Exhibit No.:
Issue: Steam System History;
Test Project;
Conversion Plan

Witness/Type of Exhibits: Mandacina Direct

Sponsoring Party: KCPL
Case No.: HO-86-139

DIRECT TESTIMONY OF

Michael C. Mandacina

ON BEHALF OF

KANSAS CITY POWER & LIGHT COMPANY

CASE NO. HO-86-139

Exhibit No. 14
Date 4-7-87 Case No. HO-86-139
Reporter Jwedy

TESTIMONY

OF

MICHAEL C. MANDACINA

Director, Internal Services & Steam Operations

KANSAS CITY POWER & LIGHT COMPANY

Case No. HO-86-139
(October 1986)

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. Michael C. Mandacina, 1330 Baltimore Avenue, Kansas City, Missouri.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Kansas City Power & Light Company as Director of Internal Services and Steam Operations.

Q. PLEASE REVIEW BRIEFLY YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from St. Louis University in 1969 with a Bachelor of Science degree in Electrical Engineering, and received a Master of Science degree in Electrical Engineering from the University of Missouri in 1973. I became a Registered Professional Engineer in the State of Missouri in 1974. I received a Master of Business Administration degree from the University of Missouri at Kansas City in 1978. I was employed by Wilcox Electric in 1969 and 1970 as an electronic design engineer in the Airborne Development Lab. I left Wilcox to join KCPL and was first employed as a Sales Engineer in the Sales Department. In 1974, I was promoted to District Supervisor in the Marketing Department. My duties included direct supervision of the District Office and Sales Representatives, and coordination of steam customer accounts. In 1976, I was promoted to District Manager

in the same department, then called Commercial Operations, and was responsible for the entire District Office operation. I was promoted to Manager, Utility Steam Operations in 1982 where I had general management responsibility for all of KCPL's downtown public utility steam operations. In July, 1984, I was promoted to my current position where I have general management responsibility for Fleet Services, Building and Shop Services, Support Services, and Internal Services Administration, as well as the downtown public utility steam operations.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE REGULATORY COMMISSIONS?

A. Yes. I testified before the Missouri Public Service Commission in KCPL'S Case No. ER-85-128. I have submitted testimony in Case No.HO-83-274.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to:

1. Briefly review the history of the Downtown District Steam Heating System and its status today.
2. Describe the electric steam boiler test project.
3. Review the plan to phase out the district steam heat system by systematic conversion to on-site electric boilers and other electric space heating equipment.

Q. HOW DID DISTRICT STEAM DEVELOP IN DOWNTOWN KANSAS CITY, MISSOURI?

A. The distribution of steam for heating and other purposes was begun by the Kansas City Electric Light Company (a predecessor of KCPL) from the generating station at 604 Wall Street (now 604 Baltimore), Kansas City, Missouri. This station began operation in 1888 for the purpose

of supplying electric energy for incandescent lighting. Limited distribution and sale of steam, as by-product of electric generation, began at that time. The popularity of steam service grew, resulting in the formation of the Kansas City Heating Company in 1905. The 604 Wall Street Station then became "Heating Station No. 1."

The increased demand for steam in the downtown area necessitated the construction of a more modern heating plant at 1308 Baltimore Avenue. By 1917, growing heat and electrical demand prompted construction of the Wyandotte Station, immediately west of the Baltimore location. These plants were connected and operated jointly as Heating Station No. 2. When the original plant at 604 Wall Street was abandoned as a primary source of electrical power, the installation was converted to a steam heating plant so that service to customers could continue.

The purchase of the Missouri River Powerhouse (now called Grand Avenue Station) from the Kansas City Transit Company in 1927 enabled the retirement of Heating Station No. 1 as a steam generating plant. Since the boilers had completely worn out, it was converted to a pressure reduction plant and connected to Grand Avenue with a new high pressure (185 psi) main.

In 1930 a high pressure main was built from the Grand Avenue plant to 10th and McGee and by 1954 it was further extended to a pressure reduction plant in the basement of the KCPL parking garage 1319 Wyandotte. Heating Station No. 2 was becoming obsolete and used only for peaking until it was demolished in 1958. By then, a second high pressure main had been built from Grand Avenue to the Wall Street plant and continued up Wyandotte to the pressure reduction station at 1319 Wyandotte.

This is the basic system as it exists today. The downtown service

area, shown in Exhibit No. ___ (MCM) Schedule 1, extends generally from 3rd Street to 14th Street on the south; and from Oak on the east to Broadway on the west.

From 1918 to 1982, the total length of steam main increased from 26,000 feet to over 61,000 feet. The bulk of this increase occurred in 1930, 1954 and 1958 when high pressure mains were extended from Grand Avenue to the south end of the system. Much of the steam distribution piping (15 psi) was built by the Kansas City Heating Company in 1905 and is therefore over 80 years old. Since 1982, about 5,457 feet of pipe have been cut off due to an increasing number of customers leaving the system.

Q. WHAT IS THE PRESENT CONDITION OF THE STEAM SYSTEM?

A. In the last four years, crews have repaired 190 major leaks in the underground piping system. The leaks have occurred throughout the system but primarily in the low pressure 15 psi piping. The majority of leaks on the high pressure system are generally due to expansion joint failure. The deteriorated condition of pipe, fittings, expansion devices and valves has resulted from long-term corrosion. The corrosion has resulted primarily from water contacting the piping. This water comes from numerous sources such as ground water, leaking city water lines and broken storm sewers. The steam lines are typically between 8 and 25 feet below the surface of the street. They are encased in concrete and direct buried so there is no way to inspect or perform preventive maintenance on the pipe lines.

New leaks are occurring frequently, and the amount of manpower and equipment necessary to keep the system functioning will not decrease in the future. It will be necessary to increase resources to maintain operations as leaks occur more often on the aging system

without a major replacement of the underground facilities. The cost to completely rebuild the underground system is estimated to be approximately $15 million. This estimate is based primarily on the experience of replacing 1,200 feet of low pressure piping in downtown Kansas City in the summer of 1984, at a cost of $400 per linear foot, and is considered representative for extensive pipe replacement.

Steam losses in 1981 were close to 45% of the total steam produced. More recently, steam losses have been reduced to about 20-25% yearly through a concentrated program of leak repairs. Presently, steam leaks are occurring at the rate of about three or four a month. Due to their urgency, most leaks are repaired on overtime. An average leak repair, including expansion joint replacements, costs about $15,000. In 1984, a leak at 7th and Main cost $27,000 just for the contracted excavation necessary to find the leak.

As leaks are repaired in one section of old line, it is typical to have new leaks occur in nearby sections of pipe, similar to the old rubber garden hose problem. The problem is exacerbated by the growing unbalanced conditions in the distribution system with the continuing loss of customers.

Repairing steam leaks is costly and greatly inconveniences the public with excavation obstructions that impede the flow of traffic in the downtown area. Some repair jobs last three to four weeks due to weather conditions, traffic restrictions, and depth of excavation. See KCPL Exhibit No. ____ (BJB), Schedule 1, pages 2.7-2.10 for pictorial examples.

Steam leaks and foreign water evaporating from contact with hot steam pipes can damage other utility equipment located near the steam line. Telephone and electric lines are very susceptible to such

overheating conditions. So repair of some small leaks can not be postponed because of the damage the steam could do.

Q. DESCRIBE THE STEAM PRODUCTION AT GRAND AVENUE STATION.

A. Steam for the downtown heating system is generated at Grand Avenue Station which was originally designed as an electric generating plant in the early 1920's. There are currently three large boilers fired by coal or natural gas, and one small package boiler fired with gas or oil, used to generate steam. These boilers were designed primarily to produce electricity. Thus, the steam for the downtown system is generated at a higher temperature and pressure than would otherwise be required, introducing an inherent thermal inefficiency in the overall steam heat cycle.

When Grand Avenue was retired from electric production in 1985, it was the oldest active generating station in the KCPL system, a factor contributing significantly to several operating constraints that affect the cost of steam. Designed in a era prior to plant automation, operations are highly labor intensive. Further, with no electric generation, the boiler design itself limits the burning of coal to high steam load periods, requiring the more expensive natural gas fuel be burned during lower load periods. With the drastic reduction in steam load over the last few years, natural gas is now used predominently as fuel to generate steam.

Q. WHAT WAS THE IMPACT OF THE CORN PRODUCTS CORPORATION (CPC) STEAM LOAD?

A. In 1982, KCPL filed a downtown steam rate case, Case No. HR-83-245, with the Commission and, concurrently, began negotiating a high load factor steam contract with CPC that would more than triple KCPL's annual steam load.

In 1983 KCPL committed to its downtown steam customers to withdraw the pending steam heat rate increase if CPC entered into an interruptible steam heat agreement (Agreement). The Agreement was signed, and on August 8, 1983, KCPL withdrew its steam filing. The Agreement allowed KCPL to spread its costs related to Grand Avenue Station steam heat production over a greater volume of steam heat sales, thus reducing KCPL's average fixed cost of service per pound of steam heat. Additionally, that Agreement permitted KCPL to reduce its fuel cost per pound of steam by (i) changing the required fuel mix to greater amounts of lower cost coal and smaller amounts of higher priced gas throughout each year, and (ii) providing coal for Grand Avenue Station in greater volumes at a reduced price. These events precluded the immediate need for a steam rate increase. During 1984, the CPC Agreement effectively reduced KCPL's steam heat production cost per pound for all of its steam heat customers below the 1983 level. However, CPC's actual steam requirements declined to about 60% of the original estimate. Thus the anticipated economies were diminished.

KCPL was advised in late 1984 that CPC had sold its Corn Products Plant to National Starch, effective in 1985. KCPL then negotiated a separate agreement with National Starch effective December, 1985. The steam heat requirements of National Starch were originally estimated to average 60,000 pounds per hour, about one-fourth of the initial estimate of the CPC steam load. However, since the National Starch process has come on line and stabilized operations in early 1986, its steam load has actually averaged only 45,000 pounds per hour, some 25% less than the estimate. This reduction adversely affects the economics of KCPL's steam production at Grand Avenue Station and has increased KCPL's average cost per pound of steam delivered.

In the electric rate case completed in July 1983, (Case No. ER-83-49), the Commission had ordered the Company to file its plan to phase-out the electric generating facilities at Grand Avenue Station. A KCPL study committee recommended that the Grand Avenue Station electric facilities be retired from commercial operation when Wolf Creek began commercial operation in 1985 and after certain electric substation facilities were installed. This phase-out of the Grand Avenue Station electric facilities caused additional production, operating, maintenance, and plant investment costs to be allocated to steam service.

Thus, the projected lower steam demand from National Starch coupled with the reallocation of Grand Avenue Station steam production costs to the steam facilities--without any rate increase to the downtown steam customers--has created unacceptable operating losses for KCPL's steam operation.

Q. WILL YOU BRIEFLY REVIEW THE PURPOSE OF THE CONVERSION TEST PROJECT?

A. The purpose of the conversion test project was to establish the operational feasibility of converting customers to on-site electric boiler steam supply. Historically, the Company's involvement has ended at the customer's service entrance, for both electric service and steam service. Installing, operating, and maintaining Company-owned production equipment in a privately-owned system is new to KCPL. The test project provided experience in designing and installing the boilers in significantly different physical settings as well as in determining customer acceptance of on-site electric boilers.

The initial scope of the project included working with up to eight customers that were presently served by steam laterals which

could be disconnected once the conversion was complete.

Q. HOW WERE THE CUSTOMERS SELECTED FOR THE TEST PROJECT?

A. In August 1984, a majority of KCPL's steam customers were surveyed to determine the space available at their locations for on-site boilers. This preliminary survey showed that most locations could readily accommodate the necessary equipment and that the boilers could be located in areas that already housed the present steam service pipe entering the building.

KCPL prepared cost estimates for initial installations of on-site boilers at various customer locations and began to confirm specific customer participation. Those customers were selected because their locations allowed KCPL to abandon sections of deteriorated underground steam laterals after completing the conversions to electric boilers.

Securing customer agreement proved time consuming. Uncertainties, such as the future of the building, the TWA corporate changeover, and out of town ownership of the buildings, caused some buildings to be excluded from the test.

Q. WHICH CUSTOMERS WERE INITIALLY SCREENED FOR THE TEST PROJECT?

A. Customers initially screened for the test project included:

112 W. 9th	Faultless Starch
807 Wyandotte	Henry Nelkin Trust
909-911 Wyandotte	*McWhirter
1331 Main	*American Formal Wear
1411 Main	Missouri Division of Employment Security
1336 Walnut	*Upsher Laboratories

1406 Walnut	*Stanley Sargent
1305 Baltimore	Trans World Airlines
1400 Main	Empire Theatre

*Boilers actually installed.

In addition, the owners of the Home Savings Building at 1006 Grand Avenue, requested to be included in the test project. They were facing a very costly replacement of their own leaky steam service lines in the building. Since we had not been able to secure installation agreements with some of the other customer originally screened, the Company agreed to include 1006 Grand in the test project.

Q. HOW WERE THE BOILER INSTALLATIONS DESIGNED?

A. Local contractors were selected for mechanical and electrical work at the customer premises. Generally, these contractors were responsible for the detailed engineering while KCPL retained overall project management.

Once a customer was selected for the project, KCPL calculated the required boiler size, based primarily on a survey of the building and past steam consumption data. When a customer signed an easement to allow a boiler installation on his premises, a selected contractor was instructed to order a boiler and proceed with the detailed engineering. Boiler deliveries averaged four to six weeks. During that time, the necessary construction permits were secured from the City of Kansas City. The construction period averaged six to eight weeks to final acceptance.

Q. BRIEFLY OUTLINE THE GENERAL RESULTS OF THE TEST PROJECT.

A. As of December 1985, five locations had boilers on site. The first

boiler was energized for service on September 30, 1985. Two additional boilers were test run and placed in service the second week of December. The fourth installation was found to be undersized, and was tested but not actually used. This sizing problem can be corrected in the future. The fifth boiler was installed at 1006 Grand by January, 1986, but testing was not completed until May 1986 because construction of the new United Missouri Bank Building prevented KCPL's electrical installation crews from completing the vault work necessary to serve this boiler. These five sites provided data about installation and O&M costs plus indications of the typical problems and customer reactions that may be encountered. For example, at locations where the customer is not served by the downtown electrical network or the electric service capacity is inadequate, lead time to install new electric distribution equipment can take some 16 to 24 weeks.

Q. HOW WERE THE TEST BOILER INSTALLATIONS METERED?

A. Where possible, the test installations have used the condensate metering systems already in place. Each installation has a magnetic tape electric meter. Meters measure the feed water to the boiler and all boiler blow downs. One installation includes a special steam flow meter on the output of the boiler. The purpose of this extensive metering is to check the efficiency of the on-site systems as well as the condition of customer condensate return systems. For a properly maintained steam and condensate system, all water sent to the boiler should be returned through the condensate return system and metered by the condensate meter except that which is lost to blow down or used for humidification.

Q. PLEASE DESCRIBE A TYPICAL BOILER INSTALLATION.

A. The schematic design of a Typical Electric Boiler Installation, in Exhibit No. __ (MCM), Schedule 2, shows the main components of an on-site steam supply system.

The boilers purchased for the test project were manufactured by the Lattner Boiler Manufacturing Company, which is locally represented by the Hughes Machinery Company. This manufacturer has successfully supplied package boilers that are in use in several privately-owned commercial applications throughout the Kansas City area.

The electric boiler systems consist of a high pressure steam boiler with electric immersion resistance elements, a condensate collection system, and miscellaneous equipment including power disconnect switches. Controls cycle these resistance elements on and off depending on the steam load demand.

A condensate collection system, operating in conjunction with the electric boiler, generally utilizes an existing condensate return system to collect the condensate and store it in a tank connected to the boiler. Additional equipment includes power switches and current transformers, electrical cabinets, water, condensate and power meters, blow down tank, boiler make up water line, and electrical conduit.

The electric boiler ratings range from 6KW, roughly 2' x 3' x 5' in size, to 1100KW, roughly 5' x 5' x 10'. The electric power supply is 3 phase 4 wire at 208 volts or 480 volts. Some of the larger installations may be served at primary voltage. A picture of an electric boiler is on page 3.10 of the Downtown Steam System Conversion Study presented as Exhibit No. ____ (BJB), Schedule 1.

Q. DID THE TEST PROJECT CONSIDER WATER TREATMENT?

A. The test project also addresses feed water treatment. Customer condensate was analyzed before KCPL put the boiler in service to

ensure that any corrosion problem that existed within the customer's system was documented prior to energizing the boiler. If a boiler requires large amounts of makeup water, it may well have a leak either in the steam system or in the condensate return system. This continued use of makeup water will eventually cause an increase of dissolved solids to collect in the boiler, which generally requires more frequent and more lengthly blow downs. Overall, the test project has required a full range of water treatment techniques.

Q. WHAT HAS BEEN THE OPERATING RESULTS OF THE TEST PROJECT?

A. The boiler test program undertaken by KCPL demonstrated that it is feasible to replace central station steam service with on-site electric boilers. Once a boiler began operation, personnel inspected the site daily during the work week. All meter readings were recorded on the log sheets. Any problems with the equipment were noted and reported to the operations supervisor, who would then schedule any required work.

Q. WHAT INFORMATION DID THE RESULTS OF THE INDIVIDUAL BOILER LOCATIONS PROVIDE?

A. It is difficult to compare one installation with another because each was operated differently during the heating season. When the weather would turn warm some of the customers would request that the boiler be shut down.

The total system efficiency, which was equal to the sum of the BTU's in steam sales for the entire period of operation divided by the sum of KW input derived from the KWH meter which measured all electric power going to the boiler and auxiliaries, ranged from 88.15 percent

for McWhirter Printers up to 93.5 percent for Stanley Sargent. This gives the Company a range in which future installations of these size ranges should fall.

Water analysis has been performed periodically by an independent consultant to determine these systems' water treatment needs. This has been accomplished on all locations, both testing prior to boiler start-up and then again after the operation has stabilized. Also, boiler water samples were taken at numerous times during the heating season. This information coupled with the results of boiler inspections will be used to determine what chemical treatment if any is required on the above installations prior to next heating season.

Chemical water treatment was recommended by the consultant for the Home Savings installation and the equipment is ready for operation. However, operational experience will not be gained until the winter of 1986-87.

The test project also demonstrated the various requirements for: 1) building permits, 2) mechanical and electrical inspections, 3) fire codes compliance prior to construction, and 4) operation of on-site boilers at customer locations.

Some unusual problems that have surfaced during the test project include providing adequate mechanical support for the boiler. One location required rebuilding a portion of the floor where the boiler was to be placed. At two locations deteriorated drains needed repair. At another location it was necessary to provide a storage area for items displaced by the boiler.

Q. WHAT WAS THE CUSTOMER RESPONSE TO THE BOILER INSTALLATION AND OPERATION?

A. Once a customer was selected for the test project, Commercial

Operations personnel met with the property owners to explain the project. Owners were informed that they would be billed at the present steam rate and that their metering method would be the same as it had been. Customers were told that the installation, operation, and maintenance costs would be borne by KCPL. The only item that the customer needed to provide was suitable space for the electric boiler installation.

Customers who have elected to participate in the test project have been very cooperative with KCPL and the contractors in completing the installation. Complaints have been of a minor nature and primarily have dealt with the inconveniences of conducting business in the midst of installation work.

Q. IN REFERENCE TO KCPL'S PROPOSED CONVERSION SCHEDULE, WHAT ARE THE REASONS THE STEAM CONVERSIONS NEED TO BE IMPLEMENTED UNDER A PHASED SYSTEMATIC PLAN?

A. There are six major reasons as follows:

1. Losses can be reduced more effectively by first converting customers located on ends of steam laterals. Conversion of the customers located in the initial five phases will allow crews to disconnect old and leaky steam pipes from the system, thereby reducing total system losses.

2. Throughout the conversion process, the operating reliability of the remaining steam system needs to be maintained. Therefore, the removal of steam line connections to the main line has to be carefully sequenced to protect the integrity of operations for the remaining customers.

3. The high pressure (185 psi) customers who can be converted to low pressure (15 psi) will be included in the conversion phase

located nearest to them. However, since the high pressure steam main will be the last pipe disconnected, many of the high pressure customers could be included in the last phases.

4. During the period of the test project, several steam customers indicated they would not need steam after the 1985-86 winter due to new construction in the Walnut and Grand Avenue areas. Obviously, there will be a reduction of steam customers in various areas of the system throughout the conversion period; and there may have to be some resequencing during the conversion process. For the most part, the Downtown Steam System Conversion Study (Exhibit No. ___ (BJB) Schedule 1) recognizes some of these variables and should therefore maintain reliability of operations unless there is a drastic change in steam line loading.

5. The installation of boilers usually requires some additional electric service also. These phases consider potential electrical supply needs and the availability of electrical feeders in the downtown area.

6. The timing for completion of each phase is critical to the operating reliability and maintenance of the entire steam system. The plan considers coordinating the customers' needs, the design and installation of the boilers and associated electrical equipment, disrupting vehicular traffic, and completing the conversion in the most economical manner for the steam customers.

Q. WHAT IS THE SCHEDULE FOR CONVERTING THE EXISTING DOWNTOWN STEAM CUSTOMERS TO ELECTRIC BOILERS?

A. The original schedule for the conversions was developed in conjunction with the Downtown Steam System Conversion Study in 1985 (see Exhibit No. ___ (BJB) Schedule 1). The Conversion Schedule, filed as part of

KCPL's July 7, 1986, tariff filing, divided KCPL's steam service territory into eleven areas, and assigned a date certain to each area after which KCPL would not be obligated to offer or provide steam service from Grand Avenue. In light of the proceeding's present procedural schedule, the dates in the Conversion Schedule are no longer a reasonable projection of actual conversion periods for the areas. Exhibit No. ___ (MCM) Schedule 3 lists each area or phase, the name and location of each customer in each phase, and indicates the present estimated time period in which KCPL will perform the conversions. These time periods have been structured so that customers are not converted during a heating season.

Q. WILL THE CUSTOMER RECEIVE NOTICE PRIOR TO THE CONVERSION OF HIS PARTICULAR PHASE AREA?

A. Yes, as each phase is scheduled for conversion, a substantial effort will be made to provide each customer ample opportunity to decide if he wishes to remain a KCPL steam customer. At the end of the time allocated for conversion of each phase, the steam laterals to that area will be disconnected from the system. Each customer converted to an electric boiler in that phase will be fully operational prior to his steam line being disconnected.

At the beginning of each phase year, each customer in that section would be personally contacted by a KCPL representative. A complete explanation would be made, a time schedule discussed, an energy survey made of the building if appropriate, and a copy of the easement contract presented to the customer. The contract would allow for the electric boiler installation on the customer's premises and outline the complete commitment that the Company and customer would agree to. This contract is contained in the proposed revision to

Section 9.02 of the General Rules and Regulations Applying To Steam Service.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes it does.

AFFIDAVIT

STATE OF MISSOURI)
) ss.
COUNTY OF JACKSON)

Michael C. Mandacina, being first duly sworn, on his oath states: that he has participated in the preparation of the foregoing written testimony, in question and answer form, consisting of 18 pages, to be presented to the Public Service Commission of the State of Missouri in Case No. HO-86-139; that the answers therein contained were given by him; that he has knowledge of the matters set forth in said answers; and that such answers are true to the best of his knowledge and belief.

Michael C. Mandacina

Subscribed and sworn to before me this 22nd day of September, 1986.

Carol Giles
Notary Public

My Commission Expires:

CAROL GILES
Notary Public, State of Missouri
Commissioned in Platte County
My Commission Expires June 15, 1987

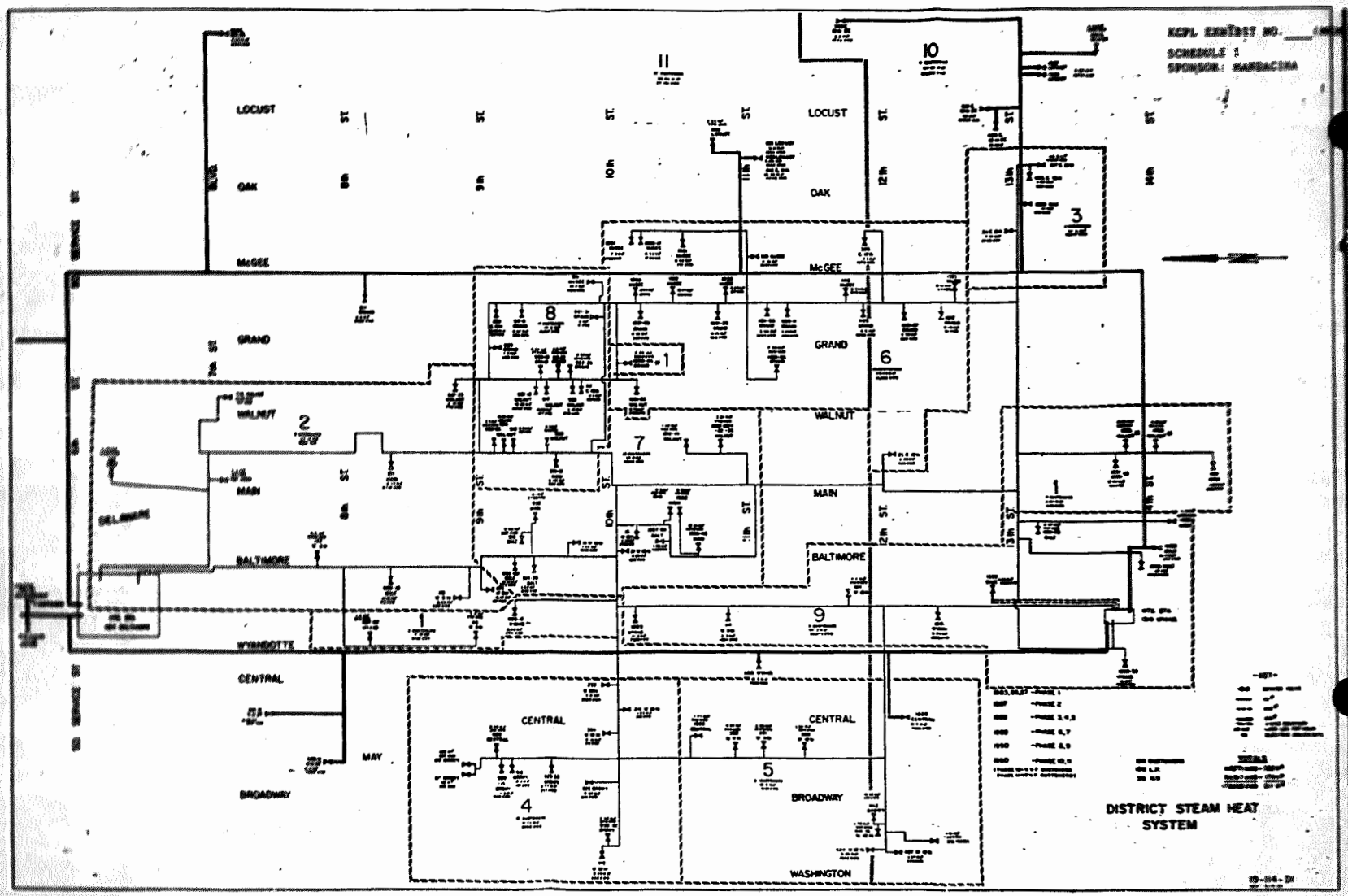
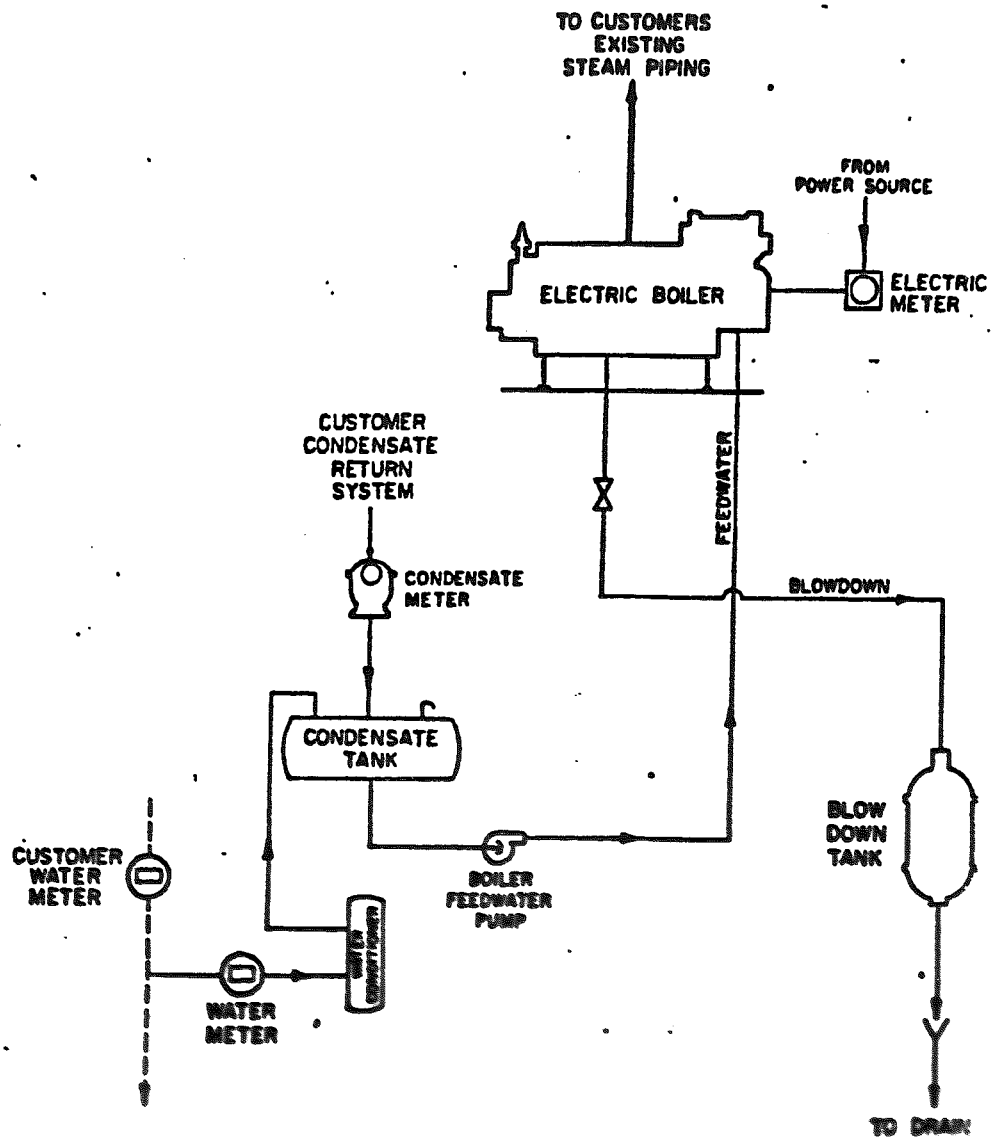

KCPL EXHIBIT NO.
SCHEDULE 1
SPONSOR: HARBACINA
LOCUST
OAK
McGEE
GRAND
WALNUT
MAIN
BALTIMORE
WYANDOTTE
CENTRAL
MAY
BROADWAY
WASHINGTON
DELAWARE
1
2
3
4
5
6
7
8
9
10
11
DISTRICT STEAM HEAT SYSTEM

Figure 3-1

KCPL EXHIBIT NO_____(MCM)
SCHEDULE 2
SPONSOR: MANDACINA

TYPICAL ELECTRIC BOILER INSTALLATION



SCHEDULE OF CONVERSION PHASES
September 8, 1986

PHASE 1: 1985-1986 Completed

Name	Address	
Upsher Labs	1336 Walnut	Comp.1985
McWhirter Printers	909 Wyandotte	Comp.1985
Home Savings Building	1006 Grand	Comp.1986
Stanley Sargent	1406 Walnut	Comp.1985

PHASE 1: 1987

American Formal Wear	1329 Main
Missouri Division of Employment Security	1411 Main
Faultless Starch	114 W. 9th St.
Nelkin Trust	807 Wyandotte

PHASE 2: 1987

Rodeway Inn	601 Main
Rodeway Inn	701 Main
Executive Plaza	122 W. 8th
Downtown Redevelopment	811 Main
Waltower Building	823 Main
R. K. Powell	810 Baltimore
John A. Marshall	110 W. 9th Street
Baltimore Inn	109 W. 9th
Racket Merchandise	713 Walnut

PHASE 3: 1988

Kansas City Missouri Library	311 E. 12th
Missouri Court of Appeals	1300 Oak
Union National Bank	405 E. 13th
William H. Pickett	417 E. 13th

PHASE 4: 1988

Goldsmith Properties	817 Broadway
Mark Twain Bank	819 Broadway
William Ashley	909 Broadway
Anjor Corporation	915 Broadway
National Equipment Corporation	923 Broadway
Sieden Furs	935 Broadway

Rothenburg Tobacco	930 Broadway
Naval Jelly	412 W. 10th
Jac-Bilt Company	908 Central
Letter Carriers Union	304 W. 10th
Uhlmann Company	219 W. 10th
Downtown Investors	222 W. 10th

PHASE 5: 1988

Landmark Marketing Company	1020 Central
Financial Assurance	300 W. 11th
Kansas City Southern Industry	301 W. 11th
Folly Theater	300 W. 12th
Kansas City St. Joe Diocese	414 W. 12th
Kansas City St. Joe Diocese	416 W. 12th
Cathedral Square Tower	444 W. 12th
Carpenter Vulquarz	427 W. 12th
First Development	1235 Washington

PHASE 6: 1989

Graphix Plus	1005 McGee
Moore & Kessinger	1009 McGee
Continental Tower Building	1021 McGee
Mia Jamison	1000 McGee
Club Midwest	1012 McGee
Downtown Properties	1040 McGee
South Western Bell Telephone	1101 McGee
Royal Blue Print	1118 McGee
Argyle Building	306 E. 12th
Lathrop Building	1001 Grand
Farm & Home Building	1021 Grand
Kansas-New York Building	1101 Grand
Bryant Building	1100 Grand
Gate City Building	1109 Grand
Traders Bank	1125 Grand
Steve Scruby	1207 Grand
Dension Optical	1217 Grand
L. Gapford	1222 McGee
12th & Walnut Building	25 E. 12th
Sentinel Federal Savings	1001 Walnut

PHASE 7: 1989

Hadley-McHugh	15 W. 10th
DST	21 W. 10th
Kroh Brothers	1007 Baltimore
Church's Chicken	1008 Main
Four Kings	1016 Main
Copaken-White-Blitt (Dillards)	1030 Main

Metropolitan Savings	1012 Walnut
Woolf Brothers	1022 Walnut
First National Bank	14 W. 10th
CBC Investors	930 Main
Ad Club	913 Baltimore
University Club	914 Baltimore
Lane Blue Print	906 Baltimore

PHASE 8: 1990

Centerre Bank	900 Walnut
Demaree Stationary	908 Walnut
Quick-Print	910 Walnut
Harriman Mtg. Inv.	920 Walnut
GSA	901 Walnut
First Federal Savings	915 Walnut
United Missouri Bank	925 Walnut
United Missouri Bank	112 W. 10th Street
Osco Drugs	925 Main
Safety Federal Savings	908 Grand
United Missouri Bank	918 Grand
United Missouri Bank	922 Grand
Grand Avenue Temple	205 E. 9th
Federal Reserve	903 Grand
Federal Reserve	915 Grand
Federal Reserve	921 Grand
Federal Reserve	916 McGee

PHASE 9: 1990

Downtown Investors	1001 Wyandotte
Kansas City Southern	114 W. 11th
Phillips House Hotel	104 W. 12th
Trans Am. Investment	1205 Wyandotte
Municipal Auditorium	1300 Baltimore
TWA	1305 Baltimore
Gaylord Prop.	1330 Baltimore
Empire Theatre	1402 Main

PHASE 10: HIGH PRESSURE - 1989-1990

Kansas City Club	1230 Baltimore
Jackson County Court House	405 E. 12th
Jackson County Justice Center	1305 Locust
Jackson County Jail	1307 Locust
Federal Office Building	601 E. 12th
Missouri State Office Building	615 E. 13th
Kansas City Power & Light Company	1400 Baltimore
Greyhound	700 E. 12th
Bartle Hall	1220 Central

PHASE II: HIGH PRESSURE - 1989-1990

Vista Hotel	200 W. 12th
Burd & Fletcher	321 W. 7th
South Western Bell Telephone	500 W. 8th
Kansas City Missouri City Hall	415 E. 11th
Kansas City Missouri Courts	1101 Locust
Kansas City Missouri Police	1129 Locust
Federal Court House	811 Grand
Heritage House	1016 Locust
Old Townley	16 E. 3rd
Market Area Development Corporation (7 cust.)	20 E. 5th
Folgers Coffee	330 W. 8th