EXHIBIT NO.: _____
WITNESS: Robert S. Miller
ISSUE: Termination of Service
TYPE OF EXHIBIT: Surrebuttal Testimony
SPONSORING PARTY: MOPSC Staff
CASE NO.: HO-86-139

MISSOURI PUBLIC SERVICE COMMISSION

UTILITY DIVISION

KANSAS CITY POWER AND LIGHT COMPANY

CASE NO. HO-86-139

Surrebuttal Testimony

of

Robert S. Miller, P.E.

Exhibit No. 33
Date 4/6/87 Case No. HO-86-139
Reporter _____

Jefferson City, Missouri

April 6, 1987

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of the investigation) of steam service rendered by) Kansas City Power & Light Company.)	Case No. HO-86-139

AFFIDAVIT OF ROBERT S. MILLER

STATE OF MINNESOTA)
) ss
COUNTY OF HENNEPIN)

Robert S. Miller, of lawful age, on his oath states: That he has participated in the preparation of the attached written testimony in question and answer form, consisting of 13 pages of testimony to be presented in the above case, that the answers in the attached written testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

Robert S. Miller

Robert S. Miller

Subscribed and sworn to before me this 6th day of April, 1987.

Wanda M Marienau

Notary Public

My Commission Expires May 23, 1987

My commission expires May 23, 1987

SURREBUTTAL TESTIMONY

OF

ROBERT S. MILLER, P.E.

Kansas City Power and Light Company

CASE NO. HO-86-139

I - Purpose of Testimony

Q. Please state your name.

A. Robert S. Miller.

Q. Have you testified previously in this case?

A. Yes.

Q. What is the purpose of your surrebuttal testimony?

A. My surrebuttal testimony is submitted in response to the rebuttal testimony submitted by Kansas City Power and Light Company (KCPL) witness Levesque. Specifically I will address:

- Operation and maintenance expenses associated with the long term rehabilitation program.
- Auxiliary electricity required to run the proposed boiler plant.
- Station heat and distribution system losses.
- Boiler size associated with the short term rehabilitation program.
- Construction cost of individual gas-fired boilers.
- Construction cost of individual electric boilers.

I also will address areas where my analysis estimating procedures resulted in a conservatively high estimate for the cost of central district steam.

II - Operation and Maintenance Expenses

Q. What is Mr. Levesque's criticism of your operation and maintenance expense?

A. Mr. Levesque stated on page 3 of his rebuttal testimony that I significantly understated the costs to operate and maintain the distribution system. He further stated that with the efficiencies of a rehabilitated distribution system the manpower could be at a level of no fewer than 10 rather than the 3 employees which I estimated.

Q. Did Mr. Levesque provide some operational experience data and estimates of labor requirements?

A. Yes, he did. The data and estimates were prepared by Mr. Gawron and were included with Mr. Levesque's workpapers. I have included Mr. Gawron's analysis in my testimony as Schedule 1.

Q. Do you agree with the Company's estimate?

A. No. There are five problems with the Company's work:

1. System Operation and Maintenance Personnel. The Company summarized the ongoing functions that will be required to maintain the proposed system. Based on those ongoing functions, the Company estimated 3.2 people would be required. This number was rounded up to 4. My estimate of 3 people plus 10% overtime is essentially the same as that prepared by Mr. Gawron.

2. Technician. The Company estimated one technician would be required to maintain steam flow meters, electrical equipment and various control equipment. The Company identified a work task and then claimed an addition to the staff was required. In my estimate of total plant personnel, I included -- besides the 3 outside people -- 3 inplant maintenance people. The inplant maintenance people can maintain

both the control equipment associated with the boiler operation as well as the steam meters and other equipment associated with the distribution system. An additional person is not required as the Company claims.

3. Heavy Equipment Crew. The Company estimated that 0.64 people would be required to fix leaks. This estimate was based on repairing 4 leaks per year in the old pipe and 2 leaks per year in the new pipe. The Company rounded this number up to one and added two more. The justification given is that more people will be required to replace the existing high pressure system, expand the system and add customer services.

It appears the Company would maintain a 3-man construction crew to fix 4 to 6 leaks per year, since the condition of the existing high pressure system does not indicate a need for replacement. Furthermore, system expansion and customer addition would be a construction effort chargeable to the customer(s) being served or would be capitalized and not expensed. A more reasonable approach would be to contract out for this work rather than maintain an underutilized construction crew.

4. Welder. The Company estimated one welder would be required. As in the case with the technician, the Company identified a work task and then claimed an addition to the staff was required. Again, the inplant maintenance staff can do this work.

5. Supervisor. The Company estimated one supervisor was required, apparently to manage the other 7. In fact, only 3 people are required and they can be managed adequately by the plant chief and/or assistant chief.

Q. What are your conclusions regarding the number of people required to operate and maintain the distribution system?

A. The Company's estimate of 10 people is overstated. My estimate of 3 people is reasonable and supported by the Company's analysis.

III - Auxiliary Electricity

Q. Mr. Levesque stated on page 4 of his rebuttal testimony that you underestimated the amount of electricity required to run electric auxiliaries at Grand Avenue Station (Grand Avenue). What is Mr. Levesque's estimated electricity requirement?

A. Mr. Levesque stated that the Company estimates 6,027,000 Kwh of auxiliary electricity would be consumed compared to my estimated auxiliary electric consumption of 2,892,000 Kwh per year.

Q. Do you agree with the Company's estimate?

A. No. Mr. Levesque's estimate is flawed in four areas:

- Use of data from a local major chemical company facility identified as Mobay in Mr. Levesque's workpapers.
- Estimate of Grand Avenue lighting.
- Estimate of Grand Avenue air conditioning.
- Estimate of Grand Avenue miscellaneous.

Q. Why do you disagree with the Company's use of the Mobay's actual experience?

A. The Mobay plant may not be an appropriate facility to use for estimating electrical consumption at Grand Avenue. Mr. Levesque's workpapers indicate the Mobay plant size is 3,000 square feet and Grand Avenue is 69,000 square feet. We have inspected Grand Avenue but we

have no information on the Mobay plant. I would be reluctant to use the Mobay data without being able to properly adjust the data to reflect conditions at Grand Avenue.

Q. Did the Company properly adjust the Mobay data?

A. No. Mr. Levesque's workpapers indicate the Mobay electric auxiliaries include boiler feed pumps, boiler fans, air conditioning, lighting, chemical pumps, and miscellaneous. The Company took the total annual Mobay electric consumption and divided it by the annual steam sendout to get a unit electric consumption rate of 3.41 Kwh per Mlb of steam sendout. They applied that unit rate to the sendout from Grand Avenue and then added additional electrical consumption due to air conditioning, lighting, and specific miscellaneous pieces of equipment. It appears that since the Mobay data already included these items, the Company compensated twice for these items.

Furthermore, the net sendout that the Company used was incorrect. Mr. Levesque stated he adjusted my sendout number which was 970,873 by adding 40,700 (additional losses) and 15,000 Mlb (additional inplant heating). Adding these three numbers, I get 1,026,573 Mlb instead of the 1,065,647 Mlb used in the Company's calculation. Thus the base electric consumption the Company used in their estimate was miscalculated.

Q. What would have been a more reasonable approach to using the Mobay data?

A. A linear regression analysis of the 12 months of Mobay data yields the following relation:

Kwh/month = 37,840 + 2.4975 * Mlb/month (sendout)

Correlation = 0.9189

This relation shows a constant electric component of 37,840 Kwh per month and a variable component of 2.4975 Kwh per Mlb of steam sendout. It may have been appropriate to use the variable component and then add the constant component based on the other electrical consumption specific to Grand Avenue.

Q. Why do you disagree with the Company's estimate of lighting?

A. The Company based their estimate on lighting the entire Grand Avenue Station. Since only a portion of Grand Avenue will be actively used, it seems logical to take steps to reduce the amount of lighting to a minimum in areas that are not actively used. One obvious area is the turbine room which is not needed to produce steam.

Q. Why do you disagree with the Company's estimate of air conditioning?

A. The Company used 8 watts per square foot for the 9,000 square foot office and foreman's areas. Based on 740 watts per ton of air conditioning this yields 94 square feet per ton of air conditioning. An older office building would normally require 190 to 360 square feet per ton which is 2 to 4 times less than the Company's estimate. Thus I conclude the Company's estimate is too high.

Also, it appears to me 9,000 square feet is excessive and is not needed. The air conditioning should be turned off in the areas not used. I conclude, therefore, that the Company's estimate of electrical consumption for air conditioning is overstated.

Q. Why do you disagree with the Company's estimate of miscellaneous electric consumption?

A. The Company estimates that 82 Kw of air compressors will be continuously required. This value may be reasonable for the old electric facility but is totally inappropriate for the lower compressed air requirements of the packaged gas/oil boilers I propose.

The Company estimates a 40 Kw cooling water pump is required. I don't expect any boiler associated equipment will require cooling water, thus this pump is not required.

Since the boilers would generate steam at the sendout pressure, no further desuperheating would be required, thus the 50 Kw desuperheating pump included in the Company's estimate would not be required.

The Company estimates a 50 Kw drip and drain pump is required. Although the function of the pump isn't clear, this is a large pump. It is comparable to the average electrical draw of the continuously running boiler feed water pumps required for the proposed boiler plant. The Company's estimate is excessive.

Q. How would you reconcile the Company's estimate of auxiliary electric consumption with yours?

A. If I apply the Nobay data of 2.4975 Kwh per Mlb of sendout to my analysis, I get 2,425,047 Kwh per year. If I add to this the Company's estimate of lighting for the boiler room and office

(452,016 Kwh) and air conditioning of the 9,000 square foot office area (86,400 Kwh) I get 2,963,463 Kwh per year. The estimate I used in my analysis was 2,892,000 Kwh per year. This alternative calculation is within 2.5% of my previous estimate and confirms my previous estimate. The Company's proposed adjustment is inappropriate.

IV - Station Heat and Distribution System Losses

Q. What is station heat?

A. Station heat is the steam used to heat the plant and provide hot water for domestic use. The amount of heat required in a boiler plant is higher than in an office building because of the relatively large amount of outside air drawn into the plant by the boilers for use in combustion.

Q. What is Mr. Levesque's criticism of your estimate of station heat?

A. Mr. Levesque believes I underestimated the amount of station heat required.

Q. What quantity did you use and what quantity does the Company believe should be used?

A. The quantity I used was 3,643 Mlb per year as shown on Schedule 1-20 of my prefiled direct testimony. The Company states on page 4 of Mr. Levesque's rebuttal testimony that my quantity should be increased by 15,000 Mlb per year.

Q. Is the Company's adjustment appropriate?

A. No, for four reasons.

1. The Company stated in response to Staff Data Request No. 408 that station heat was estimated to be 15,000 Mlb per year. Increasing my estimate as they indicated would raise the station heat requirements to 18,643 Mlb per year.

2. The Company's original estimate of 15,000 Mlb per year was based on Grand Avenue data for the year ending December 31, 1985. During that year Grand Avenue burned mostly coal. The modern, efficient packaged gas/oil fired boilers I am proposing would require less air for combustion than the inefficient coal fired boilers used in 1985.

3. Since only a portion of the Grand Avenue plant will be used under my scenario, it seems logical the Company would take steps to reduce the amount of steam used for space heating. For example, the turbine room does not need to be heated to the same temperature as occupied areas of the plant.

4. The boilers themselves radiate heat and except for basement areas and office areas, very little space heat is required.

Q. Do you see any reason to adjust your estimate?

A. No. I calculated space heating based upon heating outside air used by the boilers for combustion. The total space heating requirement of Grand Avenue may be somewhat higher than my estimate. However, it certainly is not as high as the Company claims. At any rate, the effect on the total cost of operating the district heating system will be insignificant.

Q. What did Mr. Levesque say about distribution system losses?

A. Mr. Levesque testified on page 4 that:

"Apparently he (Mr. Miller) failed to realize that the "other than radiation" losses occur mostly on the customers' premises or are steam leaks which will continue to occur even if new distribution is installed. Again, we discussed this with Messrs. Miller and Dahlen and provided actual measurement data."

Q. Did Mr. Levesque or anyone else at KCPL provide to you or Mr. Dahlen "actual measurement data" related to "other than radiation" losses?

A. No. Neither Mr. Levesque nor anyone else at KCPL provided any "actual measurement data" related to "other than radiation" losses, to losses on customers' premises, or to the amount lost through leaks.

The exact distribution between the amount of radiation loss, leak loss and unmetered steam lost in the customers' premises is impossible to determine. The methodology I used and described in my prefiled direct testimony was based on 1985 data, the latest full year available at the time I did the analysis. During 1985, 42 major leaks were repaired. I do not expect anywhere near this number in the future if the system is rehabilitated as I described. The Company did not consider the effect on the "other than radiation" losses caused by the 42 major leaks. Thus their adjustment to my estimate is inappropriate.

V - Boiler Size Associated With Short Term Rehabilitation

Q. Mr. Levesque stated on page 7 of his rebuttal testimony that a boiler much larger than the one you proposed in your direct

testimony would be required for the short term rehabilitation alternative. What are your comments regarding this?

A. If a larger boiler is required then a larger boiler should be installed. The long term rehabilitation program included installing 400,000 lb/hr of new boiler capacity consisting of (1) 70,000 lb/hr summer boiler and (2) 165,000 lb/hr boilers. The capital cost of installing (3) 133,000 lb/hr boilers yielding the same plant capacity will essentially be the same.

If the summer boiler under the short term rehabilitation program was 133,000 lb/hr instead of 70,000 lb/hr then the capital cost would be higher but the effect on the total cost of service would be small.

VI - Capital Cost of Individual Gas Fired Boiler

Q. Mr. Levesque contends on page 1 of Exhibit 4 to his rebuttal testimony that the cost of a 200 boiler horsepower (bhp) gas boiler should be $300,000 versus your estimate of $124,000. What comments do you have regarding this?

A. Mr. Levesque does not have a reasoned basis for his cost estimate. On the other hand I developed my cost estimate using standard estimating procedures and the reasonableness of my value ($620/bhp) is supported by actual contractor proposals ($748/bhp) as I discussed in my prefiled direct testimony.

Q. Do you see any reason to adjust your estimate?

A. The Company's estimate lacks a reasoned basis so I would have to say no.

VIII - Capital Cost of Individual Electric Boiler

Q. Mr. Levesque states on page 1 of Exhibit 4 to his rebuttal testimony that the cost of a 200 bhp electric boiler should be $210,846 versus your estimate of $340,000. What comments do you have regarding this?

A. Mr. Levesque based his estimate on the Home Savings building test installation. My estimate was based on the average cost of similarly sized installations estimated by the Company, and as such it applies to a broader base than just the Home Savings building.

Q. Do you see any reason to adjust your estimate?

A. No, I continue to believe my estimate is reasonable.

IX - Conservative Analysis

Q. Do you have any reason to expect the estimating procedures you used resulted in a conservatively high estimate for the cost of central district steam?

A. Yes, I do. For example, I used a boiler efficiency of 80% when calculating the fuel consumption at Grand Avenue. This is conservatively low and an efficiency of 85% could have been used for the plant I propose. This would result in the fuel consumption and cost being about 6% lower than I orginally estimated.

Also, the cost I used for new pipe was conservatively high. As I stated on page 3 of my rebuttal testimony, the methodology I used results in the estimated cost of installing new pipe being 40% to 70% higher than the estimated cost used by the Company.

Finally, as noted by Mr. Levesque on page 4 following his rebuttal testimony, the chemical treatment cost I used was much higher than actually experienced by KCPL.

Q. How does the conservatism in your estimates compare to the criticisms by the Company that your estimates are too low?

A. To the extent there may be some validity to the Company's arguments, I believe my overestimating exceeds my underestimating.

Q. Does this conclude your surrebuttal testimony?

A. Yes, it does.

Miller

ROUGH DRAFT

March 30, 1987

Proposed revision to Robert S. Miller's estimate of manpower level for a high pressure distribution system serving all present customers.

System Proposed By:
R. S. Miller

- All Existing high pressure joints replaced.
- Existing low pressure system replaced with a new high pressure system.
- All abandonment work of low pressure system completed.
- 100 new PRV stations installed in existing low pressure customers.

The following is a summary of ongoing functions that will be required to be completed to maintain the proposed system:

Trap and Valve inspection and Maintenance -

In manholes -

50 TRAP M.H.	- 10/day-2 men = 10 man-days/month
40 valve M.H.	- 10/day-2 men = 8 man-days/month
Customer service inspections	- 24/day-1 man = 5.3 man-days/month
126 services	
Read condensate meters	- 100/day-1 man = 8 man-days/month
About 200	

Schedule 1-1

Change 18 flow meter charts each week	- 18/day-1 man = 4 man-days/month
Meter changeout on a 2 year cycle 200 meters	- 3/day-2 men = 5.6 man-days/month
Inspect and maintain 126 pressure reducing stations twice annually	- 4/day-2 men = 10.5 man-days/month
Trap Repair and meter overhaul in shop	- 3/days-1 man = 3 man-days/month
Condensate sampling approximately 100 customers twice annually	- 12/day-1 man = 1.4 man-days/month
Trouble calls at 40/month	- 1hr/call-1 man = 5 man-days/month
Trouble tickets 5/month	- 2hr/ticket-2 men=2.4 man-days/month annually
	Total 63.3 man-days/month

63.3 man-days/month x 12 months = 759.6 man-days/year.

$\frac{2080 \text{ hours/year}}{8 \text{hrs/man-day}}$ = 260 man-days/year

- 10 vacation days
- 11 holiday
- 3 sick

236 man-days available/person

$$\frac{759.6}{236} = 3.2$$

The above listed functions apply only to regular scheduled maintenance and does not allow for leak repair and miscellaneous work, such as material handling, vehicle maintenance, etc. Therefore, I propose that four (4)

operation and maintenance personnel would be required to maintain a reliable steam delivery system for the long term.

In addition to the above personnel, one (1) technician type person would be required to maintain steam flow meters, electrical equipment and various control equipment beyond the scope and abilities of the 4 operation and maintenance personnel listed above. This individual would also be available for work required in the proposed new boiler plant to maintain the control equipment associated with boiler operation.

The maintenance of steam mains, service lines, manholes, and handling of material installed in the streets will require at minimum a two (2) man heavy equipment crew capable of operating cranes, backhoes, dump trucks, pavement breakers, jackhammers, shoring jacks, etc., for the purpose of excavating and installing equipment in the streets outside the customer's premises.

The proposed plan proposed that all existing expansion joints be replaced on the existing high pressure system and new high pressure piping be installed to replace the low pressure system.

The majority of existing piping on the high pressure system has been in the ground for over 30 years and will have leaks occurring in it. A conservative estimate would be four (4) leaks/year. This existing piping also has insulation containing asbestos which will lengthen the time spent in making an excavation to expose a steam main for repair. An enclosure needs to be placed over the excavation and all work done with protective equipment to eliminate the exposure of the public and workman to this hazardous material

The new Standards for working with asbestos were implemented in January 1987 and the full impact on manpower and length of time required to repair a steam leak is not documented. I estimate at a minimum the handling of asbestos under the new guidelines will double the length of time required to complete a leak repair in the streets.

4 leaks/year x 2 man crew x 5 days x 2 asbestos factor = 80 man-days/year.
(existing system)

2 leaks/year x 2 man crew x 5 days = 20 man-days/year.
(new system)

Adjusting manhole tops for street resurfacing
4/year x 2 men x 2 days = 16 man-days/year.

Operation of crane for handling equipment
in excavations 5 leaks/1 year x 1 man x 1 day = 5 man-days/year.

Operation of crane in handling equipment
in manholes such as valves and blowdown tanks
6/year x 1 man x 1 day = 6 man-days/year.

Maintenance of existing M.H. roofs, floors and
drains of the manholes on the existing high
pressure system 1/month x 2 men x 1 day = 24 man-days/year.

Total 151 man-days/year.

$\frac{151 \text{ man-days/year}}{236 \text{ man-days available/person}}$ = .64 persons/year; Therefore 1 man/year

A code welder will be required for work on the majority of equipment, including trap, valves, pipe, expansions joints etc., throughout the year and also would be used in plant maintenance.

1 man/year

Summary from above:

System Operation and Maintenance personnel	4
Technician	1
Heavy Equipment Crew	1
Welder	1
Supervisor	1
	8

This is the minimum manpower level I would consider feasible to operation and maintain the proposed steam distribution system. It does not include personnel for work required to replace the 23,000 foot of existing pipe that presently is 30 years old. It does not include any personnnel for system expansion or addition of customer services. Since the proposed system is a long range rehabilitation program, I judge it reasonable to increase the minimum work force by 2 heavy equipment operators to accomplish this work over 20 years. This brings the total Distribution System manpower to 10.

J. Gawron 3/31/87

Joe Gawron