Exhibit No.:
Issue: Downtown Steam Service Plan

Witness/Type of Exhibits: Beaudoin Direct

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

DIRECT TESTIMONY OF

Bernard J. Beaudoin

ON BEHALF OF

KANSAS CITY POWER & LIGHT COMPANY

CASE NO. HO-86-139

DIRECT TESTIMONY
of
BERNARD J. BEAUDOIN

Vice President, Finance

KANSAS CITY POWER & LIGHT COMPANY

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

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. Bernard J. Beaudoin. My business address is 1330 Baltimore, Kansas City, Missouri.

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

A. I am employed by Kansas City Power & Light Company ("KCPL" or "Company") as Vice President, Finance. I am responsible for the Departments of the Treasurer, Controller, Financial Planning, Corporate Planning & Budgeting, and Rates and Regulation.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL QUALIFICATIONS.

A. In 1963, I received a Bachelor of Arts degree from Bowdoin College and a Bachelor of Science degree from the Massachusetts Institute of Technology majoring in Electrical Engineering. While at M.I.T., I participated in a cooperative electrical engineering program under the sponsorship of the American Electric Power System in New York City and Roanoke, Virginia. Subsequently, in 1965, I received a Master of Science degree in Industrial Management from Alfred P. Sloan School of Management at M.I.T.

In 1965, I joined the New England Electric System (NEES) working in the area of relicensing of hydroelectric plants. In 1966, I became a Staff Assistant to the Financial Vice President performing a variety of economic analyses. In 1967, I joined the Information Systems Planning Department as a Data Processing Planning Assistant developing several information system feasibility studies. In 1968, I was made Project Manager of the Financial and Accounting project which involved early developmental work in a Responsibility Accounting System and a uniform set of accounts for financial reporting for NEES companies. In 1970, I was promoted to Supervisor of Management Sciences responsible for corporate model development. In 1973, I was named Manager of Management Sciences. In 1975, I was promoted to Director of Economic Planning in charge of the Load Forecasting, Load Research and Corporate Modeling Departments.

In January 1980, I joined KCPL as Manager of the Corporate Planning Department. In January 1983, I was promoted to Director of the Corporate Planning and Finance Department. I was named to my present position, Vice President - Finance, in September 1984.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE REGULATORY COMMISSIONS?

A. Yes. I testified before the Federal Energy Regulatory Commission (FERC) in New England Power Company's R12 case (FERC Docket No. ER78-78). I submitted testimony in NEP's W2 case (FERC Docket No. ER80-66). I have testified for KCPL in FERC Docket Nos. ER80-315 and ER80-450. I have testified as to KCPL's rate of return before the Missouri Public Service Commission (MPSC) in Case Nos. ER-81-42, ER-82-66, HR-82-67, ER-83-49 and ER-85-128 and before the Kansas Corporation Commission in Docket Nos. 127,486-U, 133,002-U and 142,099-U. I have also testified before the MPSC in Case No.

EF-81-366, and the KCC in Docket No. 128,802-U regarding KCPL's nuclear fuel lease.

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

A. The purpose of my testimony is twofold:

(1) to introduce the KCPL witnesses participating in this case in order to provide the Commission an outline of KCPL's overall testimony in this case; and,

(2) to present the results of KCPL's analysis which led to the Downtown Steam Service Plan (the Plan) for which KCPL is seeking approval in this case.

Q. WAS KCPL EXHIBIT NO. ___ (BJB) Schedule 1, PREPARED BY YOU OR UNDER YOUR SUPERVISION?

A. Yes, Exhibit No. ___ (BJB) Schedule 1, is KCPL's Downtown Steam System Conversion Study which was prepared by Company personnel under my direction.

Q. MR. BEAUDOIN, WOULD YOU PLEASE OUTLINE KCPL'S PRESENTATION IN THIS CASE?

A. First, I will summarize KCPL's proposed Downtown Steam Service Plan (Plan) and the related rate request. Second, I will recapitulate the analysis and conclusion contained in KCPL Exhibit No. ___ (BJB) Schedule 1, which led KCPL management to adopt the Plan which was presented to its Downtown steam customers on March 13, 1986.

Mr. M. C. Mandacina will provide historical perspective on the development of the steam system as well as a physical description and status of the steam system as it exists today. He will describe the

impact on the steam business of the loss of KCPL's largest steam customer and its successor. Mr. Mandacina will present information on the development, implementation and results of KCPL's test project of installing on-site steam boilers. He will also describe the need for a systematic conversion plan to phase-out the Downtown steam system and how KCPL proposes to accomplish the task by December 31, 1990.

Mr. R. W. Graham will discuss customer communications, and will describe the energy studies that KCPL has been performing for its steam customers as part of the Plan, including the procedures followed and the results to date. He will present the rationale for offering alternate electric equipment as part of the Plan, and ultimate conversion to electric heat. He will give KCPL's perception of the reaction of steam customers to the Plan.

Mr. R. A. Kite will cover the history of steam cases before this Commission and present the cost of service, including allocation procedures, upon which KCPL based its request for a one-time increase of $5.9 million in this case.

Mr. S. W. Cattron will sponsor the accounting exhibits KCPL prepared in response to the Commission's directive to file Minimum Filing Requirements and will testify on other accounting and tax issues.

Mr. J. J. DeStefano will present testimony on the rate of return used to develop part of the rate request.

Mr. J. K. Liberda will testify to the need to amortize the undepreciated steam plant investment over the remaining service life of the facilities to be retired December 31, 1990. He will also discuss the amortization of the cost of the on-site boilers and electric equipment over the remaining term of the customer purchase option period ending December 31, 1995.

Q. MR. BEAUDOIN, PLEASE SUMMARIZE THE EVENTS LEADING TO CASE NO. HO-86-139.

A. In Case Nos. EO-85-185 and EO-85-224, the retirement of the electric facilities at Grand Avenue Station, its impact on the Downtown Steam Service, and the test electric boiler program were raised as issues.

In its Report and Order in Case Nos. EO-85-185 and EO-85-224, the Commission created Case No. HO-86-139 for the purposes of investigating the future of public utility steam heating service rendered by KCPL in downtown Kansas City, Missouri, the appropriateness of KCPL's test electric boiler program, and the proper pricing of such steam service. The Report and Order also determined that KCPL should file its steam service plan on or before May 1, 1986. KCPL requested an extension of time to June 1, 1986, for this filing in its Application for Rehearing in Case Nos. EO-85-185 and EO-85-224.

On June 2, 1986 KCPL filed its Downtown Service Plan, Revised Rate Schedules, Phase-In Rate Schedules as well as a Conversion Schedule and revised General Rules and Regulations, all <u>without</u> a proposed effective date.

On June 27, 1986 the Commission issued an order directing the Company to file its proposed steam tariff increases with a proposed effective date of January 1, 1987. On July 7, 1986 the Company filed Revised Schedules that are designed to provide increased annual steam revenues of approximately $5,871,000 (about 120%). The Phase-in Rate Schedules, contingent upon acceptance of the Downtown Steam Service Plan, are designed to phase-in the revenue increase request over four years (about 22% per year).

Q. WHY WAS THE PLAN DEVELOPED?

A. The Plan was developed to address the significant problems facing the present steam service system, including the retirement of certain electric generation facilities at Grand Avenue Station, aging production and distribution steam plant, the loss of steam customers, including CPC International, KCPL's largest industrial steam customer, and the present wholly inadequate rates for steam service. KCPL believes that the Plan meets KCPL's commitment to its steam customers by providing alternative means of serving their energy requirements and increasing service reliability, at a lower cost to the customer than what would be required to maintain or rehabilitate the current central steam system.

Q. MR. BEAUDOIN, PLEASE SUMMARIZE THE EVENTS LEADING TO THE DEVELOPMENT OF THE PLAN.

A. KCPL's central station steam system started operations before the turn of the century. Steam was initially supplied from the Wall Street Plant (which was located at 6th and Wall), and subsequently from Grand Avenue Station. The ten miles of underground steam lines are now 60 to 80 years old, and because of their advanced age require ever-increasing levels of maintenance and repair. (Mr. Mandacina will elaborate on the condition of the steam system in his testimony.)

Grand Avenue Station no longer generates electricity for KCPL's electric customers, and KCPL has retired in place the electric generation facilities at the station. Thus, aside from some substation facilities, the entire burden of Grand Avenue's ownership and operating costs must now be borne by the steam heat customers, since steam heat is the only service being provided by these facilities.

KCPL's steam customer levels and steam sales have declined dramatically over the years. The number of steam heat customers has dropped from a high of 394 in 1950 to about 130 now. From their peak in 1971, steam sales have slumped more than 60%. However, the facilities required to serve this declining customer base remain the same, and operation and maintenance expenses continue to increase as these facilities age. In 1985, KCPL's largest steam customer, CPC International, sold its facilities to National Starch which takes only about one-fourth of the steam that CPC did. These factors have caused the unit cost of producing and delivering steam to rise sharply over the years.

KCPL has been aware of the adverse factors affecting its central station steam service system for several years. Studies conducted in 1981 and 1982 indicated that steam rates at that time were inadequate and would have to be raised substantially in order to cover operating costs and provide a reasonable return on investment. The studies also determined that the system could not be viable without the addition of a large-demand customer. In response, KCPL secured CPC International as a customer in 1984, which had the effect of more than tripling steam load. However, in 1985 CPC sold its facilities to National Starch, which has only one-fourth of CPC's steam usage. This drastic decrease in steam load, coupled with the anticipated retirement of electric facilities at Grand Avenue Station and the consequent increase in the unit cost of providing steam service led to the present study (Exhibit No. ___ (BJB) Schedule 1) and this Plan.

Q. WERE KCPL'S DOWNTOWN STEAM CUSTOMERS INFORMED OF THE DEVELOPMENT OF THIS PLAN?

A. Yes. In June 1985 Mr. A. J. Doyle, KCPL's Chief Executive Officer, met with steam customers to review the history of KCPL's steam service and to assure them of the Company's intentions to continue to meet their energy requirements. By letter dated July 19, 1985, Mr. Doyle indicated that KCPL was studying alternatives to the present central station steam service:

> "By early 1986, KCPL will develop a tentative five-year conversion plan to eliminate its low pressure steam distribution system through the use of on-site electric boilers and minimize its high pressure steam distribution system through (a) a central electrode boiler, (b) by on-site installation or (c) various combinations with electric operation. KCPL will present that tentative plan to its steam heat customers, hopefully, in March 1986 for their review, comments and possible refinement. Of course, any such plan as may be finally adopted by KCPL will be subject to review and approval by the Missouri Commission before it becomes effective."

In addition, KCPL committed to operate the steam production facilities at Grand Avenue for the term of the National Starch steam service agreement (through 1990), and not to make a steam rate increase effective before 1987. KCPL also offered to make building energy use studies at the facilities of each steam customer at no charge.

A task force under my direction was formed in July 1985 to develop a five-year conversion plan. Representatives from System Power Operations, Internal Services and Steam, Accounting, Engineering, Law, Corporate Planning and Rates were named to this task force. Engineering and financial examinations were made of the present system as well as many alternatives to that system. It became

obvious that it is not economically feasible to continue central station steam production and distribution, either in its present, or an alternative, configuration. Based on these examinations, the task force focused on on-site electric boilers as the preferred alternative, since it minimizes future capital expenditures. A test program was established to install up to eight electric boilers on the premises of present steam customers to collect information concerning installation and maintenance of such equipment, and also to gauge customer acceptance. The Downtown Steam Service Plan is predicated upon the recommendations and findings of this task force.

Q. MR. BEAUDOIN, PLEASE SUMMARIZE THE ELEMENTS OF THE DOWNTOWN STEAM SERVICE PLAN.

A. The elements of the Plan are as follows:

1. KCPL will discontinue steam service from Grand Avenue Station upon the termination of the steam service agreement with National Starch in 1990.

2. In anticipation of this discontinuance, KCPL will phase-out distribution service, commencing after Commission approval of the Plan.

3. In each phase-out steam distribution area, KCPL will offer to each customer the option of receiving on-site heating equipment, as a substitute for the discontinued central station steam service. The customer is under no obligation to accept this equipment, and is free to meet its heating needs by other methods.

4. The on-site heating equipment may be either electric steam boilers or all-electric heating equipment. The customers may choose either of the two; however, if the customer chooses

heating equipment, and it is more expensive than the corresponding boiler, the customer must in that case reimburse KCPL for the difference in the capital cost.

5. KCPL will own, install and maintain the electric steam boilers, and these steam boiler customers will continue to be steam customers served under the applicable steam service tariffs in effect at the time. KCPL will own and install the all-electric heating equipment, and the customers will be obligated to maintain such equipment at their own expense. These latter customers will become electric space heating customers of KCPL, and will be charged under the applicable electric space heating tariffs.

6. Ownership of both the electric steam boilers and the all-electric heating equipment will pass to the customers as of December 31, 1995; however, the customers have the option of earlier purchase of the boilers and equipment at its depreciated original cost. After December 31, 1995, all customers having on-site equipment (whether boilers or all-electric heating equipment) will become electric customers of KCPL and will be served under the applicable electric service tariffs.

7. KCPL will continue to offer building energy use studies at the facilities of each steam customer, to determine the appropriate sizing of the on-site equipment.

8. KCPL will continue its commitment not to seek a steam service rate increase effective before 1987.

KCPL believes this Plan is the most feasible method of continuing steam service to downtown Kansas City at a reasonable cost and with adequate reliability.

Q. WHY DOES KCPL BELIEVE THAT THIS PLAN IS THE MOST FEASIBLE METHOD OF CONTINUING STEAM SERVICE TO DOWNTOWN KANSAS CITY AT A REASONABLE COST?

A. In Sections V and VI of the Downtown Steam Conversion Study (Exhibit No. ___ (BJB) Schedule 1) KCPL considered the capital investment and operating cost of many steam supply and distribution options. In Sections VII and VIII KCPL analyzed the projected economic and cost of service impact of these options. The results on that analysis are summarized on pages 4 to 8 of the Executive Summary. For convenience I will repeat that discussion here:

> "Economic analyses were made of the various alternatives for continuing to operate Grand Avenue Station as a central source of steam production in conjunction with completely rehabilitating the underground distribution system through the year 2000. Alternatives included continuing maintenance of existing boiler equipment as well as introducing modern technology such as fluidized bed or electrode boilers.
>
> Further analyses were made of the alternatives for on-site steam production. One alternative was conversion of all customers to electric or electrode boilers. In the winter such conversion represents about a 130MW non-coincident peak electric load. Another alternative analyzed was serving five large steam customers with one electrode boiler.
>
> Importantly, these analyses recognize that KCPL's steam customer sales base has declined by 60% over the last 15 years. Currently, 131 customers consume only 477,000 Mlb (one thousand pounds) of steam per year. Customer decline is likely to continue to the year 2000 because of steam rate increases, other energy competition, Downtown building rehabilitation, and small business closures. If so, KCPL could be left with fewer than 91 customers consuming about 191,000 Mlb per year and paying more for each pound.

The table below summarizes capital expenditures and estimated annual operating costs of the best alternative for each steam supply scenario. (Figures detailed in Section VII of Study.)

BEST STEAM SUPPLY SCENARIOS

Maintain Grand Avenue Production	Scenario	Capital Expenditures* ($000's)	Levelized Annual Operating Cost ($000's)
Maintain current customer level to 2000	G1A	$17,353	$11,053
Lose 60% of customer sales by year 1990	G1C	$15,826	$ 8,747
On-Site Production*			
Maintain current customer level to year 2000; all electric boilers installed by 1990	C1A	$23,271	$11,922
Lose 60% of customer sales by year 1990; electric boilers for remaining customers installed by 1990	C1C	$10,472	$ 5,462

* In addition to electric or electrode boiler equipment, at least $3 million of downtown electric distribution system construction (primarily a substation) would have to be advanced to the 1985-1990 period.

These figures suggest that continuing current operations at Grand Avenue would be slightly less expensive on an annual basis than on-site production, maintaining current customer base and sales level. However, as sales decline, on-site production of steam is progressively less expensive annually than maintaining a central steam station and an underground steam distribution system.

These same scenarios were also submitted to a cost of service analysis to determine KCPL's projected price of steam per Mlb in the year 2000, discounting inflation. The following table summarizes these findings:

Maintain Grand Avenue Production	Scenario	Steam Rate Requirement $/Mlb
Maintain current customer level to 2000	G1A	$26.80
Lose 60% of customer sales by 1990	G1B	$52.36
On-Site Production		
Maintain current customer level to 2000	C1A	$18.44
Lose 60% of customer sales by 1990; electric boilers for remaining customers installed by 1990	C1C	$23.25

This summary indicates that the on-site production scenarios offer the lowest projected price per Mlb of steam. Maintaining the current customer levels, the Grand Avenue scenario would require future rates to more than double the current price of $10.00/Mlb to meet operating costs and return requirements at current customer levels. A 60% reduction in customer sales would require rates to more than quadruple.

In sharp contrast, the on-site production scenarios offer the opportunity to limit price increases to about twice the current level, even with a notable decline in customer base over the next 15 years. On-site conversion inherently limits KCPL's investment in future steam plant, so those who remain as steam customers would not be at risk because other customers leave the steam system. Indeed, on-site conversion would tend to retain customers on the system. Additionally, KCPL would not be required to invest more and more money in production and distribution facilities that customers would use less and less."

Q. WHY DOESN'T KCPL JUST ABANDON THE STEAM BUSINESS?

A. Complete abandonment of the steam business may be a logical financial solution for the Company, but it could be a financial disaster to many of KCPL's steam customers. It may not be physically feasible or financially possible for many of them to switch energy forms or

suppliers. In any case, abandonment would have to be approved by the Missouri Public Service Commission.

Q. WHY DOESN'T KCPL SELL THE STEAM BUSINESS?

A. Sale of the steam business may also be a logical financial solution for the Company, but it would not eliminate substantially higher rate increases for customers. Any new owner would likely face operating losses similar to KCPL's and would be forced to adjust steam rates accordingly. Unless steam rates were substantially subsidized from some other source, customers would see rate increases regardless of the owner.

Besides, KCPL believes that the improvement in its electric load factor contributed by the retention of the electric winter heating load represented by these steam customers is desirable and would be beneficial to all of KCPL's electric customers. Mr. Graham addresses this point in his testimony.

Q. WHY IS KCPL WILLING TO ACCEPT A FOUR-YEAR PHASE-IN OF ITS PROPOSED STEAM RATE INCREASE IF THE PLAN IS ACCEPTED BY THE COMMISSION RATHER THAN THE ONE-TIME INCREASE?

A. As shown above in KCPL's study and in the testimony of Mr. Kite, the necessity for the phase-out of the central station steam service is a result of the large increases required to provide adequate rates. KCPL's cost of service study shows that steam rates must be increased by 120% in order to recover the current cost of serving steam customers with the present system. KCPL is operating its system at a loss; KCPL's present rates do not provide any return on existing investment and do not even fully recover the annual operating costs of the steam system. It is likely that a doubling of rates will

certainly cause some steam customers to leave the system at a pace even more rapid than contemplated in KCPL's conversion study.

As noted on pp. 2 and 3 of the Revision to Report (Exhibit No. ___ (BJB) Schedule 1), KCPL also recognizes that the transition from steam utility service to ownership of on-site facilities presents an inconvenience and hardship to its remaining downtown steam customers. Therefore, in addition to providing the up-front capital investment for the conversion equipment, KCPL is willing to accept some operating and return losses by phasing-in the requisite rate increase in order to further mitigate the impact on its valued steam customers. KCPL believes that the phase-in is part of the transition price that must be paid in order to implement the Plan on a rigorous conversion schedule with the cooperation of its steam customers.

Q. WHAT IS THE ESTIMATED CAPITAL INVESTMENT REQUIRED TO IMPLEMENT THE CONVERSION PLAN?

A. The conversion study estimated that a range of $10 to $23 million would be required to implement the Plan contingent upon the number of customers participating in the plan.

Q. IS THIS CAPITAL INVESTMENT INCLUDED IN THE COST OF SERVICE?

A. No, because the required investment has not been made and the Plan has not been approved by the Commission. The capital investment for the test boilers has been excluded as well because none of the test facilities had been closed to plant during the 1985 test year.

Q. WHAT ARE KCPL'S OPERATING LOSSES UNDER THE PHASE-IN PLAN?

A. KCPL's annual operating loss from the downtown steam business is about $2.1 million based on the test year cost of service developed by Mr.

Kite (KCPL Exhibit No. ___ (RAK) Schedule 8). After the first year phase-in, the operating loss would reduce to $1.6 million. The second year of the phase-in would lower the operating loss to $.9 million. The third year phase-in would lower the operating loss to $.1 million. The fourth year phase-in would meet the rate of return requirement.

Q. MR. BEAUDOIN, DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

AFFIDAVIT

STATE OF MISSOURI)
) ss.
COUNTY OF JACKSON)

Bernard J. Beaudoin, 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 1 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.

Bernard J. Beaudoin

Bernard J. Beaudoin

Subscribed and sworn to before me this 19th day of September, 1986.

Carol Giles

Notary Public

My Commission Expires:

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

KC EXHIBIT NO. __ (BJB)
SCHEDULE 1
SPONSOR: BEAUDOIN

Downtown Steam System

Conversion Study

Kansas City Power & Light Company

Revised - March 1, 1986

DOWNTOWN STEAM CONVERSION STUDY

Revision to Report March 1, 1986

Executive Summary and Recommended Plan

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A. A. J. Doyle's Letter of July 19, 1985 to Steam Customers

B. Steam Customer Listing and Related Statistics

C. Agreement (Between Customers and KCPL for Heating/Steam Service and Provision of Certain Equipment)

DOWNTOWN STEAM SYSTEM CONVERSION STUDY

Revision to Report

March 1, 1986

The Conversion Study was completed December 31, 1985 and the Report submitted to KCPL's Systems Expansion Alternatives Committee (SEAC) for review on January 9, 1986. SEAC's agreement with the Study's general conclusions was transmitted to the Chief Executive Officer (CEO) for his review and comment. On January 28, 1986 SEAC met with the CEO, received his comments, and discussed further the Study recommendations. A summary of these discussions follows.

Discussion

The Study concluded that it was in the best long term interest of steam customers to convert to on-site electric boiler steam production. Because the future direction of steam rates is for increases, most customers would be better off purchasing an electric boiler from KCPL and becoming an all-electric customer in the near term future. In terms of capital investment, in some cases it may be even more economical for all concerned that KCPL pay for alternative electric heat equipment to be operated and maintained by the customer. This would be in lieu of KCPL spending capital on an electric boiler installation.

SEAC and the CEO agreed that the transition from central station to on-site production would take some five years ending 12/31/90 and that the transition from steam rate customer to electric rate customer should be limited to another five years ending 12/31/95.

In anticipation of these events, the agreement between KCPL and the customer should specify the terms and conditions under which KCPL will install, at no cost to the customer, the electric driven steam production equipment or alternative electric heat equipment as the case may be. The agreement (see Appendix C) should make available to the customer the option of purchasing steam boiler equipment at original cost less depreciation any time between the date of installation and 12/31/95. In the case of alternative electric heat equipment, the customer would upon installation be considered an electric heat customer. In any event the customer would own and assume operational responsibility for the equipment at a date not later than 12/31/95.

In addition, KCPL should seek an Accounting Order from the Missouri Commission permitting the depreciation of the on-site electric boiler or alternate electric heat equipment initially owned by KCPL over the period from date of installation to 12/31/95. If not purchased prior to 12/31/95, the customer would assume title to the fully depreciated equipment at no cost at that time.

To facilitate the transition facing the steam customer, KCPL will continue to accept some operating losses from its steam business in the next five years and will modify its original steam rate increase recommendation accordingly. Steam rates would increase in a uniform pattern via a phase-in over the next

five to ten years rather than the abrupt rise recommended in the original report. With annual increases of 22% starting in the 1987/1988 heating season, the cumulative revenue shortfall to cover current operating losses (exclusive of return on investment) endured by KCPL to serve downtown customers will be about $7 million through 1989. The total revenue shortfall to cover losses, depreciation and return during this period is about $16 million. These estimated revenue requirements are based on a recently accomplished steam Cost of Service evaluation using actual 1985 test year data.

Prior to the anticipated date of conversion, KCPL will discuss in detail with each customer the options available to him. Such options will be based on the engineering energy study of each customer installation already offered at no cost to the customer by KCPL. Based on such analysis the steam customer will be advised of his options and will be able to select a course of action knowing in advance KCPL's anticipated date of conversion, projected steam rate increases and electric heat rates.

Based on the above considerations SEAC agreed upon a restatement of some of the recommendations in the Conversion Study Report. These restated recommendations are as follows:

Recommendation 3

Complete on-site conversions no later than 1990 for those customers electing to be included in the Plan (the Conversion Plan detailed in Section X of the original report). Provide each customer a written conversion plan and

agreement incorporating the no cost steam and electric heat options available to him from KCPL.

Recommendation 4

KCPL enter a written agreement with the steam customer allowing the customer to purchase the electric boiler or alternate electric heat equipment from KCPL at any time between the installation date and 12/31/95 at the equipment's original cost less depreciation. If not purchased, give the equipment to the customer at 12/31/95.

Recommendation 5

Perform an energy study for each steam customer who requests one and explore with the customer alternative electric energy service methods that may be more cost effective than electric boiler conversion.

Recommendation 6

File a rate case in 1986 that would meet KCPL's current cost of service including operating costs, depreciation and return on investment. Request an automatic phase-in of the rate increase in uniform annual percentage increases during the period from the 1987/1988 heating season through the 1990/1991 heating season. File a steam case in 1990 to adjust steam rates in the 1991/1992 heating season, if necessary, to reflect the cost of service of those steam conversion customers still remaining at that time.

The phase-in schedule would achieve the following average steam prices at current levels of steam consumption:

PROJECTED RATE INCREASES

Year Filed	Year Effective	Average Price per Mlb	Percent Increase
	Current	$10.00/Mlb	
1986	1987	12.20/Mlb	22%
	1988	14.88/Mlb	22%
	1989	18.16/Mlb	22%
	1990	20.15/Mlb	22%

Recommendation 7

Ask for a Depreciation Authority Order for steam distribution depreciation rates sufficient to amortize the current depreciation reserve deficiency by 1990 and separate depreciation rates to amortize the installed costs of on-site electric boiler or alternative electric heat system facilities from date of installation to 12/31/95.

DOWNTOWN STEAM SYSTEM CONVERSION STUDY

Executive Summary and Recommended Plan

A. Introduction

This study of the KCPL Downtown Steam System responds to a series of events evolving since 1980. Studies conducted in 1981 and 1982 indicated that present steam rates were inadequate and would have to be raised substantially in order to cover operating costs and provide a reasonable return on plant investment.

Those studies further showed that the planned retirement of Grand Avenue Station's electric production facilities, a high-cost, labor-intensive facility devoted to minor steam-only production, would require even higher steam rates unless a high load factor, large industrial steam customer could be acquired.

In April 1984, KCPL began a five-year contract with CPC, International (CPC), that tripled KCPL's annual steam sales. Consequently, KCPL was able to withdraw its pending steam rate increase filing before the Missouri Public Service Commission. However, in October 1985, CPC sold its manufacturing plant to National Starch and Chemical Corporation. KCPL negotiated a new five-year steam contract with National Starch for only about one-fourth the anticipated annual steam load of the CPC agreement. This left KCPL's steam revenues inadequate to meet operating costs and required return on investment.

In addition to the retirement of electric production facilities at Grand Avenue and the loss of CPC's high volume steam steam load, two other serious problems impact the Company's steam business:

*major physical deterioration of the Downtown steam distribution system, leading to increased inefficiencies

*shrinking steam customer sales, with even further declines projected

The combination of these problems translates to substantial operating losses in steam operations.

In August 1984, KCPL began to investigate solutions to these problems. As steam customers became aware of the problems, they understandably were concerned about future rates and they asked Mr. A. J. Doyle to speak to them at a meeting in June 1985. At that meeting, Mr. Doyle reviewed the history of the steam business and KCPL's intentions to continue to serve its steam customers. In a later letter to the customers, he indicated that the Company was seeking alternatives to central station technology for steam service:

> "By early 1986, KCPL will develop a tentative five-year conversion plan to eliminate its low pressure steam distribution system through the use of on-site electric boilers and minimize its high pressure steam distribution system through (a) a central electrode boiler, (b) by on-site installation or (c) various combinations with electric operation. KCPL will present that tentative plan to its steam heat customers, hopefully, in March 1986 for their review, comments and possible refinement. Of course, any such plan as may be finally adopted by KCPL will be subject to review and approval by the Missouri Commission before it becomes effective." (A. J. Doyle, July 19, 1985.)

In addition, KCPL committed to operate the steam production facilities at Grand Avenue Station for the term of the National Starch agreement [until 1990] with no steam rate increase before 1987. KCPL also offered to make building energy use studies at the facilities of each steam customer, at no cost to the customer.

The purpose of this study is to meet the Company's commitment to its steam customers by seeking alternative methods of providing steam service that will both reduce operating losses to KCPL and increase the efficiency and reliability of service to steam customers.

Two possible approaches were rejected:

- o Abandon the steam business at some future date
- o Sell the Downtown steam business to another entity

Complete abandonment of the steam business may be a logical financial solution for the Company, but it could be a financial disaster to many of KCPL's steam customers. It may not be physically feasible or financially possible for many of them to switch energy form or supplier. In any case, abandonment would have to be approved by the Missouri Public Service Commission.

Sale of the steam business may also be a logical financial solution for the Company, but it would not eliminate substantially higher rate increases for customers. Any new owner would likely face operating losses similar to KCPL's and would be forced to adjust steam rates

accordingly. Unless steam rates were substantially subsidized from some other source, customers would see rate increases regardless of the owner.

This study focuses on two feasible alternatives to supply heat energy to our customers:

- o Continue to operate the steam business with new technology steam production equipment at Grand Avenue Station and rehabilitate the deteriorating Downtown underground steam distribution system;
- o Transfer steam production to the customer site via electric or electrode boilers and provide energy to the boilers via the electric distribution system.

Since August 1984, KCPL has been investigating the feasibility of on-site electric steam production and plans to convert up to eight steam customers to electric steam production for the 1985-1986 steam heating season. On-site KCPL-owned boilers are being installed at no charge to the customer. As of December 1985, five steam customers have agreed to the test project. Construction and operating data are being analyzed at these installations.

B. Economic and Rate Analysis

Economic analyses were made of the various alternatives for continuing to operate Grand Avenue Station as a central source of

steam production in conjunction with completely rehabilitating the underground steam distribution system through the year 2000. Alternatives included continuing maintenance of existing boiler equipment as well as introducing modern technology such as fluidized bed or electrode boilers.

Further analyses were made of the alternatives for on-site steam production. One alternative was conversion of all customers to electric or electrode boilers. In the winter such conversion represents about a 130MW non-coincident peak electric load. Another alternative analyzed was serving five large steam customers with one electrode boiler.

Importantly, these analyses recognize that KCPL's steam customer sales base has declined by 60% over the last 15 years. Currently, 131 customers consume only 477,000 Mlb* of steam per year. Customer decline is likely to continue to the year 2000 because of steam rate increases, other energy competition, Downtown building rehabilitation, and small business closures. If so, KCPL could be left with fewer than 91 customers consuming about 191,000 Mlb per year and paying more for each pound.

The table below summarizes capital expenditures and estimated annual operating costs of the best alternative for each steam supply scenario. (Figures detailed in Section VII.)

*One thousand pounds

BEST STEAM SUPPLY SCENARIOS

Maintain Grand Avenue Production	Scenario	Capital Expenditures* ($000's)	Levelized Annual Operating Cost ($000's)
Maintain current customer level to 2000	G1A	$17,353	$11,053
Lose 60% of customer sales by year 1990	G1C	$15,826	$ 8,747
On-Site Production*			
Maintain current customer level to year 2000; all electric boilers installed by 1990	C1A	$23,271	$11,922
Lose 60% of customer sales by year 1990; electric boilers for remaining customers installed by 1990	C1C	$10,472	$ 5,462

*In addition to electric or electrode boiler equipment, at least $3 million of downtown electric distribution system construction (primarily a substation) would have to be advanced to the 1985-1990 period.

These figures suggest that continuing current operations at Grand Avenue would be slightly less expensive on an annual basis than on-site production, maintaining current customer base and sales level. However, as sales decline, on-site production of steam is progressively less expensive annually than maintaining a central steam station and an underground steam distribution system.

These same scenarios were also submitted to a cost of service analysis to determine KCPL's projected price of steam per Mlb in the year 2000, discounting inflation. The following table summarizes these findings:

Maintain Grand Avenue Production	Scenario	Steam Rate Requirement $/Mlb
Maintain current customer level to 2000	G1A	$26.80
Lose 60% of customer sales by 1990	G1B	$52.36
On-Site Production		
Maintain current customer level to 2000	C1A	$18.44
Lose 60% of customer sales by 1990; electric boilers for remaining customers installed by 1990	C1C	$23.25

This summary indicates that the on-site production scenarios offer the lowest projected price per Mlb of steam. Maintaining current customer levels, the Grand Avenue scenario would require future rates to more than double the current price of $10.00/Mlb to meet operating costs and return requirements at current customer levels. A 60% reduction in customer sales would require rates to more than quadruple.

In sharp contrast, the on-site production scenarios offer the opportunity to limit price increases to about twice the current level, even with a notable decline in customer base over the next 15 years. On-site conversion inherently limits KCPL's investment in future steam plant, so those who remain as steam customers would not be at risk because other customers leave the steam system. Indeed, on-site conversion would tend to retain customers on the system. Additionally, KCPL would not be required to invest more and more money in production and distribution facilities that customers would use less and less.

C. Conclusions

1. Operating Grand Avenue Station over the next 15 years as a central steam production source, coupled with rehabilitating the Downtown underground steam distribution system, is not economical.

2. Converting steam customers to on-site electric production of steam serves to target capital expenditures to those customers who will use steam service from KCPL over the next 15 years; it also offers a better opportunity to control steam prices over that period.

3. Albeit early, the test conversions are demonstrating the feasibility and convenience to our customers of converting to electric boilers. Also, the test program has verified the installation and operating cost estimates assumed in this study and has corroborated estimates made by a KCPL-engaged independent engineering consultant. Finally, the test program is providing practical operating data and experience useful to future customer conversions.

4. Current revenues from Downtown steam customers are approximately $5.4 million, about $10/Mlb. Based on a 1985 estimated cost of service for the existing steam system, KCPL would require a rate increase of $3.4 million (62%) -- or $16/Mlb -- just to meet operating costs. An increase of $5.5 million (101%) -- or $20/Mlb -- would be required to meet both operating costs and return on investment. These increases

already reflect National Starch revenues. Without National Starch, an additional $2.3 million (45%) would be required, raising the unit price to about $27/Mlb.

5. Based on a projected 1990 cost of service which reflects the conversion of all existing customers, KCPL would require a rate increase of $5.1 million (96%) over 1985 revenue levels -- $22/Mlb -- to meet operating costs and earn a return on the new steam production investment. If steam sales were reduced by 60%, the price would increase to $27/Mlb for the remaining customers, about the same price projected for the 1985 system and customer base without National Starch.

6. In the transition period 1986-1990, KCPL will sustain operating and return losses as it simultaneously maintains the existing system and implements the new conversion operation.

7. The CPC contract termination penalties will contribute $2.6 million to revenue in 1986 and $.6 million in both 1987 and 1988. Because a rate increase will not be effective before 1987, these 1987 and 1988 penalty payments will not offset the need for rate increases.

8. KCPL will sustain losses associated with the unrecovered plant investment in the existing underground distribution system, estimated to be a $1.8 million investment, by 1990.

D. Recommendations

1. Cease production of central station steam at Grand Avenue, and retire those facilities as well as the Downtown underground steam distribution system by December 31, 1990.
2. Minimize capital and operating expenditures for Grand Avenue and the steam distribution system between now and 1990.
3. Complete on-site conversions by 1990. (Conversion Plan detailed in Section X)
4. Obtain a written commitment from steam customers* to remain steam customers for ten years from the date of conversion in order to target specific capital expenditures and minimize operating costs.
5. Perform an energy study for each steam customer who requests it.
6. File a series of rate increases that would achieve the following average steam price by 1990 (Rate analysis detailed in Section VIII):

* Not including five test program customers.

PROJECTED RATE INCREASES

Year Filed	Year Effective	Price per Mlb	Percent Increase	Rationale
	Current	$10/Mlb	---	Includes effect of National Starch
1986	1987	$16/Mlb	62%	Covers only current operating costs of existing central steam system
1987	1988	$20/Mlb	25%	Covers operating costs and currently authorized return on existing system
1988	1989	$22/Mlb	10%	Covers operating costs and currently authorized return for 100% conversion
1989	1990	$27/Mlb	23%	Covers operating costs and currently authorized return for conversion of 40% of customers

7. File for steam distribution depreciation rates sufficient to amortize the $1.8 million depreciation reserve deficiency by 1990.
8. Evaluate progress of the conversion plan annually; review the projections of steam rate requirements to confirm the continuing validity of the projections and report the findings to customers and to the Missouri Public Service Commission.
9. Review these recommendations thoroughly with steam customers and with the Staff of the Missouri Public Service Commission prior to any rate increase filing.

I. Background

A. Corn Products, National Starch and the Impact on Steam Sales

Studies of Kansas City Power & Light's (KCPL) steam business conducted in 1981 and 1982 indicated that rates to Downtown steam customers would have to be raised substantially to cover operating costs and provide a reasonable return on steam plant investment. The studies also indicated that with the eventual retirement of electric production facilities at the Grand Avenue Plant, allocation of that facility's costs to the steam business would mean even greater steam rate increases. Further analyses of future steam loads concluded that the addition of larger high load factor industrial steam users would be required to alleviate the need for rate increases to KCPL's Downtown customers.

In 1982, KCPL filed a Downtown steam rate case with the Missouri Public Service Commission (MPSC) and concurrently began negotiating a high load factor steam contract with Corn Products (CPC) that would more than triple KCPL's annual steam sales. Upon signing a five year contract with CPC commencing in April 1984 and receiving the news that the MPSC would not change the allocation factors between electric and steam costs, KCPL was able to withdraw its filing for that increase. At that time, the Company anticipated that the addition of CPC revenues, based on projected steam demand and projected rates, would cover the on-going revenue shortfall from

Downtown customers. KCPL's contractual steam rate to CPC also included recovery of certain boiler improvements at the Grand Avenue Station. Additionally, CPC invested about $3 million in a steam line from Grand Avenue Station to CPC's property across the Missouri River. At that time, it was believed that KCPL's aggregate steam business would not sustain further operating losses.

CPC's demand for steam was initially projected to be a constant load of 250,000 lb per hour. However, operating experience showed loads averaging 160,000 lb per hour with rapid variations of as much as 60,000 lb per hour. Thus, plant operations deviated significantly from those CPC projected when the contract was drawn.

Subsequently, in June of 1984, CPC informed KCPL of its intent to sell its manufacturing plant to National Starch and Chemical Corporation and to assign its steam supply contract to National. At that time National Starch indicated to KCPL an interest in renegotiating the CPC contract for a ten-year period at a lower rate based on an average of 60,000 lb per hour of steam demand -- about one fourth CPC's contractual steam demand. KCPL determined that such terms would substantially lower its steam sales revenues when compared to the CPC contract and thus adversely affect steam system economics.

In the electric rate case completed in July 1983, the MPSC 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. This phase-out of the Grand Avenue Station electric facilities caused additional steam production operating, maintenance, and plant investment costs to be allocated to the steam facilities.

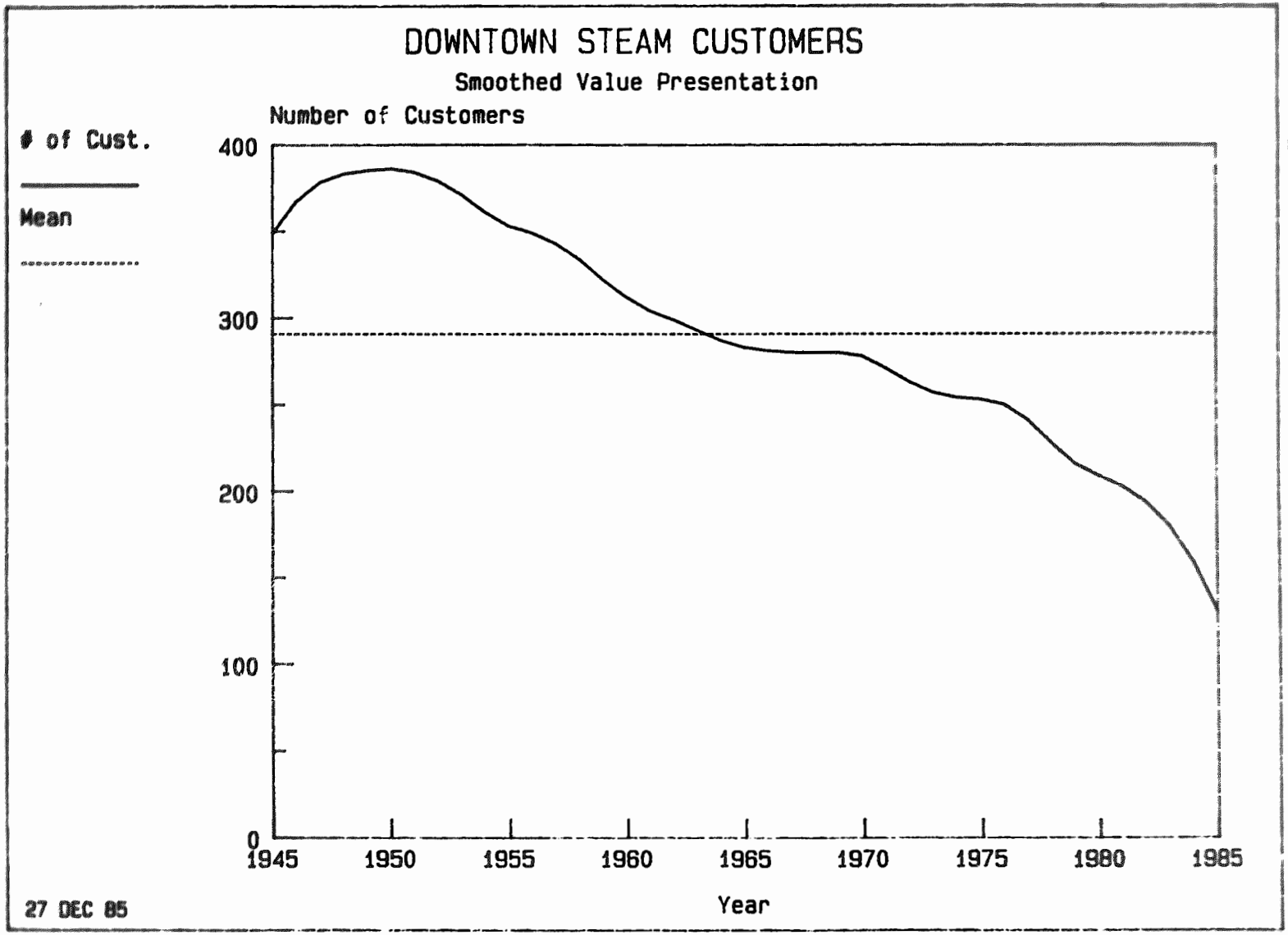
Thus, the projected lower steam demand from National Starch coupled with the anticipated re-allocation of Grand Avenue Station steam production costs to the steam facilities -- without any rate increase to the Downtown steam customers -- would create unacceptable operating losses for KCPL's steam operation.

B. Customer and Service Considerations

The typical Downtown Kansas City steam customer is essentially a commercial operation, with office buildings as the principal users. In the past, there were high usage industrial customers and some with high load factors such as the former Schlitz Brewery. However, the number of customers has declined rapidly in recent years. There were 272 customers in 1971, 210 in 1980, and presently there are approximately 131 customers.

Decline in the number of customers has been due primarily to the demise of the small Downtown office building; many have been

demolished to make room for redevelopment. This study assumes a 60% reduction in steam load over the next 15 years with a commensurate decline in number of customers. The declines in number of customers and in steam sales are depicted on the following pages.


DOWNTOWN STEAM CUSTOMERS
Smoothed Value Presentation
Number of Customers
# of Cust.
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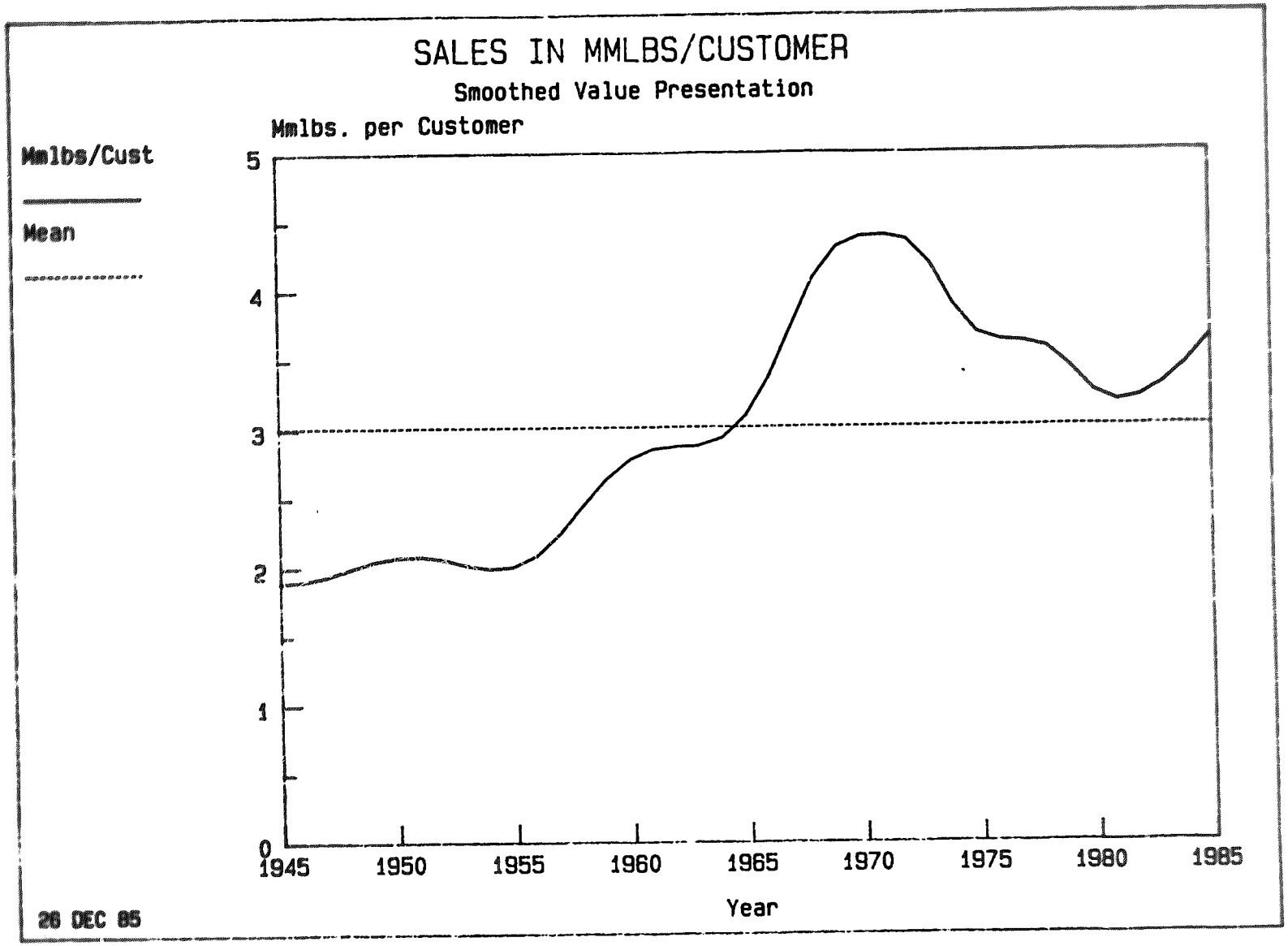
300
200
100
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
Year
27 DEC 85


SALES IN MMLBS/CUSTOMER
Smoothed Value Presentation
Mmlbs. per Customer
Mmlbs/Cust
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4
3
2
1
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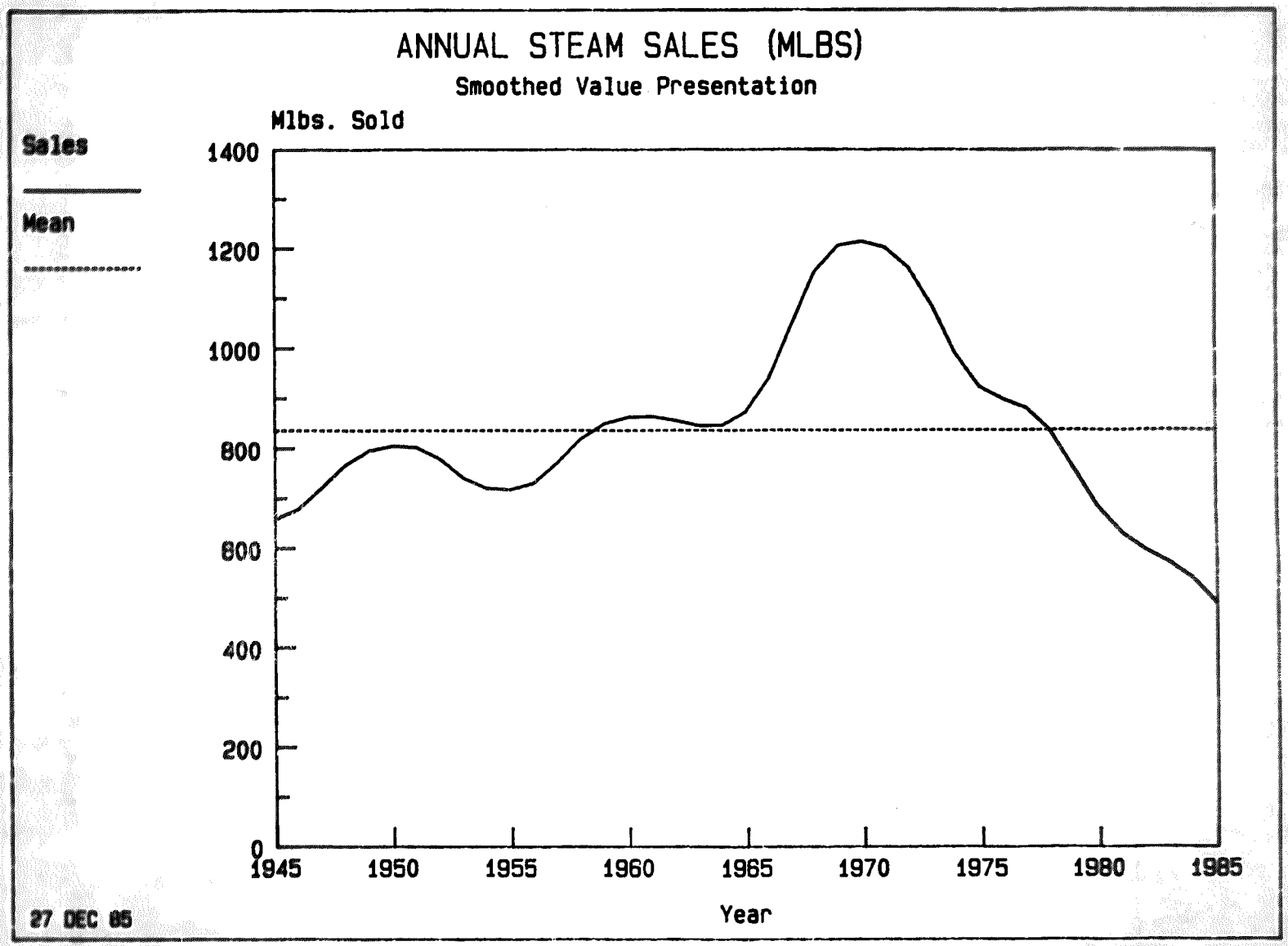
Year
26 DEC 85


ANNUAL STEAM SALES (MLBS)
Smoothed Value Presentation
Mlbs. Sold
Sales
Mean
1400
1200
1000
800
600
400
200
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
Year
27 DEC 85

Steam service is primarily delivered to customers at 185 and 15 psi (pounds per square inch) with just two customers at 105 pounds. The steam service is used principally to heat buildings and to heat water. Some customers have used the steam service at higher pressures to run steam turbines for air conditioning. The largest steam turbine user was the Federal Office Building at 601 East 12th. However, the building's two 1750-ton-steam driven compressors recently were replaced with electric drive units.

Most of the Downtown steam service is measured by condensate meters that determine the volume of water after it has been condensed from steam. A few steam flow meters are used where condensate meters are not practical, such as for humidification. There is also an orifice rate for small volume users of non-meterable steam.

C. Steam Rates

The price of steam has increased from $1.50 per Mlb in 1971 to $5.80 per Mlb in 1980, to the present price of approximately $10 per Mlb for commercial customers. Steam prices are determined by the amount used, the plant necessary to produce the steam (cost of service), and by the amount of any fuel adjustment. As noted, it is anticipated that steam prices may soon have to increase due to a shrinking customer base and KCPL's obligation to allocate more of the production expenses at Grand Avenue Station to steam facilities.

II. Summary of the Situation

A. KCPL's Energy Commitment

1. Customers' Request for Meeting

In May 1985, the Building Owners and Managers Association of Kansas City (BOMA) asked Mr. A. J. Doyle to address its group regarding KCPL's future plans for the Downtown Steam System. Due to reports that the Corn Products plant in North Kansas City would be sold in late 1985 to National Starch and Chemical Corporation, the steam customers were concerned about the effect this loss of base steam load would have on their steam rates. With that loss, coupled with the planned retirement of electric generating facilities at Grand Avenue Station, the future costs for steam production were obviously somewhat uncertain.

2. A. J. Doyle's Letter of Commitment

In response to the BOMA request, Mr. Doyle met with the group in June and explained that KCPL is committed to supply the energy needs of all its customers and certainly would not abandon its steam customers. However, due primarily to the loss of the large CPC load, the economics of steam production would change. At the meeting and in a subsequent letter to all

the steam customers, Mr. Doyle outlined KCPL's plans regarding the steam system. [Full text of letter in Appendix A.]

The main points of KCPL's commitment are:

a) KCPL and National Starch and Chemical Corporation have executed a five-year agreement for KCPL to supply steam to the firm's wet milling plant in North Kansas City. This agreement provides for steam at least through 1990.

b) Regardless of the changes in steam production costs, KCPL will not increase steam rates prior to 1987 in order to give the Company and the steam customers ample time to analyze various alternatives to the present situation.

c) The Company will develop a five-year plan that includes eliminating the low pressure steam distribution system and significantly reducing the high pressure system. This could be achieved by installation of electric-fired steam boilers situated at customer locations.

d) After discussing the electric boiler concept with the MPSC staff, KCPL implemented a test project. In the test, KCPL will install, own, operate, and maintain on-site electric boilers at up to eight existing steam customer locations. The test will provide data on the design, installation, and

operation of on-site boilers as an alternative to the underground steam distribution system. The customer remains a steam customer at KCPL steam rates. Information from the test project is to be included in the Steam Plan that will be presented to the MPSC in early 1986.

e) In addition, KCPL will provide a building energy analysis free to any current steam customer who requests it. This analysis would describe present energy consumption as well as provide recommendations for building energy use.

In summary, this Downtown Steam Conversion Study is a result of the need to develop the best possible plan to continue meeting the energy requirements of KCPL's Downtown steam customers. The study describes the most economically feasible alternatives now available to KCPL and its customers.

B. The Steam Production System and Its Status

Three 650 psi boilers produce the steam for Downtown distribution: #6, #7, and #8, installed at Grand Avenue in 1944, 1948 and 1950 respectively, replacing original station boilers. All three boilers use coal as a primary fuel and gas as an alternate fuel. They are backed up by a fourth 185 psi boiler which can operate on gas or oil fuel: #1A, installed in 1967. The three high pressure boilers have a total steaming capacity of 900,000 lbs of steam per hour, while the low

pressure boiler is capable of 200,000 lbs of steam per hour. All four boilers must be operational in the winter in case one of the primary boilers is lost.

The #6, #7, #8 boilers are reaching the age when deterioration begins to affect reliability, and their maintenance requires considerable labor. Large capital expenditures will be needed for replacements to maintain service over the long term. Interestingly, the same general need for boiler replacement existed some forty years ago when the present boilers replaced the original. The station coal and ash handling equipment, also labor intensive, is even older than the boilers; it was installed in the early '30s.

The operation and maintenance of all the equipment at Grand Avenue is labor intensive, considering the relatively small amount of steam it must produce. Parts for the obsolete equipment are difficult to obtain and often must be custom-made at considerable delay and expense.

The poor load factor -- the high winter steam heating demand and virtually no demand in the summer -- adds to the problems of providing adequate boiler capacity to supply the steam system. All major equipment must be maintained and ready for steam loads that are served only four winter months each year. The loss of the high demand, high load factor CPC steam load December 1, 1985, has made this load factor problem even more pronounced.

C. The Steam Distribution System and Its Status

The KCPL District Heating System currently consists of approximately 50,000 feet of underground piping, about 250 expansion devices, 97 manholes containing valves and condensate trap equipment, two desuperheating plants, and 131 active customer service connections.

The steam produced at KCPL's Grand Avenue Plant is delivered to the District Heating System at 185 psi and transported to Downtown Kansas City through a high pressure piping system. Thirty customers are connected directly to this high pressure system. About 75% of the 24,000 feet of high pressure piping was installed in the 1950s, the remaining portion in the 1920s and 1930s.

The 185 lb steam is reduced in pressure down to 15 lb at desuperheating plants located at 1319 Wyandotte and at 6th and Baltimore and transported through 26,000 feet of piping to the 101 low pressure customers. Sixty percent of the low pressure piping is over 60 years old.

In the last three years, crews have repaired 125 major leaks in the underground piping system. [Photo examples at end of this section.] The leaks have occurred throughout the system but primarily in the low pressure 15 lb 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.

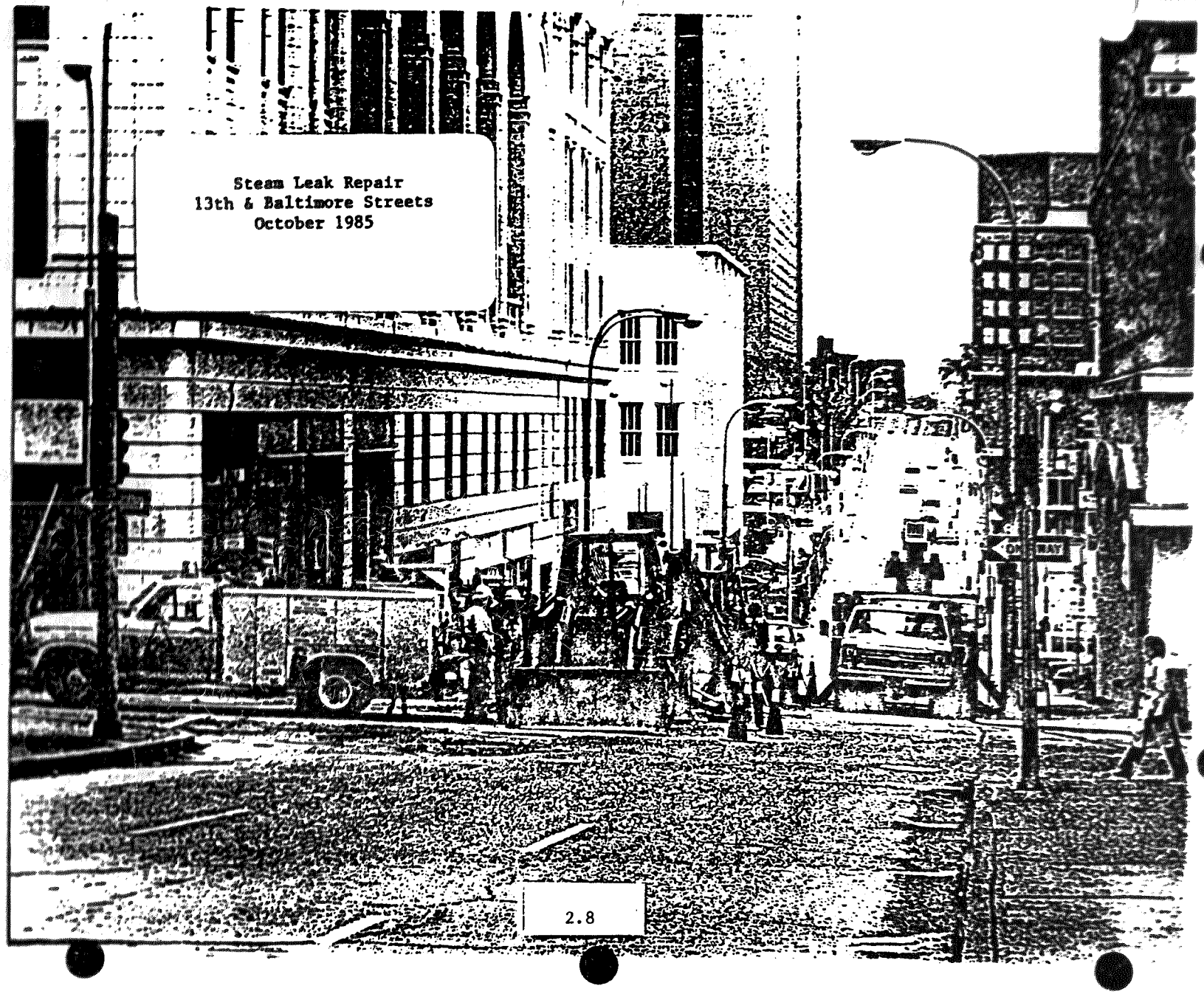
New leaks are occurring frequently, and the amount of manpower and equipment necessary to keep the system functioning will not decrease in the future. In fact, it will be necessary to increase resources to maintain operations, short of a major replacement of the underground facilities. The cost to completely rebuild the system would approximate $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. This cost is considered representative for extensive pipe replacement.

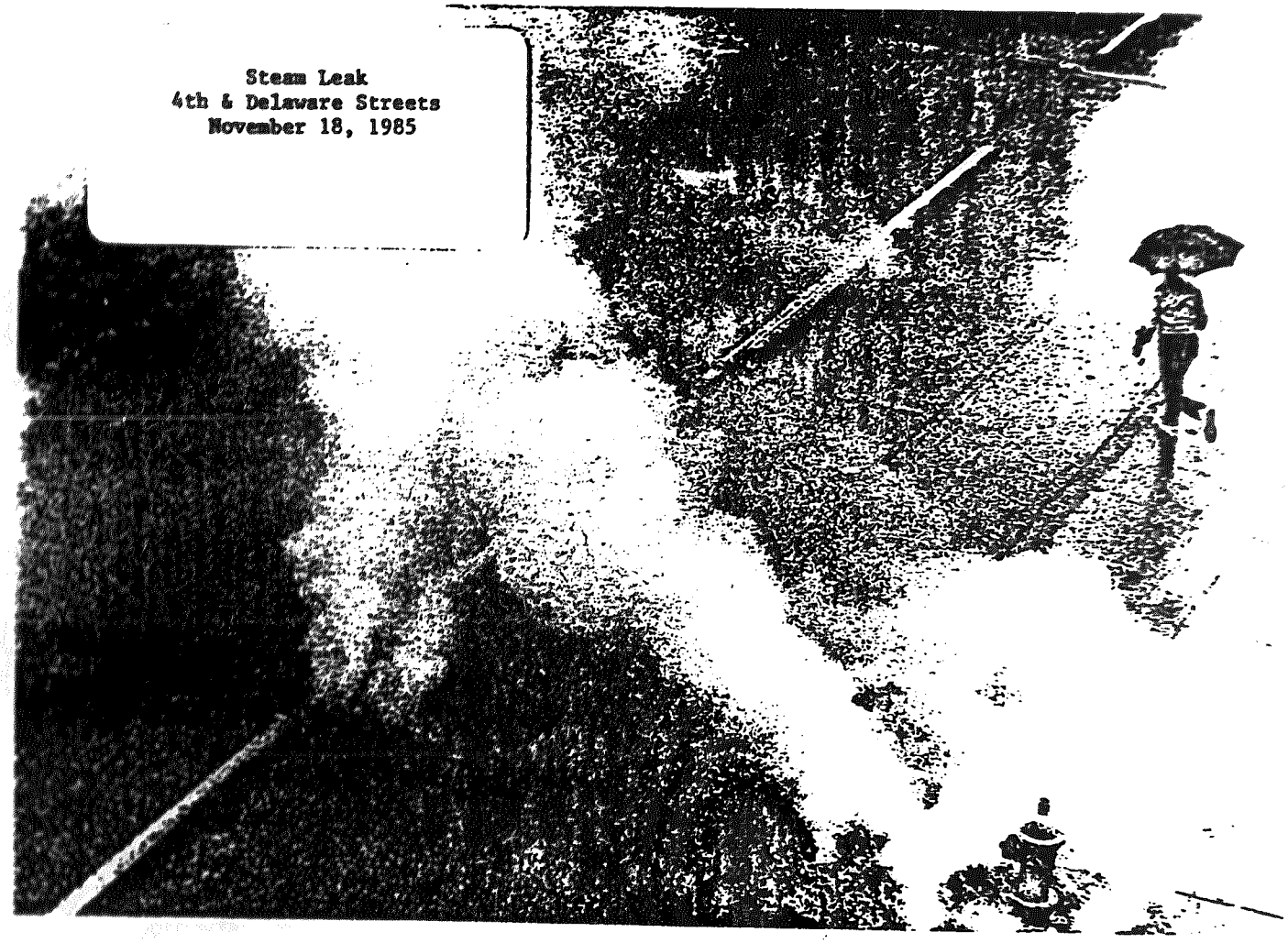
Steam losses in 1981 were close to 45% of the total steam produced. More recently, steam losses have been reduced to about 20-25% yearly through a concentrated program of leak repairs. Presently, steam leaks are occurring at the rate of about three or four a month. Due to their urgency, most leaks are repaired on an overtime basis. 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.

In addition to being costly, the repair of steam leaks greatly inconveniences the public with excavation obstructions that impede the

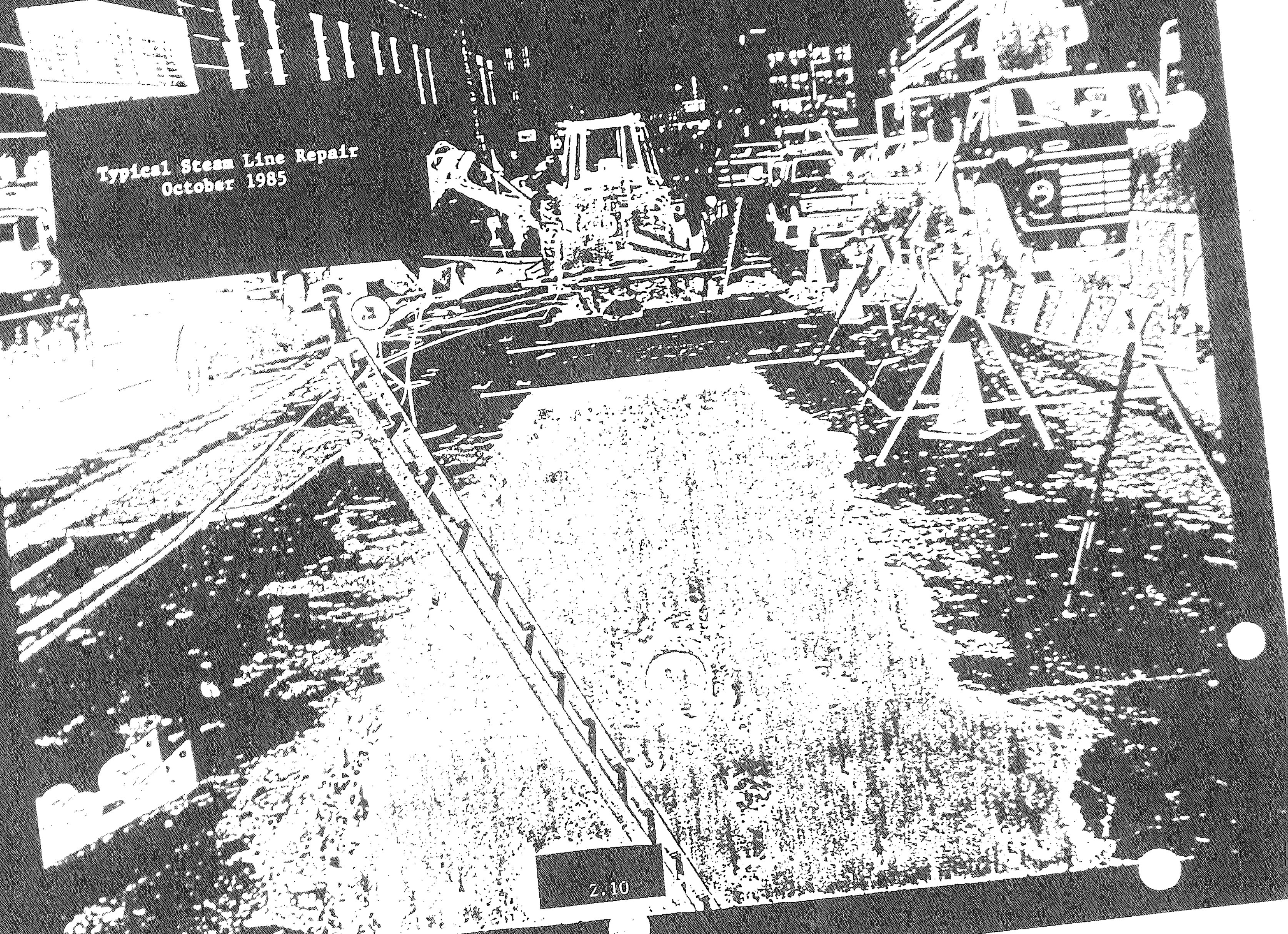
flow of traffic in the Downtown area. Some repair jobs last three to four weeks due to weather conditions, traffic restrictions, and depth of excavation.

Manpower in the Steam Department consists of three two-man construction crews whose primary duty is street excavation, plus seven men who perform daily operation and maintenance. The department is managed by a superintendent, and two supervisors direct crew activities.


Steam Leak Repair
13th & Baltimore Streets
October 1985



Steam Leak
4th & Delaware Streets
November 18, 1985



Typical Steam Line Repair
October 1985

III. Conversion Test Project

A. Project Scope and Purpose

The purpose of the conversion test project is to establish the operational and economic feasibility of converting present District Steam Heat 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 equipment within commercial property and tying Company-owned production equipment to privately-owned piping is new to KCPL and the Company has much to learn. Experience must be gained in engineering as well as in determining customer acceptance of on-site electric boilers.

The scope of the project includes working with up to eight customers that are presently served by steam laterals which can be disconnected once the conversion is complete. Installation sites were selected so that service through the 1985-86 heating season would provide data for estimating a total Downtown conversion.

B. Selection of Customers and Initial Installations

In August 1984, 125 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 entry.

In December 1984, KCPL prepared cost estimates for initial installations of on-site boilers at various customer locations and began to confirm specific customer participation. Customers were selected for initial installations because their locations allowed KCPL to abandon sections of deteriorated underground steam laterals after completing the conversions to electric boilers.

Securing agreements proved time-consuming, so instead of securing a set number of customers for the test, KCPL sought to have as many boilers as possible installed and operating during the 1985-86 heating season consistent with sound engineering and budgetary restraints.

Customers participating in the test project --1985-86 heating season-- are:

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

C. Engineering the Installations

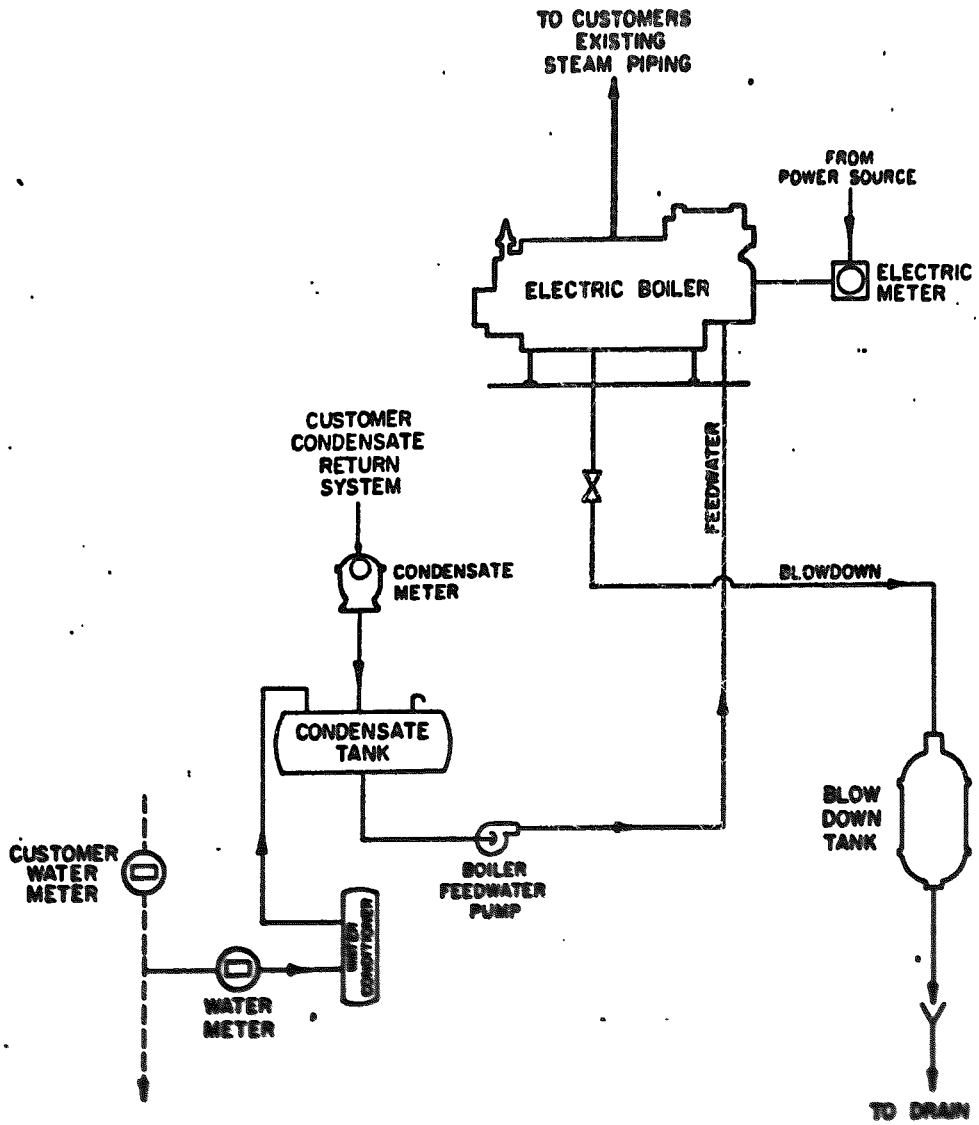
KCPL's Engineering Department proceeded with gathering bids for the various locations considered and awarded contracts to three local contractors for mechanical and electrical work at the customer premises. Generally, contractors were responsible for the detailed engineering while KCPL retained overall project management.

Once a customer was selected for the project, KCPL's Commercial Operations and Engineering Departments calculated the required boiler size, based primarily on a survey of the building and past usage data. Then, Distribution Engineering determined how the new electric load would be served. 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 Kansas City. The construction period averaged six to eight weeks to final acceptance.

The schematic of a Typical Electric Boiler Installation, Figure 3-1, shows the main components of an on-site steam supply system.

Figure 3-1

TYPICAL ELECTRIC BOILER INSTALLATION



The boilers purchased for the test project are 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.

In August 1985, the building owners of the Home Savings Building at 1006 Grand requested to be a boiler test site. Because the Home Savings Building is the largest of the on-site electric boiler installations, the job was awarded to a local consulting firm for engineering design and project management. Because of the extensive scope of work required, KCPL contracted for the design of this larger project due to time constraints for completion of the work and to gain the experience of working with contracted engineering services for this type of installation.

To date, electric distribution connections have been installed on schedule for four of the five locations.

D. Installation and Operating Experience

As of December 1985, there were five locations with 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 will not be completed until

January 1986, because construction of the new United Missouri Bank Building has prevented KCPL's electrical installation crews from completing the vault work necessary to serve the boiler. The fifth installation is being operationally evaluated. These five installations will provide data to KCPL about installation and O&M costs plus indications of the typical problems and customer reactions that may be encountered at future locations. At future locations where the electric network does not exist or does not have the capacity to serve the load, lead time to install new electric distribution equipment will probably extend some 16 to 24 weeks.

Where possible, the test installations have used the condensate metering systems already in place. Each installation has a mag tape electric meter. Other meters measure the feed water to the boiler and all boiler blowdowns. One installation includes a special steam flow meter on the output of the boiler. The purpose of all this extensive metering is primarily 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 and metered by the condensate meter except, of course, that which is lost to blow down.

The test project also addresses feedwater treatment. Customer condensate is analyzed before KCPL puts the boilers in service to ensure that any corrosion problem that exists within the customer's

system are 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 lengthy blowdowns.

For the test project, the boiler at Stanley Sargent has only manual blowdown. The total amount of dissolved solids is being maintained at an acceptable level through the use of regularly scheduled manual blowdown. After one month's operation, a test of the condensate indicates a decreasing PH level and will require some chemical treatment. This can be done manually on a regular basis. The installation of a deaerator unit in the future may solve this problem.

The boilers at American Formal Wear, Upsher Labs, and McWhirter Printers all have automatic blowdown capability and Sparge deaerator units. The condition of water at these locations will be monitored as the boilers are energized.

The boiler installation at Home Savings Building will also have automatic blowdown capability and a Sparge deaerator unit, as well as automatic chemical feedwater treatment. Automatic treatment is necessary due to a high probability of the need for significant boiler feedwater makeup.

Overall, the test project has required a full range of water treatment techniques. However, the final data and results about feedwater will not be available until more operating experience is gained during the 1985-86 heating season.

Because the actual operation and maintenance phase of the test project is just beginning, any definitive conclusions are premature. However, the Steam Department plans to inspect each boiler installation every work day and prepare a log sheet. In the future, daily inspection should not be required to provide adequate and reliable steam service to customers with on-site electric boilers. However, at this stage of our experience the operating data is valuable.

To date, customers have indicated satisfaction both with the contractors installing the boilers and with the KCPL personnel responsible for the installation, operation, and maintenance of the on-site electric boilers.

The five locations at which a boiler will be operating this heating season are: McWhirter Printers, American Formal Wear, Upsher Laboratories, Stanley Sargent, and Home Savings Building.

E. The Technology

1. Electric Boilers.

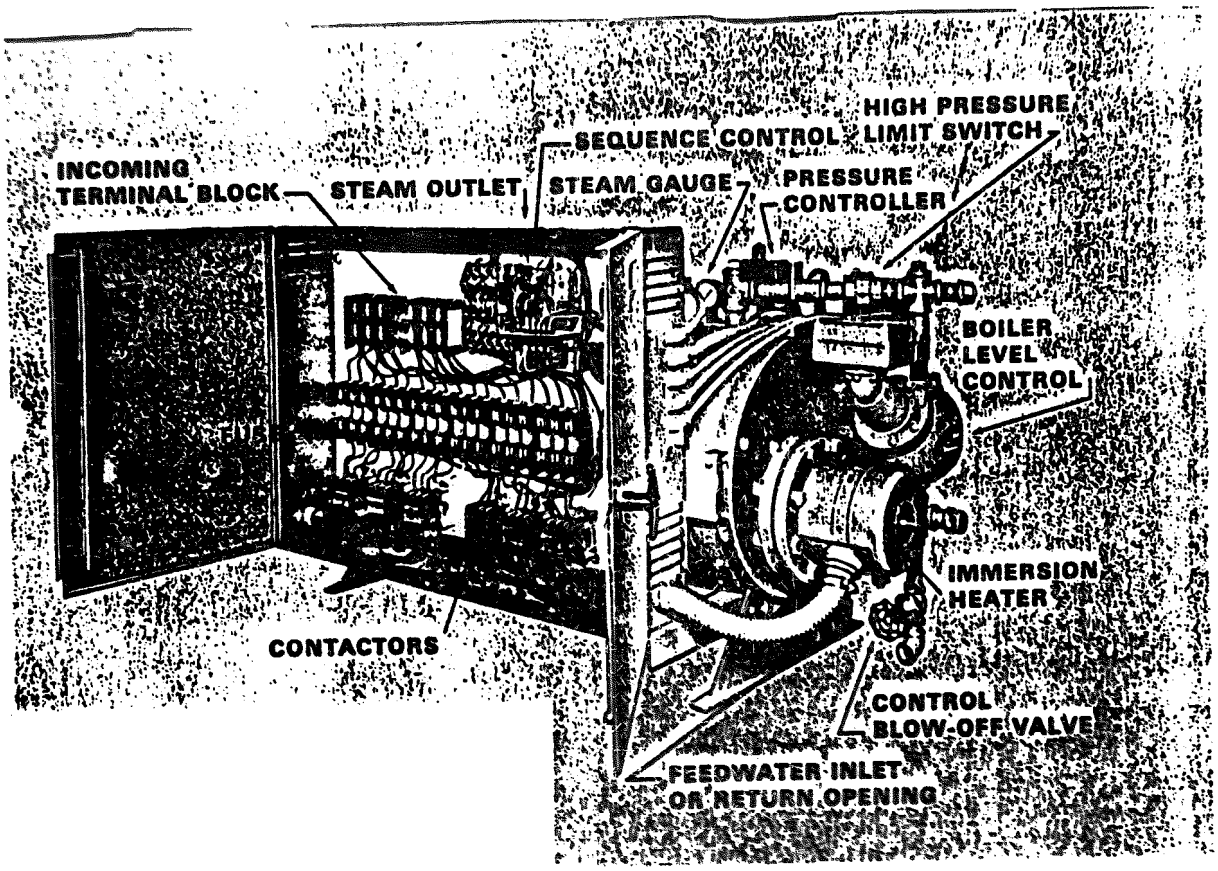
Electric boiler systems consist of a high pressure steam boiler

with electric immersion resistance elements, a condensate collection system, and miscellaneous equipment including power disconnect switches. The electric immersion resistance element steam boiler is essentially a pressure vessel. It contains fixed immersion resistance elements and controls that cycle these 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 that is, in turn, connected to the boiler by a demand control pump. Additional equipment generally includes power switches, and current transformers; electrical cabinets; water, condensate and power meters; blow down tank; boiler make up water line; and electrical conduit.

Electric boiler ratings range from 6KW, roughly 2'x3'x5' in size, to 1100KW, roughly 5'x5'x10'. Power feeds are 208V and 480V, requiring 3-phase, 4-wire supply. [Shown in Figure 3-2.]

Figure 3-2

Depiction of Electric Steam Boiler



2. Electrode Boilers.

Electrode boiler systems consist of a boiler vessel, high voltage switchgear and feedwater treatment equipment.

The boiler pressure vessel has a central column (header). Water passes from this header through nozzles toward surrounding electrode targets. Electrical current flows through the jets of water from the neutral header to the electrode and through the stream of excess water falling from the electrode to a fixed neutral. Steam is generated at the surface of the streams of water in amounts proportionate to the water's conductance.

The boiler steam output is regulated by controlling the water level in the nozzle header so that a greater or smaller number of nozzles are supplied with water, and thus a greater or smaller amount of water comes into contact with the boiler electrodes. This water level is controlled by varying the water flow to the header with the respective boiler controls -- either to maintain the desired steam pressure or to prevent the boiler exceeding the KW load setpoint. The boiler electrodes are located entirely within the boiler steam space so that stopping the boiler circulating pump shuts down the boiler.

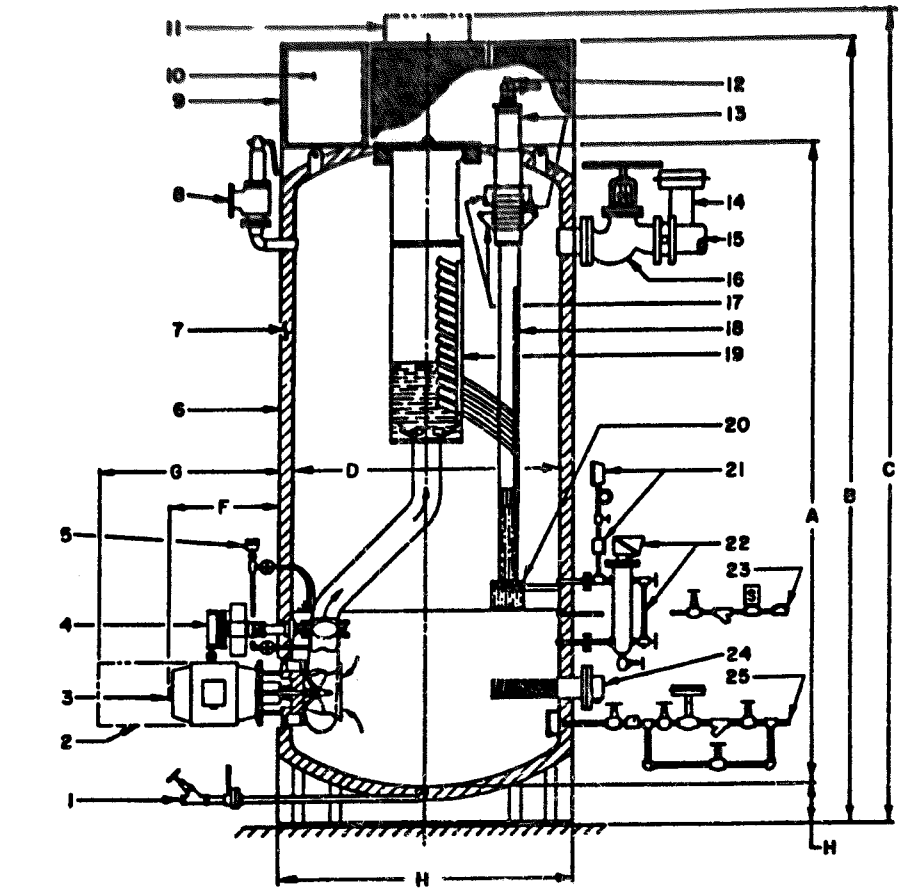
The high voltage switchgear is the stored energy type rated for the boiler voltage and current load. It protects both the branch

and feeder circuits from instantaneous overcurrent as well as protects the boiler itself.

Feedwater treatment equipment consists of a water softener to reduce the hardness of the water and a deaerator to eliminate most of the oxygen and carbon dioxide, which minimizes system corrosion.

The ratings of electrode boilers range from 2000 KW to 50,000 KW, are about 5 to 10 ft in diameter, and can be from 12 to 25 ft high with suitable clearance. These units generally operate on 13.2 KV. [Shown in Figure 3-3.]

Figure 3-3
Depiction of Electrode Steam Boiler



1. Blowdown Valves
2. Pump Removal Clearance
3. Recirculation Pump
4. Output Control Valve
5. Conductivity Cell
6. Insulation
7. Sheet Metal Encl
8. Safety Valves
9. Electrode Terminal Enclosure
10. Conduit Entrance Panel
11. Nozzle Header Removal Clearance
12. Conductor Rod
13. Insulators
14. Back Pressure Regulator
15. Steam Outlet
16. Non-Return Valve
17. Insulator Shields
18. Electrode/Strike Plate
19. Nozzle Header
20. Counter Electrodes
21. Pressure Control Manifold & Gauge
22. Water Level Control, Column & Gauge
23. Surface Blowdown
24. Standby Heater
25. Feedwater Inlet w/3-Valve Bypass

F. Installation Costs

A primary objective of the test project is to collect actual operating and installation costs. Operating costs will be available after the current heating season.

Installation costs for the five installations under construction are shown in the following table. The costs reflect material and labor required at each location and include costs for the boiler itself. Engineering, project management, taxes and the cost of providing electric distribution to the customer location are not included.

COST OF INSTALLATION

ADDRESS	LOAD	BOILER	MATERIAL	LABOR	TOTAL
Stanley Sargent 1406 Walnut	74 KW	$ 6,410	$ 9,107	$10,948	$ 26,465
McWhirter Printers 909-11 Wyandotte	296 KW	$11,045	$ 8,243	$20,192	$ 39,480
Upsher Labs 1336 Walnut	222 KW	$10,080	$15,642	$22,590	$ 48,312
American Formal Wear 1331 Main	93 KW	$ 7,050	$ 6,150	$12,174	$ 25,384
Home Savings 1006 Grand	2220 KW	$59,476	$52,043	$67,907	$179,446

G. Customer Acceptance

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. The easement agreement defined that there would be no risk to the customer.

After this initial contact and preliminary approval by the customer, Commercial Operations and Engineering personnel met again with the owner to select a suitable location for the boiler. Location drawings were then prepared and included as part of the easement documents. In most cases, the boiler was ordered and the contract selected after the customer signed an agreement.

KCPL reimburses the cost of feedwater supply to the boiler in the test project installation to the customer, because water to the boiler is supplied from the customer side of his City water meter. This arrangement eliminated the need to install a separate water service entrance.

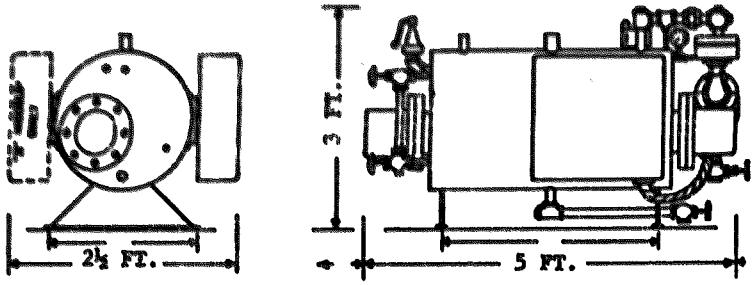
The test project has demonstrated to KCPL the requirements of various 1) building permits, 2) mechanical and electrical inspections, 3) compliance with fire codes necessary prior to construction, and 4) operation of on-site boilers at customer locations.

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.

[The ratings and mechanical configuration of boilers that have been installed in the Test Program are shown in Figure 3-4.]

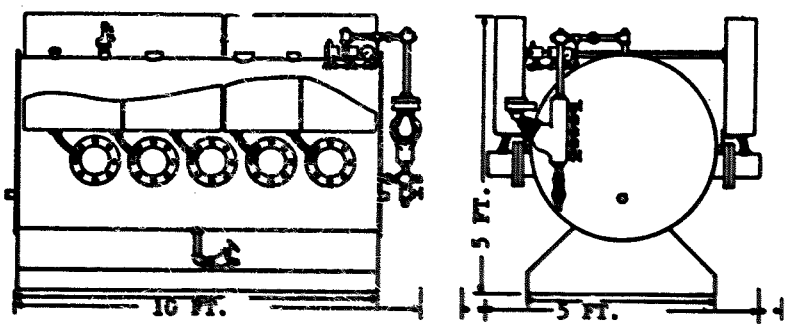
Figure 3-4
Test Program and Ratings of Installed Boilers

Typical Boiler Sizes



208 Volt - Three Phase

Test Program Location	Boiler H.P.	kW	Amps
	.6	6	16.7
	.9	9	25.0
	1.5	15	41.7
	1.8	18	50.0
	2.4	24	66.7
	3.0	30	83.4
	3.6	36	100.0
	4.8	48	133.4
	6.0	60	166.7
1406 Walnut	7.4	74	205.5
1331 Main	9.3	93	259.0
	11.2	112	310.8
	14.8	148	411.0
	16.8	168	466.2
1336 Walnut	22.2	222	616.5
909-911 Wyandotte	29.6	296	822.0
	37.0	370	1027.5
	44.4	444	1233.0
	51.8	518	1438.5
	59.2	592	1644.0
	66.6	666	1849.5



480 Volt - Three Phase

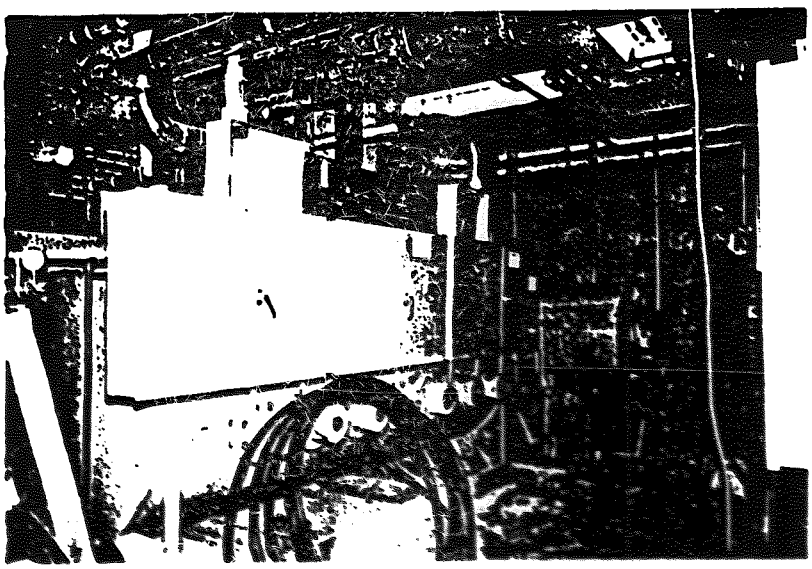
Address	Boiler H.P.	kW	Amps
	74.0	740	891.0
	81.4	814	980.1
	88.8	888	1069.2
	96.2	962	1158.3
	103.6	1036	1247.4
1006 Grand (2 req'd)	111.0	1110	1336.5

Customers that 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. [Two of the completed installations are shown in Figure 3-5.]

Figure 3-5

Test Project Boiler Installations

McWhirter Printers
909-11 Wyandotte
296 kW Electric Boiler



Home Savings
1006 Grand
1110 kW Electric Boiler (one of two)

IV. Customer Energy Studies

A. Approach

Initially, energy audits will be performed on buildings at the owners' requests. However, after satisfying these initial requests, KCPL expects to pursue building energy studies in the same order as the conversions.

After suitably reviewing organizations that could perform such work, KCPL selected Energy Masters Corporation to perform the building energy studies. The studies consist of: 1) a survey of the building, 2) an analysis of the steam and electrical-consumption over the past three years, 3) a calculation of the building heating and ventilation requirements, 4) an analysis of each energy consuming system in the building, 5) a correlation of calculated steam requirements with the actual steam usage, 6) a determination of size of a replacement electric steam boiler, 7) a schematic of the electric boiler design and a detailed cost estimate for the recommended modifications.

B. Results to Date (Preliminary)

Owners have requested studies on approximately 20 buildings. Thirteen of these building studies have already been assigned to the consultant, with three studies completed and seven others in

progress. So far the studies have all involved major buildings and have been time consuming. With some smaller buildings in the upcoming studies, we anticipate having about ten studies completed by year end. Energy Masters Corporation has adequately covered all items set forth in its contract, and we expect the firm to continue to perform the energy audits.

Complete energy studies are available for:

Home Savings Building
1006 Grand

Jackson County Detention Center
1307 Locust

Jackson County Justice Center
1305 Locust

Final drafts are being reviewed on:

Kansas City Southern Building
114 West 11th

Field work is essentially completed on the following buildings:

Deramus Building
301 West 11th

Folly Theatre
300 West 12th

Hereford Building
715 Hereford Drive

Jackson County Courthouse
405 East 12th

The Rodeway Inn
601 Main

Vista International Hotel
200 West 12th

The following buildings have been assigned to Energy Masters Corporation with only preliminary work done to date:

Board of Trade Building
1009 Wyandotte

Centennial Building
222 West 10th

DeWitt Building
15 West 10th

Insurance Exchange Building
21 West 10th

The following buildings have been assigned to Energy Masters Corporation with no work done to date:

Federal Building
911 Walnut

Federal Office Building
601 East 12th

U.S. Courthouse
811 Grand

V. Major Steam Supply Options

A. Continuation of Grand Avenue Station as a Central Station Supply of Steam

1. General Background

The Grand Avenue Station was constructed in 1904 by the Kansas City Street and Railway Company. KCPL purchased it in 1927 from the Kansas City Transit Company to increase the available supply of steam to Downtown steam customers. Twenty-inch steam lines were tapped off of the 185 lb steam header that had supplied early piston type engines. These lines were extended from Grand Avenue to heating stations that were eventually connected to pressure reduction stations. These stations and main steam lines are in service today.

In 1930, stoker-fired boilers were installed to increase the steaming capacity and to replace the original boilers. In 1944, a new 300 Mlb/hr boiler #6 was added that could be fired with either pulverized coal or gas. Two more boilers #7 and #8, similar to #6, were added in 1948 and 1950 respectively. After these additions, the stoker-fired boilers were necessary only for backup. A fourth boiler, #1A, was installed in 1967 to replace 1930s-vintage boilers, which had become undependable and costly to maintain. Boiler #1A operates on gas or oil fuel.

The three 650 pound boilers #6, #7, and #8 supply steam to the 185 pound steam headers through pressure-reducing valves. Steam from boiler #1A is produced at 185 pounds and connects directly to the 185 pound steam mains.

Boiler #6 was partially retubed in 1984. Boilers #7 and #8 will each need a partial retubing in the next five years if the station is to continue operating after 1990. The partial retubing is only a temporary measure, however, and extensive rebuilding or boiler replacement will be necessary eventually due to deterioration from more than thirty-five years of service.

Boiler #1A was retubed in 1984 and became only marginally dependable as a steam supply to the downtown 185 pound steam headers. The boiler is normally operated as backup to the coal-fired #6 and #7 boilers since it uses more costly gas or oil. In addition, boiler #1A is less efficient, because it has no air preheater or feedwater heaters.

Grand Avenue boilers #6, #7, and #8 use coal instead of gas due to the considerable cost advantage of coal over gas.

B. Major Boiler Options

Four major options are feasible to continue steam service from Grand Avenue Station past 1990:

1. Retain the four existing boilers and limit the capital expenditures to only those necessary to maintain an acceptable level of equipment reliability;
2. Replace the three existing coal-fired boilers with newer technology coal-fired boilers to improve manpower utilization and fuel conversion economy while retaining the gas/oil-fired boiler as backup;
3. Replace the three existing coal-fired boilers with electric-energized boilers and retain the gas/oil-fired boiler as backup;
4. Retain the four existing boilers to supply winter steam load when demands are sufficient to operate the boilers on coal, and install two small electrode boilers to serve sharply lower March-to-November loads.

C. Discussion of the Four Boiler Options

Option 1 - Continue present operation. [Scenario G1.]

The chief advantage of this option is the low initial capital investment. Capital expenditures are kept to a minimum, making only

those expenditures necessary for safety, environmental requirements and reliable service.

The significant disadvantage is the high operation and maintenance expense needed for a wide range of aging equipment. Major replacement and repairs will be required by year 2000 for long-term operation. However, no investment for new long-term facilities is included in this option.

Approximately 72 employees are required for winter station operation and steam production. Fifty-two employees are required during the summer when the station is on gas fuel and has only one operating boiler to maintain.

The station's fuel is low-cost coal during the winter season. When weather moderates, the steam demand drops so markedly that the station must switch to gas as a boiler fuel for approximately eight months, because the low steam demands during the off-peak season are below the minimums necessary to maintain a stable fire in a boiler operating on coal.

Presently, there is a more than two-to-one price advantage of coal over gas, with coal costing $1.33 per MMBTU and gas $3.33 per MMBTU. Gas is used only for boiler startup and flame stabilization.

Gas is used to fire the #1A boiler when a standby boiler is needed to assure a continuous steam supply.

The cost of gas is expected to escalate more rapidly than coal once the current short-term gas glut diminishes. Thus, gas is not acceptable as a long-term fuel. During cold weather extremes, gas is not dependable as a boiler fuel because KCPL's supply is subject to curtailment. When winter temperatures reach their lowest point, KCPL's gas fuel is sometimes curtailed to match gas supplies to peak demands or to keep gas demands within the pipeline capacities. For example, gas for steam generation was curtailed for several consecutive days in December 1983 due to temperature extremes.

In March 1981, the Gas Service Company advised KCPL of projected complete industrial gas curtailments December 1981 through March 1982. Complete curtailments had already occurred on three occasions in 1980 and 1981, for a total of sixty hours. In addition to these complete curtailments, there were eleven other curtailments between 1976 and 1982. For these reasons gas is not considered a dependable fuel for winter operation.

Option 2 - Replace the existing coal-fired boilers with new technology coal-fired boilers. [Scenarios G2, G3, and G4.]

This option has new technology boilers sized to match the winter steam demand. The main disadvantage is the relatively high capital cost.

New equipment would provide facilities capable of supplying central station steam beyond the year 2000, with fewer operating personnel and less maintenance. It would also permit coal-fired operation at lower steam loads.

An estimated 62 men would be needed to operate and maintain the station. Fuel handling personnel, boiler operators, instrument and electrical technicians, and station support are expected to require the same number of persons as the present operation.

It would be possible to replace existing boilers with any of three newer technology boilers. The station fuel cost would be lowest for fluidized bed coal technology, because the station would be able to operate primarily on lower cost coal for most of the eight-month low load period with this type of boiler.

The new technology options are:

STOKER BOILER. A stoker boiler is a water wall boiler that burns coal placed on a traveling grate that passes through the boiler.

PULVERIZED COAL BOILER. A pulverized coal boiler is a water wall boiler that burns pulverized coal transported from the pulverizer to the burner by a stream of air.

CIRCULATING FLUIDIZED BED BOILER. A circulating fluidized bed boiler is a water wall boiler that burns coal fed with limestone into the lower portion of the combustion chamber. The high turbulence in the circulating bed causes the coal to mix quickly and uniformly with the limestone. Hot flue gas and fly ash are separated from coarse solids by the hot cyclone.

Selection of a boiler from the above technologies would require a more complete analysis. However, the savings from reduced manpower and reduced fuel expense would not be adequate to offset the considerable cost of investing in any of the new technology boilers.

Option 3 - Replace the three existing coal-fired boilers with electrode boilers. [Scenario G5.]

This option considers central station electric-powered electrode boilers sized to match the present winter steam demand.

Electrode boilers are simple to operate and maintain. Large electrode boilers would be similar to those operated at Iatan and Hawthorn Stations for auxiliary steam. The electrode boilers would be sized for a total steam capacity of 350,000 lbs per hour, supplied from five

70,000 lb per hour boilers. Steam can be generated from the electrode boilers on a year-round basis as one boiler has the capability to "turn down" its output for the reduced number of customers desiring steam in Spring through Fall. The low pressure #1A boiler would need to be operated in the winter during forced outages of electrode boilers. Only one electrode boiler would be needed during the eight non-winter months. A projected 52 people would be required to operate this alternative, a number similar to summer station operation on gas fuel.

The electric supply for the electrode boilers would be from the substation adjacent to the Station. The electrode boiler maximum winter demand of about 130 MW would require installation of additional capacity at Grand Avenue substation at an estimated cost of $5.35 million.

The main disadvantage to the installation of central station electrode boilers is the cost of electric energy used to supply customer loads and distribution system losses. The expense for electric energy is approximately 2.5 times the anticipated total fuel cost for coal and gas of Option 1, the present operation. As with the new technology boilers, the new capital requirement is also a drawback. However, it is about half the capital cost of the new coal-fired boiler technologies. Nevertheless, when the high energy cost and high distribution system operating and maintenance cost are combined with the fixed cost of

the capital investment, the full capacity electrode boilers option is the least attractive of the alternatives considered.

Option 4 - Continue present operation, except install small central station electrode boilers for low steam loads. [Scenario G6]

This option provides savings from electrode boiler operation during the non-winter season. The existing four boilers are operated and maintained for the high demand winter period.

The advantage of this option is the relatively low capital cost of a small electrode boiler to provide for non-winter demand.

The disadvantage of this option is the high energy cost for the electric energy used to supply customer loads and distribution system losses during low-load periods.

There are no general manpower savings from this option, as the same coal-fired boilers must be operated and maintained for winter operations as well as the maintenance, though nominal, for the summer load electrode boilers.

The added energy costs, when coupled with additional fixed capital costs, make this option less advantageous than either the present operation, Option 1, or the fluidized bed new technology, Option 2.

D. Refuse-Derived Fuel (RDF) Facility Option

The utility industry has been developing technology for generating process steam and electricity from municipal solid waste, RDF, so this study considered the practicality of converting Grand Avenue Station into some form of refuse-to-energy facility.

In general, several factors led to the conclusion that a refuse-fired boiler facility at Grand Avenue Station would not be practical.

1. The available land at Grand Avenue Station could support only a 500 ton/day refuse-fired operation. Such an installation would produce approximately 120,000 lb per hour of steam. The Downtown steam heat load varies from 15,000 lb per hour in the summer to 350,000 lb per hour in the winter, so winter load requirements would have to be made up by burning gas or fuel oil in an additional boiler. An additional boiler probably would be required for light non-winter load, for load swings and for backup. A refuse-fired boiler costs an estimated $40 million, based on the industry average installed cost of $80,000/ton of refuse and a 500 ton/day facility. This capital cost does not compare favorably with other scenarios evaluated in this study.

2. The load factor for the Downtown steam heating system is the opposite of the load factor for refuse production. That is,

steam load is at a minimum in the summer months, when refuse production is at a maximum.

3. The operation of Grand Avenue Station as a refuse-derived facility would be incompatible with the plans of Kansas City and the City Market Area Redevelopment Association. Those entities plan to develop the general area between central Downtown, the City Market, and the Missouri Riverfront into a cultural and civic district. Truck delivery of refuse would severely hamper traffic in this area.

For these reasons, a refuse-derived facility at Grand Avenue Station is not considered desirable or economically feasible and is not addressed further in this study.

VI. Distributed Electrode Boiler Alternatives

One major set of possibilities for providing reliable steam service combines electrode and electric boilers. No steam is generated at a central station, and the central station and virtually all of the high pressure mains and all high and low pressure mains are retired.

Several options are based on using a single, large electrode boiler in combination with on-site electric boilers.

A. Electrode Boiler at 1319 Wyandotte [Scenario C2]

An electric boiler system would be installed at all customer locations except: the Vista Hotel, the Muehlebach Hotel, the Kansas City Club, the H. Roe Bartle Convention Center, and the Jackson County Detention Center. These five locations would be served by a high pressure electrode boiler system located in the area of 1319 Wyandotte. This option requires real estate in the area of 1319 Wyandotte, the erection of a building to enclose the electrode boiler system, and the replacement of the entire 105 lb steam distribution system.

B. Electrode Boiler at Wall Street [Scenario C3]

An electric boiler system would be installed at all customer locations except: the Vista Hotel, the Muehlebach Hotel, the Kansas City

Club, the H. Roe Bartle Convention Center, and the Jackson County Detention Center. These five locations would be served by a high pressure electrode boiler system located in the Wall Street Desuperheating Station at 6th and Baltimore. This option requires additional real estate at 6th & Baltimore and the erection of a building to enclose the electrode boiler system. It also requires replacement of the entire 105 lb steam distribution system and removal of existing equipment at the Wall Street Station.

C. Electrode Boiler at 1319 Wyandotte and Jackson County Building [Scenario C4]

An electric boiler system would be installed at all customer locations except: the Vista Hotel, the Muehlebach Hotel, the Kansas City Club, the H. Roe Bartle Convention Center, and the Jackson County Detention Center. The first four of these customers would be served by a high-pressure electrode boiler system located in the area of 1319 Wyandotte. This option requires real estate in the area of 1319 Wyandotte, erecting a building to enclose the electrode boiler system and obtaining space at the Detention Center for another electrode boiler system to serve Jackson County Detention Center. It also requires the replacement of the entire 105 pound steam distribution system.

D. Electrode Boiler at 1319 Wyandotte; Combination High Pressure System and Electrode Boiler South of I-70 [Scenario C5]

The electric boiler system would be installed at all existing low-pressure customer locations and high-pressure customers north of I-70. The existing high-pressure customers south of I-70 would be served with the existing high-pressure steam distribution system and a high pressure electrode boiler system in the area of 1319 Wyandotte. This option requires replacing the 105 lb steam distribution system, renovating the existing 185 lb steam distribution system, acquiring real estate in the area of 1319 Wyandotte, and erecting a building to enclose the electrode boiler system.

E. High Pressure Reduction Plus Electrode Boiler at 1319 Wyandotte [Scenario C6]

Selected low-pressure steam customers would be placed on the existing high-pressure steam distribution system by installing pressure reducing stations at these customer locations. The existing high-pressure steam system south of I-70 would be served by a high-pressure electrode boiler in the area of 1319 Wyandotte. The remaining customers would be served by on-site electric boiler systems. This option requires installing pressure reduction stations at necessary customer locations, acquiring real estate in the area of 1319 Wyandotte, erecting a building to enclose the electrode boiler system, replacing the 105 pound steam distribution system and renovating the 185 pound steam distribution system.

VII. Economic Analysis

Economic evaluations were made of many alternatives for providing steam service to the Downtown steam heat customers. The purpose of the economic evaluation was to select the more economically attractive scenarios for a more detailed rate analysis [Section VIII]. The Steam Conversion Study Decision Tree, Figure 7-1, outlines 26 of these scenarios. The assumptions underlying each of these cases are detailed in Figures 7-2a, 7-2b and 7-2c.

The scenarios are divided into two major groups:

- scenarios in which Grand Avenue Station continues to operate
- scenarios in which steam service is accomplished by distributing electric and electrode boilers at customer locations across the system

Figure 7-1

STEAM CONVERSION STUDY
DECISION TREE

Options Chosen For Further Analysis

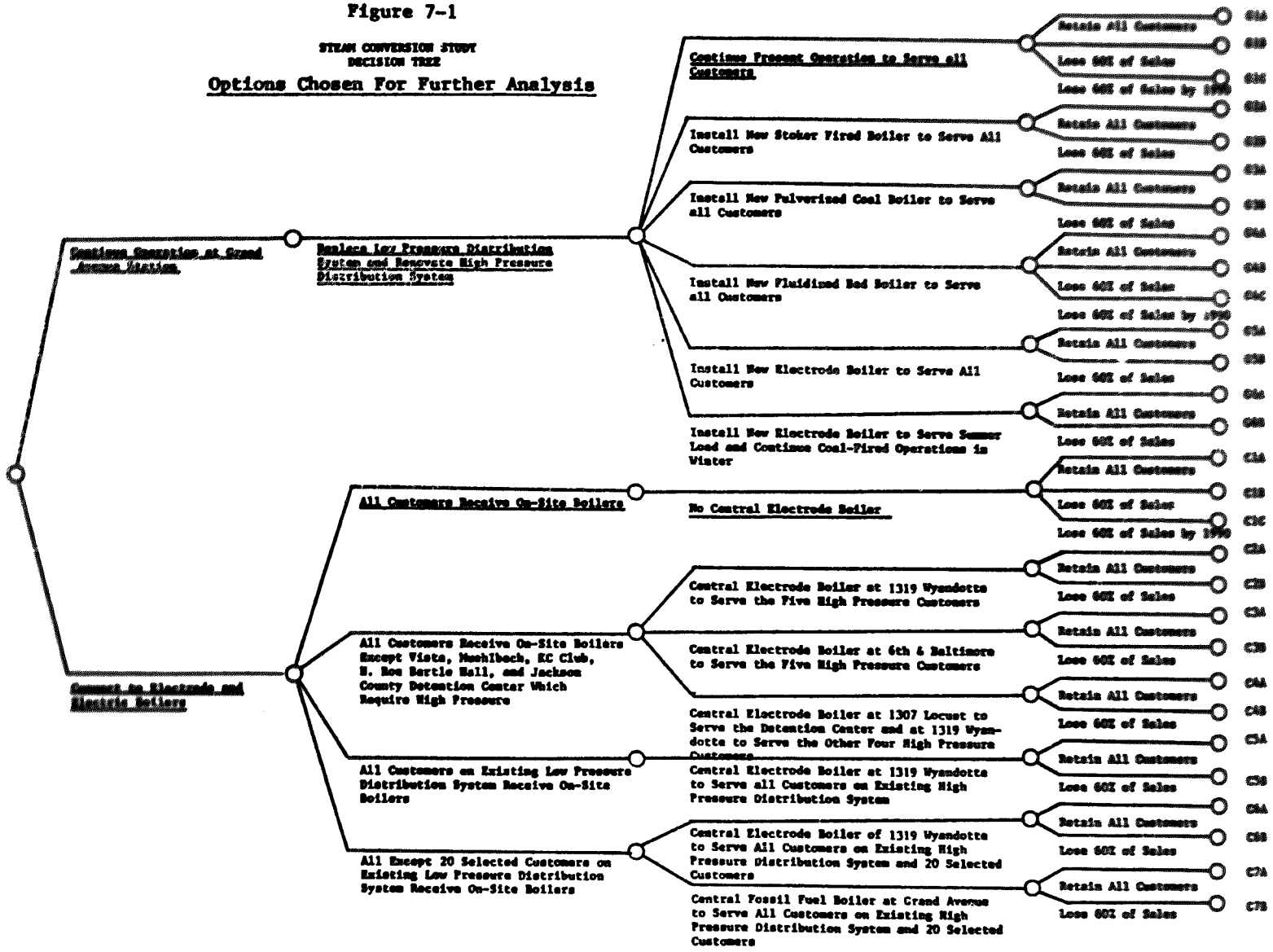


TABLE 7-__
DESCRIPTION OF SCENARIOS FOR ECONOMIC ANALYSIS

Scenario	Description	New Production Equipment Installed	Location of Central Production Facilities	New Steam Distribution Equipment Installed	Labor Levels	System Losses	Boundary Plant Retired
[illegible]	BASE CASE - Grand Avenue Station continues to operate using the current equipment. Retubes are done on the boilers and miscellaneous annual expenditures are assumed to keep Grand Avenue operational. The steam distribution system is replaced almost in its entirety.	Retube of two Grand Avenue boilers. Miscellaneous annual capital expenditures	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 72 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to Scenario B1B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)				Grand Avenue - 52		
[illegible]	Identical to Scenario B1B except that 60% of steam sales are lost by the year 1990 (Customers decr. from 131 to 91)				Grand Avenue - 52		
[illegible]	NEW STOKER FIRED BOILER - Grand Avenue Station continues to operate. 350 klb/hr stoker fired boiler is installed by 1995. The steam distribution system is replaced almost in its entirety.	350 klb/hr Stoker Fired Boiler	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 62 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to Scenario B2B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)				Grand Avenue - 52		
[illegible]	NEW PULVERIZED COAL BOILER - Grand Avenue Station continues to operate. A 350 klb/hr pulverized coal boiler is installed by 1995. The steam distribution system is replaced almost in its entirety.	350 klb/hr Pulverized Coal Boiler	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 62 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to Scenario B3B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)				Grand Avenue - 52		
[illegible]	NEW FLUIDIZED BED BOILER - Grand Avenue Station continues to operate. A 350 klb/hr pulverized coal boiler is installed by 1995. The steam distribution system is replaced almost in its entirety.	350 klb/hr Fluidized Bed Boiler	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 62 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to scenario B4B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
[illegible]	Identical to scenario B4B except that 60% of steam sales are lost by the year 1990 (Customers decr. from 131 to 91)						
[illegible]	NEW ELECTRODE BOILER - Grand Avenue Station continues to operate. A 350 klb/hr electrode boiler is installed by 1995. The steam distribution system is replaced almost in its entirety.	350 klb/hr Electode Boiler	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 52 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to scenario B5B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
[illegible]	NEW POWER PARK ELECTRODE BOILER - Grand Avenue Station continues to operate. A 50 klb per hour electrode boiler (able to handle summer peak alone) is installed by 1990. The steam distribution system is replaced almost in its entirety.	50 klb/hr Electrode Boiler Retube of two Grand Avenue boilers Miscellaneous annual capital expenditures	Grand Avenue Station	19000 ft. of low pressure pipe replaced. 75% of high pressure steam distribution system replaced.	Grand Avenue - 72 Distribution - 16	12% of downtown steam volume.	19000 ft. of low pressure steam distribution system. 24000 ft. of high pressure pipe.
[illegible]	Identical to scenario B6B except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)				Grand Avenue - 52		

FIGURE 7-2b
DESCRIPTION OF SCENARIOS FOR ECONOMIC ANALYSIS
(CONTINUED)

Scenario	Description	New Production Equipment Installed	Location of Central Production Facilities	New Steam Distribution Equipment Installed	Laser Levels	Level of Losses	Existing Plant Retired
C1A	100% CONVERSION - All customers receive steam from an on-site electric or electrode boiler. The entire steam distribution system is retired.	Electric and Electrode boilers for 131 customers	none required	none	22 mm	2% of downtown steam volume.	Grand Avenue Station Steam Distribution System
C1B	Identical to scenario C1A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
C1C	Identical to scenario C1A except that 60% of steam sales are lost by the year 1990 (Customers decr. from 131 to 91)						
C2A	1319 WYANDOTTE (5 CUSTOMERS) - All customers receive steam from an on-site electric or electrode boiler except Vista, Smithbush, K.C. Fish, H. Roe Bartle, and Jackson Co. Detention Center, which will be served by a central electrode boiler at 1319 Wyandotte. The entire steam distribution system is retired.	Electric and Electrode boilers for all but 5 customers. Central Electrode Boiler	1319 Wyandotte	Steam piping for distribution from the central electrode boiler.	31 mm	3% of all sales from on-site boilers. 12% of all sales from central boiler.	Grand Avenue Station Steam Distribution System
C2B	Identical to scenario C2A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
C2C	6th & BALTIMORE (5 CUSTOMERS) - All customers receive steam from an on-site electric or electrode boiler except Vista, Smithbush, K.C. Fish, H. Roe Bartle, and Jackson Co. Detention Center, which will be served by a central electrode boiler at 6th & Baltimore. The entire steam distribution system is retired.	Electric and Electrode boilers for all but 5 customers. Central Electrode Boiler	6th & Baltimore	Steam piping for distribution from the central electrode boiler.	31 mm	3% of all sales from on-site boilers. 12% of all sales from central boiler.	Grand Avenue Station Steam Distribution System
C2D	Identical to scenario C2A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
C4A	1307 LOCUST (5 CUSTOMERS) - All customers receive steam from an on-site electric or electrode boiler except Vista, Smithbush, K. C. Fish, H. Roe Bartle, and Jackson Co. Detention Center, which will be served by a central electrode boiler at 1307 Locust and a central electrode boiler at 1319 Wyandotte. The entire steam distribution system is retired.	Electric and Electrode boilers for all but 5 customers. Two Central Electrode Boilers	1307 Locust 1319 Wyandotte	Steam piping for distribution from the central electrode boiler.	31 mm	3% of all sales from on-site boilers. 15% of all sales from central boiler.	Grand Avenue Station Steam Distribution System
C4B	Identical to scenario C4A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
C5A	1319 WYANDOTTE (HIGH PRESSURE CUSTOMERS) - All existing low pressure customers receive steam from an on-site electric or electrode boiler. All existing high pressure customers are served from a central electrode boiler at 1319 Wyandotte. The steam distribution system is retired except for portions which are usable for distribution from the 1319 Wyandotte boiler.	Electric and Electrode boilers for all existing low pressure customers. Central Electode Boiler	1319 Wyandotte	Steam piping for distribution from the central electrode boiler.	31 mm	3% of all sales from on-site boilers. 15% of all sales from central boiler.	Grand Avenue Station Steam Distribution System (except high pressure mains south of I-70)
C5B	Identical to scenario C5A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						

FIGURE 7-2c
DESCRIPTION OF SCENARIOS FOR ECONOMIC ANALYSIS
(CONTINUED)

Scenario	Description	New Production Equipment Installed	Location of Central Production Facilities	New Steam Distribution Equipment Installed	Labor Levels	Level of Losses	Existing Plant Retired
C2A	1319 WYANDOTTE (SELECTED CUSTOMERS) - All existing high pressure customers and selected low pressure customers are served by a central electrode boiler at 1319 Wyandotte. All other customers are served by on-site electric and electrode boilers. The steam distribution system is retired except for portions which are usable for distribution from the 1319 Wyandotte boiler.	Electric and Electrode boilers for selected low pressure customers. Central Electrode Boiler 20 pressure reducing stations	1319 Wyandotte	Steam piping for distribution from the central electrode boiler.	31 men	3% of all sales from on-site boilers. 12% of all sales from central boiler.	Grand Avenue Station Steam Distribution System (except high pressure mains south of I-70)
C2B	Identical to scenario C2A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						
C7A	GRAND AVENUE FOSSIL FUEL - A new fossil fuel boiler is installed at Grand Avenue to serve the existing high pressure customers and selected low pressure customers. All other customers are served by on-site electric and electrode boilers. The steam distribution system is retired except the high pressure mains from Grand Avenue.	Electric and Electrode boilers for selected low pressure customers. Fossil Fuel Boiler at Grand Avenue 20 pressure reducing stations	Grand Avenue Station	Steam piping for distribution from the fossil fuel boiler.	Grand Avenue - 72 Distribution - 22	3% of all sales from on-site boilers. 12% of all sales from central boiler.	Steam Distribution System (except high pressure mains to selected customers).
C7B	Identical to scenario C7A except that 60% of steam sales are lost by the year 2000 (Customers decr. from 131 to 91)						

Within the two major groups of scenarios - Grand Avenue continues and distributed electric boilers - the more economically attractive scenarios were identified as possible alternatives for serving Downtown steam customers. Each of these more attractive scenarios was studied in greater detail with particular attention to the economic impact resulting from customer attrition.

Customer attrition has been a primary concern of this study. KCPL has already lost 60% of its total steam sales and over 50% of its customers during the last fifteen years. A large portion of the cost to produce steam is fixed (e.g., Grand Avenue Station), so the reduction in customers has resulted in an increasingly higher cost of service per customer. This trend is likely to continue. The selected service approach must hold the cost per Mlb of steam to a minimum, whether all customers are retained or many customers are lost.

Figures 7-3a, 7-3b, 7-4a and 7-4b display the results of the economic analysis. Figures 7-3a and 7-3b show the total capital expenditures for each of the scenarios evaluated. Figures 7-4a and 7-4b show the levelized annual revenue requirements. The dollars are on a 1985 basis. The "G" scenarios are those which continue operations at Grand Avenue and the "C" scenarios are those which convert steam service to combinations of electric and electrode boilers installed on the customer premises. The economics of retaining all current customers versus losing an additional 60% of sales between 1986 and 2000 are contrasted in the "A" and "B" scenarios at annual sales

levels of 477,000 Mlbs and 191,000 Mlbs, respectively. The "C" scenarios are identical to the "B" scenarios except that the 60% loss of sales is assumed to occur by 1990. This permits targeting capital expenditures to the remaining 40% of customer load.

Figure 7-3a

ECONOMIC COMPARISON OF STEAM CONVERSION SCENARIOS
CAPITAL EXPENDITURES
($ THOUSANDS)
1986-2000

CASE:	B1A	B1B	B1C	B2A	B2B	B3A	B3B	B4A	B4B	B4C	B5A	B5B	B6A	B6B
BOILER MODIFICATIONS	2,573	2,573	2,573	12,573	12,573	14,973	14,973	13,673	13,673	8,473	6,798	6,798	2,823	2,823
STEAM PIPING - LOW PRESS	7,635	7,635	6,180	7,635	7,635	7,635	7,635	7,635	7,635	6,180	7,635	7,635	7,635	7,635
STEAM PIPING - HIGH PRESS	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145
SUBTOTAL	14,780	14,780	13,253	14,780	14,780	14,780	14,780	14,780	14,780	13,253	14,780	14,780	14,780	14,780
ELECTRIC BOILERS - 100 MW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CENTRAL ELECTRONIC BOILERS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPENDITURES	17,353	17,353	15,826	27,353	27,353	29,753	29,753	28,453	28,453	21,726	21,578	21,578	10,603	10,603

Figure 7-3b

ECONOMIC COMPARISON OF STEAM CONVERSION SCENARIOS
CAPITAL EXPENDITURES
($ THOUSANDS)
1986-2000

CASE:	C1A	C1B	C1C	C2A	C2B	C3A	C3B	C4A	C4B	C5A	C5B	C6A	C6B	C7A	C7B
[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	3,373	3,373
[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[illegible]	0	0	0	1,348	1,348	2,175	2,175	677	677	6,948	6,948	7,348	7,348	7,873	7,873
[illegible]	0	0	0	1,348	1,348	2,175	2,175	677	677	6,948	6,948	7,348	7,348	7,873	7,873
[illegible]	23,271	19,799	19,472	18,428	15,664	18,428	15,664	18,428	15,664	11,858	10,879	8,219	7,871	7,834	6,859
[illegible]	0	0	0	2,599	2,125	1,923	1,635	2,358	2,174	4,100	3,485	4,998	4,165	0	0
[illegible]	23,271	19,799	19,472	20,928	17,789	20,353	17,300	20,986	17,838	15,958	13,564	13,219	11,236	7,834	6,859
[illegible]	23,271	19,799	19,472	22,476	19,137	22,528	19,475	21,663	18,515	22,906	20,512	20,567	18,584	15,707	14,732

Figure 7-4a

ECONOMIC COMPARISON OF STEAM CONVERSION SCENARIOS
ANNUAL REVENUE REQUIREMENTS
($ THOUSANDS)
1986-2000

CASE:	B1A	B1B	B1C	B2A	B2B	B3A	B3B	B4A	B4B	B4C	B5A	B5B	B6A	B6B
BOILER MAINT. - PC	315	315	315	2,515	2,515	2,995	2,995	2,735	2,735	1,695	1,340	1,340	725	725
- FUEL	2,518	1,664	1,664	2,337	1,610	2,337	1,610	1,763	919	919	129	60	1,584	1,191
- O&M	3,729	2,787	2,787	3,179	2,787	3,179	2,787	3,179	2,787	2,787	2,519	2,511	3,718	2,787
- PUMP TURBS	328	328	328	328	328	328	328	328	328	328	328	322	325	328
SUBTOTAL	7,989	5,213	5,213	8,358	7,159	8,838	7,639	8,004	6,588	5,648	4,316	4,239	5,274	4,926
STEAM DISTRIBUTION - PC	2,956	2,956	2,631	2,956	2,956	2,956	2,956	2,956	2,956	2,631	2,956	2,956	2,956	2,956
- O&M	1,008	883	883	1,008	883	1,008	883	1,008	883	883	1,008	883	1,008	883
SUBTOTAL	3,964	3,839	3,534	3,964	3,839	3,964	3,839	3,964	3,839	3,534	3,964	3,839	3,964	3,839
ELECTRIC BOILERS - PC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- ELECTRIC	0	0	0	0	0	0	0	0	0	0	5,377	3,868	2,258	1,955
- O&M	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	5,377	3,868	2,258	1,955
TOTAL ANNUAL EXPENSES	11,953	9,052	8,747	12,322	10,998	12,802	11,478	11,968	10,527	9,182	14,857	11,946	12,488	9,844

Figure 7-4b

ECONOMIC COMPARISON OF STEAM CONVERSION SCENARIOS
ANNUAL REVENUE REQUIREMENTS
($ THOUSANDS)
1986-2000

[illegible]	C1A	C1B	C1C	C2A	C2B	C3A	C3B	C4A	C4B	C5A	C5B	C6A	C6B	C7A	C7B
[illegible] - PC	0	0	0	0	0	0	0	0	0	0	0	0	0	1,875	1,875
- FUEL	0	0	0	0	0	0	0	0	0	0	0	0	0	1,297	646
- O&M	0	0	0	0	0	0	0	0	0	0	0	0	0	2,179	2,136
- PROP TAXES	0	0	0	0	0	0	0	0	0	328	328	328	328	328	328
[illegible]	0	0	0	0	0	0	0	0	0	328	328	328	328	6,678	5,984
STEAM DISTRIBUTION - PC	0	0	0	210	310	435	435	135	135	1,388	1,388	1,468	1,468	1,575	1,575
- O&M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[illegible]	0	0	0	210	310	435	435	135	135	1,388	1,388	1,468	1,468	1,575	1,575
[illegible] - PC	4,654	3,956	2,094	4,186	3,558	4,871	3,460	4,197	3,568	3,192	2,713	2,644	2,247	1,367	1,332
- ELEC/RIC	6,605	2,479	2,479	6,147	2,536	6,147	2,536	6,147	2,536	6,288	2,592	6,398	2,637	2,182	899
- O&M	1,262	888	888	1,695	1,500	1,695	1,500	1,695	1,500	2,879	1,825	2,848	1,775	1,223	1,888
[illegible]	11,922	7,324	5,462	12,028	7,594	11,913	7,496	12,039	7,604	11,358	7,130	11,890	6,659	4,992	3,319
[illegible]	11,922	7,324	5,462	12,337	7,904	12,348	7,931	12,175	7,739	13,274	8,846	12,885	8,454	13,234	10,878

A. Operations Continue at Grand Avenue Station

[Refer to Figures 7-3 and 7-4 for details]

The base case for this study is G1A, operations continue at Grand Avenue. This scenario entails adding $17.4 million in capital equipment. Included is replacement of 19,000 ft. of low pressure steam piping, replacement of 18,000 ft. of the total 24,000 ft. of high pressure steam pipe, retubing of boilers #7 and #8, and miscellaneous annual capital expenditures.

Additionally, total levelized annual operating expenses, which are the basis for comparing the economic feasibility of all scenarios, are $11.1 million. Included are levelized fixed charges on the new additions at Grand Avenue, fixed charges on new additions to the steam distribution system, fuel, O&M costs at Grand Avenue, O&M costs for the steam distribution system, and property taxes on existing Grand Avenue plant. The fixed charges include depreciation, income taxes, and return on new investment. The total annual expense for scenario G1A was the lowest of any of the "A" scenarios, largely due to the lower capital costs.

The G1B scenario is identical to G1A with the exception of having 60% lower sales, reflecting the loss of customers by the year 2000. The lower sales level requires less fuel and has lower operation and maintenance costs. The total annual expenses are $9.0 million. The G1C scenario is the same as G1B except that the 60% loss of

customers and sales occurs by 1990. The total annual expenses for this scenario is $8.7 million.

The other "G" scenarios are similar to G1A. The major variation in each is the installation of a single new boiler at Grand Avenue. The steam distribution system is replaced as in scenario G1A. In scenario G2A, a 350,000 lb per hour stoker-fired boiler is installed at Grand Avenue Station. The newer technology of this boiler enables fuel and operating savings when compared to the present boilers at Grand Avenue station. However, the total capital expenditures for this alternative are much higher, thus eliminating the scenario from further analysis. In G2B, with a 60% loss in sales, the capital expenditures would still eliminate the scenario from further consideration.

In scenario G3A, a 350,000 lb per hour pulverized coal boiler is installed at Grand Avenue Station. This boiler has the same fuel and O&M savings as the stoker-fired boiler in G2A. The capital expenditures for this scenario and G3B again limit consideration.

In scenario G4A, a similar fluidized bed boiler is installed at Grand Avenue, realizing even greater fuel and O&M savings. The capital expenditures for this alternative are similar to those in G2, G3, and G4, thus eliminating further consideration. Alternative G4 was used as the basis for a sensitivity evaluation of the scenarios involving installation of a full capacity boiler at Grand Avenue. This

sensitivity, G4C, proved to be inconsequential; although the capital expenditures were reduced (which assumes KCPL could plan for declining customer base), total annual expenses still exceded the G1 alternative.

The economic analysis considered two other alternatives for continuing operations at Grand Avenue. Case G5A, involves the installation of five electrode boilers, replacing coal-fired boilers, as the basic means to produce steam for all Downtown customers. In this scenario, the fossil fuel expense is eliminated. Fuel costs (coal and gas) are replaced by electricity energy cost. The capital expenditures are much less than for the new fossil boiler alternatives, but the electric costs exceed the fuel costs of those scenarios by much more than the savings on fixed costs. The last "G" alternative, G6A, is to continue operating at Grand Avenue with the present boilers in the winter, but to install an electrode boiler sized to handle the low non-heating load in the summer. The capital expenditures for this scenario are less than G5A, but the combined fuel and electricity expense also eliminates this alternative from consideration.

Of the "G" scenarios, G1 is the most economic alternative for continuing operation at Grand Avenue and is given further consideration in the cost of service analysis.

B. Operations are Converted to Electric and Electrode Boilers

[See Figures 7-3 and 7-4 for details]

Scenarios C1A through C7B involve the conversion of some or all customers to on-site electric boilers. The first of these scenarios, C1A, is a complete conversion of all customers to electric or electrode boilers. Thus, Grand Avenue Station and the entire steam distribution system are retired after 1990. The capital expenditures of $23.3 million for this scenario cover the purchase and installation of the new electric and electrode boilers. Electric distribution capital costs are accounted for in the cost of electricity to power the electric/electrode boilers.

The annual expenses for scenario C1A are $11.9 million, the lowest of any of the conversion-to-electric-boiler scenarios for present load levels. The total includes electricity, O&M, and levelized fixed charges for the new on-site boilers. The annual expenses for C1A are about $0.8 million higher than scenario G1A (continuation of present operations), but the assumed loss of 60% of sales by year 2000 [C1B] reduces the annual expenses for this scenario to $7.3 million, about $1.8 million less than G1B. In scenario C1C the 60% drop in sales occurs by 1990, and the annual expenses are reduced to $5.5 million, about $3.4 million less than G1C and the lowest annual expense for any of the reduced load scenarios.

As mentioned, the ability to keep the cost per Mlb differential at minimal levels when customers leave the system is very important. Scenario C1C is the most responsive to customer decline, being a highly flexible approach with capital expenditures made for only those

customers committing to remain on the system. When a customer is lost, the electric boiler for that customer can be removed from the customers' facility, sold or reused, and thus removed from the plant balance totals. In the scenarios reflecting a central steam production plant, this flexibility is never available, because fixed costs remain the same regardless of how many customers leave the system.

The capital expenditures in scenario C1B are 15% lower than in C1A, due to the assumed 15% reduction in peak by 1990. In this scenario, the expenditures for any customers lost after 1990 are assumed to be sunk costs and therefore must be recovered from the remaining customers. Scenario C1C shows what happens if these capital costs can be avoided. In C1C, the peak is reduced by 55% (sales by 60%) by 1990, thus avoiding the capital costs of installing electric boilers for customers who are leaving the system. The sensitivity of system cost to customer loss becomes more significant in scenario C1C, because the capital costs are highly proportional to the number of steam customers.

Scenarios C2A through C4B are similar to C1A and exhibit the same sensitivity to customer decline. Scenario C2A assumes that a central electrode boiler will be installed at 1319 Wyandotte to serve five customers who require high pressure steam. All other customers are converted to electric boilers.

The total capital cost and the annual expenditures for this scenario are slightly higher than for scenario C1A. Again, it is the "B" scenario (with 60% loss of sales) which is important for this alternative, because it indicates the sensitivity to customer deline.

Scenario C3A is identical to C2A with the exception of the central boiler location. C3A locates the central boiler at 6th and Baltimore. The capital expenditures and annual expenses are nearly the same as in the C2 alternative. The sensitivity to customer loss is once again noted in scenario C3B.

In scenario C4A, the five high pressure customers are provided service from two central boilers - one located at 1307 Locust and the other at 1319 Wyandotte. The scenario exhibits nearly identical costs to the previous "C" alternatives. Any of these alternatives may be considered good economic decisions within the electric/electrode group, since their total annual expenses are nearly the same.

Scenario C5A is identical to C1A except that the central electrode boiler at 1319 Wyandotte would be sized larger to serve all customers who are currently on the high pressure system (even though only five require the high pressure steam). The capital costs for this scenario are higher due to higher losses to the system, which occur when a central boiler distributes steam through longer lengths of pipe. Scenario C6A is a slight modification of C5A, but has added selected customers to the distribution system extending from the 1319

Wyandotte central electrode boiler. This modification reduces capital costs and annual expenses, but the losses remain, and thus the costs still exceed those of alternatives C1 through C4.

The final scenario, C7A, is a combination of continuing operations at Grand Avenue (installing a new coal-fired boiler) and converting to electric boilers at customer premises. The new boiler at Grand Avenue would serve only the existing high pressure customers and selected low pressure customers. The capital costs and the annual expenses for this case are much higher than the other conversion scenarios.

Among all these scenarios, two groups of alternatives were given further consideration in the cost of service. The G1A, G1B, and G1C scenarios were analyzed further, because this alternative is the best economic alternative among the Central Station scenarios studied. Also, the C1A, C1B, and C1C scenarios were further evaluated, because this alternative is the most attractive among the conversion options. Alternatives C2, C3, and C4 could have been reviewed also but would have provided nearly equivalent results to the C1 alternative.

The major point to be noted about the four conversion alternatives is that each provides a great deal of sensitivity to customer decline; and, therefore, any one of these alternatives would be a sound solution for a steam heat utility with business--total customers--

declining on a continual basis. The alternative that actually may be implemented will depend upon the practical aspects of boiler installation.

VIII. Cost of Service Analysis

A. Scope and Purpose

This study has identified two major approaches to supplying the needs of KCPL's Downtown steam customers through the end of the century: 1) continuing steam heat service from Grand Avenue Station, 2) installing on-site electric boilers. An engineering economic analysis screened and evaluated these methods, but such an analysis does not estimate the ultimate impact on future customer rates, including existing embedded costs and anticipated incremental costs necessary to meet future needs. To determine the ultimate price impact, this cost of service analysis of the selected supply alternatives was prepared.

For KCPL purposes, a steam heat cost of service analysis primarily determines the total revenue requirement associated with supplying steam service to fully recover all costs of providing that service (including both direct and allocated costs). In turn, the analysis ascertains the ultimate viability of providing service at the needed rate level.

First, a "status quo" cost of service of the existing steam heat system was prepared based on "normalised" 1985 data. The reason for the "status quo" analysis is to determine whether or not KCPL's current rate levels for steam service are sufficient to fully recover

the costs of providing that service. Second, in order to estimate the future impact of KCPL's steam supply alternatives on rate levels, a cost of service analysis to the year 2000 was projected for the most economically attractive supply alternatives. Third, a projected cost of service analysis for 1990 was prepared for the conversion alternative so that customers could be apprised of the rate level expected at the point of complete conversion.

B. Cost of Service Methodology

A steam heat cost of service analysis points out two types of costs incurred by KCPL in supplying steam service to the Downtown area. First, there are those costs directly related to providing steam heat service and directly charged to steam heat. Examples of such costs are investment and expenses associated with the Downtown steam distribution network and Grand Avenue Steam production. Second, KCPL incurs expenditures which are not specifically assignable to either steam or electric service, but which are necessary to support both. Examples of such expenditures are administrative and general expenses and investments in general plant. It is not possible to specifically identify administrative and general costs that are directly associated with steam heat service; so the total unassignable costs are reviewed and part of them are allocated to steam costs in proportion to the steam business.

This allocation is also necessary for costs associated with providing electric service, because any steam heating system considered in this study utilizes KCPL's electric facilities to some degree. For example, cost incurred in electric production facilities is largely mandated by the peak loads placed on the electric system. Therefore, electric production facility costs are allocated to steam heat service based on the electric loads demanded by station auxiliaries of the steam heat system at the time of the four summer monthly peaks.

The primary allocation factors used in the steam heat cost of service analysis are based on electric demand and energy usage, the number of electric and steam customers, and electric and steam heat salaries and wages. Basically, the allocation of expenses follows the allocation of plant.

In summary, the basic philosophies underlying KCPL's cost of service analysis are:

1. To the greatest extent possible, costs directly related to steam heat service are assigned to that service.
2. Joint, common or otherwise non-assignable costs are allocated to steam heat service in relation to how such costs are incurred.

Sheer volume prohibits including the detailed analysis prepared in the various steam heat cost of service studies as part of this report.

However, self-documented, computerized cost of service analyses are available upon request from the KCPL Rate Department.

C. Reference Point

In order to study the steam system at the years 1990 and 2000, it was necessary to develop usage and cost data under current operations. The budgeted 1985 accounting data from KCPL's most recent Kansas Rate Case was selected as the reference point for this analysis.

The 1985 budgeted steam data was normalized to reflect revenues and operations and maintenance expenses anticipated in the coming year. This normalization was required due to the expected declines in Downtown steam sales, the cancellation of KCPL's contract with CPC, and the execution of a contract with National Starch, all of which have occurred since the 1985 budget data were developed. The 1986 Steam Sales budget was used as the basis for this normalization.

Because this study also includes the years 1990 and 2000, when National Starch is assumed not to be purchasing steam, two costs of service analyses were conducted: 1) using normalized 1985 data, 2) 1985 normalized data excluding National Starch sales.

Demand and energy related cost allocations were made to the steam system based upon the anticipated four summer peak coincident

demands and the annual electric energy consumption at Grand Avenue Station.

D. Adjusting to the year 2000

In order to evaluate the various steam supply alternatives, 1985 data was adjusted to the year 2000. Though these studies are adjusted to reflect operations in the year 2000, all use 1985 dollars to provide a basis for comparison. The conversion from 1985 to 2000 required several adjustments to the steam and electric systems accounts to accurately represent the alternatives.

The 1985 steam and electric system accounts required five major modifications to reflect the alternative steam supply scenarios by the year 2000. First, plant accounts were adjusted to reflect additions and retirements between 1986 and the year 2000. Capital expenditures related to specific steam supply alternatives (e.g., revitalizing Grand Avenue or installing electric boilers) were included in these plant adjustments. Second, electric and steam depreciation expense was calculated for the year 2000, based on plant adjusted for additions and retirements. Third, the accumulated depreciation reserve for 1985 was adjusted through the year 2000 to reflect additional depreciation on present plant, depreciation on newly installed plant, and depreciation reserve offsets for plant retirements. Fourth, values for deferred taxes and accumulated deferred tax reserve in the year 2000 were obtained from KCPL's corporate model

and the Tax Department. Finally, both the total electric system and the steam system electric usage, as allocated, were based on projected loads in the year 2000.

The 1985 steam system accounts required three additional adjustments to reflect the alternative steam scenarios in the year 2000. First, steam revenues were calculated for the year 2000 by applying current steam rates to the Steam Department's projected Mlb sales figures. Second, steam gross receipts tax was adjusted to reflect projected steam revenues. Finally, steam heat operating and maintenance expenses were adjusted to reflect reduced steam sales and supply alternatives. For example, fuel and labor expenses for the steam system were significantly affected by the reduced sales. The expected changes in labor expenses necessitated adjustments to payroll taxes and employee benefits. Values for fuel and labor expenses in 2000 were obtained from the Steam Department for each steam supply alternative.

Once the 1985 data were adjusted to 2000, cost of service programs were run to analyze four alternatives: G1A, G1B, C1A, C1B and C1C [See Figure 7-1]. The "G" alternatives assume that the Grand Avenue Station will continue to be operated and maintained indefinitely. The "C" alternatives assume that the Grand Avenue Station and Downtown steam distribution system will be retired and replaced with on-site electric boilers by 1990. The "B" scenarios are identical to the "A," except they reflect a 60% reduction in steam sales. The C1C case is based on the further assumption that investment in

electric boilers in the future can be perfectly matched with future customer and sales levels.

Production and transmission demand allocation factors were prepared using a four coincident peak allocation methodology, with load data from the 1985 Kansas Rate Case. In order to appropriately allocate demand costs to steam service, the allocation recognized the additional estimated loads of either Grand Avenue Station auxiliaries or the on-site electric/electrode boilers. The C1 cases also required a distribution cost allocation to steam service, which was based on both electric boiler and total system electric usage characteristics. Energy and customer allocation factors were computed from data in the Kansas Rate Case and the estimated energy and customer data for the steam system.

E. Results

A total of nine fully-allocated cost of service studies were prepared: two analyzing current operations, five analyzing future supply scenarios to the year 2000, and two analyzing the conversion scenarios in 1990. Figure 8-1 shows the results of these analyses.

The first cost of service analysis (1985A) was performed on the current steam system. This analysis utilized 1985 data, including the National Starch steam load. The second cost of service analysis,

(1985B) was also performed on the current steam system but excluding the National Starch steam load.

As shown in Figure 8-1, the revenues provided from current steam heat operations, including National Starch, fail to fully recover the operating costs of providing steam service, much less provide any return on invested capital. An increase in revenues of approximately $3.4 million would be required to recover only the current operating cost; an increase of $5.5 million would be required to provide a full return on the investment.

The next five cost of service analyses focused on future supply alternatives (G1A, G1B, C1A, C1B, and C1C) and were adjusted to the year 2000. Figure 8-2 shows the results of these analyses.

As Figure 8-2 shows, the on-site electric boiler supply alternative (the "C" scenarios) yields the lowest revenue requirement. In addition, the possibility of more accurately matching electric boiler investment with reduced customer and sales levels [Scenario C1C] reduces future revenue requirements even further.

Note that G1B indicates no change in required investment associated with either Grand Avenue Station and the steam distribution system despite customer and load reductions. Case C1B exhibits only limited reduction in investment.

The next two cost of service analyses (C1A-90, C1C-90) were adjusted to the year 1990 to show the rate level required after conversion in the on-site system is completed. The results of these analyses are shown in Figure 8-3.

As shown in Figure 8-3, the steam prices ($/Mlb) required in 1990 by the conversion scenarios are less than the steam price currently required to support the existing system, minus National Starch.

The analysis indicates that customers who convert to on-site steam production will not have to pay a price any higher in 1990 ($22-$27/Mlb) than all existing customers currently on the central steam system should be required to pay right now ($27/Mlb). Furthermore, conversion to electric boilers assures that the projected price in the year 2000 ($18-23/Mlb) will be much less than the $27-52/Mlb required to maintain and rehabilitate the central production and underground distribution system.

F. Implications for Future Rate Adjustments

The rate analyses for 1985, 1990 and 2000 for the existing central steam system and the projected conversion system suggest a schedule for future rate adjustments.

1. First, an increase of $3.4 million would be filed in 1986 to be effective in 1987. Figure 8-1 indicates that existing customers

are paying about $11 per Mlb for steam but the National Starch contract, in effect, reduces the price to about $10 per Mlb. Scenario 1985-A suggests that just to cover operating costs, the steam price should be increased 62% to about $16 per Mlb a $3.4 increase.

2. Second, another increase of 25%--from $16 to $20 per Mlb--should commence in 1988 to cover operating costs and return on investment in the existing 1985 steam system. No additional operating cost or return would be earned on the conversion customers in progress.

3. Third, in 1989 the price would rise another 10%--from $20 to $22 per Mlb--to reflect the cost of service of 100% conversion of customers to the on-site production system by 1990. This price is still below the $27 per Mlb required of existing customers in 1985 (absent National Starch).

4. In 1990, the price would rise 23%--from $22 to $27 per Mlb--to reflect the cost of service of only 40% conversion of customers to the on-site production system by that year. Again, this price is no higher than the price that should be required of existing customers.

Through 1990, KCPL will sustain operating and return losses, as it maintains the existing system and implements the conversion program

at the same time. For example, during 1986, KCPL's operating cost and earnings short fall will be $5.5 million, offset somewhat by $2.6 million in cancellation penalties from CPC (see Figure 8-4). In 1987 and 1988, the CPC penalty payments drop to $.6 million, providing almost no offset to the shortfall, despite an increase in rates effective in 1987.

Since the proposed rate increases would have to be filed 11 months before their effective date, the proposed schedule could be reviewed annually to include the actual progress on the conversion program and the continuing cost of operating the existing steam system.

G. Depreciation Rates and Unrecovered Plant Investment

Based on current steam depreciation rates, KCPL would bear the losses associated with the unrecovered investment in the existing underground distribution system, estimated to be $1.8 million by 1990. These depreciation rates should be adjusted to amortize the depreciation reserve deficiency by 1990 as part of the proposed 1986 steam rate case filing.

Figure 8-1
Cost of Service Analysis

	CURRENT			0% ROR			ROR		
				Increase In Downtown Revenues			Increase In Downtown Revenues		
Alternative	Downtown Sales Revenues[1]	ROR %	$/Mlb	$	%	Total $/Mlb	$	%	Total $/Mlb
1985A[2]	$5,445,286	(19.54)	$10.05	$3,376,985	62.0%	$16.28	$5,490,913	100.8	$20.18
1985B[3]	5,335,102	(32.22)	11.18	5,622,286	105.4	22.96	7,756,339	145.4	27.44

NOTE:
(1) Includes Gross Receipts Tax.
(2) Case 1985A included the National Starch data in the cost of service.
(3) This data reflects only the downtown revenues.

Figure 8-2
Cost of Service Analysis
(Based on data adjusted to the year 2000)

	CURRENT			AUTHORIZED ROR		
				Increase In Downtown Revenues		
Alternative	Downtown Sales Revenues(1)	ROR %	$/Mlb	Total $	%	Total $/Mlb
G1A	$5,337,541	(70.11)	11.19	$7,444,190	139.5	26.80
G1B	2,388,999	(85.72)	12.52	7,601,652	318.2	52.36
C1A	5,337,541	(1.20)	11.19	3,458,866	64.8	18.44
C1B	2,388,999	(4.30)	12.52	3,192,008	133.6	29.25
C1C	2,388,999	(5.38)	12.52	2,047,062	85.7	23.25

Note: (1) Includes Gross Receipts Tax

Figure 8-3
Cost of Service Analysis
(Based on data adjusted to the year 1990)

	CURRENT			AUTHORIZED ROR		
				Increase In Downtown Revenues		
Alternative	Downtown Sales Revenues (1)	ROR %	$/Mlb	$	%	Total $/Mlb
C1A-90	5,337,541	1.64	11.19	5,129,252	96.1	21.94
C1C-90	2,388,999	(0.57)	12.52	2,795,354	117.0	27.17

Note: (1) Includes Gross Receipts Tax

Figure 8-4

CPC Contract Termination Revenues

1985	$ 234,151.00
1986	2,630,376.83
1987	656,589.96
1988	656,589.96
1989	207,920.15
Total	$4,385,627.30

IX. Engineering and Costs Impacts on Downtown Electric System and Other Engineering Considerations

A. Present Downtown Electric Distribution System

1. Method of Service

Service to the distribution system in the Downtown area presently consists of multiple 15 KV high voltage cables originating from three different substations--Grand Avenue, Northeast and Crosstown. These cables feed step-down transformers through four basic systems: the AC Network, Privately Owned Substations, Company Owned Substations, and the Underground Submersible System.

2. Existing Electrical Load - Summer and Winter

The following tabulation shows the number of cables at each substation which either serve or feed through the Downtown area. Also listed are the winter and summer peaks for the corresponding circuits and the ratio of winter to summer peaks.

Table 9-1

Distribution of Circuits By Substation Showing Winter/Summer Peaks and the Available Winter-Summer Peak Difference

Substation	No. of Circuits	Winter Peak (MVA)	Summer Peak (MVA)	Peak Difference (MVA)
Grand Avenue	13	34.9	61.6	26.7
Grand Avenue Network	14	21.0	39.5	18.5
Crosstown	3	10.7	12.7	2.0
Northeast	12	35.7	45.8	10.1
Total		102.3	159.6	57.3

B. Capacity requirements to the Downtown Electrical Distribution System Resulting from Converting Steam Distribution to Electric Boilers

1. Utilization of Existing Sources and Circuits

By comparing the individual circuit winter loads to either the summer load, the cable rating, or bus loading limitations, it is possible to calculate the capacity available to serve winter electric boiler loads. The following table summarizes this available capacity by substation:

Table 9-2

Cable Capacity Available By Substation

Substation	Cable Capacity Available (MVA)
Grand Avenue	12.3
Grand Avenue Network	18.4
Crosstown	2.0
Northeast	21.5
Total	54.2 MVA

Existing cables and substations can provide 54.2 MVA of capacity for winter load. In addition, three new 13 KV circuits are expected to be installed by 1986 from Crosstown Substation to serve new loads Downtown, providing an additional 7.5 MVA of capacity that can be made available for winter loads. Thus, 61.7 MVA total of winter capacity can be made available for supplying electric boilers Downtown. This is roughly an electrical equivalent of about 46% of the current total steam load.

2. Added Facilities

As mentioned earlier, a major expansion of electrical facilities will be required to provide adequate electric service to the complete on-site steam system. The expansion would include a new substation to the southwest of the Downtown area. (Such a substation location is already planned that can utilize existing

conduits and cable to serve part of the remaining conversion load.) Utilization of four existing circuits plus six circuits new to the Downtown area from the new substation would provide capacity to serve the remaining steam load.

Within the Downtown area, boiler loads are not always located where available capacity is. To provide adequate electrical service at the individual boiler locations, considerable extension of conduits, primary cable, secondary and service cable, plus additional switch gear and transformers will be necessary.

3. Summary of Distribution and Voltage Parameters and Source Timing for Conversion Cost Plan Inside the Freeway Loop.

A detailed study was made to determine costs for serving the entire steam load based on 100% site conversion, using the following assumptions:

a) The total steam load would be served using: Pad Mount (2.5 MW), Network (19.45 MW), Underground Submersible (111.4 MW).

b) Secondary Voltage would be at the following percent of total: 120/208 - 34%; 277/480 - 66%.

c) All secondaries and services would be approximately 100 feet long.

d) A new substation and its expansion would be completed and a source would be available to feed into the southwest of the Downtown area prior to the total conversion.

The estimated costs for electrical distribution to serve the 100% converted steam load and the Schedule of Conversion Phases are as follows:

	1986	1987	1988	1989	1990	Total
Converted Steam Load (MW)	8.5	14.0	21.0	57.0	31.0	131.5
Distribution Cost (Millions)	$1.26	$1.98	$3.64	$9.6	$5.57	$22.05
Substation Cost (Millions)*			$2.93		$3.18	$6.11

The estimated cost for 60% conversion (79MW) is $14.4 million for distribution and $2.93 million for substation. Forty percent conversion (52.6MW) is estimated to cost $9.6 million for distribution additions, with no substation expansion required. These total costs are reflected in the cost of service analyses.

*Includes $1.1 million cable cost in 1990 to extend capacity to Downtown.

C. Distribution System and Expected Loading Upon Completion of Conversion

1. Projected winter and summer electrical loading

a) The following table indicates the projected winter and summer peak feeding the Downtown area. The figures assume that all steam load is converted to electric or electrode boilers.

Table 9-3

Full Conversion To Electric and Electrode Boilers Showing Winter and Summer Peak By Substation

Substation	Winter Peak (MVA)	Summer Peak (MVA)	W/S Ratio (%)
Grand Avenue	62.6	61.6	101.6
Grand Avenue Network	39.0	39.5	98.7
Crosstown	12.7	12.7	100.0
Northeast	54.5	45.8	119.0
New Substation	64.5	0.0	--
Total	233.3	159.6	

Note: These figures do not take into consideration any load growth that may occur on the circuits feeding the boilers.

2. Projected System Load Factor Improvement

a) KCPL's System load factor for 1984 was 47.17%, reflecting a system peak of 2297 MW and an annual input to the system

of 9,518,070,000 KWH. The winter steam load will add 155,160,787 KWH/year. Based on this additional load, the system load factor would improve by 0.77% to 47.94%.

3. Impact of System Expansion for Steam Conversion On The Distribution System

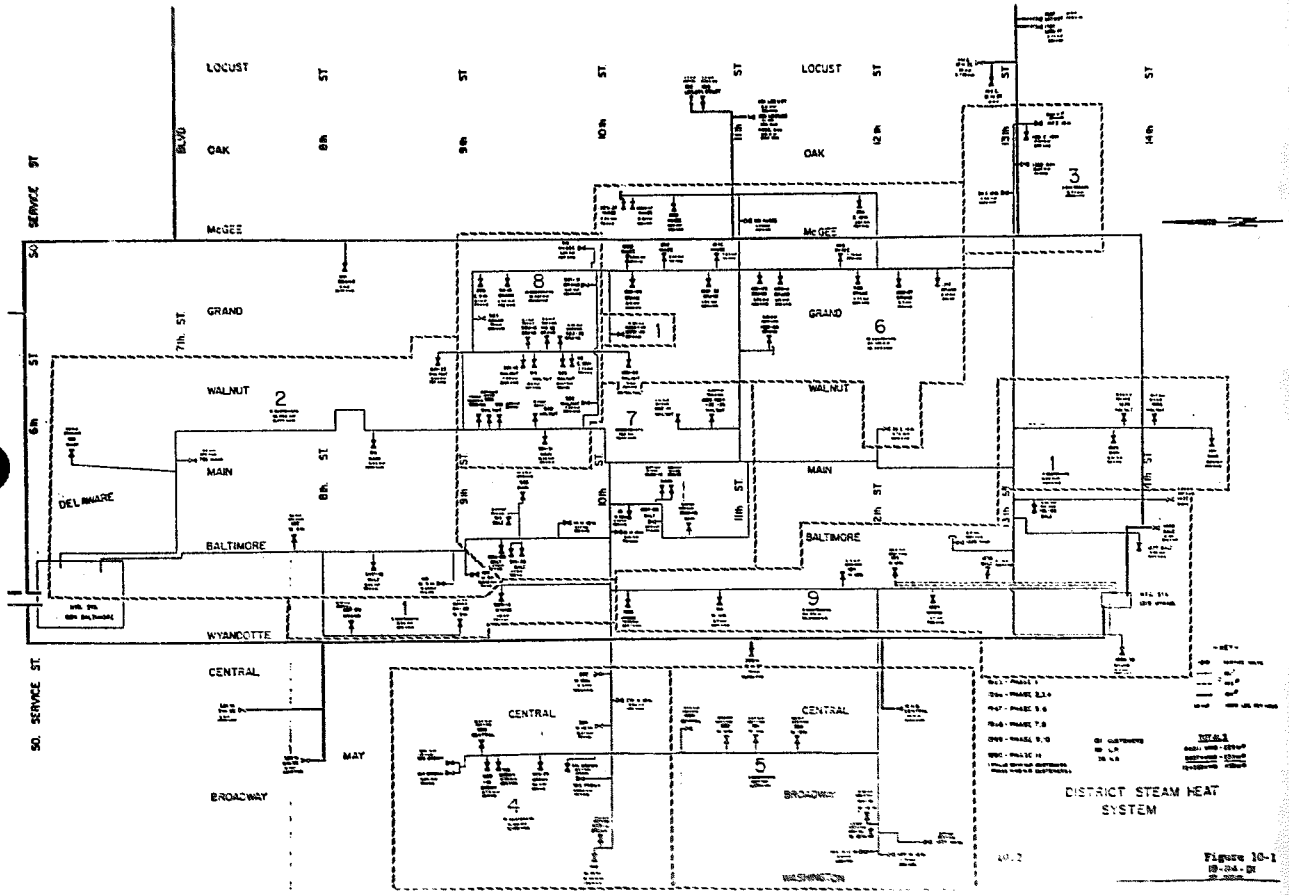
a) Optimum utilization of a distribution system is obtained when summer and winter loads are balanced. In 1985, the winter/summer loading in the Downtown area was 102.3 MVA/159.6 MVA. The addition of 57.3 MVA due to steam conversion, would balance the loading. However, completion of the steam conversion project will switch the Downtown area from a summer peak to a winter peak with a winter/summer ratio of 233.3 MVA/159.6 MVA.

Thus, an additional 73.7 MVA of "single season" distribution capacity will be required to serve the winter electric boiler load at 100% conversion. However, if not all customers are converted, a lesser amount of "single season" distribution capacity will be sufficient.

X. The Conversion Plan

Currently, there are about 131 steam customers. As of this report, five have been or are being converted to electric boilers. The following discussion outlines KCPL's suggested approach to complete the remaining conversions by the end of 1990.

Figure 10-1 shows the high and low pressure steam lines and the location of steam customers. The dotted line groups customers into phases for conversion. Several criteria comprise the selection of the phases:



DISTRICT STEAM HEAT SYSTEM

Figure 10-1

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 customers that can be converted to low pressure will be included in the conversion phase located nearest to them. However, since the 185 psi 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 test project, several steam customers have 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 re-sequencing during the conversion process. For the most part, the initial phases presented in this Plan recognize

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 and 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.

Therefore, 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 sector 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.

The following table lists each phase, the name and location of

the steam customer in that phase, and the time and year that section will be disconnected from the main steam system. The schedule has been structured so that customers are converted prior to that year's heating season.

At the beginning of the 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 commit the customer to using the electric boiler as his only steam heat source for the next ten years. (This covenant would not apply to the customers in the winter 1985-86 test program.) If these conditions are not acceptable, KCPL would not install a boiler for that customer. To do so would be economically disadvantageous to other steam customers. Although there is an advantage to the individual customer to have on-site production and control of his heat supply, he will remain on the same rate structure as all other steam customers until conversion is complete.

SCHEDULE OF CONVERSION PHASES

Revised to March 1, 1986

PHASE 1: 1985-1986-1987

Name	Address	
American Formal Wear	1329 Main	
Missouri Division of Employment Security	1411 Main	
Upsher Labs	1336 Walnut	Complete
McWhirter Printers	909 Wyandotte	Complete
Faultless Starch	114 W. 9th Street	
Nelkin Trust	807 Wyandotte	
Home Savings Building	1006 Grand	Complete
Stanley Sargent	1406 Walnut	Complete

PHASE 2: 1986-1987

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: 1986-1987

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: 1986-1987

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: 1987-1988

Name	Address
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: 1987-1988

Graphix Plus	1005 McGee
Moore & Kessinger	1009 McGee
Continental Tower Building	1021 McGee
Mia Jamison (formerly J. Spini)	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. Gepford (previously omitted)	1222 McGee
12th & Walnut Building	25 E. 12th
Centennial Federal Savings (formerly Schmeltzer)	1001 Walnut

PHASE 7: 1988-1989

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; formerly Macy's)	1030 Main
Metropolitan Savings	1012 Walnut
Woolf Brothers	1022 Walnut
First National Bank	14 W. 10th

PHASE 7: (cont'd) 1988-1989

Name	Address
CBC Investors	930 Main
Ad Club	913 Baltimore
University Club	914 Baltimore
Lane Blue Print	906 Baltimore

PHASE 8: 1988-1989

Centerre Bank	900 Walnut
Demaree Stationary	908 Walnut
Quick-Print	910 Walnut
Harriman Mortgage Inv. (formerly MO Bank & Trust)	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: 1989

Downtown Investors	1001 Wyandotte
Kansas City Southern	114 W. 11th
Phillips House Hotel	104 W. 12th
Transamerican Investment	1215 Wyandotte
Municipal Auditorium	1300 Baltimore
TWA	1305 Baltimore
Gaylord Properties	1330 Baltimore
Empire Theatre	1402 Main

PHASE 10: HIGH PRESSURE-1989

Kansas City Club	1230 Baltimore
Jackson County Court House	405 E. 12th
Jackson County Justice Center (formerly jail)	1305 Locust

PHASE 10: (cont'd) HIGH PRESSURE-1989

Name	Address
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 11: HIGH PRESSURE-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 Corp. (7 customers)	20 E. 5th
Folgers Coffee	330 W. 8th

APPENDICES

A. A. J. Doyle's 7/19/85 Letter
to Steam Customers

B. Project Cost Status Report
December 23, 1985

C. Agreement (Between Customers and KCPL
for Heating/Steam Service and
Provision of Certain Equipment)

KANSAS CITY POWER & LIGHT COMPANY
1330 BALTIMORE AVENUE
P.O. BOX 679
KANSAS CITY, MISSOURI 64141

July 19, 1985

ARTHUR J. DOYLE
CHAIRMAN OF THE BOARD
AND
PRESIDENT

Dear KCPL Steam Heat Customers:

We are pleased to make this report and these commitments to you:

REPORT:

Recall that in 1983 KCPL withdrew its then pending steam heat rate increase filing with the Missouri Public Service Commission when CPC International entered into an Interruptible Steam Heat Agreement with a then estimated 180 million pounds per month usage. That CPC Agreement allowed KCPL to spread its annual fixed charges related to Grand Avenue Station over a greater annual volume of steam heat sales, thus reducing its average 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 price gas throughout each year, and (ii) providing coal for Grand Avenue Station in greater volumes at a reduced price. During 1984 and 1985, the CPC Agreement has effectively reduced KCPL's steam heat production cost per pound for all of its steam heat customers below the 1983 level, even though CPC's actual steam requirements have been only 72% of its estimated requirements at the time the Agreement was signed.

We have been advised that CPC has sold its Corn Products Plant to National Starch effective as of January 1, 1986. The steam heat requirements of National Starch are estimated to be only 60 million pounds per month, about one-half of CPC's actual use or about one-third of CPC's initial estimate. That reduction will adversely affect the economies of KCPL's steam production at Grand Avenue Station and will increase our average cost per pound of steam delivered.

A few months ago, rumors started circulating concerning termination of the CPC steam load, the elimination of electric generating facilities at Grand Avenue Station upon commercial operation of Wolf Creek, consequent increases in KCPL's steam heat rates and abandonment by KCPL of its steam heat system. We then met with some of our steam heat customers at their request. At that meeting, we reported on many of the above matters and gave those present our assurance that KCPL is committed to provide the energy needs of all of its customers and will not abandon anyone. At that time, we made certain commitments to KCPL's steam heat customers which we want to confirm to each of you at this time, as follows:

COMMITMENTS:

1. KCPL and National Starch have reached tentative agreement concerning a new five-year interruptible steam heat supply to replace the CPC Agreement. If the new arrangement with National Starch is signed, KCPL commits to operate Grand Avenue Station steam facilities at least through 1990 in the absence of prior catastrophic damage to those facilities.

2. The commercial operation of our Wolf Creek Nuclear Station will not directly affect steam production at Grand Avenue Station, although there will be some indirect effects on the cost of steam heat service due to the retirement of electric generating facilities at Grand Avenue Station after commercial operation of Wolf Creek. However, there will be no steam heat rate increase prior to 1987.

3. KCPL has begun a test project under which KCPL will install and own electric boilers as a substitute steam source on the premises of certain steam heat customers and will continue to provide steam heet to such customers at the applicable steam heat rate on file with the Missouri Commission. This arrangement will allow KCPL to eliminate old steam distribution laterals, some of which are fast approaching 100 years old, and which require high maintenance costs. The results of this test project will provide KCPL with information and data for the development of a program over a five-year period to convert the steam heat load from the distribution facilities to on-site production.

4. By early 1986, KCPL will develop a tentative five-year conversion plan to eliminate its low pressure steam distribution system through the use of on-site electric boilers and minimize its high pressure steam distribution system through (a) a central electrode boiler, (b) by on-site installation or (c) various combinations with electric operation. KCPL will present that tentative plan to its steam heat customers, hopefully, in March 1986 for their review, comments and possible refinement. Of course, any such plan as may be finally adopted by KCPL will be subject to review and approval by the Missouri Commission before it becomes effective.

5. KCPL recognizes that the implementation of any such conversion plan could result in increased cost per pound for steam heat service as the total downtown system load is reduced and operating expenses are incurred during the transition. KCPL is making every effort to minimize its costs of producing and distributing steam heat and will continue those cost containment efforts in the future. Additionally, KCPL intends to protect its steam heat customers and will accept some losses during that transitional period.

6. In conjunction with the development of the converaion plan, KCPL will offer to make, or, at its election, cause to be made by independent expert consultants, a confidential study of the energy requirements for each steam heat customer which will provide cost estimates and specific recommendations to meet your energy needs.

It is and will be KCPL's intent and objective to continue to serve your total energy requirements and to do so at rates which will provide the greatest economies to you in the long run. Should you have any questions or wish to have an energy study made at an early date, please contact Mr. Michael C. Mandacina, our Director-Internal Services & Steam Operations, at 556-2328.

Sincerely,

AJD:be

PROJECT COST STATUS REPORT

OR-86: Downtown Steam Customers Conversion to Electric Steam Boilers

Period Ending: Nov. 30, 1985
Report Date: Dec. 23, 1985

LOCATION	CUSTOMER	RSM	% CPL	ORIGINAL ESTIMATE	AMOUNT COMMITTED	AMT EXPENDED CUMULATIVE BEGIN OF MONTH	AMOUNT EXPENDED THIS MONTH	AMT EXPENDED CUMULATIVE END OF MONTH	PROJECTIONS: AMOUNT TO COMPLETE	PROJECTIONS: TOTAL AMOUNT	PROJECTIONS: AMOUNT OVER/(UNDER)
1406 Walnut	Stanley Sargent	Yes									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	Watkin	118471KP	98	$26,200.00	$25,210.00	$12,655.00	$0.00	$12,655.00	$15,065.00	$27,720.00	$1,520.00
Elec Dist	MCPL		98	26,800.00	5,400.00	3,290.00	2,110.00	5,400.00	314.00	5,714.00	($1,086.00)
CWO 5-9568OE(F)		LOCATION SUBTOTALS	98	$53,000.00	$30,610.00	$15,945.00	$2,110.00	$18,055.00	$15,379.00	$33,434.00	($19,566.00)
900-11 Hyandotte	Rochester Printers	Yes									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	U S Engineering	119638KP	95	$52,500.00	$44,649.00	$0.00	$16,568.00	$16,568.00	$29,133.00	$45,701.00	($4,799.00)
Elec Dist	MCPL		95	68,500.00	7,334.00	7,334.00	0.00	7,334.00	7,000.00	14,334.00	($54,166.00)
CWO 5-9568IE(F)		LOCATION SUBTOTALS	95	$119,000.00	$51,983.00	$7,334.00	$16,568.00	$23,902.00	$36,133.00	$60,035.00	($58,965.00)
1234 Walnut	Upsher Labs	Yes									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	U S Engineering	119638KP	95	$46,700.00	$40,242.00	$0.00	$16,858.00	$16,858.00	$26,579.00	$42,629.00	($4,071.00)
Elec Dist	MCPL		95	83,300.00	7,278.00	1,741.00	5,537.00	7,278.00	753.00	8,031.00	($75,269.00)
CWO 5-9568OE(F)		LOCATION SUBTOTALS	95	$130,000.00	$47,520.00	$1,741.00	$21,587.00	$23,328.00	$27,332.00	$50,660.00	($79,340.00)
112 W. 9th	Faultless	No									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	A. D. Jacobson	125386KP	0	$72,000.00	$0.00	$0.00	$0.00	$0.00	$35,075.00	$35,075.00	($36,925.00)
Elec Dist	MCPL		0	76,500.00	0.00	0.00	0.00	0.00	76,500.00	76,500.00	0.00
CWO 5-9568EE(F)		LOCATION SUBTOTALS	0	$148,500.00	$0.00	$0.00	$0.00	$0.00	$111,575.00	$111,575.00	($36,925.00)
1331 Main	American Formal	Yes									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	U S Engineering	119638KP	95	$38,400.00	$24,814.00	$0.00	$22,723.00	$22,723.00	$3,143.00	$25,866.00	($4,534.00)
Elec Dist	MCPL		95	33,600.00	3,238.00	3,238.00	0.00	3,238.00	11,762.00	15,000.00	($18,600.00)
CWO 5-9568AE(F)		LOCATION SUBTOTALS	95	$64,000.00	$28,052.00	$3,238.00	$22,723.00	$25,961.00	$14,905.00	$40,866.00	($23,134.00)
887 Hyandotte	Watkins	No									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler	A. D. Jacobson	125386KP	0	$51,000.00	$0.00	$0.00	$0.00	$0.00	$26,598.00	$26,598.00	($24,402.00)
Elec Dist	MCPL		0	55,000.00	0.00	0.00	0.00	0.00	55,000.00	55,000.00	0.00
CWO 5-9568JE(F)		LOCATION SUBTOTALS	0	$106,000.00	$0.00	$0.00	$0.00	$0.00	$81,598.00	$81,598.00	($24,402.00)
1886 Grand	Home Savings	Yes									
WORK AREA	PERFORMED BY	P O NUMBER									
Boiler Bldg	Hughes Mech	124531BP	95	$65,000.00	$55,991.00	$0.00	$0.00	$0.00	$55,991.00	$55,991.00	($9,009.00)
Elec Dist	MCPL		30	147,000.00	25,957.00	24,797.00	1,160.00	25,957.00	121,043.00	147,000.00	0.00
Mech Contr	Fagen Co	123476KP	80	141,000.00	68,680.00	0.00	0.00	0.00	68,680.00	68,680.00	($72,320.00)
Elec Contr	R. F. Fisher	128721KP	60	220,000.00	51,298.00	0.00	0.00	0.00	51,298.00	51,298.00	($168,710.00)
Engr Serv	Energy Assiers	123419KP	98	0.00	21,874.00	0.00	9,980.00	9,980.00	11,894.00	21,874.00	21,874.00
CWO 5-9568ZE(F)		LOCATION SUBTOTALS	59	$573,000.00	$222,992.00	$24,797.00	$11,140.00	$35,937.00	$308,098.00	$344,035.00	($228,965.00)
MCPL Engineering and Project Management Labor		CWO 5-5895AE(F) ACTUAL MANHOURS THIS MONTH	CUMULATIVE MANHOURS END OF PERIOD								
WORK AREA	PERFORMED BY										
Boiler	PSCBE	101	1484	80	$58,000.00	$37,256.00	$34,562.00	$2,694.00	$37,256.00	$20,744.00	$58,000.00	$0.00
Elec Dist	Dist Engr	0	0	80	62,500.00	0.00	0.00	0.00	0.00	20,000.00	20,000.00	($42,500.00)
ROW	Real Estate	0	31	90	1,000.00	697.00	697.00	0.00	697.00	303.00	1,000.00	0.00
Drawings	Drafting	0	40	98	0.00	595.00	595.00	0.00	595.00	405.00	1,000.00	1,000.00
LABOR SUBTOTALS		101	1475	80	$121,500.00	$38,548.00	$35,854.00	$2,694.00	$38,548.00	$41,452.00	$80,000.00	($41,500.00)
Other DESCRIPTION											
Mileage, Warranty Bonds, Misc.					$500.00	$492.00	$361.00	$131.00	$492.00	$258.00	$750.00	$250.00
OTHER SUBTOTALS					$500.00	$492.00	$361.00	$131.00	$492.00	$258.00	$750.00	$250.00
ENGR & PROJ MGMT SUBTOTALS		101	1475	80	$122,000.00	$39,040.00	$36,215.00	$2,825.00	$39,040.00	$41,710.00	$80,750.00	($41,250.00)
PROJECT TOTALS		101	1475	55	$1,315,500.00	$420,197.00	$89,270.00	$76,953.00	$166,223.00	$636,730.00	$802,953.00	($512,547.00)
					* AMOUNT AUTHORIZED		$347,000.00				$802,953.00	($144,047.00) *
WORK AREA SUBMARRIZON TOTALS												
Boiler				42	$761,600.00	$378,414.70	$48,377.10	$68,033.60	$116,470.70	$344,103.30	$460,574.00	($301,026.00)
Elec Dist				13	553,960.00	49,752.30	48,892.90	8,859.40	49,752.30	292,626.70	342,379.00	($211,581.00)

AGREEMENT

This Agreement is entered into this ____ day of _____, 19__, by and between Kansas City Power & Light Company (Company) and _____ (Customer).

Whereas, Company is presently furnishing Customer with central station steam service for space heating or other purposes on Customer's premises at _____, and

Whereas, Company is terminating such central station steam service on or before December 31, 1990, pursuant to the order and authority granted by the Missouri Public Service Commission, and

Whereas, Customer is desirous of substituting certain other sources of heating in place of said central station steam service and the Company is willing to provide steam service by means of an electric boiler and associated facilities or, alternatively, certain electric space heating equipment upon the terms and conditions set forth below,

It is agreed to as follows:

1. Upon the receipt of all necessary and appropriate easements, licenses and rights of way, which shall be granted to Company at no cost and in a form acceptable to it, and pursuant to mutual agreement the Company shall install, or cause to be installed, on Customer's premises at _____ either (a) an electric boiler and associated facilities (Boiler), or (b) certain electric space heating equipment (Equipment), or a combination of Boiler and Equipment, of the type and size, and in

the location on Customer's premises, indicated in Exhibit A, attached hereto and made a part hereof. Such Boiler or Equipment shall be sized to meet Customer's steam service or space heating requirements, respectively, as mutually determined by Company and Customer. In the event that either Boiler or Equipment can be feasibly installed, the less expensive of the two shall be installed unless Customer reimburses Company for the difference in cost. Company does not make any warranty or representation as to the adequacy or appropriateness of the size and quantity of the Equipment or Boiler installed on Customers premises.

2. This Agreement shall expire on December 31, 1995, whereupon Company shall give and convey title to the Boiler or Equipment as the case may be, evidenced by good and sufficient bills of sale, if and when all of Customer's accounts with Company are fully paid through December 31, 1995. Customer may also terminate this Agreement by giving ninety (90) days written notice to Company. Company shall thereupon determine the depreciated original cost of the Boiler or Equipment, as the case may be, as of the expiration date of the notice period. On each expiration date, or as soon thereafter as all necessary permits and approvals are obtained and the Customer's account or accounts are fully paid through such expiration date, Customer shall purchase and Company shall sell such Boiler or Equipment at its determined depreciated original cost. Upon the expiration or termination of this Agreement, all associated easements, licenses and rights of way shall be released, except to the extent necessary and useful in providing electric service to the Customer.

3. The following terms and conditions apply in the event Boiler is installed pursuant to the Agreement:

a. For as long as this Agreement is in effect, Customer agrees to take and pay for steam service furnished by means of Boiler, pursuant to the provisions of the applicable rate schedules, rules and regulations from time to time in effect and on file with the Missouri Public Service Commission. As long as this Agreement is in effect, Customer shall not be separately billed for the electric energy and power consumed by the Boiler in providing steam service to Customer, and Company shall keep and maintain the Boiler in good repair, condition and working order.

b. Boiler, is and at all times remains, the sole and personal property of Company, and Customer shall have no right, title or interest therein, except as set forth in this Agreement.

4. The following terms and conditions apply in the event Equipment is installed pursuant to the Agreement:

a. Customer agrees that for the term of this Agreement that the Equipment shall be the sole source of permanent electric space heating on said premises. Electric energy and power for the Equipment shall be supplied by Company pursuant to the applicable rate schedules, rules and regulations from time to time in effect and on file with the Missouri Public Service Commission.

b. Customer shall use, maintain and preserve the Equipment in a careful and proper manner, and shall comply with all laws, ordinances, regulations and manufacturer instructions relating to the possession, use or maintenance of the Equipment. Customer, at

its own cost and expense, shall keep and maintain the Equipment at all times in good repair, condition and working order. Company has no obligation with respect to the operation, maintenance, inspection, repair or replacement of the Equipment, or any part thereof.

c. Company shall at all times during business hours have the right to enter on said premises for the purpose of installing or inspecting the Equipment or observing its use. Customer shall give Company notice immediately of any attachment or other judicial process affecting the Equipment.

d. Customer shall inspect the Equipment promptly upon installation. Unless Customer thereupon gives written notice to Company specifying any defect in or other proper objections to the Equipment, Customer agrees that it shall be conclusively presumed, as between Company and Customer, that Customer has fully inspected and acknowledged that the Equipment is in good condition and repair, and that Customer is satisfied with and has accepted the Equipment in such good condition and repair.

e. Customer hereby assumes all risk of loss of and damage to the Equipment from any cause. No loss or damage to the Equipment will impair any obligation of Customer hereunder, which will continue in full force and effect. In the event of loss or damage to the Equipment, Customer at its option shall place the same in good repair, or purchase the same at its then depreciated original cost. COMPANY IS NOT A MANUFACTURER OF THE EQUIPMENT OR A DEALER IN SIMILAR PROPERTY AND HAS NOT MADE, AND DOES NOT MAKE, ANY

REPRESENTATION, WARRANTY OR COVENANT, EXPRESS OR IMPLIED, WITH RESPECT TO THE CONDITION, QUALITY, DURABILITY, SUITABILITY OR MERCHANTABILITY OF THE EQUIPMENT. Company will, however, take any steps reasonably within its power to make available to Customer any manufacturer's or similar warranty applicable to the Equipment. Company shall not be liable to Customer for any loss, liability or damage caused or alleged to be caused directly or indirectly by the Equipment, by any inadequacy thereof or defect therein, or by any incident in connection therewith.

f. Customer shall indemnify Company against all claims, actions, proceedings, costs, damages and liabilities, including reasonable attorneys fees, arising out of the use or operation of the Equipment. The Equipment shall at all times remain personal property, notwithstanding that it may now be, or hereafter become, in any manner attached to, or embedded in, real property or any building thereon. The Equipment is and shall at all times remain the sole property of Company, and Customer shall have no right, title or interest therein except or set forth in this Agreement.

5. This Agreement cannot be assigned by Customer without first obtaining the written consent of Company, which shall not be withheld unreasonably.

In witness whereof, we have signed this Agreement as of the date first above written.

Kansas City Power & Light Company

By_____

_____

By_____

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