHC/C Growth			
Government Policy	11%	11%	
Financial Incentives	38%	41%	
Public Awareness	38%	41%	
Other	13%	7%	
<u>Projected Characteristics</u>	<u>All Systems</u>	<u>Hospital</u>	<u>% Hospital</u>
Systems, Area and Piping			
Number of Systems	5,793	2,026	34.97%
Building Area Served (mm Sq. Ft.)	11,728	1,394	11.89%
Distribution Line Length (Mi)	20,869	3,763	18.03%
Production and Sendout			
Production Capacity (mmBTU/Hr)	786,382	121,425	15.44%
Energy Sendout (mmBTU/Yr)	1,121,896,267	188,136,000	16.77%

Annual Energy Sendout
Projected Hospital vs. All Projected

Production Capacity by Type
All Surveyed Hospital Systems

Discussion

Hospital systems composed a surprisingly large portion of respondents to the National Census. The 124 respondents to the survey represented almost 20% of all inventoried systems, and more than 6% of total surveyed energy production capacity. The great majority of hospital respondents were Veterans' Administration facilities, with relatively few private and community health care facilities included. Projections estimate that the surveyed sample includes less than 10% of all health care facilities in the United States that are dependent on district energy systems. When the full number of hospitals that use district systems is included, this sector conservatively accounts for well over 15% of total annual energy sendout from all district energy systems in the United States.

Individual system assistance needs voiced by survey respondents indicated upgrades to distribution networks and maintenance improvements as their highest priorities, while financial incentives and stronger public awareness were felt most important to improve the growth and vitality of the entire DHC/C industry.

CHARACTERISTICS -- MILITARY SYSTEMS

<u>Characteristics</u>	<u>All Systems</u>	<u>Military</u>	<u>% Military</u>
Production Capacity (mmBTU/hr)	120,463	975	0.81%
Steam	88,524	304	0.34%
Hot water	10,535	264	2.51%
Chilled Water	18,394	405	2.20%
Electricity	3,009	2	0.06%
Desired Help For Systems			
Central Plant Upgrade	21%	13%	
Distribution Upgrade	34%	24%	
Maintenance	29%	36%	
Other	15%	13%	
Desired Help for DHC/C Growth			
Government Policy	11%	0%	
Financial Incentives	38%	33%	
Public Awareness	38%	33%	
Other	13%	33%	
Projected Characteristics	<u>All Systems</u>	<u>Military</u>	<u>% Military</u>
Systems, Area and Piping			
Number of Systems	5,793	310	5.35%
Building Area Served (mm Sq. Ft.)	11,728	1,871	15.95%
Distribution Line Length (Mi)	20,869	4,013	19.23%
Production and Sendout			
Production Capacity (mmBTU/Hr)	786,382	178,356	22.68%
Energy Sendout (mmBTU/Yr)	1,121,896,267	180,551,487	16.09%

Annual Energy Sendout
Projected Military vs. All Projected

Production Capacity by Type
All Surveyed Military Systems

Discussion

Responses to the Census survey by system operators from military bases and facilities was disappointingly low. Only 26 responses were received from more than 600 domestic military installations. Through the use of additional inventory sources, more realistic estimates of military use of district energy systems were made. Conservative estimates indicate that the military sector uses district energy on a collective order of magnitude that may be much greater than the estimates given here, which project that DoD activities accounting for at least 16% of the total annual energy sendout from all district energy systems in the United States.

Individual system assistance needs voiced by survey respondents strongly indicated maintenance improvements as their highest priority, while financial incentives, stronger public awareness, and "other" were noted as important to improve the growth and vitality of the DHC/C industry.

CHARACTERISTICS -- INDUSTRIAL SYSTEMS

<u>Characteristics</u>	<u>All Systems</u>	<u>Industrial</u>	<u>% Industrial</u>
Production Capacity (mmBTU/hr)	120,463	2,636	2.19%
Steam	88,524	1,586	1.79%
Hot water	10,535	335	3.18%
Chilled Water	18,394	644	3.50%
Electricity	3,009	70	2.32%
Desired Help For Systems			
Central Plant Upgrade	21%	12%	
Distribution Upgrade	34%	31%	
Maintenance	29%	34%	
Other	15%	12%	
Desired Help for DHC/C Growth			
Government Policy	11%	10%	
Financial Incentives	38%	37%	
Public Awareness	38%	40%	
Other	13%	13%	
Projected Characteristics			
Systems, Area and Piping			
Number of Systems	5,793	432	7.46%
Building Area Served (mm Sq. Ft.)	11,728	1,045	8.91%
Distribution Line Length (Mi)	20,869	2,267	10.86%
Production and Sendout			
Production Capacity (mmBTU/Hr)	786,382	62,258	7.92%
Energy Sendout (mmBTU/Yr)	1,121,896,267	93,022,800	8.29%

Discussion

Industrial systems composed a relatively small portion of respondents to the National Census. The 36 respondents to the survey represented just over 2% of total surveyed energy production capacity. The very small size of the survey sample, combined with a lack of alternate data, does not support well estimates of production capacity by type of output as shown on this page. Projections of annual energy sendout were derived primarily from the Commercial Buildings Energy Consumption studies conducted by DOE for 1989. A significant amount of work is required to obtain better information about the full extent of district energy systems within this user sector.

Individual system assistance needs voiced by survey respondents strongly emphasized upgrades to distribution networks and maintenance improvements as their highest priorities, while financial incentives and stronger public awareness were felt most important to improve the growth and vitality of the entire DHC/C industry.

Annual Energy Sendout Projected Industrial vs. All Projected

Production Capacity by Type All Surveyed Industrial Systems

CHARACTERISTICS -- "OTHER" SYSTEMS

<u>Characteristics</u>	<u>All Systems</u>	<u>Other</u>	<u>% Other</u>
Production Capacity (mmBTU/hr)	120,463	1,304	1.08%
Steam	88,524	159	0.18%
Hot water	10,535	1,105	10.49%
Chilled Water	18,394	34	0.19%
Electricity	3,009	4	0.15%
Desired Help For Systems			
Central Plant Upgrade	21%	29%	
Distribution Upgrade	34%	42%	
Maintenance	29%	25%	
Other	15%	29%	
Desired Help for DHC/C Growth			
Government Policy	11%	14%	
Financial Incentives	38%	57%	
Public Awareness	38%	29%	
Other	13%	0%	
<u>Projected Characteristics</u>	<u>All Systems</u>	<u>Other</u>	<u>% Other</u>
Systems, Area and Piping			
Number of Systems	5,793	1,015	17.52%
Building Area Served (mm Sq. Ft.)	11,728	2,400	20.46%
Distribution Line Length (Mi)	20,869	3,598	17.24%
Production and Sendout			
Production Capacity (mmBTU/Hr)	786,382	161,793	20.57%
Energy Sendout (mmBTU/Yr)	1,121,896,267	,600,000	19.04%

Annual Energy Sendout

Projected "Other" vs. All Projected

Production Capacity by Type

All Surveyed "Other" Systems

Discussion

District energy systems that do not fit well within any of previous five user sectors are classified as "other". This sector can include such users as secondary schools, multifamily residential developments, state and federal government office complexes, and the like. While extensive data that documents the full extent of these users is not easily available, projections indicate that the quantity of district energy used within this sector may be similar to that of the college and university sector. Substantial efforts will be required for the collection and verification of data to confirm this estimate.

Help Desired for Individual Systems

Percent of Responses from Each Sector

Help Desired for the DHC/C Industry

Percent of Responses from Each Sector

APPENDIX A

DEFINITIONS, UNITS AND METHODS

Definitions

District Energy System. A district heating, cooling or cogeneration system (DHC/C) that provides thermal energy from a central plant in the form of steam, hot water, or chilled water through a network of pipes to meet the space conditioning or process heat needs of at least two connected commercial, industrial and residential buildings. If electricity is produced, the system is a cogenerating facility. In this report, district energy systems are characterized by:

Building Area Served. The total enclosed area within all buildings connected to a district energy system which use the thermal energy distributed by that system. Presented in this report as million square feet (mm Sq. Ft.)

Distribution Line (or Piping) Length. A linear measure of all supply and return piping that is used to distribute thermal energy to buildings in a district energy system. Presented in this report as miles.

Production Capacity. A measure of the rate at which thermal energy and/or electricity can be produced for distribution by a district energy system. Presented in this report as million BTU per hour (mmBTU/Hr).

Annual Energy Sendout. A measure of the quantity of thermal energy and/or electricity that is produced for distribution by a district energy system during a full calendar year. Presented in this report as million BTU (mmBTU).

Fuel Use (or Consumption). A measure of the quantity of fuel used by the central plant(s) of a district energy system during a full calendar year to produce thermal and/or electrical energy for distribution. Presented in this report as million BTU (mmBTU).

User Sector. A subdivision of all district energy systems that is defined by common characteristics within its customer base and/or ownership pattern. This report subdivides all district energy systems into the following six user sectors:

College and University. Systems that are located on college and university campuses, and that have a primary customer base consisting of on-campus buildings.

Community and Utility. Systems that serve a variety of customers within a community. These systems are usually in a downtown or densely developed area, and may be owned by a government, utility, or other private organization.

Hospital. Systems that have a primary customer base consisting of health care buildings and facilities.

Industrial. Systems that have a primary customer base associated with manufacturing activities, and their related service and support facilities.

Military. Systems that are located on military bases and installations, and that have a primary customer base consisting of on-base buildings and facilities.

Other. Systems that do not fit easily within the five previous user sectors. This sector can include such users as secondary schools, multifamily residential developments, state or federal government office complexes, and the like.

Energy Units and Measures

Unit of Energy. This report uses the BTU as a common energy measurement unit in all of its presentations. Definitions of this unit and its multiples used in this report follow.

BTU. A measure of heat content. One British Thermal Unit (BTU) is the quantity of heat needed to raise the temperature of one pound of water by 1 degree Fahrenheit.

mmBTU. One Million BTU (1×10^6). In calendar year 1991, the total amount of energy consumed in the United States was about 81,500,000,000 mmBTU.

Quad. One Quadrillion BTU (1×10^{15}). In calendar year 1991, the total amount of energy consumed in the United States was about 81.5 Quads.

Survey Mailings and Responses

Eleven associations and agencies were identified as those likely to represent the great majority of the nation's district energy system operators within their collective memberships or constituencies. Mailing labels were requested from each association or agency either for those members known to operate a district energy system, or for the association's entire membership if such operating information was not known. A list of the identified associations and agencies appears below. Representatives from those associations or agencies listed in italicized print served on the Technical Committee for the Census. Mailing labels were not received from those associations or agencies noted with an asterisk.

- o AAAE* -- American Association of Airport Executives
- o AAHE* -- American Association of Hospital Executives
- o AIPE -- *American Institute of Plant Engineers*
- o APPA -- American Public Power Association
- o APWA -- American Public Works Association
- o AEE -- Association of Energy Engineers
- o APPA -- *Association of Higher Education Facilities Officers*
- o BOMA -- Building Owners and Managers Association
- o CERL* -- *Construction Engineering Research Laboratory, DOD*
- o DVA -- Dept. of Veterans Affairs, Health Administration
- o IDHCA -- *International District Heating and Cooling Assoc.*

Using the labels provided from the associations listed above, the survey instrument for the Census was mailed by the Association of Higher Education Facilities Officers (APPA) to approximately 10,000 addressees in Fall, 1992. The mailings requested a return of the survey to APPA whether or not a district energy system was operated by the addressee.

The Census was intended to be administered among U.S. Department of Defense (DOD) military bases and installations by the Construction Engineering Research Laboratory (CERL). A modified, and somewhat more extensive survey, was developed by CERL for this purpose. However, full approval from DOD for the administration of the survey was not given, and the survey was mailed to only a very limited number of installations.

Slightly over 1,000 addressees completed and returned the survey, including 26 returns from military installations. Of these returns, about 350 indicated that they did not use or operate a district energy system. 637 returns said that they did use or operate a district system, and completed the survey to describe that system.

All responses were entered into an electronic database to aid in data verification, analysis and reporting. Respondents who indicated they did not operate a district energy system are not included in this

report. The 637 returns that indicated they operated a district energy system form the primary data base for the Census. As described in the following section, fifteen additional district systems that did not respond to the survey were added to this data base using operating information for 1992 that was provided by the International District Heating and Cooling Association. The Census reports on this total of 652 district energy systems.

Methods for Data Verification

All identifying, descriptive and operating information from the survey forms was keyed into an electronic data base as received. Once data from all surveys had been entered into the database, several checks were made to correct errors and assess the initial reasonableness of data received for both individual systems and the entire sample. A discussion of major error sources, and the methods used for data verification follows.

System Identification

Many respondents identified their system by the name of its site or central plant rather than by the name of the operating organization; e.g., "Main Campus System", "Chiller Plant", "Boiler Plant #2", and the like. Original survey forms for database entries that were named in this fashion were reviewed, with database entries changed to reflect both the name of the operating organization, and the site or plant identifier; e.g., "University of North Carolina, Main Campus".

Operating Data Errors

Errors in operating data (building area served, energy-related information, and financial and employee information) could be caused by keyboard entry mistakes, use by respondents of different energy or cost units than those requested, respondent misinterpretation of a specific data request, and/or incorrect or incomplete information provided by a respondent.

As an initial basis to identify and, where possible, correct such errors, operating data were tested using four ratios and benchmarks:

<u>Ratio</u>	<u>Benchmark</u>
System Efficiency (Input Fuel/Sendout)	= 0.50
Load Factor [(Sendout/8,760)/Prod. Capacity]	= 0.30
Bldg. Area/Production Capacity (Sq. Ft./Cap.)	= 50,000
Bldg. Area/Annual Sendout (Sq. Ft./Sendout)	= 50.00

These benchmarks do not represent operating standards. However, since most district energy systems should have operating characteristics that fall below the benchmarks, they were used as a broad reasonableness test applicable to the extensive amount of data from the surveys. For every system in the database that exceeded any of the benchmark values, original survey forms were reviewed and data corrections were made according to the following protocol:

- 1) Keyboard Entry Errors. Corrections were made to any entry in the database differing from the data submitted by the respondent.
- 2) Energy Unit Errors. Corrections were made for any entry where a respondent indicated or used a different energy unit than requested (e.g., therms rather than MCF for natural gas, mBTU rather than mMBTU for energy sendout).
- 3) Length, Area and Value Unit Errors. Corrections were made for any database entry where a respondent had indicated or used a different measurement unit than requested (e.g., miles rather than thousand linear feet for piping line length).
- 4) Omitted Data. No entries were added to the database if values requested on the survey instrument were not completed by the respondent. The extent of these omissions are described in the "Discussion of Overall Data Quality" section below.

- 5) Added Data. Data for fifteen known district energy systems that did not respond to the survey were added. Production capacity, annual energy sendout, piping line lengths, and building area served for these systems were taken from existing 1990 and 1992 information provided by the International District Heating and Cooling Association (IDHCA). All of these systems were assigned to the "Community and Utility" sector of the Census.

Discussion of Overall Data Quality

Key findings from an analysis of overall data quality for the entire sample of 652 district energy systems included in the Census follow.

Descriptive Statistics

The quality of descriptive data provided by survey respondents appeared complete and credible with the following three major exceptions. The omissions and errors described below were evident particularly in the college, hospital, and industrial sectors:

- Number of Employees (FTE). 126 respondents (19.6%) provided no employee data. 114 respondents (17.5%) provided employment figures that appear to include all employees of the organization, or all maintenance and physical plant personnel, rather than just those directly associated with their district energy system.
- Value of Installed Plant (mm \$). 214 respondents (32.8%) provided no value for their installed plant. 120 respondents (18.4%) provided dollar figures that appear to include the value of the organization's entire physical plant, rather than just the value of the district energy system's central plant, controls and distribution system.
- Annual Capital Budget (mm \$). 357 respondents (54.8%) provided no information for annual capital budgets. 26

respondents (4.0%) provided dollar figures that appear to include the organization's entire annual capital budget, rather than just that budget directly associated with their district energy system.

Performance and Technical Statistics

Performance and technical information provided on survey forms by respondents often omitted one or more data points for production capacity, annual energy sendout, or input fuel use. These omissions occurred in relatively even proportions within each user sector of the inventory. A brief discussion of the extent of this missing data and their major effects on findings and analyses from the Census follows:

- Extent of Missing Data. The number and percent of all surveys with missing data were: (a) 77 or 11.8% for production capacity; (b) 165 or 25.3% for annual energy sendout; and (c) 109 or 16.7% for annual input fuel use.
- Effects on Capacity and Sendout Totals. The missing data indicate that summations of both the total survey and the sectoral estimates for production capacity and annual energy sendout are conservative. True figures may be 10% to 25% greater.
- Effects on Efficiency Calculations and Benchmarks. The missing data does not allow the calculation of valid survey-wide or sectoral-wide system efficiencies, load factors, or other benchmark ratios similar to those described earlier in this section for use in the initial data tests.
- Effects on Comparisons among Sectors. Since missing data was distributed in a relatively even proportion among all user sectors, comparisons of the relative strengths of each surveyed sector appear generally valid. True sectoral comparisons are affected much more significantly by entirely missed systems than by missing survey data.

Methods for Projections and Estimates

Projections were made by sector to provide a reasonable estimate of the total extent of district energy systems in the United States. The projections are shown on page 29 of this report. Information upon which the projections are based was drawn from data developed through this Census, as well as a variety of other existing industry, association and federal sources. Estimates were made by sector to allow a broad assessment of how much of the U.S. DHC/C community is represented within each sector, rather than as a sophisticated market analysis for the industry.

General Methodology

Projections were made by sector to estimate total building area served, number of systems, annual energy sendout, production capacity, and distribution pipe length. A brief summary of methods and data sources used in these projections follows.

1) *Building Area Served* -- Projections of total square feet of building area served by district energy systems were derived for each of the six user sectors in this report as follows:

- Building areas served in college, hospital, industrial, and community sectors were derived from data contained in the USDOE/EIA "Commercial Buildings Energy Consumption Survey, 1989" (CBECS), updated to reflect 1992 total commercial square footage. The CBECS data contains estimates of total commercial building area served by district energy systems, excluding areas served in residential, military, and industrial process uses.
- Building areas served in the military sector were estimated from information provided by Department of Defense (DoD) personnel, previous steam system inventories, the "Naval Air Pollution Source Information System", and the

U.S. Army "Facilities Engineering and Housing, Annual Summary of Operations, 1989". Within these reports, data detail and format differed by branch of service; dates covered ranged from a FY 1992 summary of energy audit information, to a mid-1980's steam system inventory.

- Little formally documented data were available to estimate total building area served in the "other" sector (residential developments, state and federal government complexes, secondary schools, etc.). However, previous studies carried out by the National Research Council, and information provided staff from the University of Rochester suggested that the total area served within this sector is "at least" as great as that of the college sector. To remain conservative, projections in this report use 75% of the college sector building area.

- 2) *Number of Systems* -- The number of systems within college, community, and military sectors were taken from existing APPA, IDHCA, and DOD studies. The number of systems within the hospital, industrial, and "other" sectors were projected by dividing the projected total square feet served per sector, as defined above, by the estimated average square feet served per system within that sector, as defined in this Census.
- 3) *Annual Energy Sendout* -- Annual energy sendout was estimated for the all sectors except the military by multiplying total square feet served within that sector by conditional energy intensity factors as contained in the 1989 DOE/EIA CBECS report. Annual energy sendout for the military sector was taken directly from data contained in the previously referenced DoD and service branch facilities reports.
- 4) *Production Capacity* -- Production capacity was estimated for all the sectors except the military by multiplying total projected annual energy sendout within that sector by the Load Factor for

that sector as found in this Census. Production capacity for the military sector was taken directly from the data contained in the previously referenced DoD and service branch facilities reports.

- 5) *Distribution Pipe Length* -- Length of distribution pipe was estimated for all the sectors except the military by dividing total projected annual energy sendout within that sector by a factor of pipe length per unit of annual energy sendout for that sector as calculated from surveyed data in this Census. Distribution pipe length for the military sector was taken directly from the data contained in the previously referenced DoD and service branch facilities reports.

Reasonableness Tests

Projections were tested for reasonableness through several benchmark performance ratios, review by selected district energy experts, and comparisons with previous estimates, total facilities or activity within each sector. Results from these reasonableness tests follow.

- 1) *Benchmark Ratios* -- The projections show that an "average" district energy system serves a building area of 2.02 million square feet with a production capacity of 136 mmBTU per hour, an annual energy sendout of 194 thousand mmBTU, and an annual load factor of 0.163. These values are reasonable and indicative of the large number of institutional and campus systems in the United States. The ratios also differ as expected within sectors; e.g. mean values for building area, production capacity and sendout, and load factor are higher for the generally larger systems found within the community and utility sector.
- 2) *Review by Experts* -- Both the general methodology and the estimates from the projections were reviewed by selected district energy professionals and system component vendors. Estimating methods and ratios were considered reasonable by those reviewers, although most voiced the general desire for a larger,

randomized sample upon which to base more statistically significant estimates. While most reviewers found the total estimates somewhat higher than expected, estimates by sector were judged reasonable or conservative.

- 3) *Comparisons and Total Activity* -- Results from earlier studies and known activity within several sectors further indicate that the projected estimates may be conservative. The possibility of low estimates was especially noted in the hospital, military and industrial sectors, where the numbers of projected systems appear to be substantially lower than those actually in place. For example, the projections estimate about 300 military systems with under 2,000 miles of distribution piping. These projections compare to a total of about 600 U.S. military installations, with previous estimates of total distribution piping that have ranged as high as 6,000 total miles.

Conclusions and Recommendations

The projections made in this Census indicate that there are approximately 6,000 district energy systems currently operating in the United States, with a collective total annual energy sendout of well over one quadrillion BTU. These estimates appear reasonable as a total U.S. projection. Sectoral estimates are considered most accurate for the college and the community and utility sectors. They appear conservative for systems within the military, hospital, and industrial sectors. Given the paucity of available information, estimates for systems within the "other" sector should be considered the least accurate.

Despite uncertainties in these projections, they show clearly that district energy makes a significant contribution to the nation's total energy use and distribution infrastructure. Continuing data development and collection efforts are strongly recommended to build on information contained in this Census, and to address the uncertainties identified here.

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APPENDIX B

LIST OF INVENTORIED SYSTEMS

This Appendix presents a listing of all the organizations and district energy systems that are included in the *1992 National Census of District Heating, Cooling and Cogeneration*. The listing is presented by major user sector. Within each user sector, the listing is arranged alphabetically by the name of the system operator. Multiple listings of the same system operator indicate that the organization provided information to differentiate its total system according to two or more separate central plants, or by type of output energy produced; e.g., chilled water and steam.

In addition to the name of the system operator, each entry is identified by city and state location, by total annual energy sendout and hourly production capacity, and by type(s) of output energy produced. A "0.0" entry for either sendout or capacity indicates that this information was not provided on the survey form by the respondent, and was not easily available from alternate existing inventory sources. Definitions and units used for energy sendout and capacity are as follow:

■ *Annual Energy Sendout*

Total annual energy sendout for the most recent year available for all forms of energy produced by the system (steam, hot water, chilled water, and electricity). Annual energy sendout is expressed in million British Thermal Units (mmBTU).

■ *Production Capacity*

Total hourly production capacity for the most recent year available for all forms of energy produced by the system (steam, hot water, chilled water, and electricity). Hourly production capacity is expressed in million British Thermal Units per hour (mmBTU/Hr).

List of Inventoried Systems

Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
ADAMS STATE COLLEGE	ALANESA	CO	1,250.00	1.40	XXX			
ALBRIGHT COLLEGE SELWYN HALL	READING	PA	0.00	0.20	XXX			
ALBRIGHT COLLEGE WALTON HALL	READING	PA	0.00	0.25	XXX			
ALPENA COMMUNITY COLLEGE	ALPENA	MI	0.00	0.00				
AMARILLO COLLEGE	AMARILLO	TX	41.86	9.42			XXX	
AMBASSADOR COLLEGE	BIG SANDY	TX	0.00	10.80			XXX	
ANDOVER NEWTON THEOLOGICAL SCHOOL	NEWTON	MA	16,800.00	8.37	XXX			
APPALACHIAN STATE UNIVERSITY	BOONE	NC	203,750.00	94.92	XXX			
AQUINAS COLLEGE	GRAND RAPIDS	MI	33,800.00	35.40	XXX			
ARIZONA HEALTH SCIENCE CENTER	TUCSON	AZ	387,461.45	171.45	XXX		XXX	
AUBURN UNIVERSITY	AUBURN	AL	775,427.90	234.99	XXX		XXX	
AUGUSTANA COLLEGE	SIOUX FALLS	SD	46,000.00	47.00	XXX			
AURARIA HIGHER EDUCATION SYSTEM	DENVER	CO	0.00	34.08			XXX	
BABCOCK TAYLOR HEATING SYSTEM	HASTINGS	NB	0.00	3.00		XXX		
BALL STATE UNIVERSITY (Chilled Water)	MUNCIE	IN	226,647.12	108.00			XXX	
BALL STATE UNIVERSITY (Steam)	MUNCIE	IN	654,518.00	256.00	XXX			
BARITAN VALLEY COMM. COLLEGE	SOMERVILLE	NJ	\$,161.40	5.55		XXX	XXX	
BARNARD COLLEGE	NEW YORK	NY	0.00	0.00				
BAYLOR COLLEGE OF MEDINCINE	HOUSTON	TX	338,389.00	128.40	XXX		XXX	
BAYLOR UNIVERSITY	WACO	TX	198,359.00	26.52	XXX		XXX	XXX
BERCE COLLEGE	BERCE	KY	180,000.00	190.00	XXX			
BETHEL COLLEGE	NORTH NEWTON	KS	0.00	0.00	XXX			
BIOLA UNIVERSITY CENTRAL PLANT	LA MIRADA	CA	20,670.39	25.88		XXX	XXX	XXX
BLACK HAWK COLLEGE	MOLINE	IL	1,159.32	11.66		XXX	XXX	
BLACK HILLS STATE UNIVERSITY	SPEARFISH	SD	0.00	0.00	XXX	XXX		
BOB JONES UNIVERSITY	GREENVILLE	SC	55,144.84	90.00	XXX	XXX		XXX
BOWIE STATE UNIVERSITY	BOWIE	MD	1.00	0.00	XXX			
BRADLEY UNIVERSITY	PEORIA	IL	174,720.00	65.00	XXX			
BRIGHAM YOUNG UNIVERSITY	PROVO	UT	666,330.00	716.62	XXX	XXX	XXX	
BRIGHAM YOUNG UNIVERSITY (Chilled Water)	LAVE	HI	0.00	15.10			XXX	

List of Inventoried Systems

Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
BROOKLYN COLLEGE	BROOKLYN	NY	0.00	0.15	XXX			
BUCKNELL UNIVERSITY	LEWISBURG	PA	14.60	2.82				XXX
BUFFALO STATE COLLEGE	BUFFALO	NY	305,056.36	0.00	XXX			
CALIFORNIA INSTITUTE OF TECHNOLOGY	PASADENA	CA	547,698.04	275.00	XXX		XXX	XXX
CALIFORNIA STATE UNIV. (Hydronic System)	BAKERSFIELD	CA	29,780.02	29.42		XXX	XXX	
CALIFORNIA STATE UNIVERSITY, FRESNO	FRESNO	CA	0.00	79.20	XXX		XXX	
CALIFORNIA STATE UNIVERSITY, NORTHRIDGE	NORTHRIDGE	CA	172,900.00	93.00	XXX			
CALIFORNIA STATE UNIVERSITY, SACRAMENTO	SACRAMENTO	CA	153,600.02	137.20	XXX		XXX	XXX
CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO	SAN BERNARDINO	CA	74,000.00	104.00		XXX	XXX	
CENTRAL FLORIDA COMMUNITY COLLEGE	OCALA	FL	0.00	8.89		XXX	XXX	
CHARLES COUNTY COMMUNITY COLLEGE	LAPLATA	MD	40,000.00	0.00				
CHRISTIAN HERITAGE COLLEGE	EL CAJON	CA	0.00	3.00		XXX	XXX	
CLAREMONT COLLEGE	CLAREMONT	CA	0.00	50.50	XXX			
CLARK UNIVERSITY	WORCESTER	MA	87,601.62	68.97	XXX	XXX		XXX
COLBY COLLEGE	WATERVILLE	MA	0.00	90.00	XXX			
COLLEGE OF CANYONS	VALENCIA	CA	0.00	0.20				XXX
COLLEGE OF DUPAGE	GLEN ELLYN	IL	0.00	5.88	XXX			XXX
COLORADO COLLEGE	COLORADO SPRING	CO	141,626.00	80.00		XXX		
COLUMBIA UNIVERSITY MORRIS HEIGHTS	NEW YORK	NY	96,000.00	443.60	XXX		XXX	
COLUMBUS STATE COMMUNITY COLLEGE	COLUMBUS	OH	0.00	0.00	XXX			
CONNECTICUT COLLEGE	NEW LONDON	CT	94,290.34	116.40	XXX		XXX	
CONTRA COSTA COMMUNITY COLLEGE	MARTINEZ	CA	0.00	0.00				
DAKOTA STATE UNIVERSITY	MADISON	SD	35,112.00	62.81	XXX			
DAKOTA Wesleyan University	MITCHELL	SD	0.00	17.40	XXX		XXX	
DALLAS COUNTY COMMUNITY COLLEGE	MESQUITE	TX	0.00	2.91		XXX	XXX	
DALLAS COUNTY COMMUNITY COLLEGE	DALLAS	TX	0.00	3.86		XXX	XXX	
DARTMOUTH COLLEGE	HANOVER	NH	37,400.00	15.30				XXX
DENISON UNIVERSITY	GRANVILLE	OH	374.02	0.00	XXX			
DEPAUW UNIVERSITY	GREENCASTLE	IN	120,134.40	124.80	XXX		XXX	
DRAKE UNIVERSITY (Forest Avenue)	DES MOINES	IA	0.00	22.85		XXX	XXX	
DRAKE UNIVERSITY (Main)	DES MOINES	IA	0.00	17.45			XXX	

List of Inventoried Systems

Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
DUKE UNIVERSITY	DURHAM	NC	800,000.00	250.00	XXX			
EAST CAROLINA UNIVERSITY	GREENVILLE	NC	114.00	0.19	XXX			
EASTERN CONNECTICUT STATE UNIVERSITY	WILLIMANTIC	CT	0.00	0.00				
EASTERN ILLINOIS UNIVERSITY	CHARLESTON	IL	0.00	0.34	XXX			
EASTERN MICHIGAN UNIVERSITY		MI	109,160.00	13.39	XXX			XXX
EASTERN NEW MEXICO UNIVERSITY	ROSWELL	NM	0.00	0.00				
EDEN THEOLOGICAL SEMINARY	ST. LOUIS	MO	0.00	6.08	XXX		XXX	
EL PASO COMM. COLL. TRANSMOUNTAIN CAMPUS	EL PASO	TX	13,398.84	7.10		XXX	XXX	
EL PASO COMMUNITY COLLEGE RIO GRANDE CAMP	EL PASO	TX	7,351.00	4.30		XXX	XXX	
EL PASO COMMUNITY COLLEGE VALLE VERDE CAMP	EL PASO	TX	20,892.47	17.62		XXX	XXX	
ELMHURST COLLEGE	ELMHURST	IL	40,588.46	68.35	XXX	XXX	XXX	
EMORY UNIVERISTY (Steam)	ATLANTA	GA	108,000.00	30.00			XXX	
EMORY UNIVERSITY (Central Steam)	ATLANTA	GA	770,000.00	400.00	XXX			
EMORY UNIVERSITY (Quadrangle)	ATLANTA	GA	42,000.00	21.00			XXX	
EMORY UNIVERSITY (WMB Chiller)	ATLANTA	GA	36,000.00	12.00			XXX	
EMPORIA STATE UNIVERSITY	EMPORIA	KA	194.44	27.36	XXX		XXX	
FLORIDA ATLANTIC UNIVERSITY	BOCA RATON	FL	2,500.00	60.05		XXX	XXX	
FLORIDA INTERNATIONAL UNIVERSITY	MIAMI	FL	0.00	52.20			XXX	
FLORIDA INTERNATIONAL UNIVERSITY	NORTH MIAMI	FL	0.00	14.89			XXX	
FLORIDA STATE UNIVERSITY	TALLAHASSEE	FL	52.00	0.24	XXX			
FORT VALLEY STATE COLLEGE	FORT VALLEY	GA	0.00	0.00				
FRANCIS MARION UNIVERSITY	FLORENCE	SC	3.00	0.02		XXX		
FROSTBURG STATE UNIVERSITY	FROSTBURG	MD	0.00	100.00	XXX			
GENEVA COLLEGE	BEAVER FALLS	PA	6,000.00	20.93	XXX			
GEORGE MASON UNIVERSITY	FAIRFAX	VA	0.00	33.05		XXX	XXX	
GEORGETOWN COLLEGE	GEORGETOWN	KY	0.00	0.00				
GEORGETOWN UNIVERSITY	WASHINGTON	DC	1,056,000.00	468.00	XXX		XXX	
GRINNELL COLLEGE	GRINNELL	IA	40,000.00	60.00	XXX			
HAHNEMANN UNIVERSITY AND HOSPITAL	PHILADELPHIA	PA	0.00	0.00				
HAMLIN UNIVERSITY	ST. PAUL	MW	95.58	157.48		XXX	XXX	

List of Inventoried Systems

Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
HARDIN SIMMONS UNIVERSITY	ABILENE	TX	0.00	20.40			XXX	
HARVARD MEDICAL SCHOOL	BOSTON	MA	0.00	0.00				
HARVARD UNIVERSITY	CAMBRIDGE	MA	90,720.00	72.00			XXX	
HARVARD UNIVIVERSITY (Matep Ops)	BOSTON	MA	2,364,160.00	1,407.40	XXX		XXX	XXX
HAVERFORD COLLEGE	HAVERFORD	PA	33.00	40.00	XXX			
HOFSTRA UNIVERSITY	HEMPSTEAD	NY	68,014.00	53.18	XXX		XXX	XXX
HUMBOLDT STATE UNIVERSITY	ARCATA	CA	0.00	0.00	XXX			
IDAHO STATE UNIVERSITY	POCATELLO	ID	107.00	0.06	XXX			
INDIANA STATE UNIVERSITY	TERRE HAUTE	IN	410,000.00	412.40	XXX		XXX	
IOWA STATE UNIVERSITY	AMES	IA	1,677,229.04	1,639.56	XXX		XXX	XXX
JEFFERSON COMMUNITY COLLEGE	HILLSBURO	MO	0.00	0.00				
JERSEY CITY STATE COLLEGE	JERSEY CITY	NJ	39,800.00	26.00	XXX		XXX	
JUNIATA COLLEGE	WINTINGTON	PA	105,000.00	0.00		XXX		
KENT HALL ALUMNI LODGE	ST. MARY'S CITY	MD	135.00	0.95		XXX	XXX	
KENT STATE UNIVERSITY	KENT	OH	530.00	0.28	XXX			
LA PIERCE COLLEGE	WOODLAND HILL	CA	0.00	0.04	XXX			
LA PIERCE COLLEGE MUSIC AND FINE ARTS	WOODLAND HILL	CA	0.00	0.00				
LA PIERCE COLLEGE PHYSICS BOILER RM	WOODLAND HILL	CA	0.00	0.00	XXX			
LAMAR UNIVERSITY-BEAUMONT	BEAUMONT	TX	37.94	72.72	XXX	XXX	XXX	
LAMAR UNIVERSITY-BEAUMONT: LUCAS PLANT	BEAUMONT	TX	5,281.25	3.91	XXX		XXX	
LAMAR UNIVERSITY-BEAUMONT: NORTH CENTAL PL	BEAUMONT	TX	31,328.97	23.18		XXX	XXX	
LAMAR UNIVERSITY-BEAUMONT: SOUTH CENTRAL P	BEAUMONT	TX	25,618.22	18.96	XXX		XXX	
LANDMARK COLLEGE	PUTNEY	UT	0.00	0.00		XXX		
LEHIGH UNIVERSITY MOUNTAIN TOP CAMPUS	BETHLEHEM	PA	150,009.60	129.40	XXX		XXX	
LEHIGH UNIVERSITY PACKER CAMPUS	BETHLEHEM	PA	150,012.00	138.00	XXX		XXX	
LINCOLNLAND COMMUNITY COLLEGE	SPRINGFIELD	IL	0.00	0.00				
LONGWOOD COLLEGE	FARMVILLE	VA	96.00	0.09	XXX			
LOS ANGELES HARBOR COLLEGE	WILMINGTON	CA	4,500.00	31.54		XXX		
LOS ANGELES PIERCE COLLEGE MPE BOILER PLANT	WOODLAND HILL	CA	0.00	0.02	XXX			
LOUISIANA STATE UNIVERSITY- SHREVEPORT	SHREVEPORT	LA	0.00	18.02	XXX		XXX	
LOUISIANA STATE UNIVERSITY	BATON ROUGE	LA	806,666.96	239.60	XXX		XXX	

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
MACOMB COMMUNITY COLLEGE	WARREN	MI	0.00	22.88	XXX		XXX	
MAIN CAMPUS CHILLED WATER SYSTEM	FT. WORTH	TX	82.20	45.31			XXX	
MANHATTAN SCHOOL OF MUSIC	SPARTANBURG	SC	0.00	4.29	XXX		XXX	
MANKATO STATE UNIVERSITY	MANKATO	MN	240,486.29	257.68	XXX		XXX	
MARYVILLE UNIVERSITY	ST. LOUIS	MO	7,215.80	26.20		XXX	XXX	
MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Chil	CAMBRIDGE	MA	180,000.00	126.00			XXX	
MASSACHUSETTS INSTITUTE OF TECHNOLOGY (East	CAMBRIDGE	MA	28,800.00	36.00			XXX	
MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Stea	CAMBRIDGE	MA	781,194.00	400.00	XXX			
MAYBILLE STATE UNIVERSITY	MAYVILLE	ND	0.00	50.00	XXX			
MCLENNAN COMMUNITY COLLEGE	WACO	TX	52,668.76	43.77		XXX	XXX	
MEDICAL COLLEGE OF OHIO AT TOLEDO	TOLEDO	OH	360,000.00	120.00	XXX			
MEMPHIS STATE UNIVERSITY	MEMPHIS	TN	24,000.00	217.00	XXX		XXX	
MESSIAH COLLEGE	GRANTHAM	PA	4,263.00	2.86		XXX	XXX	
MICHIGAN STATE UNIVERSITY	EAST LANSING	MI	2,917,730.76	1,137.84	XXX		XXX	XXX
MICHIGAN TECH UNIVERSITY	HOUGHTON	MI	170.00	0.25	XXX			
MIDDLEBURG COLLEGE	MIDDLEBURY	VT	153.84	2.30	XXX			XXX
MIDWESTERN STATE UNIVERSITY	WICHITA FALLS	TX	246,000.00	92.72	XXX		XXX	
MINOT STATE UNIVERSITY	MINOT	ND	38.00	0.03	XXX			
MISSISSIPPI COUNTY COMM. COLLEGE	BLYTHEVILLE	AR	0.00	0.00				
MOHIGAN COMMUNITY COLLEGE	NORWICH	CT	0.00	0.00				
MONTANA STATE UNIVERSITY	BOZEMAN	MT	296,004.42	192.00	XXX			XXX
MOREHEAD STATE UNIVERSITY	MOREHEAD	KY	173,000.00	208.50	XXX			
MORTON COLLEGE	CICERO	IL	0.00	0.00				
MOUNT SAINT MARYS COLLEGE	EMMITSBURG	MD	14.96	0.02	XXX			
MOUNT UNION COLLEGE	ALLIANCE	OH	0.00	0.00				
MT. HOLYOKE COLLEGE	SOUTH HADLEY	MA	12,543.50	13.41	XXX			XXX
MURRY STATE UNIVERSITY	MURRAY	KY	97,200.00	188.83	XXX		XXX	
NASHVILLE STATE TECHNICAL INSTITUTE	NASHVILLE	TN	0.00	0.00				
NEW YORK UNIVERSITY	NEW YORK	NY	775,095.20	459.70		XXX	XXX	XXX
NORTH AMERICAN BAPTIST SEMINARY	SIOUX FALLS	SD	0.00	3.00		XXX		

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
NORTH CAROLINA A&T (STEAM)	GREENSBORO	NC	247,970.00	125.00	XXX			
NORTH LAKE COLLEGE	IRVING	TX	39,707.00	29.62	XXX	XXX	XXX	XXX
NORTHEASTERN ILLINOIS UNIVERSITY	CHICAGO	IL	101,000.00	75.00		XXX	XXX	
NORTHEASTERN JR. COLLEGE	STERLING	CO	23.08	62.00	XXX	XXX	XXX	
NORTHERN KENTUCKY UNIVERSITY	HIGHLAND HEIGHTS	KY	73,275.25	73.40	XXX	XXX	XXX	
NORTHERN ARIZONA UNIVERSITY, NORTH PLANT	FLAGSTAFF	AZ	134,000.00	138.00	XXX			
NORTHERN ARIZONA UNIVERSITY, SOUTH CAMPUS	FLAGSTAFF	AZ	300,000.00	103.00		XXX		
NORTHERN ILLINOIS UNIVERSITY	DEKALB	IL	525,247.00	528.00	XXX		XXX	
NORTHERN MICHIGAN UNIVERSITY	MARQUETTE	MI	244.00	0.09	XXX			
NORTHERN STATE UNIVERSITY	ABERDEEN	SD	70,000.00	70.25	XXX			
NORWICH UNIVERSITY HEATING PLANT	NORTHFIELD	VT	2,768.00	1.22	XXX			XXX
OHIO STATE UNIVERSITY	COLUMBUS	OH	1,213,668.40	599.63	XXX			
OHIO UNIVERSITY	ATHENS	OH	100,000.00	231.00	XXX	XXX		
OKLAHOMA STATE UNIVERSITY CHILLED WATER	STILLWATER	OK	289,213.30	151.20			XXX	
ORDER OF ST. BENEDICT	COLLEGEVILLE	MN	17,079.60	14.36	XXX		XXX	XXX
OREGON STATE UNIVERSITY	CORVALLIS	OR	401.00	0.30	XXX			
PALO ALTO COLLEGE (CLOSED LOOP)	SAN ANTONIO	TX	0.00	23.90		XXX	XXX	
PENN STATE UNIVERSITY	UNIVERSITY PARK	PA	1,405,042.40	903.70	XXX			XXX
PHILLIPS JUNIOR COLLEGE	AUGUSTA	GA	0.00	0.00				
PIMA COMMUNITY COLLEGE (DOWNTOWN)	TUCSON	AZ	589.66	3.40		XXX	XXX	
PIMA COMMUNITY COLLEGE (EAST)	TUCSON	AZ	0.00	8.40		XXX	XXX	
PIMA COMMUNITY COLLEGE (WEST)	TUCSON	AZ	110.06	18.04	XXX		XXX	
PRESENTATION HEIGHTS	ABERDEEN	SD	0.06	9.92	XXX		XXX	
PRINCE GEORGE'S COMM. COLLEGE	LARGO	MD	0.00	31.81	XXX		XXX	
PRINCETON UNIVERSITY	PRINCETON	NJ	187,000.00	468.00	XXX		XXX	
PURDUE UNIVERSITY	PURDUE	IN	548,970.00	158.10	XXX		XXX	XXX
PURDUE UNIVERSITY NORTH CENTRAL	WESTVILLE	IN	0.00	47.00	XXX		XXX	
RADFORD UNIVERSITY	RADFORD	VA	101,891.00	0.00	XXX			
RED ROCKS COMMUNITY COLLEGE	LAKE WOOD	CO	63.00	0.06		XXX		
RENDLAKE COLLEGE (Phase 2)	INA	IL	0.00	26.00		XXX	XXX	
RENDLAKE COLLEGE (Phase 1)	INA	IL	0.00	22.00		XXX	XXX	

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
RENSSELAER POLYTECHNIC INSTITUTE (HEATING)	TROY	NV	249,000.00	125.00	XXX			
RICE UNIVERSITY	HOUSTON	TX	819,000.00	205.50	XXX		XXX	XXX
RICHLAND COLLEGE	DALLAS	TX	88,491.18	38.92		XXX	XXX	
RICKS COLLEGE	REXBURG	ID	156,000.00	77.86	XXX			
ROCKEFELLER UNIVERSITY	NEW YORK	NY	384,995.80	164.80	XXX		XXX	XXX
RUTGERS UNIVERSITY (Busch)	NEW BRUNSWICK	NJ	575,330.00	250.00		XXX		
RUTGERS UNIVERSITY (CHILLED WATER)	NEW BRUNSWICK	NJ	24,000.00	18.00			XXX	
RUTGERS UNIVERSITY (Camden)	CAMDEN	NJ	71,090.00	300.00		XXX		
RUTGERS UNIVERSITY (College Avenue)	NEW BRUNSWICK	NJ	147,100.00	116.00		XXX	XXX	
RUTGERS UNIVERSITY (Main)	NEW BRUNSWICK	NJ	171,600.00	9.20		XXX	XXX	
RUTGERS UNIVERSITY (Murray Hall)	NEW BRUNSWICK	NJ	27,954.00	15.22		XXX	XXX	
RUTGERS UNIVERSITY (Newell Center)	NEW BRUNSWICK	NJ	29,509.00	23.30		XXX	XXX	
RUTGERS UNIVERSITY (Walters Hall)	NEW BRUNSWICK	NJ	46,551.00	42.00		XXX	XXX	
RUTGERS UNIVERSITY, NEWARK	NEWARK	NJ	150.00	110.00		XXX		
S.E. MISSOURI STATE UNIVERSITY	CAPE GIRARDEAU	MO	0.00	230.03	XXX			XXX
S.U.N.Y. AT BUFFALO (NORTH CAMPUS)	AMHERST	NY	0.00	180.00			XXX	
S.U.N.Y. AT BUFFALO (SOUTH CAMPUS)	AMHERST	NY	254.00	0.19	XXX			
S.U.N.Y. AT COBLESKILL	COBLESKILL	NY	4,240.00	96.22	XXX		XXX	
S.U.N.Y. AT FARMINGDALE	FARMINGDALE	NY	111,110.00	126.13	XXX			
S.U.N.Y. AT GENESEO	GENESEO	NY	78,211.00	164.50	XXX			
S.U.N.Y. AT PLATTSBURGH	PLATTSBURGH	NY	271,800.00	245.00		XXX		
S.U.N.Y. AT POTSDAM	POTSDAM	NY	230.97	4.38	XXX		XXX	
SAINT MARY COLLEGE	LEAVENWORTH	KS	35.20	13.28	XXX	XXX	XXX	
SAINT NORBERT COLLEGE	DEPERE	WI	80,000.00	30.00	XXX			
SAM HOUSTON STATE UNIVERSITY (East)	HUNTSVILLE	TX	0.00	37.40		XXX	XXX	
SAM HOUSTON STATE UNIVERSITY (West)	HUNTSVILLE	TX	0.00	26.90	XXX		XXX	
SAN ANTONIO COLLEGE (CLOSED LOOP)	SAN ANTONIO	TX	9,232.00	58.57		XXX	XXX	
SAN BERNADINO VALLEY COLLEGE, NORTH HALL/ P	SAN BERNARDIN	CA	7,740.00	4.30	XXX			
SAN BERNADINO VALLEY COLLEGE, PHYSICAL SCIEN	SAN BERNARDIN	CA	4.99	2.70			XXX	
SAN BERNARDINO VALLEY COLLEGE	SAN BERNARDIN	CA	2,304.00	1.32			XXX	

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
SAN BERNARDINO VALLEY COLLEGE	SAN BERNARDIN	CA	2,700.00	3.00	XXX			
SAN DIEGO STATE UNIVERSITY	SAN DIEGO	CA	7,303,399.80	2,033.23	XXX		XXX	XXX
SAN JOSE STATE UNIVERSITY	SAN JOSE	CA	282.99	930.73	XXX		XXX	XXX
SANGAMON STATE UNIVERSITY	SPRINGFIELD	IL	0.00	16.80			XXX	
SONOMA STATE UNIVERSITY	ROHNERT PARK	CA	120.20	18.02		XXX	XXX	
SOUTH DAKOTA SCHOOL OF MINES AND TECH.	RAPID CITY	SD	35,052.00	70.00	XXX			
SOUTH DAKOTA STATE UNIVERSITY	BROOKINGS	SD	187,000.00	163.00	XXX			
SOUTH MOUNTAIN COMMUNITY COLLEGE	PHOENIX	AZ	12.00	11.04			XXX	
SOUTHERN BAPTIST THEOLOGICAL SEMINARY	LOUISVILLE	KY	0.00	51.00	XXX			
SOUTHERN ILLINOIS UNIVERSITY	CARBONDALE	IL	1,005,000.00	324.00	XXX		XXX	
SOUTHERN ILLINOIS UNIVERSITY AT EDWARDSVILLE	EDWARDSVILLE	IL	229,754.00	137.60		XXX	XXX	
SOUTHERN METHODIST UNIVERSITY	DALLAS	TX	140,336.38	208.00	XXX		XXX	
SOUTHWEST WISCONSIN TECHNICAL COLLEGE	FENNIMORE	WI	14,843.82	27.02		XXX	XXX	
ST LAWRENCE UNIVERSITY	CANTON	NY	4,349.20	1.27	XXX			XXX
ST. MARY'S UNIVERSITY	SAN ANTONIO	TX	59,646.04	28.82		XXX	XXX	
ST. OLAF COLLEGE	NORTHFIELD	MI	159,228.48	180.15	XXX		XXX	
ST. PHILIPS COLLEGE (CLOSED LOOP)	SAN ANTONIO	TX	21,036.00	65.52	XXX	XXX	XXX	
ST. VINCENT COLLEGE	LATROBE	PA	286.00	0.30	XXX			
STANFORD UNIVERSITY COGENERATION PLANT	STANFORD	CA	1,652.56	222.83	XXX	XXX	XXX	XXX
STATE BOARD OF TECH. COLLEGE	ST. PAUL	MN	0.00	0.00				
STUDENT CENTER HEATING PLANT	FT. WORTH	TX	5,098.00	10.69	XXX			
SUL ROSS STATE UNIVERSITY	ALPINE	TX	25,694.00	39.75	XXX			
SWARTHMORE COLLEGE	SWARTHMORE	PA	87,157.64	77.45	XXX			XXX
SYRACUSE UNIVERSITY	SYRACUSE	NY	1,000.00	0.35	XXX			
TARLETON STATE UNIVERSITY	STEPHENVILLE	TX	14,354.00	41.40	XXX			
TEMPLE UNIVERSITY, H.S.C. STEAM	PHILADELPHIA	PA	320,000.00	180.00	XXX			
TEMPLE UNIVERSITY, MAIN CAMPUS CHILLED WATER	PHILADELPHIA	PA	108,000.00	88.80			XXX	
TEMPLE UNIVERSITY, MAIN CAMPUS STEAM	PHILADELPHIA	PA	417,000.00	180.00	XXX			
TENNESSEE STATE UNIVERSITY	NASHVILLE	TN	57,580.80	33.60	XXX		XXX	
TENNESSEE TECHNOLOGICAL UNIVERSITY	COOKEVILLE	TN	72,737.20	30.17	XXX		XXX	
TEXAS A&I UNIVERSITY	KINGSVILLE	TX	130,600.00	84.00		XXX	XXX	

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
TEXAS A&M UNIVERSITY	COLLEGE STATO	TX	2,717,800.00	1,460.12	XXX	XXX	XXX	XXX
TEXAS A&M UNIVERSITY AT GALVESTON	GALVESTON	TX	56,817.00	34.59		XXX	XXX	
TEXAS TECH UNIVERSITY (Plant 1)	LUBBOCK	TX	846,647.31	886.03	XXX		XXX	
TEXAS TECH UNIVERSITY (Plant 2)	LUBBOCK	TX	368,018.00	328.40	XXX		XXX	
THE WOODLANDS (York Units)	THE WOODLAND	TX	0.00	0.00				
TOWNSON STATE UNIVERSITY	TOWSON	MD	169,123.75	133.80	XXX		XXX	
TRANE CENTRA HVAC	BROWNSVILLE	TX	0.03	6.00			XXX	
TRANE CENTRAL HVAC	AVON PARK	FL	0.00	3.60			XXX	
TRANSYLVANIA UNIVERSITY	LEXINGTON	KY	14.00	7.21	XXX		XXX	
TRENTON STATE COLLEGE	TRENTON	NJ	0.00	136.00	XXX		XXX	
TULSA JUNIOR COLLEGE	TULSA	OK	0.00	0.00				
U.S. COAST GUARD ACADEMY	NEW LONDON	CT	5,018.00	13.75	XXX			
UNION COLLEGE	SCHENECTADY	NY	105,630.80	79.25	XXX		XXX	XXX
UNION THEOLOGICAL SEMINARY- MAIN QUADRANG	RICHMOND	VA	8,134.00	6.69	XXX			
UNION THEOLOGICAL SEMINARY-ADVANCE RICE CO	RICHMOND	VA	2,840.00	1.67		XXX		
UNIVERSITY OF ALABAMA	TUSCALOOSA	AL	15,553.20	300.00	XXX			
UNIVERSITY OF ALABAMA, HUNTSVILLE	HUNTSVILLE	AL	96,710.40	39.42		XXX	XXX	
UNIVERSITY OF ARIZONA MAIN CAMPUS	TUCSON	AZ	869,287.50	401.63	XXX		XXX	
UNIVERSITY OF ARKANSAS	FAYETTEVILLE	AR	473.00	372.00	XXX		XXX	
UNIVERSITY OF CALIFORNIA , DAVIS	DAVIS	CA	1,048,714.15	356.00	XXX		XXX	XXX
UNIVERSITY OF CALIFORNIA, IRVINE	IRVINE	CA	432.18	78.24	XXX	XXX	XXX	
UNIVERSITY OF CALIFORNIA, RIVERSIDE	RIVERSIDE	CA	405,263.20	174.84	XXX		XXX	
UNIVERSITY OF CALIFORNIA, SANTA BARBARA	SANTA BARBARA	CA	0.00	0.00				
UNIVERSITY OF CALIFORNIA, SANTA CRUZ	SANTA CRUZ	CA	50,749.98	39.26		XXX		XXX
UNIVERSITY OF CALIFORNIA, SANTA CRUZ	SANTA CRUZ	CA	99,879.80	39.26		XXX		XXX
UNIVERSITY OF CHICAGO	CHICAGO	IL	995.00	0.90	XXX	XXX		
UNIVERSITY OF CINCINNATI	CICINNATI	OH	0.00	0.00				
UNIVERSITY OF COLORADO	BOULDER	CO	0.00	0.00				
UNIVERSITY OF COLORADO HEALTH SCI CENTER	DENVER	CO	0.00	1.29				XXX
UNIVERSITY OF CONNECTICUT, HEALTH CENTER	FARMINGTON	CT	160,536.38	98.91	XXX		XXX	

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
UNIVERSITY OF DAYTON	DAYTON	OH	0.00	0.00				
UNIVERSITY OF DELAWARE	NEWARK	DE	114.00	60.20	XXX		XXX	
UNIVERSITY OF FLORIDA (CENTRAL CHILLED WATER)	GAINESVILLE	FL	732,000.00	246.00			XXX	
UNIVERSITY OF FLORIDA (CHILLED WATER)	GAINESVILLE	FL	962,568.60	418.00	XXX			XXX
UNIVERSITY OF GEORGIA - CENTRAL STEAM	ATHENS	GA	903.00	0.36	XXX			
UNIVERSITY OF GEORGIA - NORTH CAMPUS C. W. L	ATHENS	GA	132,000.00	18.30			XXX	
UNIVERSITY OF GEORGIA - SOUTH CAMPUS C.W. LO	ATHENS	GA	352,980.00	66.00			XXX	
UNIVERSITY OF GEORGIA - SCIENCE CENTER C.W. LO	ATHENS	GA	180,000.00	27.84			XXX	
UNIVERSITY OF GEORGIA- VET SCHOOL C. W. LOOP	ATHENS	GA	84,054.72	12.60			XXX	
UNIVERSITY OF HOUSTON	HOUSTON	TX	792,350.00	376.00	XXX		XXX	
UNIVERSITY OF IDAHO	MOSCOW	ID	275,000.00	155.00	XXX			
UNIVERSITY OF ILLINOIS (Abbott)	CHAMPAIGN	IL	2,852,454.60	1,127.00	XXX			XXX
UNIVERSITY OF ILLINOIS (Library)	CHAMPAIGN	IL	0.08	39.78			XXX	
UNIVERSITY OF ILLINOIS (Main)	CHAMPAIGN	IL	0.06	39.60			XXX	
UNIVERSITY OF ILLINOIS (North Campus CW)	CHAMPAIGN	IL	0.11	60.00			XXX	
UNIVERSITY OF ILLINOIS (Veterinary Medicine)	CHAMPAIGN	IL	788,400.06	216.24	XXX		XXX	
UNIVERSITY OF IOWA, MAIN	IOWA CITY	IA	3,068,626.80	1,377.75	XXX		XXX	XXX
UNIVERSITY OF IOWA, OAKDALE	IOWA CITY	IA	72,170.00	89.29	XXX	XXX		
UNIVERSITY OF KENTUCKY, COOLING PLANT #1	LEXINGTON	KY	177,984.00	96.00			XXX	
UNIVERSITY OF KENTUCKY, COOLING PLANT #2	LEXINGTON	KY	37,398.00	48.00			XXX	
UNIVERSITY OF KENTUCKY, MEDICAL CENTER	LEXINGTON	KY	518.00	0.70	XXX			
UNIVERSITY OF KENTUCKY, MEDICAL CENTER COOLI	LEXINGTON	KY	189,156.00	90.00			XXX	
UNIVERSITY OF LOUISIANA	LA VERNE	CA	0.00	0.00				
UNIVERSITY OF LOUISVILLE, BELKNAP	LOUISVILLE	KY	304,335.26	246.50	XXX		XXX	
UNIVERSITY OF MARYLAND, COLLEGE PARK (LEN)	COLLEGE PARK	MD	3,000.96	2.40		XXX	XXX	
UNIVERSITY OF MARYLAND, COLLEGE PARK (SCUB1	COLLEGE PARK	MD	60.50	9.02		XXX	XXX	
UNIVERSITY OF MARYLAND, COLLEGE PARK (SCUB2	COLLEGE PARK	MD	12,006.60	82.20		XXX	XXX	
UNIVERSITY OF MARYLAND, MARIE MOUNT SCUB	COLLEGE PARK	MD	6,806.60	36.00		XXX	XXX	
UNIVERSITY OF MEDICINE AND DENTISTRY OF N.J	NEWARK	NJ	918,124.00	462.50	XXX	XXX	XXX	XXX
UNIVERSITY OF MICHIGAN-CENTRAL PLANT	ANN ARBOR	MI	2,929,689.60	1,243.90	XXX	XXX		XXX
UNIVERSITY OF MICHIGAN-HOOVER PLANT	ANN ARBOR	MI	66,896.00	111.00	XXX			

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
UNIVERSITY OF MINNESOTA DULUTH	DULUTH	MN	230,000.00	170.00	XXX			
UNIVERSITY OF MINNESOTA, MPLS.-ST. PAUL	MINNEAPOLIS	MN	0.00	1,160.00	XXX		XXX	
UNIVERSITY OF MINNESOTA, NORTHRIDGE	MORRIS	MN	78,875.00	58.00	XXX			
UNIVERSITY OF MISSISSIPPI	UNIVERSITY	MS	106,807.00	94.66	XXX		XXX	
UNIVERSITY OF MISSOURI-COLUMBIA	COLUMBIA	MI	1,666,083.40	883.00	XXX			XXX
UNIVERSITY OF MONTANA	Bozeman	MT	196,000.00	170.00	XXX			
UNIVERSITY OF MONTEVALLO	MONTEVALLO	AL	925.00	7.25	XXX		XXX	
UNIVERSITY OF NEBRASAKA, LINCOLN	LINCLON	NE	0.00	496.40	XXX		XXX	XXX
UNIVERSITY OF NEBRASKA MED. CENTER	OMAHA	NE	817,102.64	378.00	XXX		XXX	
UNIVERSITY OF NEW HAMPSHIRE	DURHAM	NH	210,376.40	247.04	XXX	XXX	XXX	XXX
UNIVERSITY OF NEW MEXICO	ALBUQUERQUE	NM	602,745.60	549.41	XXX		XXX	XXX
UNIVERSITY OF NEW YORK, HEALTH SCIENCE CENTE	BROOKLYN	NY	665.00	48.14	XXX		XXX	
UNIVERSITY OF NORTH ALABAMA	FLORENCE	AL	305,772.00	94.95	XXX			
UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL	CHAPEL HILL	NC	1,786,320.00	1,050.20	XXX		XXX	XXX
UNIVERSITY OF NORTH CAROLINA, GREENSBORO	GREENSBORO	NC	12,648.96	4.80			XXX	
UNIVERSITY OF NORTH CAROLINA, GREENSBORO (C	GREENSBORO	NC	169,904.33	103.29	XXX			
UNIVERSITY OF NORTH CAROLINA, GREENSBORO (M	GREENSBORO	NC	19,395.07	6.91			XXX	
UNIVERSITY OF NORTH CAROLINA, GREENSBORO (M	GREENSBORO	NC	3,320.35	1.80			XXX	
UNIVERSITY OF NORTH CAROLINA, GREENSBORO (P	GREENSBORO	NC	21,213.36	0.00			XXX	
UNIVERSITY OF NORTH CAROLINA, GREENSBORO (S	GREENSBORO	NC	18,275.11	4.68			XXX	
UNIVERSITY OF NORTH CAROLINA, WILMINGTON	WILMINGTON	NC	0.00	0.00				
UNIVERSITY OF NORTH DAKOTA	GRAND FORKS	ND	684,836.00	300.00	XXX			
UNIVERSITY OF NORTH TEXAS-CENTRAL PLANT	DENTON	TX	222,708.80	53.78	XXX		XXX	
UNIVERSITY OF NORTH TEXAS-WOOTEN	DENTON	TX	49,902.12	16.67	XXX		XXX	
UNIVERSITY OF NORTHERN IOWA	CEDAR FALLS	IA	950,068.00	402.50	XXX			XXX
UNIVERSITY OF NOTRE DAME	NOTRE DAME	IN	1,373,043.14	591.18	XXX	XXX	XXX	XXX
UNIVERSITY OF OKLAHOMA	NORMAN	OK	1,589,406.74	673.92	XXX		XXX	XXX
UNIVERSITY OF OKLAHOMA HEALTH SCIENCES	OKLAHOMA CITY	OK	1,393,857.05	510.65	XXX		XXX	
UNIVERSITY OF OREGON	EUGENE	OR	711,942.00	309.10	XXX		XXX	XXX
UNIVERSITY OF PITTSBURGH	PITTSBURGH	PA	1,000,000.00	610.00	XXX			

List of Inventoried Systems

Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
UNIVERSITY OF PITTSBURGH (Chilled Water)	PITTSBURGH	PA	0.00	99.00			XXX	
UNIVERSITY OF PUGET SOUND	TACOMA	WA	41,685.00	45.69	XXX			
UNIVERSITY OF REDLANDS	REDLANDS	CA	0.00	0.00				
UNIVERSITY OF ROCHESTER	ROCHESTER	NY	972,000.00	780.00	XXX		XXX	
UNIVERSITY OF SOUTH CAROLINA	COLUMBIA	SC	1,489,918.16	501.02	XXX		XXX	
UNIVERSITY OF SOUTH DAKOTA	VERMILLION	SD	91,082.00	110.00	XXX			
UNIVERSITY OF SOUTH FLORIDA	TAMPA	FL	770,400.00	157.60		XXX	XXX	
UNIVERSITY OF SOUTHERN COLORADO	PUEBLO	CO	78,150.00	85.50	XXX			
UNIVERSITY OF SOUTHERN INDIANA	EVANSVILLE	IN	26,845.08	40.80		XXX	XXX	
UNIVERSITY OF SOUTHERN MISSISSIPPI	HATTIESBURG	MS	212,350.00	229.00	XXX	XXX	XXX	
UNIVERSITY OF ST. THOMAS	HOUSTON	TX	0.00	0.00				
UNIVERSITY OF TENNESSEE CENTRAL ST. PLANT	KNOXVILLE	TN	659.00	0.32	XXX			
UNIVERSITY OF TENNESSEE, CHATTANOOGA	CHATTANOOGA	TN	44.99	48.02		XXX	XXX	
UNIVERSITY OF TENNESSEE, MEMPHIS	MEMPHIS	TN	217,050.00	113.00	XXX		XXX	
UNIVERSITY OF TEXAS AT ARLINGTON	ARLINGTON	TX	349,956.10	190.40	XXX		XXX	
UNIVERSITY OF TEXAS AT AUSTIN	AUSTIN	TX	3,594,206.30	2,112.60	XXX		XXX	XXX
UNIVERSITY OF TEXAS AT EL PASO	EL PASO	TX	0.00	10.62		XXX	XXX	
UNIVERSITY OF TOLEDO	TOLEDO	OH	150,960.00	140.00	XXX			
UNIVERSITY OF TULSA	TULSA	OK	6,120.04	61.80		XXX	XXX	
UNIVERSITY OF UTAH	SLC	UT	666.00	0.00		XXX		
UNIVERSITY OF VERMONT	BURLINGTON	VT	318.00	0.16	XXX			
UNIVERSITY OF VIRGINIA	CHARLOTTESVILL	VA	958,000.00	577.80	XXX	XXX	XXX	
UNIVERSITY OF WASHINGTON	SEATTLE	WA	124,601.10	713.00	XXX		XXX	XXX
UNIVERSITY OF WEST FLORIDA	PENSACOLA	FL	540,426.10	1,000.30	XXX	XXX	XXX	
UNIVERSITY OF WISCONSIN - MILWAUKEE	MILWAUKEE	WI	450,103.30	298.00	XXX		XXX	
UNIVERSITY OF WISCONSIN EAUCLAIRE	EAU CLAIRE	WI	300,000.00	115.00	XXX			
UNIVERSITY OF WISCONSIN GREEN BAY	GREEN BAY	WI	110,780.00	166.40	XXX		XXX	
UNIVERSITY OF WISCONSIN LA CROSSE	LA CROSSE	WI	200.00	0.12	XXX			
UNIVERSITY OF WISCONSIN MADISON	MADISON	WI	2,098,800.00	1,693.90	XXX		XXX	XXX
UNIVERSITY OF WISCONSIN OSHKOSH	OSHKOSH	WI	280,000.00	200.00	XXX			
UNIVERSITY OF WISCONSIN PARKSIDE	KENOSHA	WI	93,000.00	134.60	XXX		XXX	

List of Inventoried Systems

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
UNIVERSITY OF WISCONSIN PLATTEVILLE	PLATTEVILLE	WI	160,000.00	100.00	XXX			
UNIVERSITY OF WISCONSIN RIVER FALLS	RIVER FALLS	WI	147,000.00	100.00	XXX			
UNIVERSITY OF WISCONSIN STOUT	MENOMINEE	WI	170,000.00	200.00	XXX			
UNIVERSITY OF WISCONSIN SUPERIOR	SUPERIOR	WI	104,269.00	151.00	XXX			
UNIVERSITY OF WISCONSIN WHITEWATER	WHITE WATER	WI	290,000.00	210.00	XXX			
UNIVERSITY OF WYOMING	LARAMIE	WY	364,061.00	132.00	XXX		XXX	
UT SOUTHWESTERN MEDICAL CENTER-DALLAS	DALLAS	TX	452,862.00	159.50	XXX		XXX	XXX
UTAH STATE UNIVERSITY (LOGAN)	LOGAN	UT	743,733.00	0.00	XXX			
VALLEY CITY STATE UNIVERSITY	VALLEY CITY	ND	889.00	1.22	XXX		XXX	
VALPARAISO UNIVERSITY	VALPARAISO	IN	84,480.00	43.88		XXX	XXX	XXX
VANDERBILT UNIVERSITY	NASHVILLE	TN	1,131,635.00	382.40	XXX		XXX	XXX
VILLANOVA UNIVERSITY	VILLANOVA	PA	181.00	0.11	XXX			
VIRGINIA POLYTECHNIC INSTITUTE	BLACKSBURG	VA	910,758.80	587.95	XXX		XXX	XXX
VIRGINIA THEOLOGICAL SEMINARY	ALEXANDRIA	VA	0.00	0.10	XXX			
WABASH COLLEGE	CRAWFORDSVILL	IN	199.80	7.20	XXX		XXX	
WASHBURN UNIVERSITY	TOPEKA	KA	268.00	0.06	XXX			
WASHINGTON COLLEGE	CHESTERTOWN	MD	37,440.00	52.00	XXX			
WASHINGTON STATE UNIVERSITY	OFMPOA	WA	157,680.00	85.20	XXX		XXX	
WASHINGTON STATE UNIVERSITY	PULLMAN	WA	112,800.00	57.09	XXX		XXX	XXX
WAUKESHA COUNTY TECHNICAL COLLEGE	PEWAUKEE	WI	50.00	9.93		XXX	XXX	
WESLEYAN UNIVERSITY	MIDDLETOWN	CN	0.00	51.22	XXX		XXX	XXX
WEST GEORGIA COLLEGE (Academic Quad)	CARROLLTON	GA	13,701.68	9.42		XXX	XXX	
WEST TEXAS STATE UNIVERSITY	CANYON	TX	0.00	24.10	XXX		XXX	
WEST VIRGINIA STATE COLLEGE (CENTRAL BOILER)	INSTITUTE	WV	0.00	8.37	XXX			
WESTERN CAROLINA UNIVERSITY CHILLED WATER	CULLOWHEE	NC	21,024.00	8.40			XXX	
WESTERN CAROLINA UNIVERSITY STEAM PLANT	CULLOWHEE	NC	145,252.00	174.34	XXX			
WESTERN ILLINOIS UNIVERSITY	MACOMB	IL	0.00	0.41	XXX			
WESTERN MICHIGAN UNIVERSITY	KALAMAZOO	MI	21,830.00	10.60	XXX			XXX
WESTERN OREGON STATE COLLEGE	MONMOUTH	OR	64,087.00	0.00				
WHEATON COLLEGE	NORTON	MA	101,495.00	150.00	XXX			

List of Inventoried Systems

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Sector : College and University

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
WILLIAMS COLLEGE	WILLIAMSTOWN	MA	121,840.20	151.70	XXX			XXX
WINTON SCOTT HEATING PLANT	FT. WORTH	TX	9,337.00	18.85	XXX			
WORTH HILLS COMPLEX	FT. WORTH	TX	4,413.92	18.07	XXX		XXX	
YOUNGSTOWN STATE UNIVERSITY (Chilled Water)	YOUNGSTOWN	OH	23.88	60.00			XXX	
YOUNGSTOWN STATE UNIVERSITY (Steam)	YOUNGSTOWN	OH	0.00	175.00	XXX			

Sector : Community or Utility

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
ALBAMA POWER COMPANY	BIRMINGHAM	AL	616,000.00	600.00	XXX			
ALTAMONT, CITY OF	ALTAMONT	KS	0.00	0.00				
ASPEN, CITY OF	ASPEN	CO	0.00	0.00				
BALTIMORE THERMAL ENERGY CORPORATION	BALTIMORE	MD	2,100,000.00	1,266.00	XXX			
BOROUGH OF ROYALTON	MIDDLETOWN	PA	0.00	0.00				
BOSTON THERMAL ENERGY	BOSTON	MA	3,050,000.00	1,830.00	XXX			
BRONSON, CITY OF	BRONSON	KS	0.00	0.00				
BUTLER, CITY OF	BUTLER	MO	0.00	20.74				XXX
CENTURIA MUNICIPAL ELECTRIC UTILITY	CENTURIA	WI	0.00	0.00				
CHIGNIK ELECTRIC UTILITY	CHIGNIK	AK	131.00	0.20		XXX		
CLEVELAND THERMAL ENERGY CORP.	CLEVELAND	OH	1,134,673.00	0.00	XXX			
CONCORD STEAM CORP.	CONCORD	NH	260,000.00	244.28	XXX			XXX
CONSOLIDATED EDISON COMPANY	NEW YORK	NY	42,750,000.00	18,875.00	XXX			
DAYTON POWER AND LIGHT CO PANY	DAYTON	OH	760,000.00	900.00	XXX			
DETROIT EDISON	DETROIT	MI	4,470,000.00	3,564.60	XXX			XXX
DISTRICT ENERGY CORP. OF LINCOLN & LANCASTER	LINCOLN	NE	7,627.20	9.60		XXX	XXX	
DISTRICT ENERGY ST. PAUL, INC	ST. PAUL	MN	795,300.00	764.50		XXX		
DULUTH STEAM COOPERATIVE ASSN.	DULUTH	MN	650,000.00	400.00	XXX			
ENERGY NETWORKS INC.	HARTFORD	CT	1,056,100.00	833.75	XXX	XXX	XXX	XXX
ENERGY SYSTEMS COMPANY	MORRISTOWN	TN	937,474.00	831.00	XXX		XXX	
EUGENE WATER AND ELECTRIC BOARD	EUGENE	OR	281,738.00	0.00	XXX			
FAIRBANKS MUNICIPAL UTILITIES	FAIRBANKS	AK	91,200.00	0.00	XXX			

List of Inventoried Systems

Sector : Community or Utility

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
FULTON ELECTRIC SYSTEM	FULTON	KY	0.00	0.00				
Franklin Heating Station	ROCHESTER	MN	755,197.88	642.80	XXX		XXX	XXX
HARRISBURG STEAM WORKS	HARRISBURG	PA	835,291.00	522.84	XXX			XXX
HOLYOKE GAS & ELECTRIC DEPT.	HOLYOKE	MA	619,479.20	484.80	XXX			XXX
INDIANAPOLIS POWER & LIGHT	INDIANAPOLIS	IN	7,171,000.00	0.00	XXX			
JAMESTOWN BOARD OF PUBLIC UTILITIES	JAMESTOWN	NY	107,318.60	44.40		XXX		
KENT COUNTY DISTRICT HEATING AND COOLING	GRAND RAPIDS	MI	875,701.00	503.31	XXX			XXX
KWIG POWER COMPANY	KWIGILLINGOK	AK	1.12	1.70				XXX
LANSING BOARD OF WATER AND LIGHT	LANSING	MI	1,943,570.00	1,054.00	XXX			
MILWAUKEE COUNTY POWER PLANT	WAUWATOSA	WI	1,155,955.60	832.48	XXX		XXX	XXX
MINNEAPOLIS ENERGY CENTER	MINNEAPOLIS	MN	1,672,180.00	1,348.05	XXX	XXX	XXX	
NASHVILLE THERMAL	NASHVILLE	TN	893,630.00	574.00	XXX		XXX	
NASSAU DISTRICT ENERGY CORP.	NASSAU COUNTY	NY	476,503.00	0.00	XXX	XXX	XXX	
NATEREAGE LIGHT PLANT	CHIFOMALER	AL	0.00	0.48				XXX
NRG THERMAL CORP.	MINNEAPOLIS	MN	3,163,607.00	950.00	XXX			
PACIFIC GAS & ELECTRIC CO.	SAN FRANCISCO	CA	602,000.00	0.00	XXX			
PHILADELPHIA THERMAL ENERGY CORP.	PHILADELPHIA	PA	3,424,427.00	0.00	XXX			
PITTSBURGH ALLEGHENY COUNTY THERMAL	PITTSBURGH	PA	424,500.00	0.00	XXX			
PITTSBURGH THERMAL	PITTSBURGH	PA	269,809.00	0.00	XXX			
PUBLIC SERVICE COMPANY OF COLORADO	DENVER	CO	1,082,000.00	665.00	XXX			
ROCHESTER DISTRICT HEATING COOP	ROCHESTER	NY	276,000.00	0.00	XXX			
SEATTLE STEAM COMPANY	SEATTLE	WA	811,000.00	850.00	XXX			
SLEEPY EYE PUBLIC UTILITY	SLEEPY EYE	MN	12,906.40	14.43	XXX			XXX
ST. LOUIS THERMAL COMPANY	ST. LOUIS	MO	1,113,500.00	1,884.00	XXX			
TRENTON DISTRICT ENERGY CORP.	TRENTON	NJ	617,690.00	4,290.00		XXX	XXX	
TRIGEN KANSAS CITY	KANSAS CITY	MO	1,009,726.25	1,217.00	XXX			XXX
TRIGEN OKLAHOMA CITY	OKLAHOMA CITY	OK	384,507.22	514.00	XXX		XXX	
TRIGEN TULSA	TULSA	OK	651,327.78	558.40	XXX		XXX	
VILLAGE OF PRAGUE	PRAGUE	NE	0.00	0.00				
WISCONSIN ELECTRIC POWER COMPANY	MILWAUKEE	WI	2,282,000.00	1,620.00	XXX			

List of Inventoried Systems

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Sector : Community or Utility

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
WYANDOTTE, CITY OF	WYANDOTTE	MI	550.00	0.58	XXX	XXX		
YOUNGSTOWN THERMAL ENERGY CORP.	YOUNGSTOWN	OH	364,000.00	0.00	XXX			

Sector : Hospital

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
ALEDA E. LUTZ VAMC	SAGINAW	MI	0.00	27.04	XXX			
AMERICAN LAKE VAMC	TACOMA	WA	6.00	0.01	XXX			
BALTIMORE VA MEDICAL CENTER	BALTIMORE	MD	45,882.54	77.10	XXX			
BATTLE CREEK VAMC	BATTLE CREEK	MI	130,274.00	87.34	XXX			
C.V.T.C. (Chiller)	LYNCHBURG	VA	0.00	0.00				
C.V.T.C. (Craft & Research)	LYNCHBURG	VA	0.00	1.62			XXX	
C.V.T.C. (Smith Square)	LYNCHBURG	VA	0.00	0.00				
CARL T. HAYDEN VA MEDICAL CENTER	PHOENIX	AZ	49,135.00	86.25	XXX		XXX	XXX
CARL VINSON VA MEDICAL CENTER	DUBLIN	GA	59,481.00	80.69	XXX		XXX	
CASTLE POINT VETERANS ADMINISTRATION MED. C	CASTLE POINT	NY	71,784.00	40.66	XXX		XXX	
CATAWBA HOSPITAL	CATAWBA	VA	33.52	5.08	XXX	XXX	XXX	
CLEMENT J. ZABLOCKI MEDICAL CENTER	MILWAUKEE	WI	1,659,125.00	384.17	XXX	XXX	XXX	
CLEVELAND VA MEDICAL CENTER	BRECKSVILLE	OH	219.60	0.15	XXX			
COGERATION MANAGEMENT COMPANY	CAMBRIDGE	MA	1,552,142.00	0.00	XXX			
DDE VA MEDICAL CENTER	LEAVENWORTH	KS	121,281.00	69.76	XXX			
DEPARTMENT OF VETERANS AFFAIRS	PALO ALTO	CA	0.00	0.00				
DEPARTMENT OF VETERANS AFFAIRS MED. CENTER	PITTSBURGH	PA	115.70	112.80	XXX		XXX	
DEPT. OF VET. AFF. MED. CTR.	PHILADELPHIA	PA	0.00	0.00				
DEPT. OF VET. AFF., LEISSNON, PA	LEISSNON	PA	208.40	18.06	XXX		XXX	
DEPT. OF VET. AFFAIRS MED. CTR. (603)	LOUISVILLE	KY	55.00	17.82	XXX		XXX	
DEPT. OF VETERANS AFFAIRS MED. CTR,	PROVIDENCE	RI	40.00	0.05	XXX			
DEPT. OF VETERANS AFFAIRS MEDICAL CENTER	DANVILLE	IL	136,487.00	106.00	XXX			
DEPT. OF VETERANS AFFAIRS MEDICAL CENTER	DAYTON	OH	222,267.00	143.60	XXX			
DEPT. OF VETERANS AFFAIRS MEDICAL CENTER	ALBANY	NY	132,740.42	125.72	XXX	XXX	XXX	
DEPT. OF VETERANS AFFAIRS MEDICAL CENTER	SYRACUSE	NY	1,440.00	0.98		XXX		

List of Inventoried Systems

Sector : Hospital

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
DVA MEDICAL CENTER	SAN FRANCISCO	CA	67,337.00	45.59	XXX		XXX	XXX
EDWARD HINES JR. VA. HOSPITAL	HINES	IL	454,824.80	134.80	XXX		XXX	
FDR VA MEDICAL CENTER	MONTROSE	NY	181,623.00	100.00	XXX			
FORT MEADE VAMC	FORT MEADE	SD	53,952.00	52.50	XXX			
FT. HARRISON VA MEDICAL CENTER	FT. HARRISON	MT	42,204.00	40.49	XXX			
JAMES E. VAN ZANDT VA MEDICAL CENTER	ALTOONA	PA	21,245.00	30.13	XXX			
KNOXVILLE VETERANS MEDICAL CENTER	KNOXVILLE	IA	154,814.90	106.50	XXX		XXX	
M.D. ANDERSON CANCER CENTER- KNIGHT RD FAC.	HOUSTON	TX	23,700.58	33.93	XXX		XXX	
M.D. ANDERSON CANCER CENTER-BASTROP FACILIT	HOUSTON	TX	19,962.54	9.05	XXX		XXX	
M.D. ANDERSON CANCER CENTER-HOSPITAL	HOUSTON	TX	90,458.75	106.46	XXX		XXX	
M.D. ANDERSON CANCER CENTER-HOUSTON MAIN B	HOUSTON	TX	41,996.94	34.58	XXX		XXX	
M.D. ANDERSON CANCER CENTER-SMITHVILLE FAC.	HOUSTON	TX	50,576.20	27.85	XXX	XXX	XXX	
M.D. ANDERSON CANCER CENTER-WOODLANDS FA	HOUSTON	TX	1,085.74	1.55	XXX		XXX	
NEW MEXICO REGIONAL MEDICAL CENTER	ALBUQUERQUE	NM	0.00	41.32	XXX		XXX	
NORTH CHICAGO VA MEDICAL CENTER	NORTH CHICAGO	IL	9,600.00	78.00			XXX	
NORTHERN VIRGINIA TRAINING CENTER	FAIRFAX	VA	0.00	26.37		XXX	XXX	
OLINE TEAGUE VETERANS CENTER	TEMPLE	TX	0.00	0.00				
OREGON HEALTH SCIENCES UNIV.	PORTLAND	OR	203,699.00	187.00	XXX		XXX	
OVERTON BROOKS VA MEDICAL CENTER	AHREVEPORT	LA	53.12	14.45	XXX		XXX	
PIEDMONT GERIATRIC HOSPITAL	BURKEVILLE	VA	40,400.00	16.08	XXX		XXX	XXX
RICHMOND, VA MEDICAL CENTER	RICHMOND	VA	0.00	0.00				
SAM RAYBURN MEMORIAL VETERANS CENTER	BONHAM	TX	721.34	11.11			XXX	
ST MARY'S HOSPITAL	ROCHESTER	MN	180,887.54	291.25	XXX		XXX	XXX
SVTC Central Boiler Plant	PETERSBURG	VA	0.00	146.00	XXX			
U.S. ARMY AIR DEFENSE CENTER	FORT BLISS	TX	25.00	0.04	XXX			
UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES	LITTLE ROCK	AR	419,183.32	207.91	XXX		XXX	
UNIVERSITY OF KANSAS MEDICAL CENTER	KANSAS CITY	KS	340,000.00	284.00	XXX		XXX	
UNIVERSITY OF TEXAS MED. BRANCH AT GALVESTO	GALVESTON	TX	840,250.00	236.52	XXX		XXX	
V. A. MEDICAL CENTER	OMAHA	NE	108.80	28.05	XXX		XXX	
V. A. MEDICAL CENTER	TOMAH	WI	102,797.00	75.00	XXX			

List of Inventoried Systems

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Sector : Hospital

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
V. A. MEDICAL CENTER	BATH	NY	114,412.00	83.44	XXX			
V.A. LAKESIDE MEDICAL CENTER	CHICAGO	IL	156,824.20	281.18	XXX		XXX	
V.A. MEDICAL CENTER	BUFFALO	NY	11,700.00	6.00	XXX			
V.A.M.C. EAST ORANGE	EAST ORANGE	NJ	0.00	103.83	XXX		XXX	
VA HOSPITAL	FARGO	ND	39,640.00	42.96	XXX		XXX	
VA MEDICAL CENTER	WEST LOS ANGEL	CA	197,700.00	164.40	XXX		XXX	
VA MEDICAL CENTER	SHERIDAN	WY	65,960.00	45.20	XXX			
VA MEDICAL CENTER	BATH	NY	114,412.00	83.44	XXX			
VA MEDICAL CENTER	FAYETTEVILLE	AR	25,227.32	23.86	XXX		XXX	
VA MEDICAL CENTER	BILOXI	LA	64,137.00	78.90	XXX		XXX	
VA MEDICAL CENTER	BILOXI	MI	76,700.00	70.75	XXX		XXX	
VA MEDICAL CENTER	MARTINSBURG	WV	156,027.24	121.24	XXX		XXX	
VA MEDICAL CENTER	KANSAS CITY	MO	103,203.00	109.53	XXX		XXX	
VA MEDICAL CENTER	CANANDAIGUA	NY	119,878.00	75.00	XXX			
VA MEDICAL CENTER	MONTGOMERY	AL	56,345.00	50.90	XXX	XXX	XXX	
VA MEDICAL CENTER	DENVER	CO	96,200.00	57.75	XXX			
VA MEDICAL CENTER	HUNTINGTON	WY	36,750.00	27.75	XXX			
VA MEDICAL CENTER	FORT WAYNE	IN	0.00	0.01	XXX			
VA MEDICAL CENTER	MIAMI	FL	47,506.00	38.29	XXX			
VA MEDICAL CENTER	LYONS	NJ	141.64	16.28	XXX		XXX	
VA MEDICAL CENTER	BATAVIA	NY	3.60	0.00	XXX			
VA MEDICAL CENTER	FORT HOWARD	MD	37,035.00	14.64	XXX			
VA MEDICAL CENTER	MOUNTAIN HOME	TN	184,540.00	153.47	XXX		XXX	
VA MEDICAL CENTER	BIG SPRING	TX	11,584.00	6.02	XXX		XXX	
VA MEDICAL CENTER	LAKE CITY	FL	58.20	16.24	XXX		XXX	
VA MEDICAL CENTER	MARLIN	TX	78,270.00	23.30	XXX		XXX	
VA MEDICAL CENTER	LINCOLN	NE	52,353.00	45.58	XXX		XXX	
VA MEDICAL CENTER	NORTHAMPTON'	MA	0.00	66.96	XXX			
VA MEDICAL CENTER	CHEYENNE	WV	47,397.00	0.00	XXX			
VA MEDICAL CENTER	WICHITA	KS	0.00	0.04	XXX			
VA MEDICAL CENTER	MEMPHIS	TN	0.00	0.00				

List of Inventoried Systems

Sector : Hospital

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
VA MEDICAL CENTER	NEW YORK	NY	0.00	0.00				
VA MEDICAL CENTER	ALEXANDRIA	LA	90,973.16	21.03	XXX		XXX	XXX
VA MEDICAL CENTER (575)	GRAND JUNETIO	CO	32.36	4.81	XXX		XXX	
VA MEDICAL CENTER (668)	SPOKANE	WA	54,571.64	46.41	XXX		XXX	XXX
VA MEDICAL CENTER MINNEAPOLIS	MINNEAPOLIS	MI	36,328.00	39.80	XXX		XXX	
VA MEDICAL CENTER SEPULVEDA	SEPULVEDA	CA	18.00	32.36	XXX		XXX	
VA MEDICAL CENTER UPTOWN DIVISION	AUGUSTA	GA	82,549.44	98.21	XXX		XXX	
VA MEDICAL CENTER, ALLEN PARK	ALLEN PARK	MI	102,000.00	78.00	XXX			
VAMC - JEFFERSON BARRACKS DIVISION	ST. LOUIS	MO	131,778.67	156.81	XXX		XXX	
VAMC - JOHN COCHRAN DIVISION	ST. LOUIS	MO	72,470.15	89.56	XXX		XXX	
VAMC - MARION	MARION	IN	111,264.00	90.33	XXX			
VAMC - SALT LAKE CITY	SALT LAKE CITY	UT	75,000.00	74.80	XXX		XXX	
VAMC BAY PINES	BAY PINES	FL	165,888.00	40.92	XXX		XXX	
VAMC FAYETTEVILLE NC	FAYETTEVILLE	NC	83.00	19.37	XXX		XXX	XXX
VAMC FORT LYON	FORT LYON	CO	0.00	85.90	XXX			
VAMC NORTH PORT NY	NORTH PORT	NY	1,501.20	30.23	XXX		XXX	
VAMC TUCSON, AZ	TUCSON	AZ	17.10	17.10			XXX	
VAMC WEST HAVEN	WEST HAVEN	CT	183,384.00	134.70	XXX		XXX	
VAMC, COATESVILLE, PA	COATESVILLE	PA	173,526.00	26.40	XXX		XXX	
VAMC, HOT SPRINGS, SD	HOT SPRINGS	SD	4,395.00	7.48	XXX			
VAMC, INDIANAPOLIS	INDIANAPOLIS	IN	28.00	10.67	XXX		XXX	
VAMROC, SIOUX FALLS, SD	SIOUX FALLS	SD	53,074.00	51.21	XXX		XXX	
VAMROC, WHITE RIVER	WHITE RIVER JUN	VT	568.00	7.01	XXX		XXX	
VETERANS ADMINISTRATION MEDICAL CENTER	BOSTON	MA	0.00	13.80			XXX	
VETERANS AFFAIRS	MANCHESTER	NH	25.00	0.03	XXX			
VETERANS AFFAIRS MED. CTR., RICHARD L. ROUDE.	INDIANAPOLIS	IN	0.00	22.51			XXX	
VETERANS AFFAIRS MEDICAL CENTER	ANN ARBOR	MI	0.00	0.00				
VETERANS AFFAIRS MEDICAL CENTER	IOWA CITY	IA	66,000.11	48.88	XXX		XXX	
VETERANS AFFAIRS MEDICAL CENTER	SALISBURY	NC	128,824.00	93.00	XXX		XXX	
VETERANS AFFAIRS MEDICAL CENTER	HAMPTON	VA	94,598.00	90.00	XXX			

List of Inventoried Systems

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Sector : Hospital

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
VETERANS AFFAIRS MEDICAL CENTER	CHILlicoTHE	OH	132,000.00	99.00	XXX			
VETERANS AFFAIRS MEDICAL CENTER	WASHINGTON	DC	0.00	40.00	XXX			
VETERANS AFFAIRS MEDICAL CENTER	HOUSTON	TX	276,700.00	104.70	XXX	XXX	XXX	
VETERANS AFFAIRS MEDICAL CENTER	WALLA WALLA	WA	9,216.00	25.12	XXX			
VETERANS AFFAIRS MEDICAL CENTER	LEXINGTON	KY	6.96	61.92	XXX		XXX	
VETERANS MEDICAL CENTER	ROSEBURG	OR	43.18	0.64	XXX	XXX	XXX	
WESTERN STATE HOSPITAL	STAUNTON	VA	50,002.40	90.60	XXX		XXX	XXX
WJBD VETERANS HOSPITAL	COLUMBIA	SC	65.00	20.28	XXX		XXX	

Sector : Industrial

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
ALUSVISSE FLEXIBLE PACKAGING	SHELBYVILLE	KY	6.60	8.28			XXX	
BAKER ENERGY	RICHMOND	VA	112,320.00	82.20		XXX	XXX	XXX
BRISTOL MYERS SQUIBB			1,066,380.00	394.50	XXX	XXX	XXX	XXX
CARRIAGE INDUSTRIES	CALHOUN	GA	135,000.00	77.62	XXX			
COMPAQ COMPUTER	HOUSTON	TX	493,000.00	180.00		XXX	XXX	
CORNING, INC., Sullivan Park	CORNING	NY	0.00	85.36		XXX	XXX	
CRADDOCK TERRY, INC.	GRETNA	VA	14.40	3.30			XXX	
Cleaver Brooks Package Boiler	EMPORIA	KS	46.00	0.06	XXX			XXX
E-SYSTEM ECI DIV.	ST. PETERSBURG	FL	0.00	18.00			XXX	
FACTORY POWER COMPANY	CINCINNATI	OH	738.00	0.33	XXX	XXX		
FORSTER MFG STRONG	WILTON	ME	23,800.00	34.25	XXX			XXX
FORSTER MFG. MAHAWAMHEAG	WILTON	ME	17,000.00	45.44	XXX			XXX
GALEY AND LORD INDUSTRIES, INC SOC. HILL FAC.	SOCIETY HILL	SC	175,000.00	320.00	XXX			
GIANT REFINING PORTALES PLANT			1,179.00	8.45	XXX		XXX	
HARDINGE BROTHERS	HORSEHEADS	NY	0.00	0.00				
HEWLETT PACKARD , NJ DIVISION	ROCKAWAY	NJ	1,453.60	2.50			XXX	XXX
Heating and Cooling	RICHARDSON	TX	0.00	168.16		XXX	XXX	
KIMOTO TECH INC	CEDARTOWN	GA	50.00	0.02	XXX			
LORIN INDUSTRIES	MUSKEGON	MI	0.00	22.88	XXX			XXX

List of Inventoried Systems

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Sector : Industrial

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
NASA MICHoud ASSEMBLY (WATER/STEAM)	NEW ORLEANS	LA	419.80	156.36	XXX		XXX	
NMN Steam	GREENSBORO	NC	253,000.00	32.40	XXX		XXX	
OWENS CORNING	NEWARK	OH	364,100.00	150.30	XXX		XXX	
PHILLIPS FIBERS CORRUGATED PLANT	SENECA	SC	33,320.00	13.84	XXX		XXX	
QO CHEMICALS, INC.	OMAHA	NE	180.00	0.22	XXX			
ROHR INC RIVERSIDE CA	RIVERADE	CA	61.20	66.61	XXX	XXX	XXX	XXX
SLATER STEELS	FT. WAYNE	IN	0.00	8.30	XXX			
STEELCASE, INC. (No. 1)	GRAND RAPIDS	MI	355,500.00	236.00	XXX			
STEELCASE, INC. (No. 2)	GRAND RAPIDS	MI	506,016.60	232.00	XXX			XXX
SWISS TECH\BIGELOW BOILER AND CHILLER	CLINTON	MA	0.00	10.60	XXX		XXX	
Sandstrand Power Generation Station	ROCKFORD	IL	0.00	21.42				XXX
Steam Heating (EMF)	DENVER	CO	18,995.00	12.00	XXX			
Steam Heating (Main Plant)	DENVER	CO	256,199.00	180.00	XXX			
Steam Heating (ssb)	DENVER	CO	48,390.00	25.11	XXX			
UNIVERSAL BEDROOM FURN, LTD. PLANT 1	MORRISTOWN	TN	10,000.00	3.60	XXX			
UNIVERSAL BEDROOM FURN. LTD. PLANT 2	MORRISTOWN	TN	50,000.00	18.00	XXX			
WOLVERINE WORLD WIDE LEATHER	ROCKFORD	MI	16,433.00	17.76	XXX			XXX

Sector : Military

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
CARLISLE BARRACKS	CARLISLE BARRA	PA	80,966.00	46.00	XXX	XXX		
FORT BENNING	FORT BENNING	GA	64,200.04	81.90	XXX		XXX	
FORT BENNING	FORT BENNING	GA	138,000.02	56.30	XXX		XXX	
FORT BENNING	FORT BENNING	GA	0.00	0.00				
FORT EUSTIS	FORT EUSTIS	VA	349.00	2.03	XXX			XXX
FORT GORDON	FORT GORDON	GA	0.00	0.00				
FORT KNOX KY	FORT KNOX	KY	0.00	15.40	XXX			
FORT KNOX KY	FT KNOX	KY	0.00	33.00		XXX		
FORT KNOX, KY	FORT KNOX	KY	0.00	43.40	XXX			
FORT LEAVENWORTH, KANSAS	FORT LEAVENWO	KS	0.00	0.03	XXX			

List of Inventoried Systems

Sector : Military

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
FORT LEE	FORT LEE	VA	6,375.00	0.25	XXX			XXX
FORT LEE	FORT LEE	VA	0.00	20.25	XXX			
FORT LEE	FORT LEE	VA	0.00	6.70	XXX			
FORT LEE	FORT LEE	VA	0.00	0.53	XXX			
FORT LEE	FORT LEE	VA	0.00	0.05	XXX			
FORT LEE CENTRAL PLANT	FORT LEE	VA	0.00	0.35	XXX			
FORT MCCLELLAN AL.	ANNISTON	AL	0.00	0.00				
FT SILL OKLA	FT SILL	OK	0.00	198.54	XXX		XXX	XXX
FT. BENJAMIN HARRISON	FT BEN HARRISO	IN	18,347.00	36.25	XXX		XXX	
U.S ARMY GARRISON, FORT HUACHUCA	FORT HUACHUCA	AZ	0.00	4.20		XXX	XXX	
U.S. NAVAL ACADEMY	ANNAPOLIS	MD	672,242.40	368.40	XXX	XXX	XXX	
US ARMY ENGINEER CENTER AND FORT LEONARD W	FORT LEONARD	MO	0.00	23.24	XXX		XXX	
US ARMY ENGINEER CENTER AND FORT LEONARD W	FORT LEONARD	MO	0.00	0.09		XXX		
US ARMY ENGINEER CENTER AND FORT LEONARD W	FORT LEONARD	MO	0.00	0.05	XXX			
US ARMY ENGINEER CENTER AND FORT LEONARD W	FORT LEONARD	MO	0.00	21.89		XXX	XXX	
US ARMY ENGINEER CTR. AND FORT LEONARD WOO	FORT LEONARD	MO	0.00	16.24	XXX		XXX	

Sector : Other

Name of System	City	State	mmBTU Sendout	mmBTU Capacity	Steam	Hot Water	Chill Water	Electric
Boiler System Bldg 2	CHESAPEAKE	VA	20,844.00	9.30		XXX		
CULVER EDUCATIONAL FOUNDATION	CULVER	IN	10.00	0.01	XXX	XXX		
EDUCATIONAL TESTING SERVICE	PRINCETON	NJ	16,928.00	19.72	XXX	XXX	XXX	
KENTWOOD PUBLIC SCHOOLS	CALEDONIA	MI	0.00	1,054.95		XXX	XXX	
MISSIONARY TRAINING CENTER	PROVO	UT	0.00	58.18		XXX	XXX	
NORTHFIELD MOUNT HERMON SCH. MH CAMPUS	NORTHFIELD	MA	33,134.00	36.12	XXX			
NORTHFIELD MOUNT HERMON SCH. NORTHFIELD CA	NORTHFIELD	MA	32,390.00	21.73	XXX			
PACIFIC ENERGY COMPANY	COMMERCE	CA	1,458,499.00	0.00	XXX	XXX	XXX	
PHILLIPS ACADEMY ANDOVER	LANDOVER	MA	159,705.20	103.54	XXX			XXX
SOUTH DAKOTA SCHOOL FOR THE DEAF	SIOUX FALLS	SD	0.00	0.00				
WESTTOWN SCHOOL	WESTTOWN	PA	37.00	0.03	XXX			

APPENDIX C

SURVEY INSTRUMENT

This Appendix presents the survey instrument and instructions used to administer the *1992 National Census of District Heating, Cooling and Cogeneration*.

Instructions -- 1992 Census

District Heating, Cooling and Cogeneration

Purpose and Definition:

The *1992 National Census* of District Heating, Cooling and Cogeneration (DHC/C) is intended to characterize and quantify the extent, types and uses of DHC/C systems in the United States. For the purpose of the Census, a DHC/C system is defined as:

Any system that provides thermal energy for space heating, space cooling, or process uses from a central plant, and that distributes the energy to two or more buildings through a network of pipes. If electricity is also produced, the system is a cogenerating facility.

The National Census is supported by the United States Department of Energy and the Oak Ridge National Laboratory, with the cooperation of the International District Heating and Cooling Association and other national associations that represent commercial, institutional, government and industrial system operators throughout the United States. The Census is administered on behalf of these sponsors by the Association of Physical Plant Administrators of Universities and Colleges.

Explanation of Units Used on the Census Form:

Conventions used for units of 1,000 and 1,000,000 are as follow:

mBTU	=	1,000 BTU	mmBTU	=	1,000,000 BTU
KW	=	Kilowatt	MW	=	Megawatt
MCF	=	1,000 Cubic Feet			

Multiple Systems -- If your organization operates more than one system, *please complete a separate Census Form for each system that you operate.*

Results from the Census -- The release of results from the Census is scheduled for early in 1993. Results will be available in both hard copy and on data diskettes. *Each respondent to the Census will be provided with a complementary summary of these results upon completion.*

DUE DATE and ADDRESS -- Please return completed Census Forms *via mail or facsimile by October 15, 1992* to the Association of Physical Plant Administrators at the address listed below.

Return to: Association of Physical Plant Administrators
1446 Duke Street
Alexandria, VA 22314

Phone: 703/684-1446 Fax: 703/549-2772

1992 Census

District Heating, Cooling and Cogeneration

Page 1 of 2

Name of System: _____

Contact Person: _____

Title: _____

Address: _____

Telephone: _____ Fax: _____

Type of System: ☐ Utility ☐ Gov't ☐ College/Univ ☐ Military Base
☐ Airport ☐ Hospital ☐ Industrial ☐ Commercial
☐ Other (Describe) _____

Customer Base (Indicate units as noted):

Number of Buildings Served: ☐ 11-50 ☐ 51 or more

Building Area Served (million sq. ft.): _____

Description of Area Served (i.e.; Downtown, city "x"; Center of college campus, etc.):

FY 1991 Energy Production:

<u>Types of Energy Produced</u>		<u>Production Capacity</u>	<u>Annual Energy Sendout</u>
Steam	☐ Yes ☐ No	_____ mBTU/Hr	_____ mmBTU
Hot Water	☐ Yes ☐ No	_____ mBTU/Hr	_____ mmBTU
Chilled Water	☐ Yes ☐ No	_____ Ton	_____ Ton-Hr
Electricity	☐ Yes ☐ No	_____ KW	_____ MWH

Please return by October 15, 1992 to:

**Association of Physical
Plant Adminstrators
1446 Duke Street
Alexandria, VA 22314**

Phone: 703/684-1446

Fax: 703/549-2772

Name of System: _____

(Page 2 of 2)

Age of System (Years):

⁷⁸ _____ Primary Boiler _____ Primary Chiller _____ Distribution System

_____ Date Service Started (Calendar Year)

Most Recent Upgrade (Date and Description): _____

Distribution Line Length (1,000 ft):

_____ Steam Supply Lines	_____ Condensate Return Lines
_____ Hot Water Supply Lines	_____ Hot Water Return Lines
_____ Chilled Water Supply Lines	_____ Chilled Water Return Lines

Types of Fuel Used:

Annual Consumption

Average Cost per Unit

☐ Coal	_____ Tons	\$ _____ per Ton
☐ Fuel Oil	_____ Gallons	\$ _____ per Gallon
☐ Natural Gas	_____ MCF	\$ _____ per MCF
☐ Purchased Thermal	_____ mmBTU	\$ _____ per mmBTU
☐ Electricity	_____ MWH	\$ _____ per KWH
☐ Renewables*	_____ mmBTU	\$ _____ per mmBTU

*Please Describe _____

System Employees, Value and Capital Budget (1991):

_____ Total Number of Employees (Full Time Equivalent)

_____ Approximate Value of Installed Plant and Facilities

_____ Capital Improvements Budget (1991)

What Would Most Help

. . . Your System . . .

. . . The DHC Industry's Growth . . .

☐ Central Plant Upgrade	☐ Revised Gov't Policy & Regulation
☐ Distribution System Upgrade	☐ Supportive Financial Incentives
☐ Improved Maintenance	☐ Increased Public Awareness
☐ Other _____	☐ Other _____

General Comments: _____

END

DATE

FILMED

5/11/94