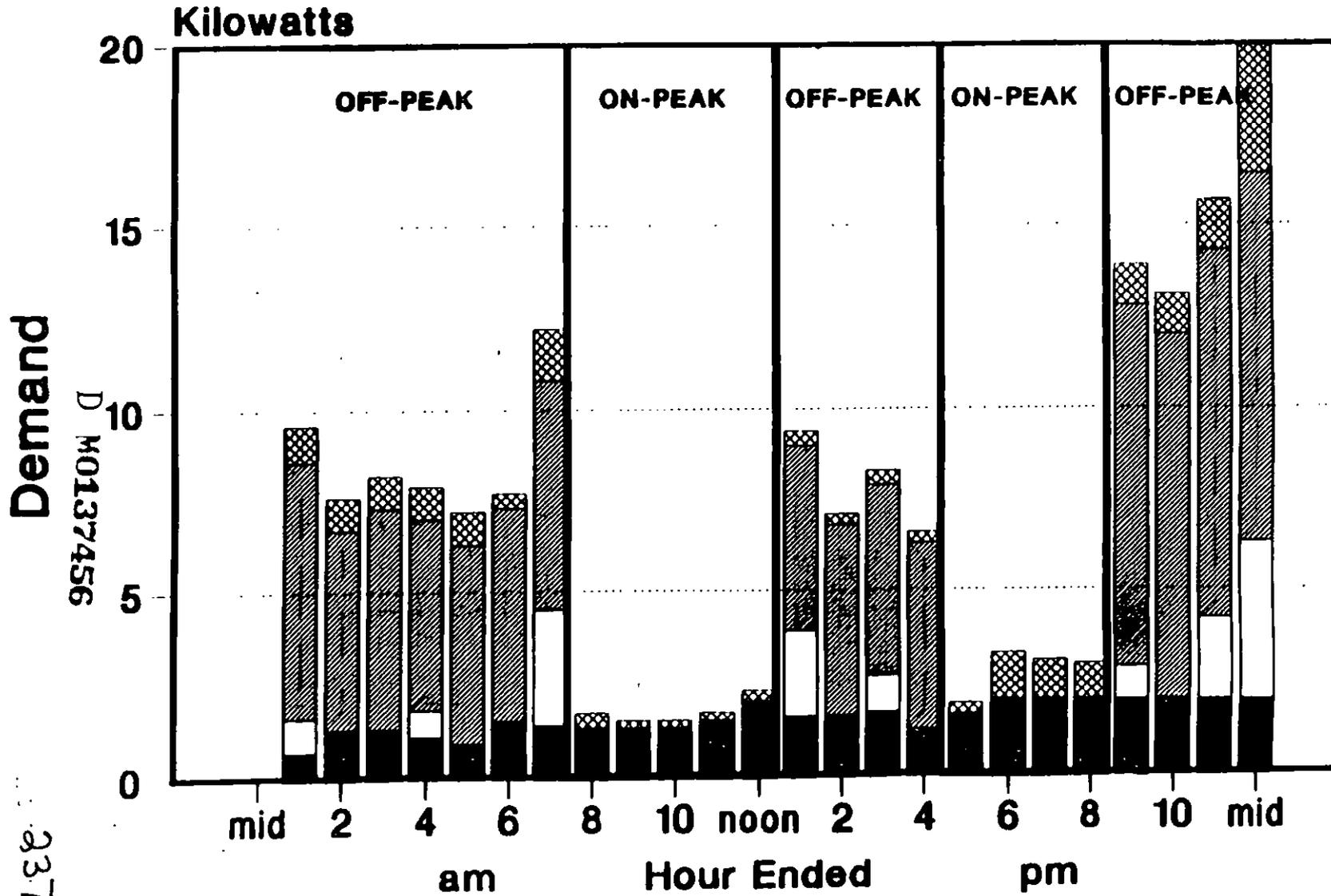


# RTS Task Force - Mid-Day Half Boost

## Test Home #2 - HP+

### Tuesday, 1/22/91



D M0137456

337

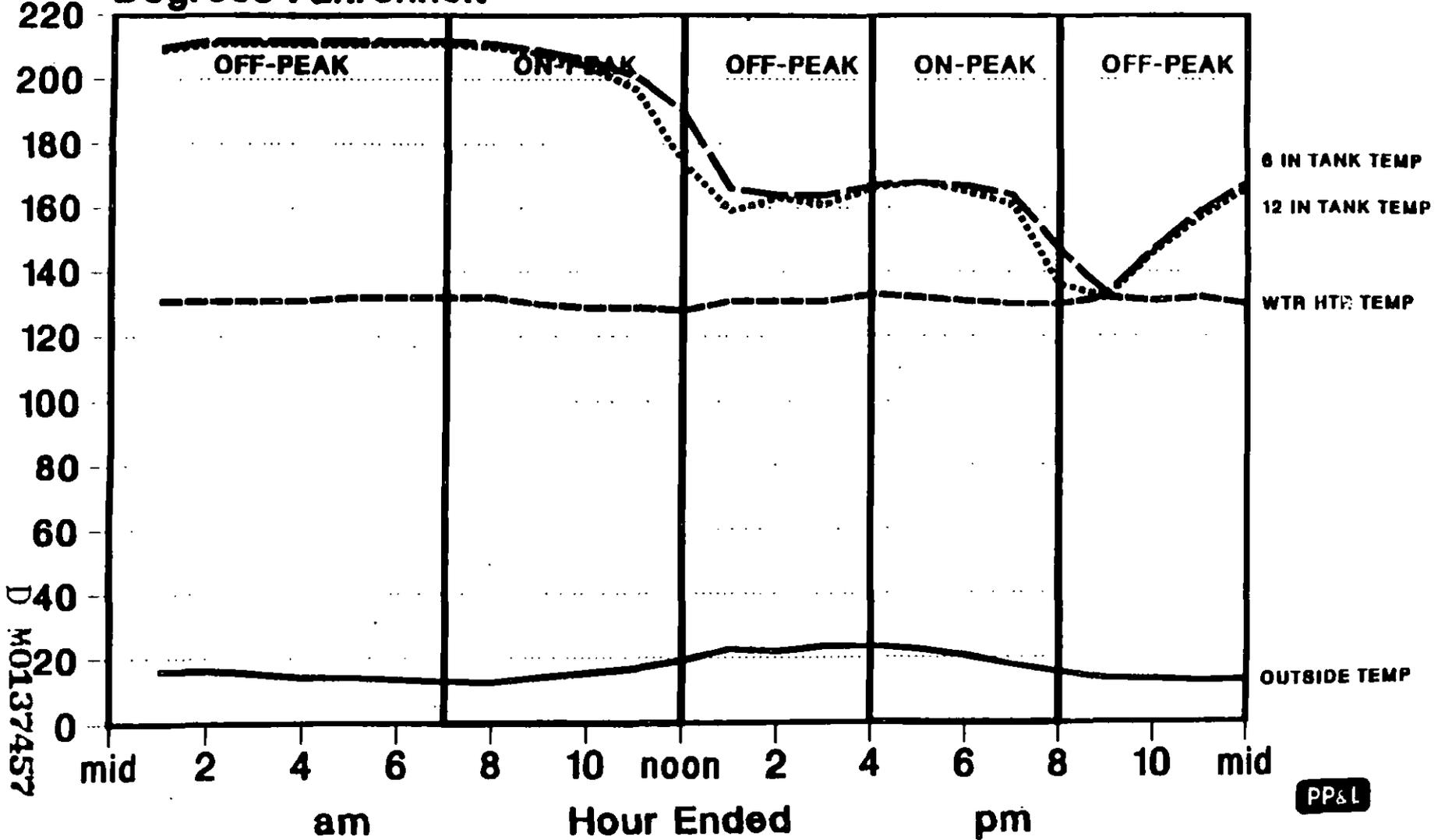
PP&L

# RTS Task Force - Mid-Day Half Boost

## Test Home #2 - HP+

### Tuesday, 1/22/91

Degrees Fahrenheit



D M0137457

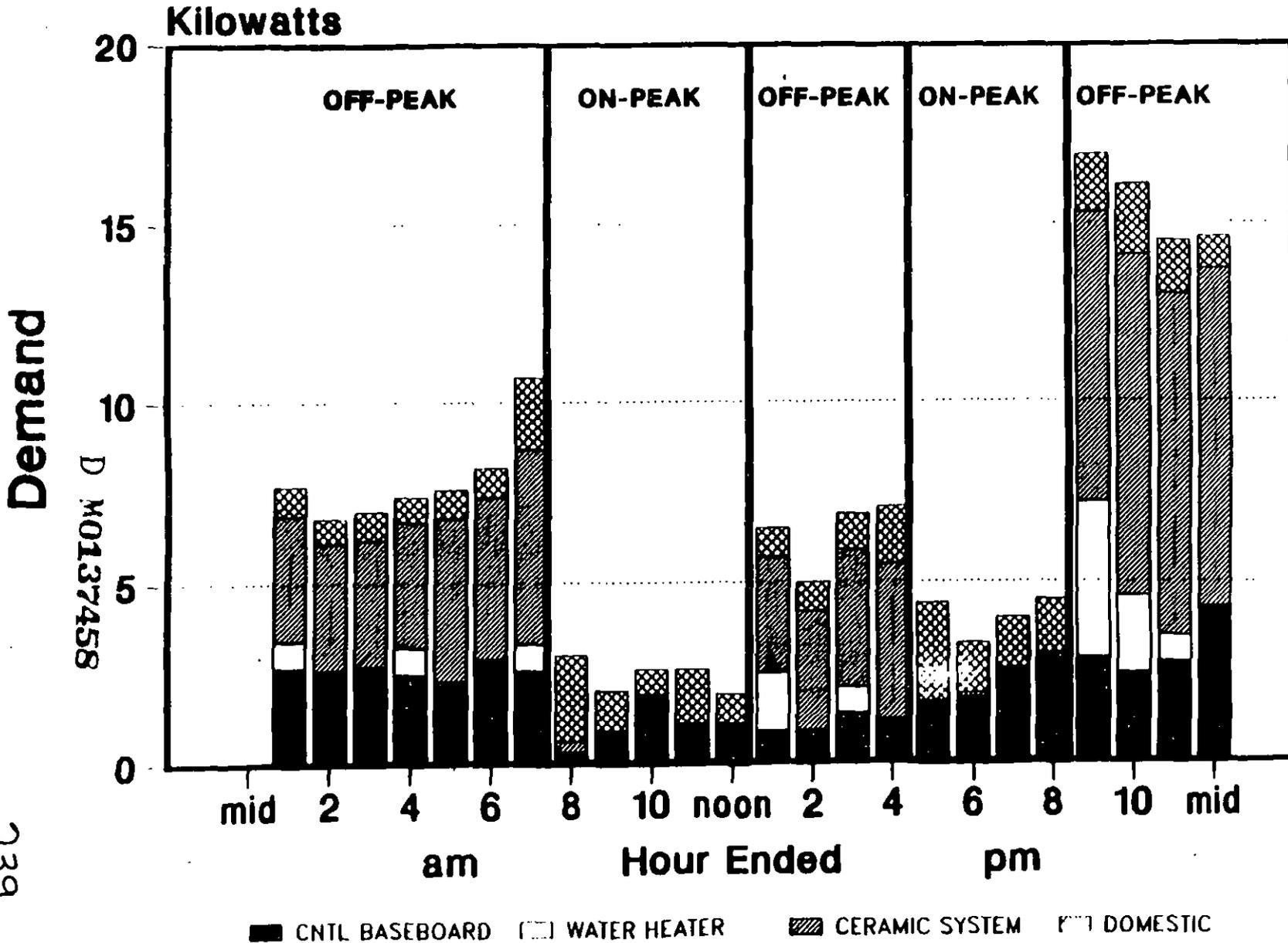
238

PP&L

# RTS Task Force - Mid-Day Half Boost

## Test Home #3 - Ceramic Room Heaters

### Tuesday, 1/22/91



PP&L

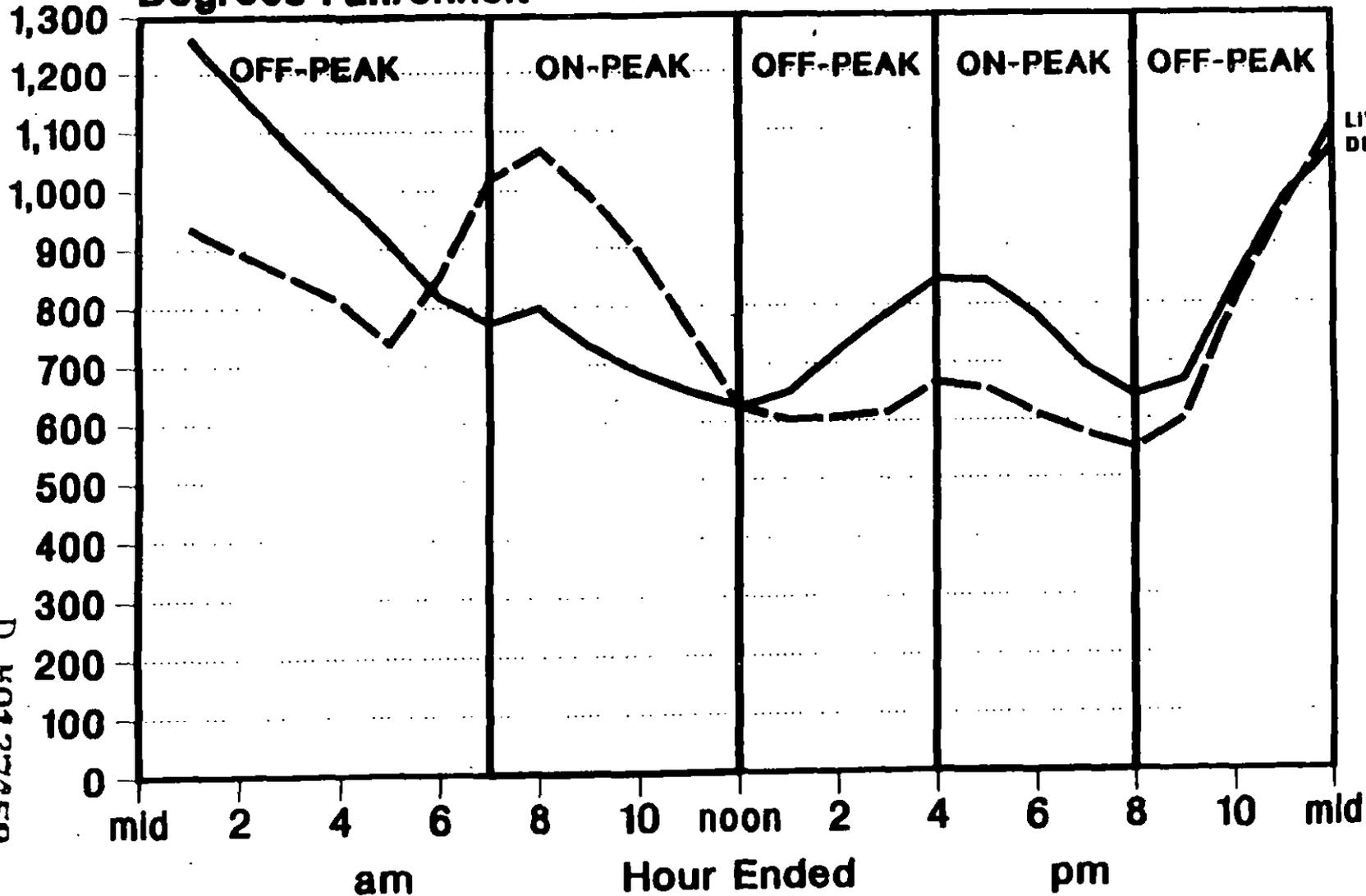
639

# RTS Task Force - Mid-Day Half Boost

## Test Home #3 - Ceramic Room Heaters

### Tuesday, 1/22/91

**Degrees Fahrenheit**



LIVING RM HTR  
DINING RM HTR

PP&L

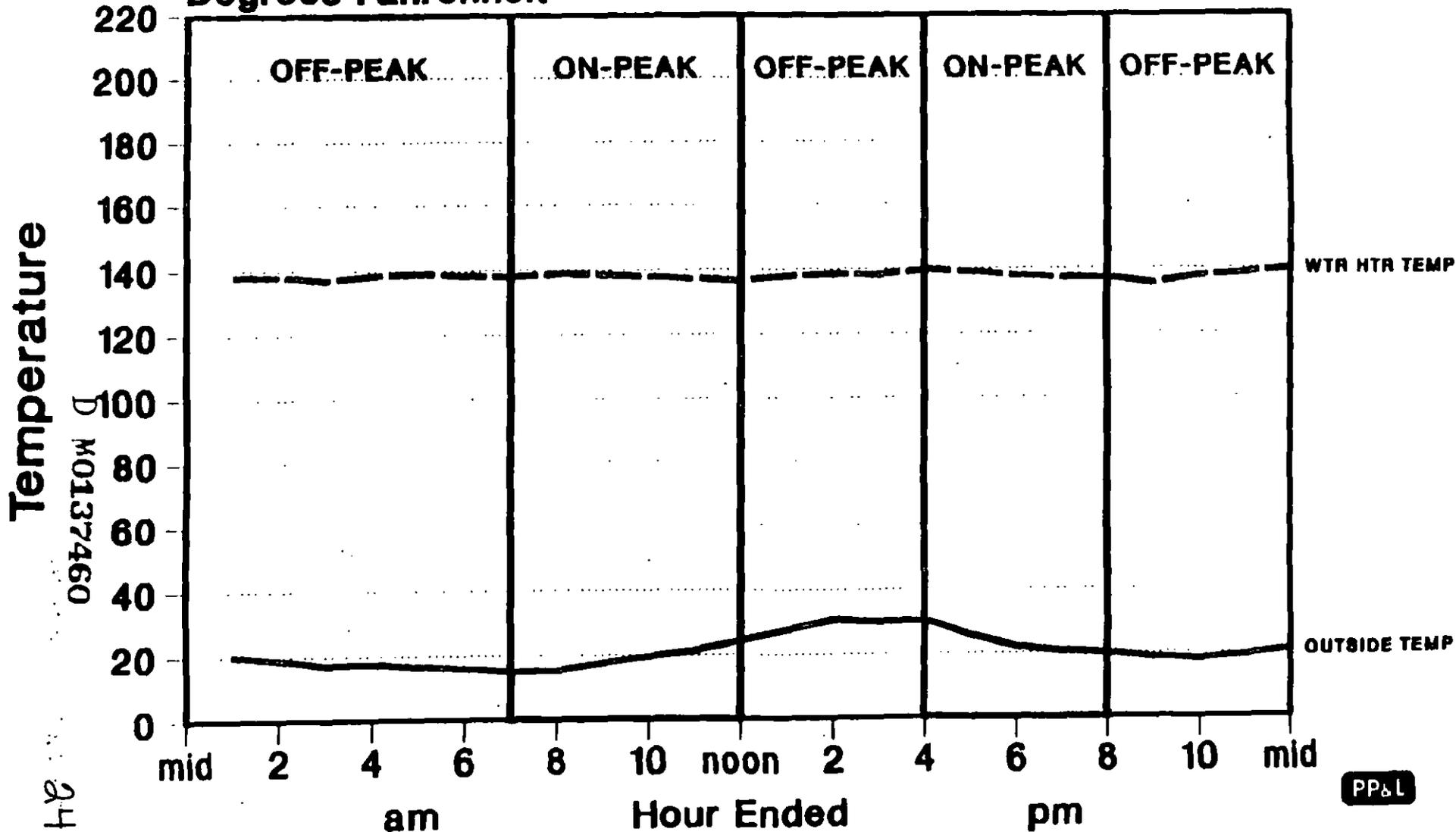
D M0137459 240

# RTS Task Force - Mid-Day Half Boost

## Test Home #3 - Ceramic Room Heaters

### Tuesday, 1/22/91

Degrees Fahrenheit



241

**APPENDIX IV**

**TEST #3 - HYDROKINETIX "SMART" SYSTEM**

**TEST HOME #4 - DEMAND AND TEMPERATURE PROFILE FOR 30 GALS. EXCESS STORAGE  
(HP+ SYSTEM)**

**TEST HOME #5 - DEMAND AND TEMPERATURE PROFILE FOR 60 GALS. EXCESS STORAGE  
(HP+ SYSTEM)**

**D M0137461**

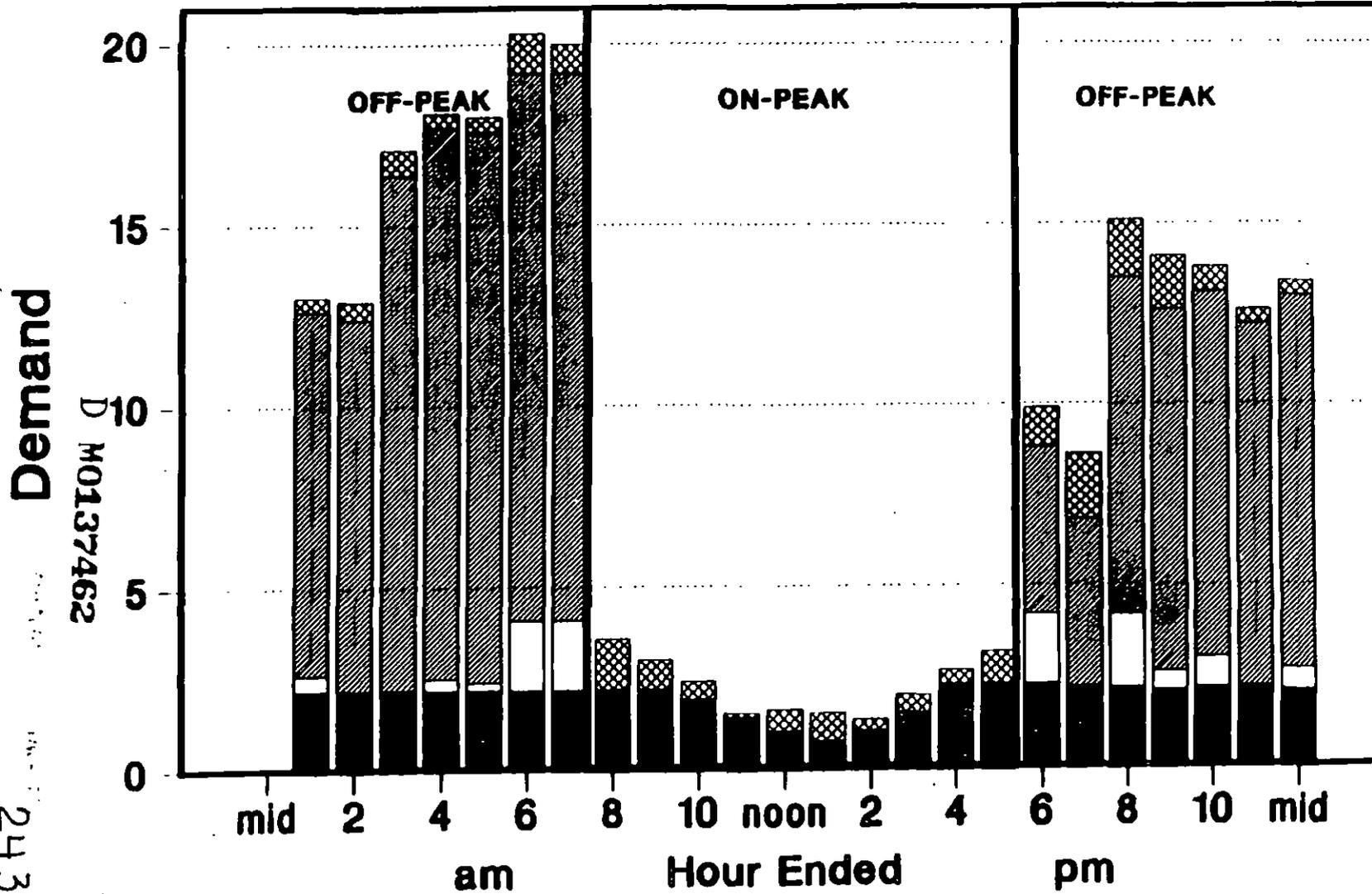
**242**

# RTS Task Force - Hydrokinetix SMART System

Test Home #4 - HP+

Tuesday, 1/22/91

Kilowatts



Demand

D M0137462

243

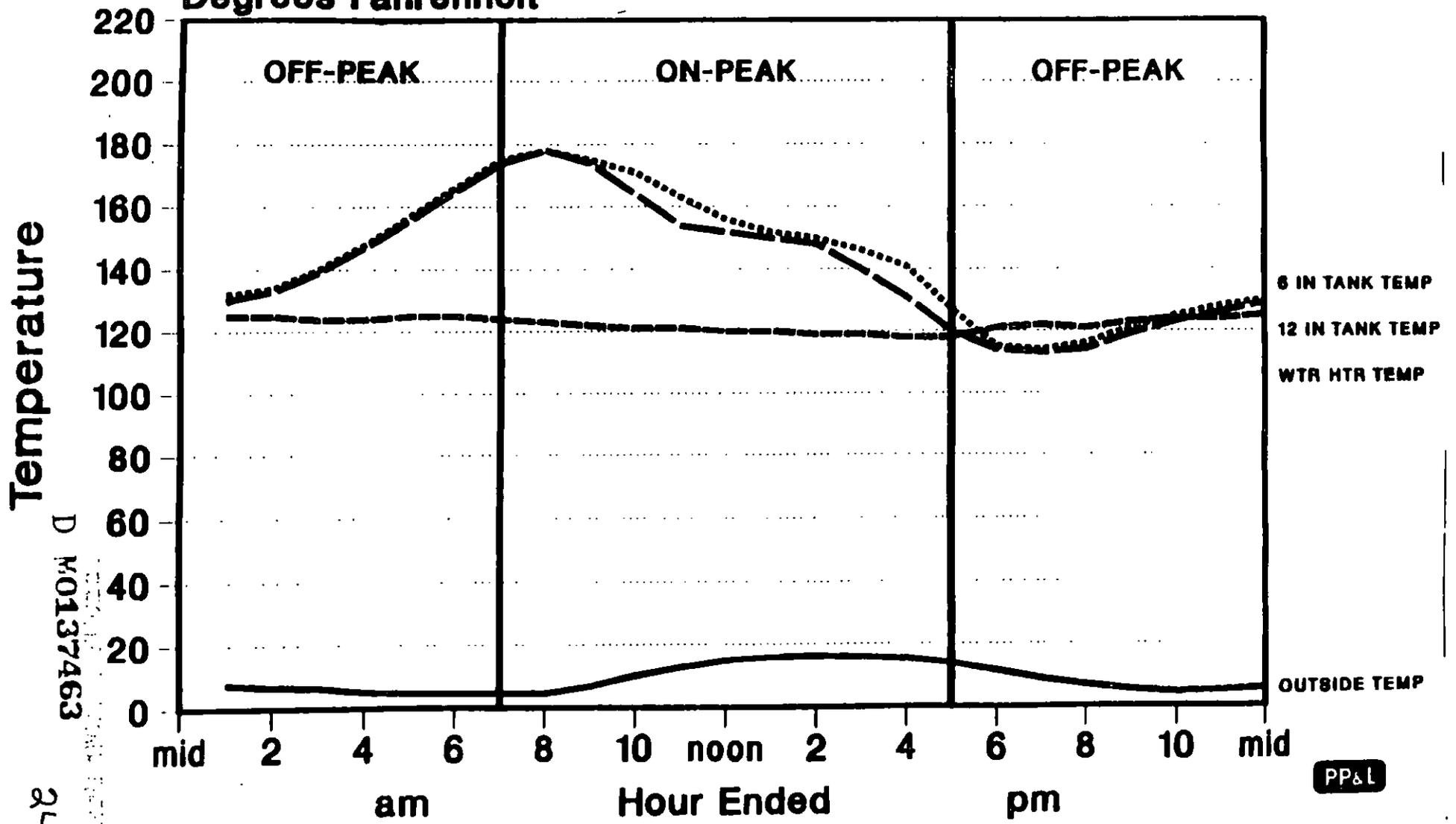
PPAL

# RTS Task Force - Hydrokinetix SMART System

Test Home #4 - HP+

Tuesday, 1/22/91

Degrees Fahrenheit



D M0137463

244

PP&L

# RTS Task Force - Hydrokinetix SMART System

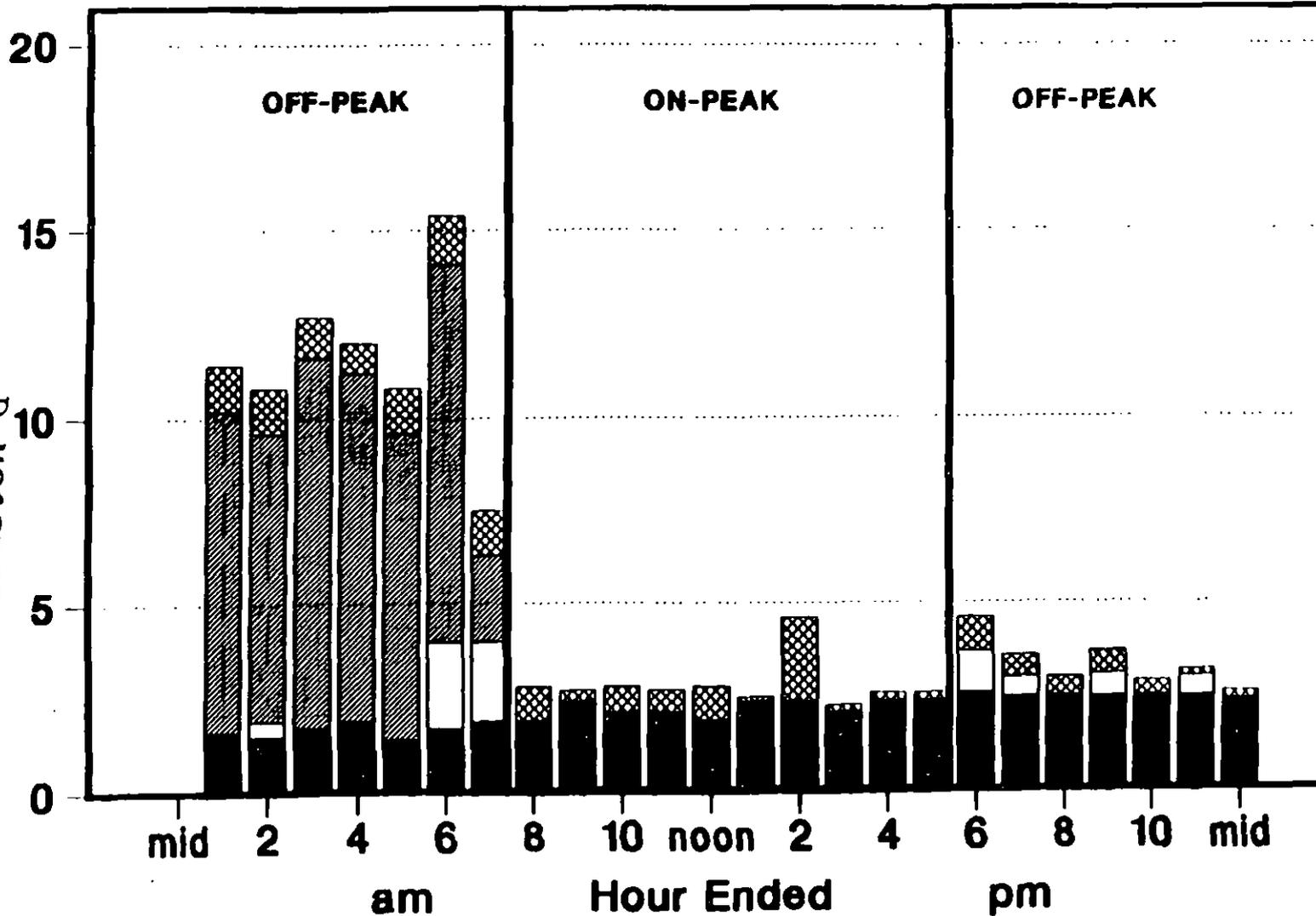
Test Home #5 - HP+

Tuesday, 1/22/91

Kilowatts

Demand

D M0137464



COMPRESSOR
  WATER HEATER
  STORAGE
  DOMESTIC

PP&L

245

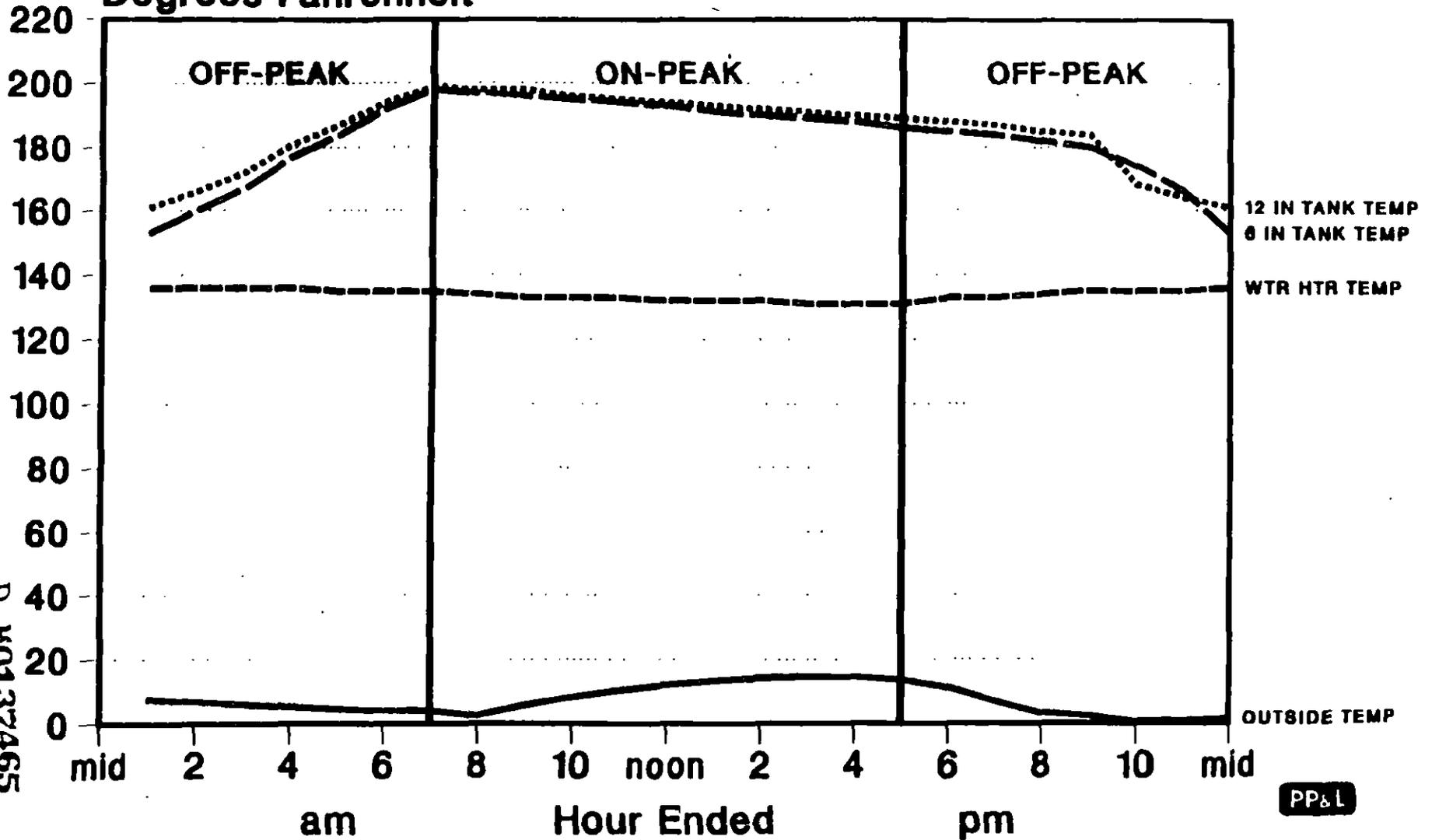
# RTS Task Force - Hydrokinetix SMART System

Test Home #5 - HP+

Tuesday, 1/22/91

Degrees Fahrenheit

Temperature



D M0137465

976

PP&L

**APPENDIX V**

**TEST #1 - DEMAND LIMITING TEST**

**TEST HOME #6 - DEMAND AND TEMPERATURE PROFILE FOR THE HP+ SYSTEM**

D M0137466

247

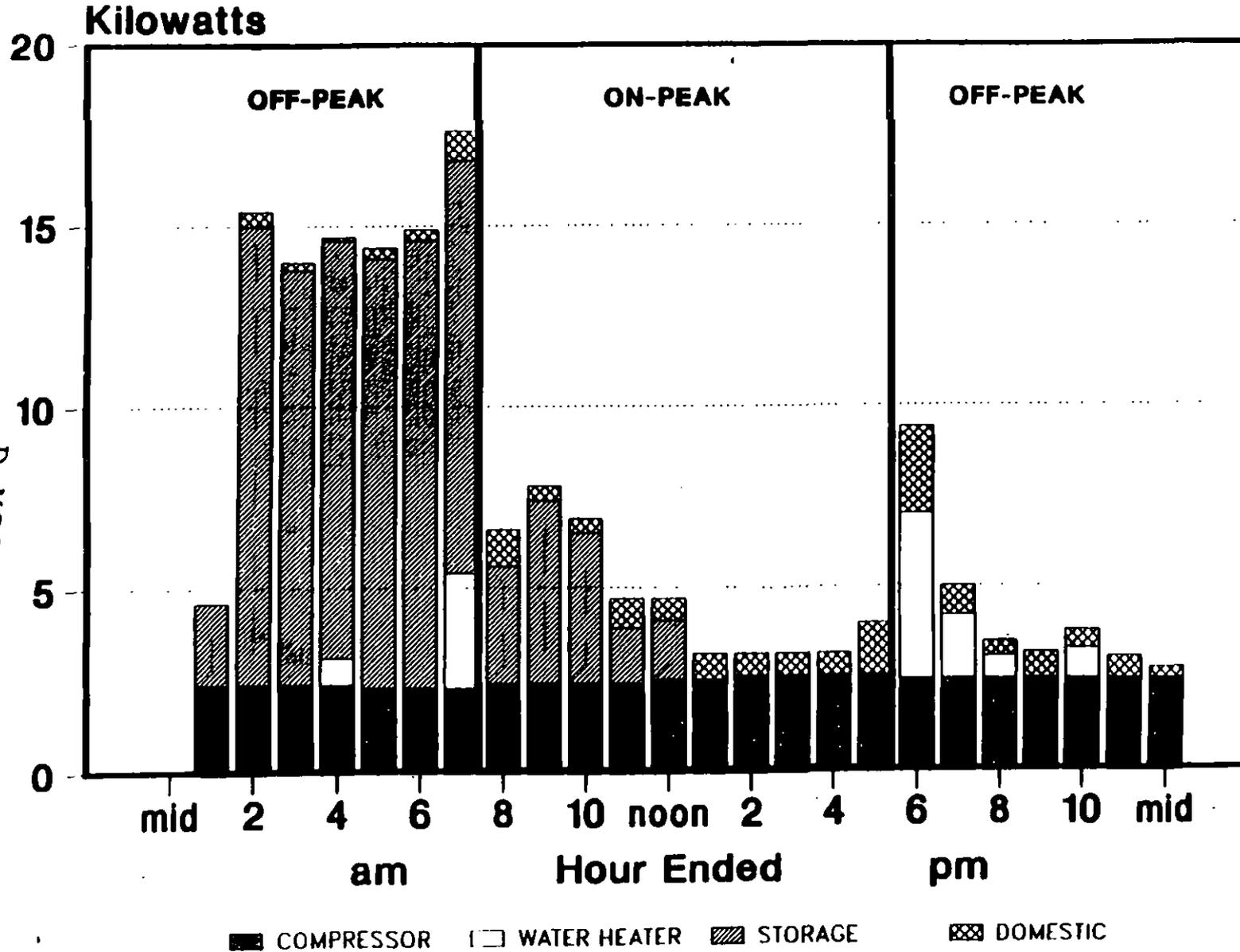
# RTS Task Force - Demand Limiting Test

## Test Home #6 - HP+

### Tuesday, 2/12/91

Demand  
D M0137467

248



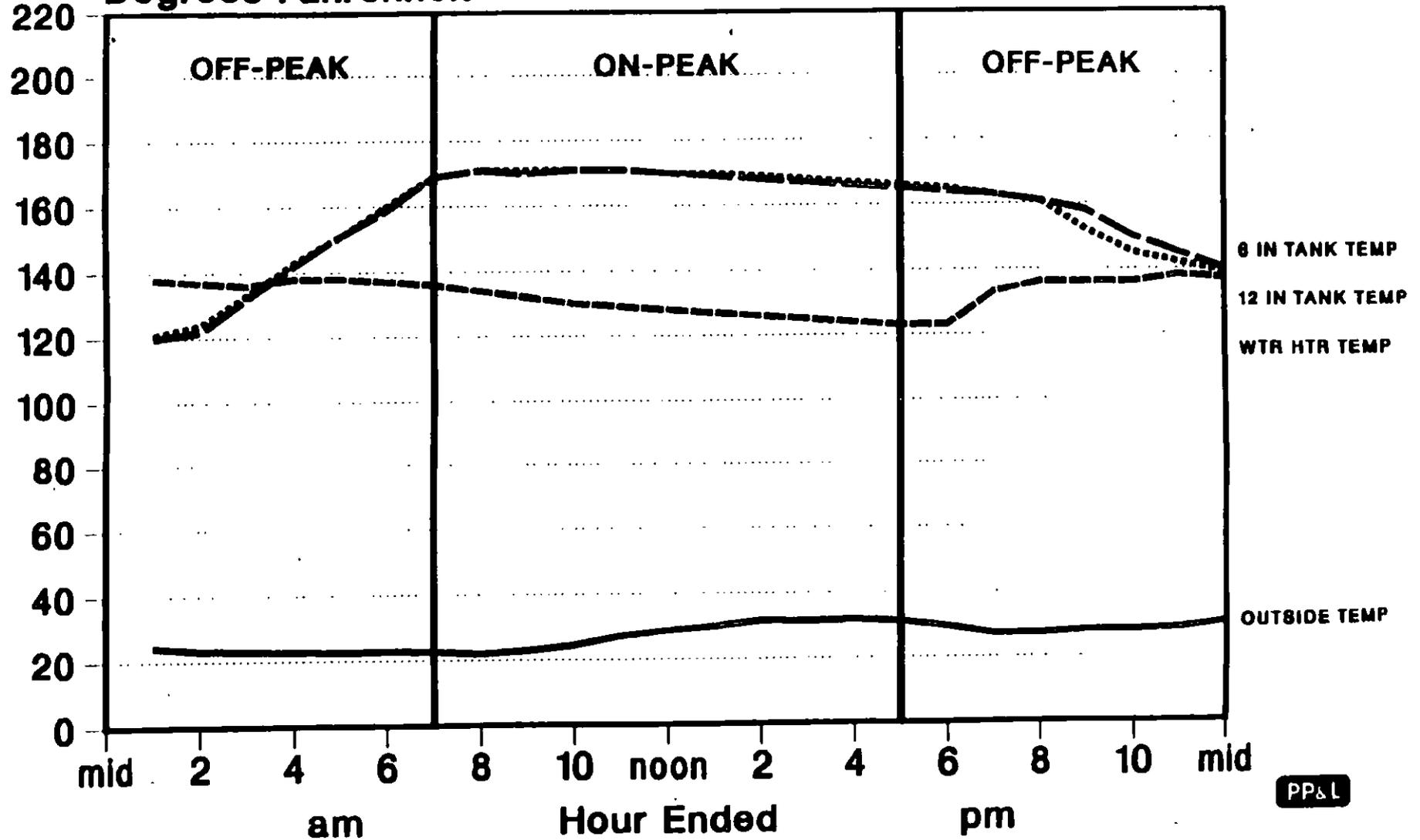
PP&L

# RTS Task Force - Demand Limiting Test

## Test Home #6 - HP+

### Tuesday, 2/12/91

Degrees Fahrenheit



Temperature

D M0137468

249

PP&L





**Executive Planning Conference**

**May 1991**

**PP&L**

DB 0155434

**Revenue Enhancements  
from  
Retail Market Opportunities**

DB 0155435

**SALES OUTLOOK - 4/91**  
(MILLIONS KWH)

| Customer Segment          | 1996   | 1991   | Growth |          |
|---------------------------|--------|--------|--------|----------|
|                           |        |        | Sales  | Annual % |
| <b>Customer Class</b>     |        |        |        |          |
| Electrically Heated Homes | 6,365  | 5,430  | 935    | 3.2      |
| General Residential       | 5,765  | 5,330  | 435    | 1.6      |
| Commercial                | 10,360 | 8,880  | 1,480  | 3.1      |
| Industrial                | 9,115  | 8,505  | 610    | 1.4      |
| Other                     | 1,590  | 1,355  | 235    | 3.3      |
| Total                     | 33,195 | 29,500 | 3,695  | 2.4      |
| <b>Rate Class</b>         |        |        |        |          |
| RS: EHH (w/o RTS)         | 5,912  | 5,139  | 773    | 2.8      |
| RTS                       | 450    | 289    | 161    | 9.3      |
| GRS                       | 5,759  | 5,323  | 436    | 1.6      |
| GS-1                      | 1,740  | 1,415  | 325    | 4.2      |
| GS-3                      | 7,152  | 6,094  | 1,058  | 3.3      |
| GH                        | 482    | 621    | -139   | -4.9     |
| LP-4                      | 4,686  | 4,093  | 593    | 2.7      |
| LP-5: Air Reduction       | 582    | 524    | 58     | 2.1      |
| Steel                     | 600    | 800    | -200   | -5.6     |
| Other                     | 4,227  | 3,834  | 393    | 2.0      |
| SL/AL                     | 100    | 100    | 0      | 0.0      |
| Total - PPUC              | 31,689 | 28,232 | 3,457  | 2.3      |
| Total - FERC              | 1,506  | 1,268  | 238    | 3.5      |
| Total                     | 33,195 | 29,500 | 3,695  | 2.4      |

**SPECIALLY CONFIDENTIAL**

DB 0155436

RESIDENTIAL SENSITIVITY ANALYSIS

|                        | <u>GRS</u> | <u>RTS</u> | <u>EHH</u> | <u>TOTAL</u> |
|------------------------|------------|------------|------------|--------------|
| AVERAGE ANNUAL USE     | 7,200      | 25,000     | 17,000     |              |
| AVERAGE ANNUAL RATE    | 8.37       | 5.00       | 7.57       |              |
| AVERAGE ANNUAL REVENUE | 603        | 1,250      | 1,287      |              |

SCENARIO #1

30% - GRS  
 70% - EHH  
 25% OF EHH - RTS

|                |        |        |         |         |
|----------------|--------|--------|---------|---------|
| #NDU           | 4,800  | 2,800  | 8,400   | 16,000  |
| ANNUAL REVENUE | \$2.9M | \$3.5M | \$10.8M | \$17.2M |

SCENARIO #2

50% - GRS  
 50% - EHH  
 25% OF EHH - RTS

|                |        |        |        |         |
|----------------|--------|--------|--------|---------|
| #NDU           | 8,000  | 2,000  | 6,000  | 16,000  |
| ANNUAL REVENUE | \$4.8M | \$2.5M | \$7.7M | \$15.0M |

SCENARIO #3

SPECIALLY CONFIDENTIAL

100% - GRS

|                |        |        |        |        |
|----------------|--------|--------|--------|--------|
| #NDU           | 16,000 | 0      | 0      | 16,000 |
| ANNUAL REVENUE | \$9.6M | \$0.0M | \$0.0M | \$9.6M |

DB 0155437

**RATE OF RETURN ANALYSIS  
RATE CLASS SUMMARY  
PPUC JURISDICTION**

| Rate Class | Rate of Return |       |       | Return on Equity |       |       |
|------------|----------------|-------|-------|------------------|-------|-------|
|            | 1984           | 1991  | 1996  | 1984             | 1991  | 1996  |
| RS         | 10.5%          | 9.2%  | 7.1%  | 9.8%             | 8.9%  | 4.4%  |
| GS-1       | 11.1%          | 20.4% | 24.5% | 11.4%            | 34.2% | 44.5% |
| GS-3       | 11.6%          | 12.8% | 12.9% | 12.9%            | 17.1% | 17.8% |
| LP-4       | 10.8%          | 12.7% | 13.3% | 10.7%            | 16.7% | 18.7% |
| LP-5       | 11.2%          | 13.3% | 14.0% | 11.9%            | 18.2% | 20.3% |
| PPUC       | 10.7%          | 11.2% | 10.5% | 10.5%            | 13.5% | 12.2% |

| Sub Rate Class | Rate of Return |       | Return of Equity |        |
|----------------|----------------|-------|------------------|--------|
|                | 1991           | 1996  | 1991             | 1996   |
| EHH            | 8.4%           | 6.6%  | 7.1%             | 3.1%   |
| RTS            | 2.0%           | -3.0% | -7.5%            | -18.8% |
| GRS            | 10.4%          | 8.8%  | 11.7%            | 8.2%   |
| IS-2           | 11.5%          | 12.1% | 14.1%            | 15.9%  |

SPECIALLY CONFIDENTIAL

**RATE OF RETURN ANALYSIS**

|                 | Revenue | Expenses | Return | Rate Base | Rate of Return | Return on Equity |
|-----------------|---------|----------|--------|-----------|----------------|------------------|
| <b>1984</b>     |         |          |        |           |                |                  |
| RS: Composite   | 678     | 489      | 189    | 1,796     | 10.5%          | 9.8%             |
| EHH             |         |          |        |           |                |                  |
| RTS             |         |          |        |           |                |                  |
| GRS             |         |          |        |           |                |                  |
| GS-1            | 125     | 85       | 40     | 356       | 11.1%          | 11.4%            |
| GS-3            | 316     | 216      | 100    | 861       | 11.6%          | 12.9%            |
| GH              |         |          |        |           |                |                  |
| LP-4            | 203     | 141      | 62     | 572       | 10.8%          | 10.7%            |
| LP-5: Composite | 271     | 191      | 80     | 714       | 11.2%          | 11.9%            |
| Air Reduction   |         |          |        |           |                |                  |
| Steel           |         |          |        |           |                |                  |
| Other           |         |          |        |           |                |                  |
| SL/AL           |         |          |        |           |                |                  |
| System          | 1,680   | 1,187    | 493    | 4,599     | 10.7%          | 10.5%            |
| <b>1991</b>     |         |          |        |           |                |                  |
| RS: Composite   | 872     | 671      | 201    | 2,181     | 9.2%           | 8.9%             |
| EHH             | 401     | 309      | 92     | 1,090     | 8.4%           | 7.1%             |
| RTS             | 15      | 14       | 1      | 54        | 2.0%           | -7.5%            |
| GRS             | 456     | 348      | 108    | 1,038     | 10.4%          | 11.7%            |
| GS-1            | 155     | 102      | 53     | 260       | 20.4%          | 34.2%            |
| GS-3            | 468     | 335      | 133    | 1,038     | 12.8%          | 17.1%            |
| GH              | 49      | 39       | 10     | 182       | 5.6%           | 0.7%             |
| LP-4            | 260     | 191      | 69     | 543       | 12.7%          | 16.7%            |
| LP-5: Composite | 270     | 204      | 66     | 495       | 13.3%          | 18.2%            |
| Air Reduction   | 21      | 17       | 4      | 35        | 11.5%          | 14.1%            |
| Steel           |         |          |        |           |                |                  |
| Other           | 249     | 187      | 62     | 460       | 13.5%          | 18.6%            |
| SL/AL           | 19      | 15       | 4      | 69        | 6.1%           | 1.9%             |
| System          | 2,093   | 1,557    | 536    | 4,768     | 11.2%          | 13.5%            |

**SPECIALLY CONFIDENTIAL**

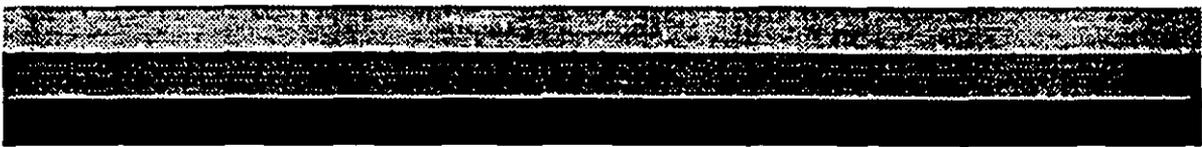
DB 0155439



*JUNE 21, 1991*

*SPECIALLY CONFIDENTIAL*

*FINAL REPORT*



*PENNSYLVANIA POWER & LIGHT COMPANY*

*DB 0155440*

---

## **RESIDENTIAL**

---

- 5) RTS -- The Implementation Team supports the continuation of the RTS rate because of our commitment to customers who invested additional dollars in their off-peak system. RTS programs have also proven to be an effective load management tool. RTS systems should remain as one of the electric heating options under the umbrella concept and future promotion should be targeted at those market segments most likely to be satisfied by these systems and that meet PP&L's load management objectives. There are, however, concerns associated with earnings, increasing evening system peak and deterioration of infrastructure. All of these concerns suggest the need to review PP&L's RTS programs to determine the long-term implications and the future of marketing off-peak systems.

**SPECIALLY CONFIDENTIAL**

**DB 0155441**

257

---

# RESIDENTIAL

---

## RECOMMENDATION

- II.A.3. Perform a comprehensive re-evaluation of PP&L's RTS programs, considering all related costs, benefits and exposures; assess the total market potential, identify desirable market segments and determine optimum market saturation levels, taking into account the longer-term implications for other future off-peak marketing opportunities.

## IMPLEMENTATION TEAM CONCLUSION

### Accept

The introduction of RTS systems in PP&L's service area represents a major marketing success story. It established a system that was competitive in the market; provided an alternative to baseboard and traditional heat pumps; created the infrastructure needed to promote a new form of heating system; and helped achieve important load management objectives.

The Implementation Team supports the continuation of the RTS rate because of our commitment to customers who invested additional dollars in their heating system. PP&L has an obligation to enable these customers to recoup their investment. Also, the RTS program has proven to be an effective load management tool. Future modification can ensure the effectiveness of the load control option.

It is also recommended that the RTS Program remains as one of the electric heating options under the umbrella concept to satisfy customers' needs. Future promotion should be targeted at those market segments most likely to be satisfied by these systems and that meet our load management objectives.

However, the many exposures associated with the continued aggressive marketing of off-peak systems indicate a clear need to modify the promotion of RTS programs and a need to review several related areas identified as concerns. These concerns include:

- Earnings from an RTS customer being lower than earnings from an RS customer choosing another type of electric heating system, and only slightly higher than a general residential customer.
- Creation of a new peak-load to PP&L's evening hours.

SPECIALLY CONFIDENTIAL

DB 0155442

---

## **RESIDENTIAL**

---

- Marketing RTS against other electric heating systems with higher earnings potential.
- Deterioration of the infrastructure to support current and future RTS customers, specifically ACCUBLOC and ceramic systems.

Termination of the RTS rate would severely damage PP&L's credibility with customers and allies, and would negatively impact the morale of our employees, especially in the Marketing Department. The impact would be similar to the one created by the withdrawal of the RH rate for which PP&L is yet to recover.

### **ACTION**

- 1) Reduce RTS program-related costs such as grants and advertising to minimize the effect on earnings.
- 2) Maintain RTS rate and seek methods to improve the rate of return.
- 3) Develop a load management strategy to integrate the role of RTS with other marketing options.
- 4) Select the optimal RTS system control scheme for future installations with a long-term load management strategy in mind.
- 5) Conduct market research to determine customers' acceptance of RTS control schemes.
- 6) Conduct annual RTS forums with manufacturing reps to communicate PP&L's marketing objective and the role and future of RTS programs.
- 7) Target off-peak systems to customers most likely to be satisfied by these systems.
- 8) Establish a program to address infrastructure concerns to respond to customers' calls for parts and service; namely ACCUBLOC.

**SPECIALLY CONFIDENTIAL**

**DB 0155443**

---

## *RESIDENTIAL*

---

- 9) Modify CIS system to allow for early identification of service requests. Establish mandatory fields/screens for new home service requests that require useful marketing information such as whether the customer has considered/heard of off-peak and other electric options; the name of the builder, electrician, HVAC contractor; type of fossil system customer is considering, e.g. warm air, hydronic, with/without air-conditioning; primary reason for selecting a fossil fuel system, etc. This information is essential to prepare the marketing plan that meets the customer's needs BEFORE the first contact by a Marketing Consultant.
- 10) Establish procedures for automatic mailing of information by the customer Contact Center on off-peak programs and other electric options to customers requesting service to new homes.
- 11) Train Customer Service Reps to provide a short marketing message on the benefits of electric off-peak and other heating options.

### **RESPONSIBILITY**

- 1) M&ED Residential Staff and Division field personnel.
- 2-5) Requires an interdepartmental approach between M&ED Staff, System Planning, Rates & Market Research, Distribution, System Meters and System Operating.
- 6-8) M&ED Residential Staff and Division field personnel.
- 9&10) Customer Service Department (lead) with input from M&ED Staff and Corporate Communications.
- 11) DOTC with input from M&ED, Customer Service and Corporate Communications.

SPECIALLY CONFIDENTIAL

DB 0155444

---

# RESIDENTIAL

---

## TIMING

- 1) Decision reached by the end of third quarter, 1991, and before 1992 programs are announced.
- 2-5) Work on these actions should begin immediately to facilitate development of the 1992 budget and marketing emphasis; rate modifications to be ready for introduction into future rate filings; testing and market research to be completed by the end of second quarter, 1992; and a long-term load management strategy developed by third quarter, 1992 to determine the future of residential off-peak programs.
- 6) Beginning December, 1991, after 1992 programs have been announced.
- 7) Decision reached by the end of third quarter, 1991, and before 1992 programs are announced.
- 8) By fourth quarter, 1991.
- 9&10) By the end of 1991 so that marketing information is available to field Residential Marketing field employees and customers beginning in 1992.
- 11) Complete by the end of 1991 to enable effective communications between Customer Service Reps and customers beginning in 1992.

SPECIALLY CONFIDENTIAL



January 29, 1991

F.S. Mayberry A9-7  
 D.P. Bolbat TW-21  
 W.R. Fairchild SC-2  
 C.A. Gallagher TW-5  
 H.S.L. Kekuna A9-4  
 J.G. Leary N-2B  
 R.E. Lee A7-3  
 C.R. Solomon TW-6

→ Draft - CC: J. Sipics  
 L. Olah  
 J. Wilson  
 J. Polaha

*Assume  
 comments  
 finished*

"Do 'costs to supply' differ for  
 different system supply/demand  
 energy values for diff load  
 pattern? cap value?"

RTS Task Team  
 Preliminary Economic Evaluation of RTS  
Draft Report

The attached draft report provides a preliminary economic evaluation of RTS and explains the evaluation techniques. Also attached are some ideas for changes to the RTS program that may improve the program's economics. (these changes have not been evaluated)

Please review the report so we can discuss it at the February 15th meeting. In particular, I'd like to discuss the potential changes to RTS attached and any others that the Task Team suggests.

Dave Selkregg

D M0136720

CONFIDENTIAL

262

RTS TASK TEAM  
ECONOMIC EVALUATION OF RTS  
DRAFT REPORT

*Attachment I*

263

D M0136721

TABLE OF CONTENTS

Page No.

Introduction

Observations

Incremental Earnings Effects

Revenue Requirements Effects

Impact on Non-Participant Rates

Participant Perspective

Appendix - Assumptions

D 10136722

264

INTRODUCTION

This report presents an economic evaluation of the Residential Thermal Storage (RTS) program including the effects of RTS on

- o incremental earnings
- o revenue requirements
- o non-participating customer rates, and
- o RTS customer energy bills.

RTS systems include Heat Pump Plus, ceramic room units, hydronic, accubloc and Central Air storage systems. Because the majority (\_\_\_%) of RTS customers choose Heat Pump Plus or ceramic systems, an economic evaluation ~~was~~ <sup>was</sup> not done for the other systems. However, results should be similar to those shown.

The evaluation is based on estimates of RTS customer energy use and demand profiles, and therefore may only approximate actual conditions (see the appendix for data assumptions).

*State  
PES, 15.10.  
only done  
only a HP Plus.*

Note: Incremental Distribution costs are not included in this ~~draft~~ <sup>draft</sup> ~~Re~~  
~~next revision~~

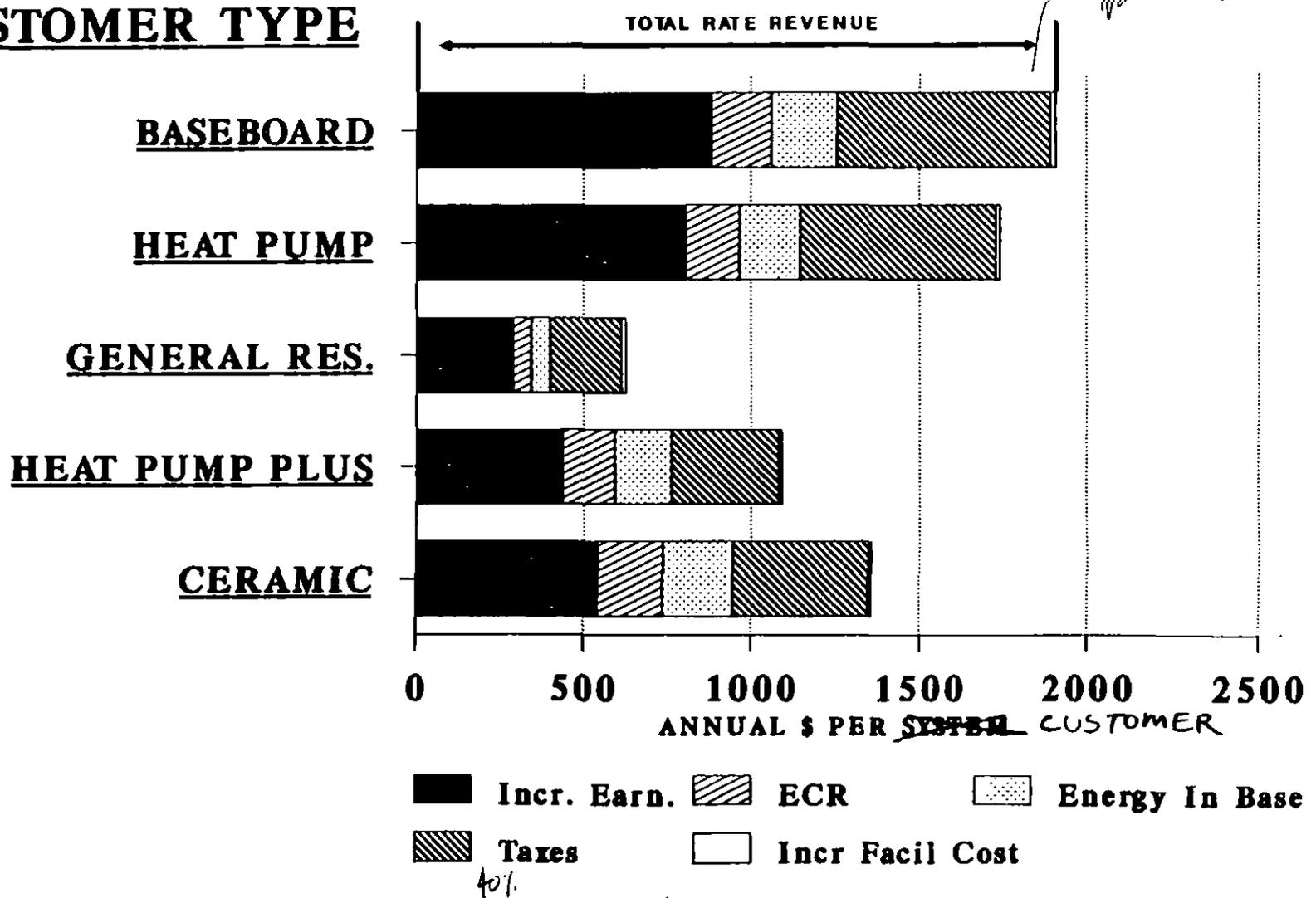
DOCUMENT CONTROL NUMBER  
D M0136723  
265



# INCREMENTAL EARNINGS FIRST YEAR

*Total rate revenue*  
*0.0777 \$/kwh F.S*  
*0.0418 \$/kwh ATB*  
*Figure 1*

## CUSTOMER TYPE



D M0136725  
 267

Program cost not included

### INCREMENTAL EARNINGS EFFECTS

- o Figure 1 shows the annual incremental earnings for five types of PP&L customers. Incremental earnings represent the portion of revenue resulting from adding an additional customer that will flow to PP&L earnings, absent ~~a~~ a rate case.
  - As shown on the facing page, annual incremental earnings equals the total annual revenue from the customer less incremental costs.
    - o Incremental costs include taxes, energy costs (ECR and energy costs in base rates), and any incremental facility costs.
    - o Program costs are not included in this figure.
  - For example, had a customer with baseboard heat connected to the PP&L system in 1990, PP&L would have received about \$2000 of additional revenue. After subtracting taxes, energy costs, and incremental facility costs, PP&L's earnings would have increased by about \$900.
- o Evaluation of incremental earnings is for the period between base rate cases when earnings can be enhanced by adding new customers. After the base rate case, all revenue requirements become embedded and a new rate of return is established.

D M0136726

268



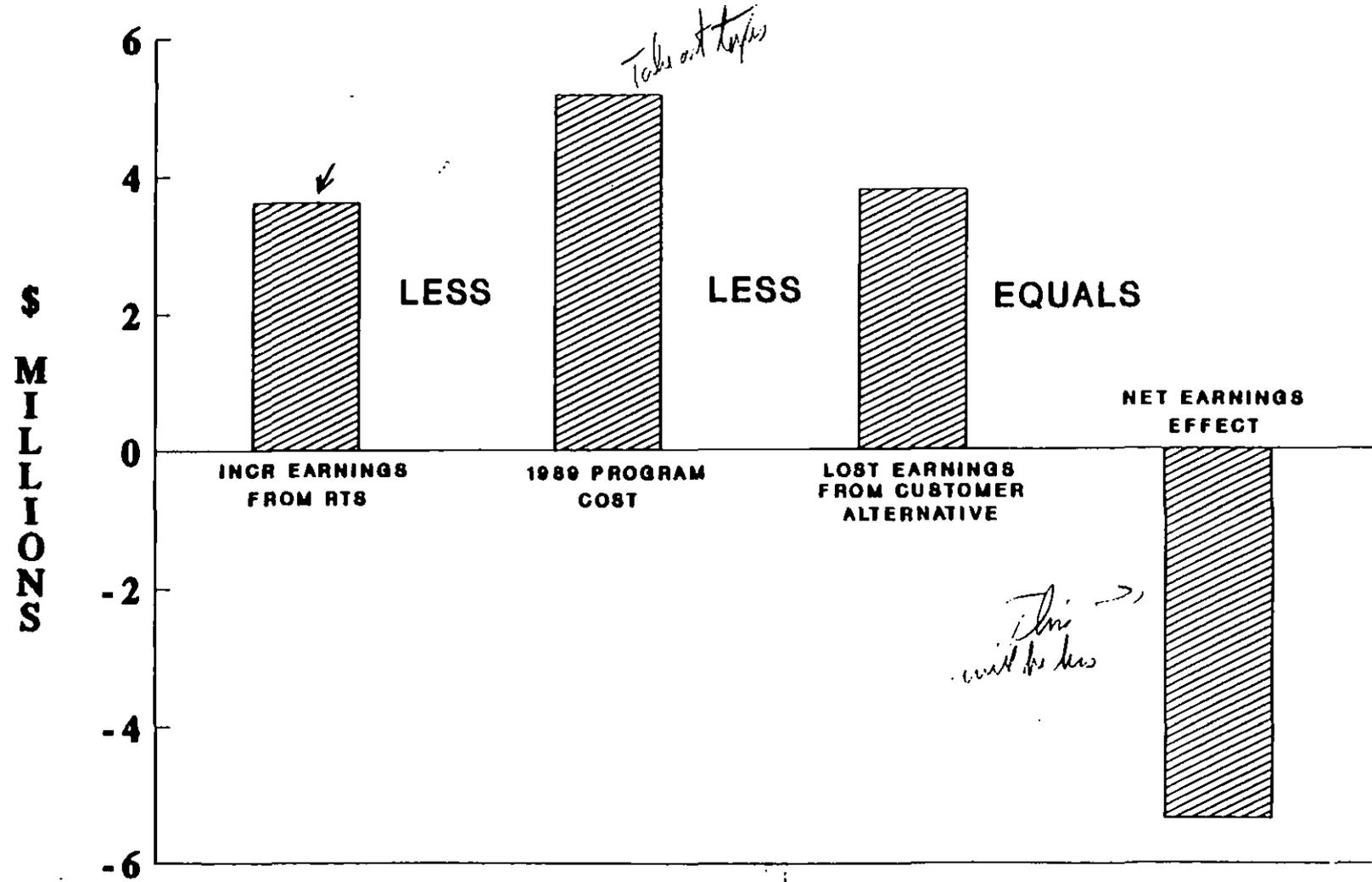
- o Figure 2 shows the cumulative present value of incremental earnings for 1990 through 1994.
  - The analysis assumes that a base rate case will occur in 1995 and that revenues and costs associated with these customers would become embedded.
- o RTS customers (Heat Pump Plus & ceramic) contribute more incremental earnings than general residential customers, but less incremental earnings than baseboard or heat pump customers.
- o Accordingly, the analysis suggests that, from a short-term earnings perspective, PP&L can spend up to (including grants and marketing costs) about \$600 to influence a customer to install heat pump plus instead of gas heat or about \$1000 to install a ceramic system instead of gas heat.
  - PP&L's 1991 budget for the RTS program is about \_\_\_ \$/system.
- o In addition, the analysis shows that PP&L's short-term earnings would be reduced if a customer that would have chosen baseboard or a heat pump is influenced to install an RTS system.
- o PP&L's 198\_\_ market research results indicate that about 40% of PP&L's RTS customers would have chosen electric heat if RTS ~~was~~ not available (10% baseboard; 30% Heat Pump).
  - The choice of the remaining 60% of PP&L's RTS customers could be split between gas (about 10%), oil (about 20%) or other systems (30%).
  - Historically, about 35% of PP&L's RTS customers have ceramic systems and about 65% have heat pump plus.

PP&L  
10/1/81  
270

D M0136728

**NET EARNINGS EFFECT  
FOR RTS CUSTOMERS CONNECTED IN 1989  
CUMULATIVE PRESENT VALUE (1990-1994)**

Figure 3



\$ MILLIONS

D M0136729

o Figure 3 shows the net effect on earnings (1990-1994 cumulative present value) from the results of the RTS program in 1989.

- In 1989 about 1,970 new RTS customers connected to the PP&L system.

- The cumulative present value of incremental earnings from the new RTS customers (assuming 35% were ceramic and 65% were HP plus) equals about \$3.6 million.

- The cost for the RTS program in 1989 equaled about \$5.2 million (from the <sup>PP&L</sup> 1989 Annual Conservation & Load Management Report).

- If RTS were not offered, the customers would have chosen an alternative system. The incremental earnings that PP&L would have received from those customers equals about \$3.8 million.

o This is based on the 40/60 split of RTS customers <sup>that</sup> would have chosen an electric system or general residential if RTS was not offered.

- The incremental earnings from the new RTS customers, less program costs, less lost incremental earnings from the customer alternative, equals ~~about~~ a negative \$5.3 million.

o Consequently, the cumulative present value of incremental earnings from the new RTS customers added in 1989 approximately equals the incremental earnings PP&L would have received if the customers would have chosen an alternative system.

o However, the expenses to influence the customers to choose RTS (grants plus marketing costs) result in a negative net effect on earnings.

D M0136730

272

REVENUE REQUIREMENTS EFFECTS

- o Revenue requirements are a way of expressing the costs associated with an investment or operating alternative. They can be thought of as expected revenues that would provide a minimum acceptable return to utility investors. Revenue requirements include:
  - Carrying charges, which are the annual revenues required to pay for capital investments.
  - Expenses, which include operating, maintenance and the Cost of System Output (CSO).
    - o CSO is the net cost of energy for PP&L's PaPUC jurisdictional customers.
- o The RTS program affects PP&L revenue requirements by changing customer energy and demand use.
  - Changes to customer energy use affect PP&L's CSO.
  - Changes to customer demand effect PP&L's capacity obligation to PJM. Although PP&L has no identified need for capacity prior to the year 2000, PP&L has been able to sell capacity to other utilities. The income from these capacity sales can reduce the amount of revenue required from PP&L's PUC jurisdictional customers.

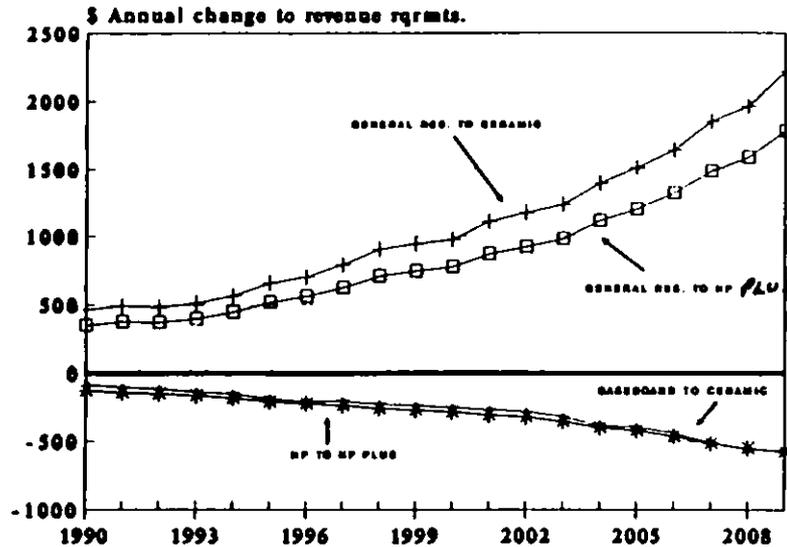
REGULATORY COMMISSIONER: 073

D M0136731

Figure 4

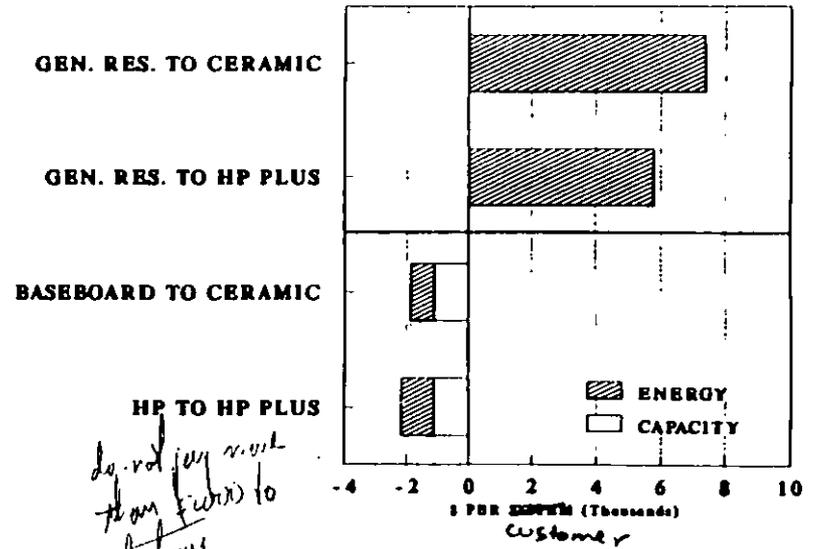
# IMPACT ON TOTAL REVENUE REQUIREMENTS

## CHART A ANNUAL



## CHART B 20 YEAR PRESENT VALUE

CONVERSION FROM:



NOTES :

ASSUMES NIGHTTIME PEAK IS CORRECTED  
PROGRAM COST NOT INCLUDED

D M0136732  
274

o Figure 4 shows the change to PP&L's total revenue requirements resulting from adding an RTS customer. The change to revenue requirements depends on whether the customers alternative to RTS would be a fossil or electric system.

- Chart A shows the annual change to revenue requirements.
- Chart B shows the 20 year cumulative present value change to revenue requirements.

o When the RTS program influences customers to choose RTS rather than a fossil system, PP&L revenue requirements are increased.

- Energy costs are increased from higher amounts of kWh sales (an average general residential customer with a single family home uses about 9000 kWh/yr compared to about 26,000 kWh for an RTS customer).
- PP&L's capacity obligation to PJM is unchanged because an RTS customer and a general residential customer contribute about the same demand to PP&L's peak (assuming that the RTS nighttime peak problem is corrected).

o When the RTS program influences customers to choose RTS rather than an alternative electric system, revenue requirements are reduced.

- Energy costs are reduced by transferring customer energy use from on-peak to off-peak periods when lower cost generation can meet marginal needs.
- PP&L's capacity obligation to PJM is reduced by shifting customer demand away from PP&L peak periods (evening, evening peak, etc.).

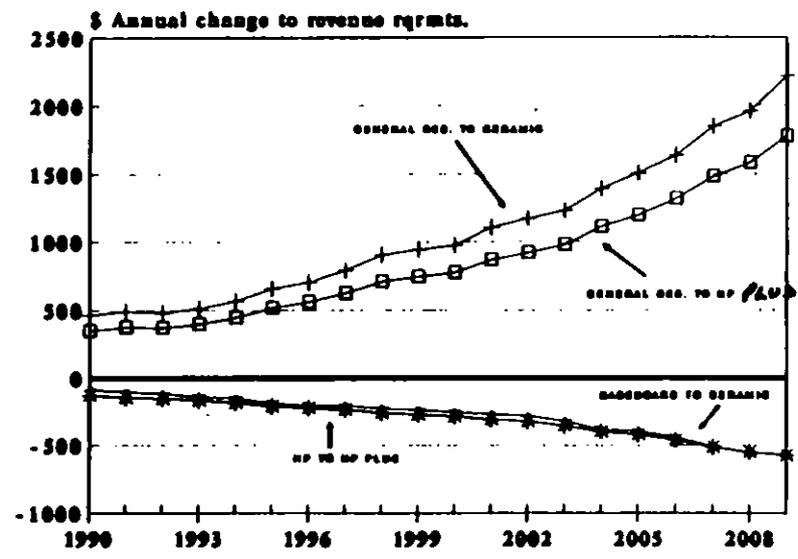
PP&L  
FORM 1275  
D M0136733

Figure 4

# IMPACT ON TOTAL REVENUE REQUIREMENTS

## CHART A

### ANNUAL

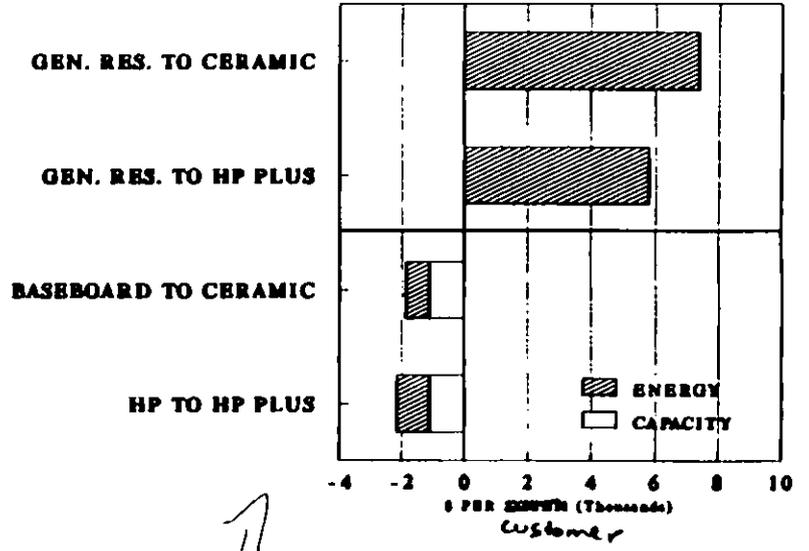


NOTES :  
 ASSUMES NIGHTTIME PEAK IS CORRECTED  
 PROGRAM COST NOT INCLUDED

## CHART B

### 20 YEAR PRESENT VALUE

CONVERSION FROM:



*To be done  
 using incremental*

276

D M0136734

- o In contrast to the analysis of incremental earnings, changes to revenue requirements are a measure of the effects of RTS on PP&L's embedded costs after a base rate case.
- o When the RTS program influences customers to choose RTS instead of an electric system, PP&L can spend up to the total reduction in revenue requirements to influence customer participation. Spending includes grants, marketing costs, and lost revenues from rate incentives.

- When the RTS program costs more than it saves, subsidies must come from either investors (in the form of lower return on investment) or other ratepayers in the form of higher rates.
- Accordingly, PP&L can spend up to about \$2000 (cumulative present value 1990-2009) per RTS customer converted from electric to RTS without exceeding the associated reduction in revenue requirements.

*on the  
basis of  
the  
the base rate case*

- o When the RTS program influences customers to choose RTS instead of a fossil system, the amount of increased revenue requirements indicates the amount of additional revenues PP&L should receive.

- When costs from switching customers from fossil to RTS exceed additional revenues the excess costs must be recovered from investors or other ratepayers.
- Accordingly, PP&L should obtain additional revenues of about \$6-7 thousand (plus program costs) per RTS customer converted from fossil to RTS.

*AC*

D M0136735

277

NON-PARTICIPANT ~~ADD~~ RATES  
 IMPACT ON ~~SYSTEM AVERAGE PRICE~~  
 20 YEAR CUMULATIVE PRESENT VALUE

Figure 5

CONVERSION FROM:

BASEBOARD TO CERAMIC

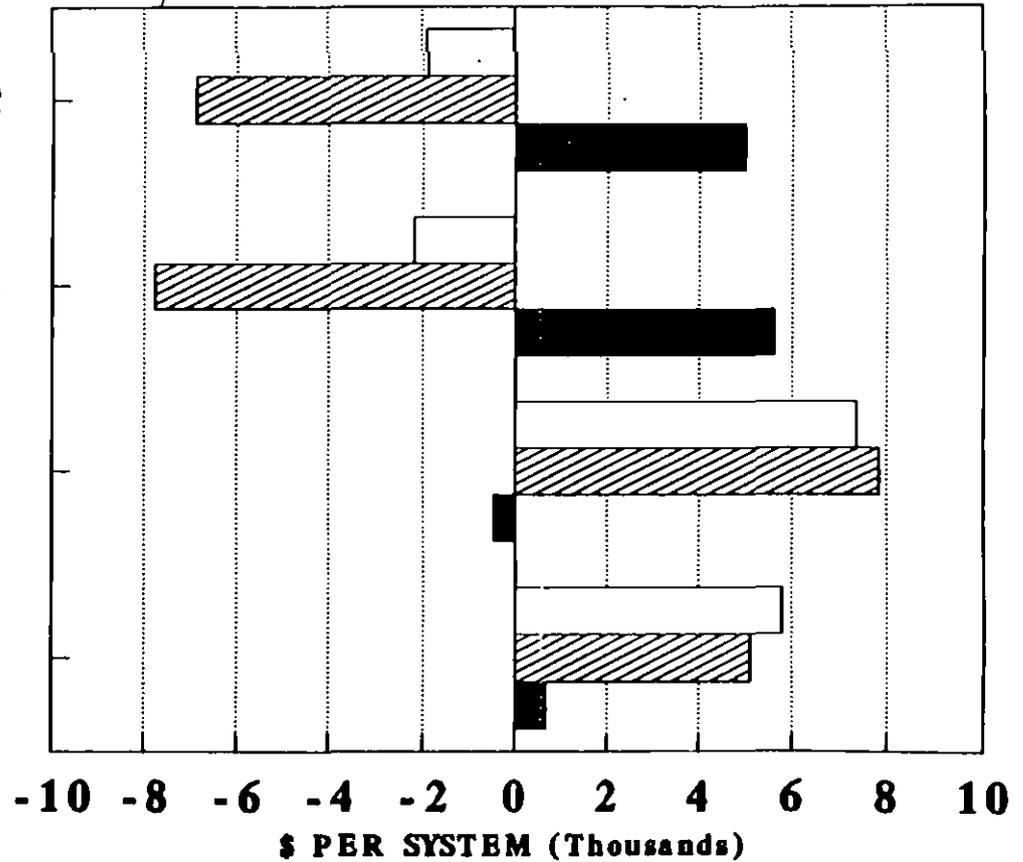
HP TO HP PLUS

GEN. RES. TO CERAMIC  
 (GAS, HEAT, HOT WTR., DOMESTIC)

GEN. RES. TO HP PLUS  
 (GAS, HEAT, HOT WTR., DOMESTIC)

*becomes ratio  
 or no. subsidies*

*changes ratio to  
 content of subsidy*



Change Rev Rqrmt
  Change Revenues  
 Rate Impact

D M0136736

278

Assumes nighttime peak is corrected  
 program cost not included

### IMPACT ON NON-PARTICIPANT RATES

- o Figure 5 shows the effect of the RTS program on the system average price to non-RTS customers.
  - This analysis assumes that the current differential between RTS and RS rates is maintained throughout the 20 year period.
- o Adding RTS customers whose alternative was baseboard or heat pump results in the following effects:
  - PP&L revenue requirements are reduced by about \$2000 per customer (20 year cumulative present value), as discussed in the previous section.
  - PP&L revenues are reduced by about \$7000 per customer (20 year cumulative present value) as a result of the lower RTS rate.
  - Because the amount of lost revenues exceeds the reduction in revenue requirements, over the long-term PP&L would need to recover the difference from rate payers or reduce the rate of return to investors.
  - Consequently, when new customers are influenced to install RTS instead of baseboard or heat pump PP&L needs to recover about \$5000 (present value) per RTS customer in additional rate revenue from other customers over 20 years (~~i.e. average system price increases~~).
  - Figure 5 does not consider M&ED costs (advertising, grants, etc.) that <sup>may</sup> also be recovered.

D M0136737



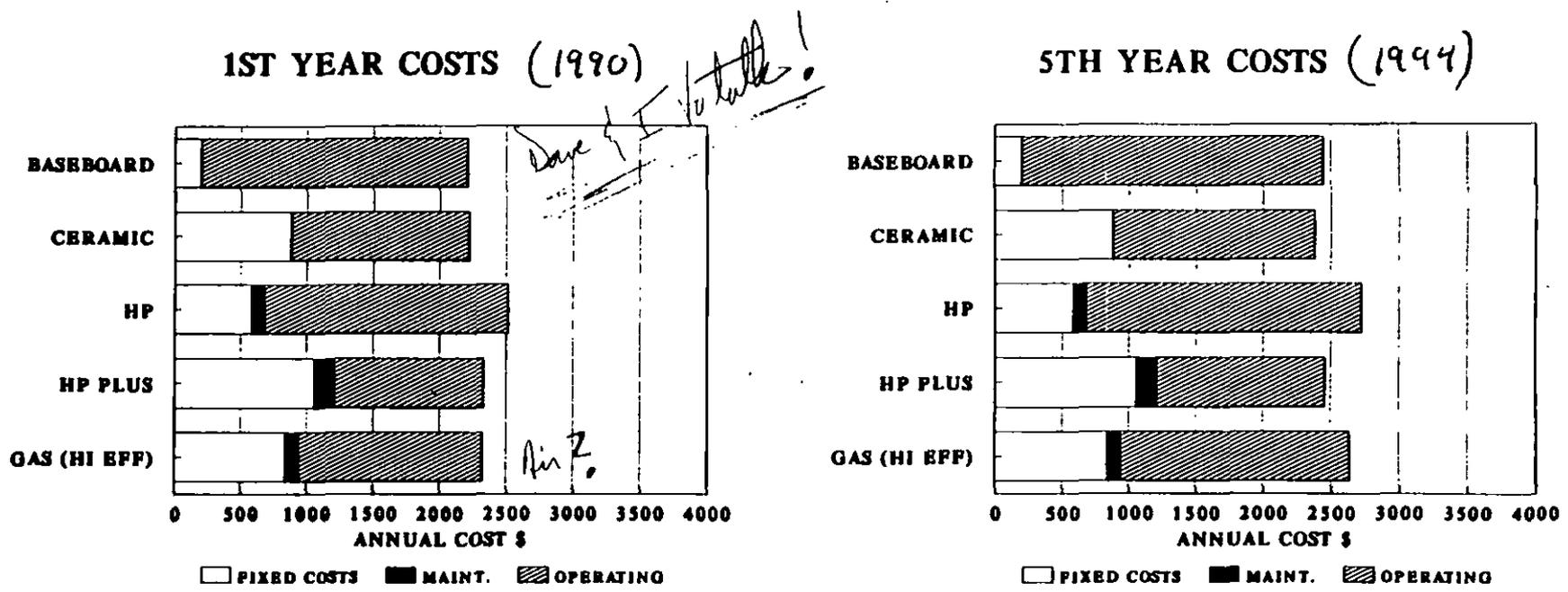
- o Adding RTS customers whose alternative was a fossil fueled system results in the following effects:
  - PP&L revenue requirements increase by about \$6000-\$7000 per customer (20 year cumulative present value), as discussed in previous section.
  - PP&L revenues increase about \$5000-\$8000 per customer (20 year cumulative present value) as a result of higher kWh sales.
  - Because the increased revenue requirements approximately equal the increased revenues, there is little long-term net rate impact.
  - Again, Figure 5 does not consider M&ED costs that may also be recovered.

D M0136739

281

Figure 6

# PARTICIPANT PERSPECTIVE



Notes:

- Fixed cost Based on 15 yr Mortgage at 10%
- "Gas" includes gas heat, gas hot wtr., and partial gas domestic
- Operating includes electric plus fossil fuel costs

D M0136740  
 282

PARTICIPANT PERSPECTIVE

- o Figure 6 compares total annual costs for an RTS system with alternative systems from the customers' perspective. First year (left) and fifth year (right) costs are shown.
  - Fixed costs are based on the annual costs for a 15 year mortgage.
  - Maintenance costs are an estimate of annual levelized costs over system life.
  - Operating costs include electric plus any fossil fuel costs.
  
- o Although the annual operating cost for RTS systems is lower than the alternatives, the higher installation costs make the total ownership costs fairly close to the other systems.
  
- o The total annual cost for owning and operating any of the alternative system varies only about 300 \$/year (15%) in 1990 and 350 \$/year (15%) in 1994.

*Look for some awarding done!*

D M0136741

283

OPERATIONAL CONCEPTS

APPENDIX  
ASSUMPTIONS

- o Annual customer energy use was calculated by M&ED using a ~~method~~ method, assuming:
  - 2000 ft<sup>2</sup> home meeting Act 222 standards.
  - located in Harrisburg Division.
- o Hourly energy and demand profiles are based on LISMP data.
- o Energy value is based on PP&L's incremental value of energy from the 1990 LCP production cost model.
- o Capacity value is assumed to equal 50% of the PJM installed capacity rate (31 \$/kW-yr in 1990).
- o Incremental earnings values are based on the R&MR report "Analysis of Net Incremental and Embedded Earnings Contribution By Rate Class" (8/89).
- o Analysis of demand effects assumes that the RTS nighttime peak contribution will be ~~also~~ corrected.

D M0136742

284

Preliminary  
Potential changes To RTS

The following changes to the RTS program may help improve program economics:

- o Modify PP&L's marketing approach on RTS to target only customers whose alternative to RTS would be a fossil system.

ACL problem?

DSM program

- By minimizing the number of RTS customers that would have chosen an electric system PP&L can increase the net incremental earnings contribution of the overall RTS program,

- o Reduce the incentives (including rate incentives) that are given to influence customers to choose RTS.

PP&L buy

- As an alternative to giving RTS customers a reduced rate, PP&L could pay the customer's incremental cost for installing RTS and give a monthly incentive for any "inconvenience".

- PP&L could own and maintain the storage system or set up a leasing arrangement.

- Total PP&L costs should be ~~limited to~~ based on the anticipated change to PL revenue requirements + customer revenues.

- o The PUC investigation into DSM includes a mechanism for recovery of program costs. Using this mechanism for RTS may improve net incremental earnings contributions.

but don't want to pay for it



**RESIDENTIAL MARKETING PERFORMANCE UPDATE**

**NEW CONSTRUCTION PROGRAMS**

**OCTOBER 1987**

**SPECIAL CONFIDENTIAL**

**MARKETING & ECONOMIC DEVELOPMENT**

**D M0126062**

286

C. Fossil-Fuel Price Analysis -- Oil and Gas (Continued)

Fossil Fuel Costs Versus Electricity

The comparative dollar cost per million Btu for gas and oil versus electric space heating options on both the RS and RTS Rates denotes the competitive price disadvantage we face. ~~Assume a 60 percent seasonal efficiency for oil space heating and 78 percent seasonal efficiency for gas space heating versus an average COP of 2.0.~~ Under these conditions, based on the dollar cost per million Btu for space heating options, gas is the least expensive and only the Heat Pump Plus has a price advantage over oil.

Table III  
Comparable Customer Options And Related Costs

| <u>Customer Options</u>                     | <u>Dollar Cost</u><br><u>Per Million Btu</u> |
|---|--|
| Gas (70% seasonal efficiency)               | \$ 8.54                                      |
| Electric/Heat Pump Plus (COP = 2.0)         | \$ 8.89                                      |
| Oil (60% seasonal efficiency)               | \$ 9.26                                      |
| Electric/Conventional Heat Pump (COP = 2.0) | \$11.51                                      |
| Electric/Ceramic (COP = 1.0)                | \$17.78                                      |
| Electric/Baseboard Resistance (COP = 1.0)   | \$22.94                                      |

D. Competitive Practices

UGI, PG&W, Columbia Gas, and oil dealers and associations participate in most of the same builder, home, shopping mall, and manufactured housing shows that PP&L enters. ~~Their~~ advertising and displays focus on ~~low cost equipment~~ and installation, low operating costs, and comfort. In some cases, they directly attack electric space heating equipment. PG&W emphasizes that 22 percent of the customers who installed natural gas in 1986 replaced electric heating systems.

As stated earlier, both UGI and PG&W filed for rate decreases that became effective October 1, 1987. UGI emphasizes that this is their seventh consecutive reduction in the past three years. PG&W states that this is their fifth consecutive reduction since 1985 amounting to a total annual savings to their average residential heating customers of 22 percent. They both offer to run gas lines to new developments at no cost if gas is installed in some of the homes. No minimum guaranteed number of gas homes is required to some of the developments. Offers of lease purchase agreements for heating systems, discount prices for appliances, co-op advertising, financing and free trenching are common. It is difficult to substantiate most of these offers since they vary from one location to another and from one builder to another.

PP&L



ARTICLE FOR PP&L TODAY

**QUESTION:** What is the comparative cost of a unit of heat in a home (between gas, oil and electric) taking into account the efficiency of gas and oil furnaces and the average coefficient of performance of heat pumps, that is, what is the comparative heating bill?

**ANSWER:** Energy costs can vary depending on the fuel used, efficiency of the heating system, home construction and individual use patterns. The following are estimated costs to heat a 1,000 square foot area (built to Pennsylvania's insulation requirements) with traditional heating systems:

|                    | <u>Seasonal Efficiency<br/>Factor (Percent)</u> | <u>Cost Per<br/>1,000 Sq. Ft.</u> |
|--------------------|---|-----------------------------------|
| Coal               | 75  | \$182                             |
| Natural Gas        | 70  | \$230                             |
| Oil                | 70  | \$240                             |
| Electric Heat Pump | 200   | \$334                             |
| Electric Baseboard | 100   | \$651                             |

Another electric heating option is the use of storage heating under PP&L's Residential Thermal Storage (RTS) rate. The estimated costs for heating using two types of electric thermal storage are:

|   | <u>Seasonal Efficiency<br/>Factor (Percent)</u> | <u>Cost Per<br/>1,000 Sq. Ft.</u> |
|---|---|-----------------------------------|
| Heat Pump With<br>Storage (Called<br>Heat Pump Plus)    | 195   | \$221                             |
| Ceramic Storage<br>Heaters (Individual<br>Room Heaters) | 95  | \$430                             |

Thus, storage heating can provide low operating costs comparable to oil and gas heating.



**PP&L**

September 12, 1989

Mr. B. D. Kenyon, TW-16  
Mr. G. E. McNair, TW-5

**DIVISION OPERATIONS**  
**STRATEGIC PLANNING CONFERENCE**

Attached is my paper on Sales Profitability for inclusion in the planning conference notebook.

I will be doing additional work prior to the conference identifying costs for other market segments such as commercial food service and attempting to better segment our economic development efforts. I would welcome any comments you have on the paper.



H. A. Courtright

Attachment

cc: Mr. L. A. Downing, A9-4  
Mr. G. S. Farber, A9-4  
Mr. J. R. Lesko, A9-4  
Mr. P. L. Roberts, A9-4  
Mr. T. L. Funk, A9-4  
Mr. J. B. McCarthy, A9-4

M&ED/4188  
HAC:pal

289

DM 055969

**SALES PROFITABILITY**

**Division Operations  
Strategic Planning Conference**

**October 1989**

290

**Henry A. Courtright, Director  
Marketing & Economic Development**

**Issued: September 12, 1989**

**DM 055970**

## SALES PROFITABILITY

### Introduction

PP&L's marketing programs have been focused toward increasing kilowatt-hour sales to the Company while, at the same time, deferring the need for new central station generation through load management programs. Programs have been developed by analyzing the sales and demand management potential in each market and applying resources to achieve the potential levels. Cost and benefits by market segment have been determined and are reported quarterly.

The Company key strategies are to:

- Increase Sales Through Marketing and Economic Development
- Operational Excellence
- Effective Cost Management

The sales potential and resources to achieve these increased sales are both finite. The question is, how can sales results be maximized for the investment made in marketing, thus supporting the Company's key strategies?

### Issues

There are two issues which will be addressed in this paper:

1. Which market segments provide the best return to the Company, and how should marketing efforts be developed and resources focused to maximize profitability?
2. Should goals be established on revenue, earnings, or kilowatt-hour sales?

### Profitability Analysis Approach

Each market segment has been analyzed to provide cost and earnings perspective. The earnings perspective also addresses the capacity "value" of demand management applications. These figures, coupled with the sales volume potential from the market, will provide the contribution of each market to an overall market value. This paper addresses marketed sales and not base load, such as general residential customers which would occur without marketing.

Although markets can be segmented by levels of profitability, there are other factors which must be considered in designing a marketing strategy. They include:

1. **What are the total opportunities for sales in a market and the potential for those sales to remain over the long term?**

PP&L's customer markets have changed dramatically over the years. For example, the Company's major sales base was from coal-mining companies in the pre-1960 period; however, coal mining sales are now vastly reduced. Sales to steel companies and textiles are also two market segments which have changed significantly.

We know that each year 15,000 to 20,000 homes will be built in our service area with a certain sales potential, yet are we confident that a major air-reduction plant or steel firm can be attracted on a regular basis? Should we forego more certain, less profitable sales for highly profitable, but more risky sales?

DM 055971

291

**2. What is the interrelationship between market segments?**

An unanswered question is how has PP&L's strong residential electric heat marketing program influenced the use of electric heat in commercial buildings?

**3. Are less profitable market segments valuable if they help block the competition's market development?**

Through a multi-market electric heat strategy, PP&L has limited the extension of gas lines, thus increasing sales in all segments.

**4. What are the relationships between resources expended and sales results -- are they a linear relationship or is there a decreasing rate of return beyond a certain point -- and what is that point?**

These and other points will be considered in the development of recommendations.

**Incremental Earnings by Rate Users**

Rates & Market Research has developed an analysis of the incremental and embedded earnings contribution by rate class. Incremental sales, the objective of M&ED to increase, will be used in this analysis. Table 1 is a listing of the incremental earnings by rate class.

**Table 1**  
**Incremental Earnings**

| <u>Rate Class</u>                   | <u>Total Rate<sup>1</sup><br/>Revenue</u> | <u>¢/KWH<br/>Incremental Earnings<sup>2</sup></u> |
|-------------------------------------|---|---|
| <b><u>Residential</u></b>           |   |   |
| RS-General                          | 8.25                                      | 3.83  |
| RS-Electric Heat                    | 7.36                                      | 3.41  |
| RTS-Thermal Storage                 | 4.84                                      | 1.94  |
| <b><u>Commercial/Industrial</u></b> |   |   |
| GS-1                                | 10.61                                     | 5.21  |
| GS-3                                | 7.33                                      | 3.38  |
| LP-4                                | 6.29                                      | 2.81  |
| LP-5                                | 5.38                                      | 2.28  |
| IS-2 (Air Reduction)                | 4.04                                      | 1.50  |
| IS-M (Steel)                        | 3.47                                      | 1.18  |

<sup>1</sup>Total Average Rate Charged Customers for Each KWH Used

<sup>2</sup>Incremental Earnings + Total Rate Revenue - ECR - State and Income Tax Adjustments - Gross Receipts Tax - Energy Costs in Base Rates - State & Federal Income Taxes - Facilities Carrying Charge Cost

### Capacity Value Attributable to Load Management Programs

PP&L's marketing programs have included load management strategies such as off-peak space and water heating and interruptible loads. These strategies do have two values:

1. The capacity avoidance value in deferring power plant construction.
2. The lower overall rate resulting from the load management contributions which essentially eliminate plant capacity charges in the rates. These lower rates can provide sales which otherwise may not be made a higher rate level.

For the purpose of this paper, a capacity avoidance "credit" of \$350 per kw will be used to reflect the value of these programs. This credit is equivalent to the cost of a combustion turbine at today's costs. (This value was used in a paper on RTS systems recently submitted to the PUC.)

### Value of Future Sales

A present worth value will be calculated for five years to reflect the value of future sales.

### Sales Profitability Analysis

Table 2 provides a summary of the sales profitability by market segment, including economic development. Highlights of each segment's analysis are:

#### 1. Residential -- Electric Heat

Although the earnings per home marketed as electric heat are only \$575, the large annual volume of the market provides a good total profit. Recognizing PP&L's past success in achieving a dominant share in the home heating market, this segment provides an excellent return at low risk.

#### 2. Residential -- RTS Storage

The low cost RTS rate results in less earnings for an RTS home compared to RS. This program was developed as a load management tool. From that perspective, the demand avoidance cost of average of \$485 (1987-1989 year-to-date) exceeds the present value, assuming the \$350 per kilowatt level is a fair appraisal of that value. The \$485 average cost includes the residential advertising program which will be modified in 1990 to include more focus on heat pumps, thus transferring some of the ad cost to that market segment and reducing costs for storage heating.

#### 3. Commercial

The costs of marketing commercial electric heat are estimated to be very similar to residential marketing on a cents per kilowatt-hour basis. Even though each job is much larger than a typical home, the overall market segment is smaller.

TABLE 2  
SALES PROFITABILITY ANALYSIS  
BY MARKET SEGMENT<sup>1</sup>

| Segment                                     | Incremental Earnings<br>¢/KWH | Sales Costs<br>¢/KWH <sup>2</sup> | Typical Job<br>KWH                  | Mkt. Cost<br>\$/Job | Annual Earnings<br>\$/Job | Demand Avoidance<br>\$Cost/Job | Demand <sup>3</sup><br>\$Value/Job | 5 Year Net Present Worth<br>\$/Job <sup>4</sup> | Est. Annual Volume | Market Value 5 Year Present Worth<br>(\$ Million) |
|---|-------------------------------|-----------------------------------|-------------------------------------|---------------------|---------------------------|--------------------------------|------------------------------------|---|--------------------|---|
| RS-Electric Heat                            | 3.83                          | 1.61                              | 15,000                              | 241                 | 575                       | --                             | --                                 | 1,996   | 10,000             | 19.96   |
| RTS-Storage                                 | 1.94                          | -- <sup>5</sup>                   | 20,000                              | --                  | 388                       | 3,152 <sup>5</sup>             | 2,275                              | 632   | 2,000              | 1.26  |
| GS-3 Commercial Space Heating               | 3.38                          | 1.7                               | 90,000 <sup>8</sup>                 | 1,530               | 3,042                     | --                             | --                                 | 10,303  | 300                | 3.09  |
| Industrial (avg of LP 4,5)                  | 2.54                          | 0.5                               | 750,000 <sup>8</sup>                | 3,750               | 19,050                    | --                             | --                                 | 70,354  | 100                | 7.04  |
| Industrial (EDI)                            | 1.54                          | .05                               | 2.5 million                         | 1,250               | 38,500                    | --                             | --                                 | 148,515   | 50                 | 7.43  |
| Interruptible IS-2                          | 1.50                          | 0.1                               | 170 million                         | 170,000             | 2.55 million              | -- <sup>7</sup>                | 7 million                          | 16.9 Million                                    | 1                  | 16.9  |
| IS-M  | 1.18                          | 0.05                              | 840 million                         | 420,000             | 9.91 million              | -- <sup>7</sup>                | 35 million                         | 73 million                                      | less than one      | 73.0  |
| Economic Development (avg. of GS-3, LP 4,5) | 2.96                          | 0.5                               | 1.43 <sup>6</sup> million (57 jobs) | 7,150               | 42,328                    | --                             | --                                 | 157,500   | 300                | 47.25   |

1. RS-General and GS-1 are excluded because they are not segments to which PP&L actively markets.
2. Sales cost for Residential and Economic Development are taken directly from M&ED Cost Benefit Indicator Report. Commercial and Industrial sales costs are estimated based on total I&C costs in the report.
3. Demand Avoidance Value based on \$350/kw.
4. Present worth factor of 3.89 (using 9% interest value of money).
5. All costs for RTS charged as demand avoidance costs. Average for 1987-89 YTD is \$485/kw.
6. Based on 25,000 KWH/Job and 1988 average jobs per firm located. Reflects spin-off effect of additional commercial and residential growth from job producing industries.
7. Reflected in lower ¢/KWH rate for interruptible.
8. Estimated.

294

DM 055974

4. Industrial

This segment's sales provide a good earnings return due to their high earnings per typical job and low marketing costs. The risk associated with industrial marketing is acceptable since it is spread over the 5,000+ customer class with a reasonable certainty of making a significant number of sales each year. Industrial EDI sales also provide an excellent profit level, even with a one cent credit, due to low marketing costs of EDI sales.

5. Interruptible (Large Customer)

This segment provides the best overall value to PP&L. It also provides a high degree of marketing risk in resource allocation since the annual volume of new sales is only one to two per year and is highly sought by other utility competitors.

6. Economic Development

The overall value of this segment is extremely high. The broad impact of economic development from the "spin-off" effect on other new business and base residential load causes this to be one of the most valuable segments of our programs. Sales costs for this segment are moderate and the risk of not obtaining good load additions each year is relatively low.

7. Rate of Annual Earnings to Sales Acquisition Costs

The comparison shown below provides an indication of the simple payback by market segment.

**Table 3**  
**First Year Total Value Return to Sales Costs (Ratio)**

|                                |              |
|--------------------------------|--------------|
| RS-Electric Heat               | 2.4 to 1     |
| RTS-Storage                    | 0.8 to 1     |
| Commercial                     | 2.0 to 1     |
| Industrial                     | 5.0 to 1     |
| Industrial-EDI                 | 30.0 to 1    |
| Interruptible (Large Customer) | 15 - 20 to 1 |
| Economic Development           | 6.0 to 1     |

**Percent of Total Resources Allocated by Market Segment**

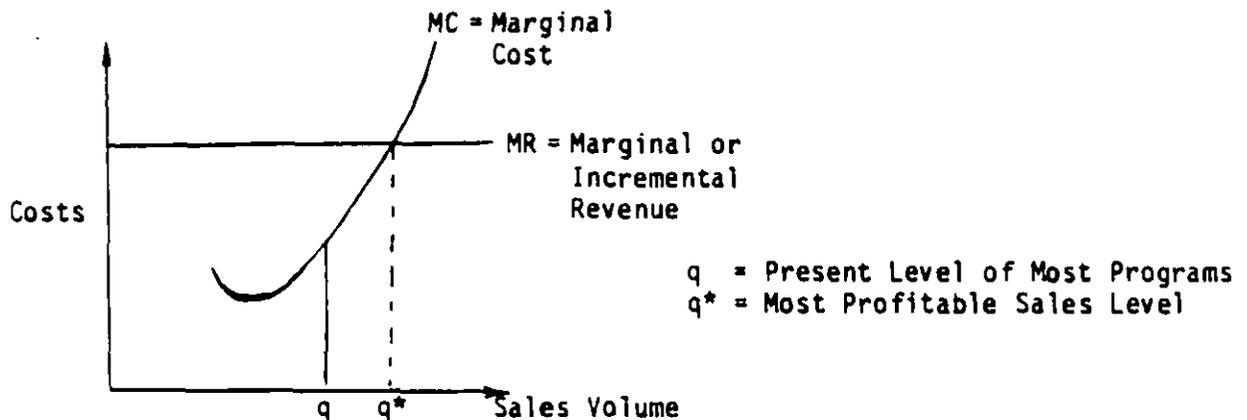
M&ED's present allocation of resources, based on the 1988 Cost-Benefit report, is:

|                                      | <b><u>Percent</u></b> |
|--------------------------------------|-----------------------|
| <b>Demand Management-Residential</b> | <b>21.7</b>           |
| <b>Customer Assistance</b>           | <b>16.4</b>           |
| <b>Marketing-I&amp;C</b>             | <b>13.4</b>           |
| <b>Service</b>                       | <b>12.1</b>           |
| <b>Marketing-Residential</b>         | <b>7.4</b>            |

|  | <u>Percent</u> |
|--|----------------|
| Land Management                        | 7.3            |
| <b>Economic Development</b>            | <b>7.2</b>     |
| <b>Community Development</b>           | <b>6.5</b>     |
| Street Lighting                        | 2.3            |
| Communications                         | 2.1            |
| Research                               | 1.5            |
| Other                                  | 0.9            |
| <b>Demand Management-I&amp;C</b>       | <b>0.4</b>     |
| Education                              | 0.4            |
| Public Participation/Attitude Tracking | 0.3            |
| Facility Siting                        | 0.1            |

### Reallocation of Resources

The determination of what level resources should be allocated to any one market segment is very difficult. According to basic economics, the programs by market segment would continue to contribute to profits, provided the marginal revenue added by one additional kilowatt-hour sale exceeds the marginal cost of that one kilowatt-hour sale. Based on costs shown in Table 2, nearly all segments, except RTS, could be vastly expanded according to this economic theory.



The question of where PP&L is on the marginal cost curve and the shape of that curve must be better known to determine the impact of adding resources to any market segment. For example, if the marginal cost curve for economic development is very steep (that is, the results increase little for major expenditures), then the addition of major resources may not be prudent.

Since it is extremely difficult to develop accurate marginal cost curves, an analysis of market coverage is best used to determine if additional resources should be added to increase profitability. Each market which appears underdeveloped should be reviewed to determine the best approach for resource allocation.

### Establishing Goals

M&ED goals are presently kilowatt-hours focused at all levels -- department, division, and individual. Economic Development reports by jobs which are translated to kilowatt-hours.

The development of a department level strategy to focus on earnings maximization would provide a better return to PP&L for the funds expended in M&ED. This strategy could also be developed at the division level to allocate resources for earnings maximization.

However, at the section and individual level, the application of earnings-based strategy must be reviewed with caution so we do not lose focus on our first priority of customer satisfaction. Provided both the RTS and RS rates have profitable value, the marketing of residential electric heating must be done to meet customer needs first. Also, with a limited customer assignment, an I&C consultant cannot allocate his or her personal resources for earnings, but must analyze the needs of assigned customers for application of profitable measures already determined and marketed by the Company.

### Recommendations

The information developed for this paper provides a start in developing a marketing strategy based on earnings. The initial steps should be to:

1. Continue the present marketing strategy to market to all segments -- residential, commercial and industrial. All segments appear profitable at this time. It is important for PP&L to maintain a marketing strategy which includes all classes of business, provided they are profitable. This approach counters competitors' efforts to gain a foothold in certain markets and broaden their efforts.
2. Examine sales growth potential through the expansion of economic development programs to increase incremental sales.
3. Strengthen the energy-intensive industry programs to increase the probability of securing large industries.
4. Continue the use of EDI-type tariff riders since they provide good earnings return at very low marketing cost.
5. Make program changes and productivity improvements to bring the RTS program into a more profitable position.
6. Continue to develop additional cost information by market segment to provide a better profitability analysis.
7. For 1990, develop a parallel set of goals based on kilowatt-hour sales and earnings to pilot the transition to earnings measurement at the department and division level. Do not change section or individual goals at this time.

**DOCKETED**  
APR 28 1995

OCA STATEMENT NO. 3

SM  
4-26-95  
Hbg  
R-943271

BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA POWER & LIGHT COMPANY )  
DOCKET NO. R-00943271 )

DIRECT TESTIMONY

OF

DR. CHARLES E. JOHNSON

ON CLASS COST OF SERVICE AND RATE DESIGN

ON BEHALF OF THE

PENNSYLVANIA OFFICE OF CONSUMER ADVOCATE

**DOCUMENT  
FOLDER**

**RECEIVED**  
95 APR 27 PM 1:20  
PA. P. U. C.  
INFO. CONTROL DIV.

APRIL 1995

TABLE OF CONTENTS

Page

I. QUALIFICATIONS . . . . . 1

II. PURPOSE AND SUMMARY . . . . . 3

III. CLASS COST-OF-SERVICE STUDY . . . . . 5

    Demand Allocation Methodology . . . . . 7

    Minimum Distribution System . . . . . 13

    Interruptible Credits . . . . . 17

    OCA-Proposed Study . . . . . 18

IV. RATE DESIGN . . . . . 22

    Residential Customer Charge . . . . . 22

BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA POWER & LIGHT )  
COMPANY ) DOCKET NO. R-00943271  
)

DIRECT TESTIMONY  
OF  
DR. CHARLES E. JOHNSON

I. QUALIFICATIONS

1

2 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3 A. My name is Charles E. Johnson. I am a Principal with Exeter Associates, Inc. Our  
4 offices are located at 12510 Prosperity Drive, Silver Spring, Maryland, 20904.

5 Q. PLEASE OUTLINE YOUR EDUCATIONAL BACKGROUND.

6 A. I hold a combined B.S. Degree in Chemistry and Physics from the University of  
7 Utah, an M.S. in Mathematics from the University of Wisconsin, and a Ph.D. in  
8 Mathematics from the Ohio State University.

9 Q. HOW HAVE YOU BEEN EMPLOYED SINCE RECEIVING YOUR  
10 DEGREES?

11 A. After completing my graduate education, I was an Instructor of Mathematics at  
12 Kansas State University in Manhattan, and an Assistant Professor of Mathematics at  
13 Wichita State University. In 1974, I left the academic environment and was em-  
14 ployed by Control Data Corporation as a Manager responsible for mathematical  
15 modeling. In 1977, I joined the economic consulting firm of J.W. Wilson and  
16 Associates, Inc. Since that time, I have been consulting in the area of energy  
17 economics and utility regulation. I became a principal of Exeter Associates, Inc. in  
18 January 1986.

1 Q. HAVE YOU TESTIFIED PREVIOUSLY IN REGULATORY PROCEEDINGS?

2 A. Yes, I have testified as an expert witness before regulatory commissions in Delaware,  
3 the District of Columbia, Florida, Georgia, Idaho, Illinois, Louisiana, Minnesota,  
4 Montana, New Hampshire, New Jersey, New Mexico, North Carolina, Oklahoma,  
5 Pennsylvania, Rhode Island, South Carolina and Texas. These proceedings have  
6 involved the regulation of electric and gas utilities, telephone companies and insurance  
7 carriers. I have testified frequently in the areas of cost of service studies and rate  
8 design, and have also addressed depreciation and financial issues.

9 Q. WOULD YOU PLEASE DESCRIBE SOME OF YOUR ADDITIONAL  
10 PROFESSIONAL ACTIVITIES?

11 A. I have provided assistance to numerous entities involved in business and economic  
12 rate regulation. Much of this work has been in public utility regulation on behalf of  
13 state regulatory agencies or other public authorities such as state attorneys general and  
14 federal agencies. I developed a series of seminars on cost of service and rate design  
15 and have provided training on these issues to Commission Staff in Kansas, Minnesota,  
16 Maryland and New Hampshire. These seminars covered both embedded and marginal  
17 cost-of-service studies and development of various types of rate forms. I developed a  
18 Utility Planning and Management Manual for use by federal government facilities for  
19 the planning, acquisition and management of utility services. I have also provided  
20 assistance to independent consumer groups and have assisted a number of industrial  
21 enterprises and government facilities in examining their operations in light of their  
22 tariff options and the potential for altering usage patterns or installing cogenerating  
23 facilities. Recent work has involved the determination of appropriate depreciation  
24 rates for regulated utilities.

1 I have spent a substantial amount of effort during the past several years in  
2 assisting major federal facilities with their electric power supply arrangements. In  
3 February of last year, the DOE laboratories in Northern California began taking  
4 power over the California-Oregon Transmission Project, which was the culmination of  
5 years of effort. I was intimately involved in planning for power supply purchases and  
6 developing a recharge mechanism for the three laboratories -- Lawrence Livermore  
7 National Laboratory, Lawrence Berkeley Laboratory and the Stanford Linear  
8 Accelerator Center -- with a combined peak demand of over 120 MW. Electricity for  
9 the laboratories is currently provided by three different sources that are scheduled  
10 under varying constraints and cost structures.

11 I am a member of the Society for Depreciation Professionals, the Washington  
12 Operations Research and Management Sciences Council, the Washington area affiliate  
13 of the Operations Research Society of America and the Institute for Management  
14 Sciences.

## 15 **II. PURPOSE AND SUMMARY**

16 Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

17 A. I have been asked to (1) review the class cost-of-service study submitted by PP&L in  
18 this proceeding and prepare an alternative study that better captures the cost-causality  
19 of the rate classes; (2) recommend an appropriate distribution of revenues to be  
20 recovered from the rate classes, and (3) review PP&L's proposed rate designs and  
21 recommend any modifications that are warranted.

22 Q. WHAT CONCLUSIONS HAVE YOU REACHED?

23 A. After reviewing the PP&L class cost-of-service study, I have concluded that the study  
24 is flawed and should be modified to correct three problems I have identified.

1 (1) The 12-CP demand allocator used in the PP&L study does not fully capture the  
2 cost causality for production investment.

3 (2) The separation of the distribution costs into demand and customer related  
4 components by the use of a minimum distribution system does not take into  
5 account the load-carrying capability of the minimum distribution system and  
6 overstates the cost of service to classes with low loads per customer.

7 (3) The value of interruptible load to the system and firm ratepayers is overstated by  
8 using the current cost of constructing a combustion turbine peaking unit as its  
9 value.

10 I have prepared a class cost-of-service study that corrects for these errors in the  
11 following ways.

12 (1) Production investment has been allocated on the basis of cost causality, relying on  
13 peak demands and energy consumption.

14 (2) Distribution demand allocators have been adjusted to account for the load-  
15 carrying capability of the minimum distribution system.

16 (3) The value of interruptible credits to other ratepayers in the cost study is taken as  
17 the current value of peaking capacity to the system.

18 Based on the class cost-of-service study I prepared and other considerations, I  
19 recommend above-average increases for rate schedules ISA, LP-5 and Lighting; below  
20 average increases for rate schedules GS-1, GS-3, LP-4, LPEP and Standby Service;  
21 and an average increase for rate schedules RS and RTS.

22 The Residential Services and Residential Thermal Service customer charges cover  
23 the costs of billing, metering and services and should not be increased. The two  
24 energy blocks of the Residential Service rate should be retained and not extended to  
25 three blocks. I also recommend that the RTS rate be frozen at the currently existing

1 locations and that PP&L endeavor to make changes to the rate that are both  
2 acceptable to RTS customers and effective in reducing the RTS contribution to the  
3 Company's winter peak demands.

### 4 III. CLASS COST-OF-SERVICE STUDY

5 Q. HAVE YOU EXAMINED THE CLASS COST-OF-SERVICE STUDY  
6 SUBMITTED BY PP&L IN THIS PROCEEDING?

7 A. Yes. I have reviewed both JMK-1 and JMK-2, the cost-of-service studies for the  
8 periods ending 9/30/94 and 9/30/95.

9 Q. IS JMK-2 AN ADEQUATE BASIS ON WHICH TO DETERMINE CLASS  
10 REVENUE LEVELS?

11 A. No, the class cost-of-service study filed as JMK-2 is not an appropriate basis on  
12 which to set revenue requirements without making certain modifications to it. I have  
13 identified three specific areas in the Company's study that I recommend modifying  
14 before it should be used as a basis for setting class revenues.

15 (1) Demand Allocation Methodology.

16 Even though the Company witnesses recognized that the cost of generating plant  
17 in service is partly determined by the amount of energy that the plant is expected  
18 to provide, energy consumption has not been incorporated into the allocation of  
19 generating plant investment in the PP&L study. PP&L has relied on the average  
20 of the 12 monthly coincident peak demands (12 CP) in allocating production  
21 investment. I propose the use of a method that incorporates both energy and  
22 demand in the allocation of production investment and is referred to as the peak  
23 and average (P&A) method.

1 (2) Classification of Distribution Plant.

2 PP&L has separated distribution plant into demand and customer components by  
3 use of the so-called minimum distribution system. This approach characterizes a  
4 minimum cost distribution system as being entirely customer related, even though  
5 the components of such a system are capable of carrying a substantial portion of  
6 the load for small customers. If the load-carrying capability of the minimum  
7 system is accounted for, the misallocation of distribution costs is reduced and the  
8 costs more accurately represent the cost responsibility for classes consisting of  
9 customers with small loads.

10 (3) Interruptible Credits.

11 The PP&L class cost-of-service study provides a rate base offset to customer  
12 classes that contain customers with interruptible load. The Company uses the  
13 current cost of constructing a combustion turbine peaking unit, \$300 per kW, as  
14 an offset, even though the market price of capacity on the PJM system is a  
15 fraction of that cost. Use of a level more in keeping with the current value of the  
16 interruptible load to PP&L and its other customers reduces the cost responsibility  
17 that is shifted to customers taking firm power service under the Company's study.

18 Q. HAVE YOU MADE ANY OTHER CHANGES TO THE COMPANY'S  
19 STUDY?

20 A. No, but there are other changes that would be appropriate. This should not be taken  
21 as agreement with the Company's methods in areas other than those addressed.

22 For example, the PP&L cost study sets class revenues for those classes receiving  
23 EDI/IDI credits at the actual revenue level (i.e., incorporating the credit). Thus, the  
24 indicated class rates of return for those classes is averaged between customers  
25 receiving the credits and customers not receiving the credits. If revenues were to be

1 set at levels to produce equal rates of return for all classes, this would be equivalent  
2 to assigning the cost of the EDI/IDI credits to the remaining customers in the same  
3 class. For example, the \$2.6 million in credits received by the LP-5 class would all  
4 be recovered in rates from LP-5 customers. This is an inequitable distribution of  
5 those costs.

6 If the EDI/IDI programs are of greater benefit than cost to all customers, then the  
7 cost of providing those credits should be recovered from all customers; if not, it  
8 should not be recovered from any ratepayers. PP&L has not shown that those credits  
9 are of a benefit to ratepayers greater than the cost of the credits. It is my intention to  
10 recommend a mechanism for sharing those costs between ratepayers and shareholders  
11 in revenue requirements testimony to be filed in this proceeding. The sharing of the  
12 ratepayer portion among ratepayers should be based on a basis reasonably consistent  
13 with any benefit that might be received. I recommend that total revenues be used for  
14 this purpose.

15 Demand Allocation Methodology

16 Q. WHAT DEMAND ALLOCATION METHODOLOGY HAS PP&L USED TO  
17 ALLOCATE PRODUCTION INVESTMENT IN ITS RECOMMENDED  
18 STUDY?

19 A. PP&L has used the class contribution to the 12 monthly peak demands (12 CP) to  
20 allocate production investment.

21 Q. HAS THE COMPANY JUSTIFIED THE USE OF THE 12-CP METHOD?

22 A. No. The Company witness, Mr. Kleha, has identified four considerations that, in his  
23 judgment, support the use of the 12-CP method. His arguments only support the use  
24 of demands from months other than the winter peak months and do not specifically  
25 provide support for using the 12 CP method. If it were a choice between using the

1 winter peak (or average of several winter monthly peaks) and the 12 CP, his  
2 arguments would be supportive of the choice of the Company-proposed 12-CP  
3 method. However, his arguments do not support the 12-CP method over other  
4 methods that might be considered. In his list of four considerations, he has not  
5 included a very important one.

6 Q. WHAT IMPORTANT CONSIDERATION HAS MR. KLEHA EXCLUDED IN  
7 THE SELECTION OF A PRODUCTION CAPACITY ALLOCATOR?

8 A. In his list of considerations, Mr. Kleha did not include the energy requirements of the  
9 classes. The energy requirements of the classes make up the total jurisdictional  
10 energy requirements of the Company, and the Company's energy requirements affect  
11 the production investment decisions of the Company. If it were only necessary to  
12 meet the maximum demand (even the 12 monthly maximum demands) for a short  
13 duration, PP&L could do so at lowest cost by installing combustion turbine peaking  
14 units and would not need to install baseload generating capacity. In order to supply  
15 energy the year around and meet the maximum demands, the Company installs a mix  
16 of generation facilities -- baseload, intermediate and peaking. The baseload units  
17 have relatively higher fixed costs and relatively lower variable costs so that if they  
18 run a large number of hours of the year, the total cost is lower than for the other two  
19 types. The peaking units have relatively lower fixed costs and relatively higher  
20 variable costs, enabling loads of short duration to be met at the lowest total cost.  
21 Intermediate units have both fixed costs and variable costs between those of baseload  
22 and peaking units. As Company witness Sipics stated, "When you look at our base  
23 load units, the reason we spend a lot more capital than you would need to spend to  
24 build a combustion turbine is because we were looking to provide energy over greater  
25 periods of time." [Tr. 298]

1           The amount of investment in generating plants is a function of both the amount of  
2 capacity the utility has and the mix of its generation capacity. A utility with a high  
3 load factor could meet its total production costs at the lowest cost by having more  
4 baseload plant than a utility with a low load factor would have. Because the energy  
5 requirements of the utility are a factor in determining the amount of production  
6 investment, the energy requirements of the rate classes should be a consideration in  
7 allocating the production investment to the classes. PP&L has not done so in its  
8 study, which results in overstating the costs of the lower load factor classes, such as  
9 residential and small commercial customers.

10 Q.           WHAT METHODOLOGY IS APPROPRIATE FOR ALLOCATION OF PP&L'S  
11 PRODUCTION INVESTMENT?

12 A.           The appropriate methodology for allocating PP&L's production investment is one that  
13 incorporates both class peak demands and class energy in reasonable portions. There  
14 are two questions that must be settled in order to implement such a method.

15 (1) What are reasonable percentages of the investment to allocate on energy and  
16 demand, and

17 (2) What measure of class peak demands should be used?

18 My answer to the first question is that 61.05 percent of the production investment  
19 should be allocated on the basis of class energy and 38.95 percent should be allocated  
20 on the basis of class demands. This is based on use of the system load factor, which  
21 is average demand for the year divided by peak demand during the year. The answer  
22 to the second question is that the average of the three winter peak and two summer  
23 peak demands should be used to allocate the demand-related portion of production  
24 investment.

1 Q. WHAT JUSTIFICATION IS THERE FOR USING THE SYSTEM LOAD  
2 FACTOR IN DETERMINING THE PERCENTAGE OF GENERATING  
3 INVESTMENT TO BE ALLOCATED ON CLASS ENERGY?

4 A. There are several reasons this is a reasonable percentage of production investment to  
5 use for the component to be allocated based on energy used by the rate classes. Some  
6 guidance can be obtained by examining other cost allocation methodologies. First, we  
7 can look at the average and excess demand allocation methodology. The load factor  
8 is the average usage of the system, i.e., the percentage of the capacity that would be  
9 required if every class had a 100 percent load factor. It is argued that the percentage  
10 of total capacity required to meet average loads should be allocated based on average  
11 demands, i.e., on energy. This is one of the justifications for using the load factor as  
12 the means of weighting the energy and demand components in the average and excess  
13 demand allocation method. The energy component is weighted by the load factor and  
14 the demand is weighted by one minus the load factor.

15 Another method, the equivalent peaker method, also provides some guidance. In  
16 this method, the economic cost of meeting demand is considered an appropriate  
17 measure of the amount of capacity to be allocated based on demand, with the residual  
18 to be allocated on energy. For example, with the long-run economic cost of meeting  
19 peak demand being the investment in a combustion turbine peaking unit at \$300 per  
20 kW, if baseload generating units cost \$1,000 per kW, then 30 percent of production  
21 investment should be considered as demand related and 70 percent as energy related.  
22 PP&L does not have a baseload generating unit planned, but estimates that the cost of  
23 pulverized coal capacity would be \$1,700 per kW. Use of these relative costs would  
24 result in less than 20 percent of production investment being classified as demand

1 related. For other PJM utilities, the percentages for the relative cost of a CT  
2 compared to a coal plant are typically in the 30 to 40 percentage range.

3 Q. ISN'T IT INCONSISTENT TO USE THE INVESTMENT IN A COMBUSTION  
4 TURBINE FOR CLASSIFYING PRODUCTION COSTS AS ENERGY AND  
5 DEMAND RELATED WHEN YOU ASSERT THE CURRENT COST OF  
6 MEETING PEAK DEMAND IS SUBSTANTIALLY LOWER?

7 A. No. For the allocation of PP&L's production investment, we need to take a longer  
8 run view than we do for determining the value to the system of short-term  
9 interruptible contracts.

10 The relationship between costs of meeting peaking load and baseload coal  
11 generating capacity costs have been relatively constant for a relatively lengthy period  
12 of time. While the cost of meeting peak demand 40 or 50 years ago was the same as  
13 for any capacity, it has been relatively constant since then.

14 PP&L's existing production investment reflects percentages at the time they were  
15 placed in service similar to the current projections. For example, the Brunner Island  
16 coal-fired units were placed in service between 1961 and 1969 at a cost of \$208 per  
17 kW. Combustion turbines were installed at four stations in 1967 at an average cost of  
18 \$79.50 per kW, which is 38.2 percent of the Brunner Island investment. For  
19 Keystone, this percentage is 43.0 percent, but is 50.5 percent when compared to the  
20 CTs installed in 1969. For more recent coal plants, most of which cost more than  
21 Keystone, the comparison percentages range from 34 to 46 percent. For Susquehanna  
22 nuclear units, the percentages are below five percent. Based on this review, it is  
23 clear that the PP&L load factor of 61.05 percent (producing a demand-related  
24 percentage of 38.95) is in the appropriate range.

1           Finally, the system load factor is stable from year to year. Whereas estimates of  
2 the cost of a combustion turbine or a coal plant might fluctuate from year to year,  
3 accepting the load factor as the basis for separating the demand-related investment  
4 from the energy-related investment would produce a relatively stable approach over  
5 time.

6 Q.           WHAT JUSTIFICATION IS THERE FOR USING THE THREE WINTER  
7           PEAK DEMANDS AND TWO SUMMER PEAK DEMANDS AS THE  
8           MEASURE OF CLASS PEAK DEMANDS?

9 A.           The Company rightly claims that peak demands in more months than the winter affect  
10 PP&L's production costs. During the most recent five-year period, the annual peak  
11 demand occurred three times in January, once in February and once in December and  
12 the peak loads in December and February are typically near the January peaks.  
13 Therefore, class loads in all of these months are important in determining the amount  
14 of capacity PP&L must have available.

15           As for the summer months, increases in the PP&L summer peak load would  
16 result in added costs to the PP&L ratepayers. Mr. Sipics testified that an increase in  
17 the summer demand would increase the obligation to PJM [Tr. 274]. It would also  
18 reduce the amount of capacity PP&L has to sell to the summer-peaking PJM pool.  
19 Thus, the summer peak demand has a cost impact on PP&L and, consequently, is  
20 important in assigning costs to the rate classes. Of all summer months, July and  
21 August have been the months when PP&L's historical summer peak has occurred.  
22 Therefore, I have used these two months in the development of the demand  
23 component of the capacity allocator. Using three winter months gives a higher  
24 weighting to the winter months, which seems appropriate, given that PP&L is a  
25 winter peaking utility.

1 Q. HOW DO YOU COMBINE ENERGY AND PEAK DEMAND TO  
2 CALCULATE THE PEAK AND AVERAGE ALLOCATION VECTOR?

3 A. I have calculated the Peak and Average allocation vector by multiplying the class  
4 energy percentages by the load factor, multiplying one minus the load factor by the  
5 simple average of the three winter and two summer monthly peak demands, and  
6 adding the two together. The PP&L demand allocation vectors for lower levels were  
7 calculated from the production demand vector and I have replicated those calculations  
8 in my study.

9 Minimum Distribution System

10 Q. WHAT APPROACH HAS PP&L USED IN ALLOCATING ITS  
11 DISTRIBUTION SYSTEM INVESTMENT AND EXPENSES?

12 A. Company witness Joseph M. Kleha sponsored the PP&L class cost of service studies  
13 and separated distribution plant into various categories for allocation; with higher  
14 voltage (i.e., 69 kV and above) plant investment being allocated on the basis of the 12  
15 monthly peak demands, primary voltage plant investment being allocated on the basis  
16 of the 12 monthly peak demands at primary level, secondary voltage plant investment  
17 being separated into customer and demand components and allocated on numbers of  
18 customers or weighted number of customers and class maximum demands, and  
19 lighting fixtures being directly assigned. This is described in Exhibit JMK-3.  
20 Distribution expenses are generally allocated in the same manner as plant.

21 Q. DO YOU RECOMMEND THE USE OF THE MINIMUM SIZED  
22 DISTRIBUTION SYSTEM TO SEPARATE COSTS INTO A CUSTOMER  
23 COMPONENT AND A DEMAND COMPONENT?

24 A. I do not recommend the use of a minimum sized distribution system for this purpose.  
25 However, I recognize it as a common, but not universal, method of doing so. In this

1 proceeding, I am not recommending an alternative method, but advise the  
2 Commission that this method overstates the amount of costs that are considered to be  
3 customer related. It is possible to make an adjustment to the method that reduces this  
4 overstatement and I will do so, but this should not be taken as support for the  
5 underlying assertion that all calculated costs of connecting a customer to the electric  
6 power grid are customer-related and all residual costs are demand related.

7 Q. HOW DID MR. KLEHA SEPARATE SECONDARY DISTRIBUTION  
8 INVESTMENT INTO THE DEMAND AND CUSTOMER COMPONENTS?

9 A. Mr. Kleha used the minimum size method described in the NARUC Cost Allocation  
10 Manual as a guide for the preparation of his study. Under this approach, the  
11 investment in each account is separated into a customer component by calculating the  
12 cost of a distribution system consisting of the smallest and least cost components  
13 currently being installed by PP&L. For example, the smallest size overhead  
14 transformer currently being installed by PP&L is a 10 kVa transformer with a total  
15 installed cost of \$24,672,274 for the 76,734 transformers of this size, or \$321.53 for  
16 each transformer. For the total of 338,575 overhead transformers of all sizes, this  
17 would require \$108,862,020 just for 10 kVa transformers. A similar calculation for  
18 the 25 kVa underground transformers produces a total of \$45,296,827, or  
19 \$154,158,847 for the two types. This amount is considered by PP&L to be customer  
20 related and the balance of the account, \$273,073,741, is considered to be demand  
21 related.

22 A similar analysis is performed for each account. Page 13 of Exhibit JMK-3  
23 contains the sizes of the components that have been selected by Mr. Kleha as the  
24 minimum sized components and the amount or number of each component and the  
25 cost for each, as calculated by Mr. Kleha, along with the total investment for each

1 account that would be required to construct a distribution system that contained as  
2 many poles, transformers and miles of conductor as the existing PP&L distribution  
3 system, but composed entirely of these "minimum sized components," the so-called  
4 minimum sized distribution system.

5 We must bear in mind that the minimum sized system is a theoretical construct  
6 only and would never actually be built. It does not meet the engineering requirements  
7 for carrying load that are typically necessary for actual distribution systems that are  
8 constructed. However, each component is a size that is being installed today and  
9 independently of the size of other components, could carry some load.

10 Q. HOW MUCH LOAD CAN THE VARIOUS SIZED COMPONENTS CARRY?

11 A. Some of the components are not tied to load. For example, 40 foot poles do not have  
12 an inherent load-carrying capacity, but can accommodate conductor and transformers  
13 of various sizes. The same is true of underground conduit. For transformers, the  
14 kVa overhead transformers can easily carry 10 kW of demand. Most utilities install  
15 transformers of a size that allows for considerable growth and the transformers can  
16 accommodate loads larger than their nameplate rating. Similarly, the 25 kVa  
17 underground transformers can reasonably be expected to carry 25 kW. Conductors  
18 of the size used in the minimum system can reasonably be expected to carry the load  
19 of the minimum size transformers, as can conductors used for services. All in all, the  
20 transformers are the constraining component of the minimum system components.

21 Q. SHOULD THE COSTS OF THE MINIMUM DISTRIBUTION SYSTEM BE  
22 ALLOCATED ON THE NUMBER OF CUSTOMERS IN EACH CLASS?

23 A. No. The balance of the investment in the distribution system should not be allocated  
24 on class demands unless some other adjustment is made. I conclude that the costs  
25 incorporated into the minimum distribution system are not fully customer related

1 costs, but there is a load-carrying component, as well. Because the residual  
2 component is considered to be demand related and is allocated on customer demands,  
3 the demands of customers are served by both components -- once in the customer  
4 component and once in the demand component.

5 Q. WHY IS THIS OBJECTIONABLE?

6 A. The objection to the method is that the minimum distribution system (which is  
7 characterized by its advocates as being entirely customer related) includes an implicit  
8 allocation of demand-related costs that is allocated based on customer count rather  
9 than on demand of the customers. This overstates the costs of providing service to  
10 the classes of customers that have low demands per customer.

11 Q. HOW CAN THIS BE CORRECTED?

12 A. Some analysts attempt to correct for this double counting by developing what is  
13 known as the zero intercept method that they purport will completely isolate the  
14 customer-related component. The method has several problems: (1) it requires  
15 extensive data, (2) it is difficult to implement, and (3) there are other problems with  
16 this approach. In any event, the zero intercept method has not been proposed by  
17 PP&L in this docket, so there is no need to address it. An alternative to attempting  
18 to completely isolate a customer-related portion is to adjust the demand allocator that  
19 is used to allocate the demand-related portion so that the load-carrying capability of  
20 the minimum system is not ignored. Whatever load the minimum system could carry  
21 should be reduced from the allocator for the demand component to recognize that  
22 load-carrying capability.

23 Q. HOW CAN THE LOAD-CARRYING CAPABILITY OF EACH CLASS'  
24 PORTION OF THE MINIMUM SYSTEM BE DETERMINED?

1 A. As I stated earlier, the constraining factor of the load-carrying capability is the  
2 amount of transformer capacity. Each class' allocation of transformer investment can  
3 be translated into a number of transformers and, thereby, into total transformer  
4 capacity. This amount of demand can then be deducted from the demand allocator.  
5 The remaining loads are class loads that cannot be carried by the minimum system  
6 and for which the additional distribution investment was incurred. It is entirely  
7 reasonable for the remaining (demand-related) distribution investment to be allocated  
8 on this basis. I have performed these calculations and developed an alternative  
9 distribution demand allocator that accounts for the load-carrying capability of the  
10 minimum system.

11 Interruptible Credits

12 Q. HAS PP&L PROPERLY REFLECTED THE VALUE OF INTERRUPTIBLE  
13 SERVICE IN ITS COST-OF-SERVICE STUDY?

14 A. No. There are several ways that utilities attempt to incorporate interruptible service  
15 into their class cost-of-service studies and PP&L's is flawed. PP&L has used a rate  
16 base offset in its cost-of-service study to reflect the assertion that the interruptible  
17 load has the same value as a combustion turbine peaking unit.

18 The problem with this approach is that the current value of the interruptible load  
19 may be equal to the current value of a combustion turbine peaking unit, but is not  
20 equal to the current construction cost of one. Peaking capacity is relatively cheap  
21 presently and has a value far lower than the current cost of constructing a new  
22 peaking unit. The PJM capacity deficiency rate is \$73 per kW-year, but has been  
23 traded for 15-20 percent of that value according to Company witness Sipics at page 15  
24 of Statement 9. If a utility in PJM were short of capacity, rather than construct a  
25 combustion turbine for \$300 per kW or pay the PJM Capacity Deficiency Charge of

1 \$73 per kW-year, it could contract with another utility to meet the requirements for as  
2 little as \$10.95 to \$14.60 per kW-year for the capacity. This sets the current value of  
3 the interruptible load for each kW that is reduced when a curtailment is called. While  
4 there may be historical reasons that the Company may need to provide credits to the  
5 interruptible customers that are greater than this, other customers currently receive a  
6 benefit only equal to this amount. According to the Company, the cost of contracting  
7 for peaking capacity to meet PJM deficiencies is expected to be below the cost of  
8 constructing a new combustion turbine peaking unit through the remainder of this  
9 century. Therefore, in determining their cost of service, it is this value that should  
10 be reflected. In determining the rate base offset, I rounded these values up to \$15 per  
11 kW-year, and calculated the equivalent rate base offset.

12 When the above adjustment is made to the interruptible credit of \$85,999,200  
13 used by Mr. Kleha in his study, the result is a \$17,669,699 rate base offset. This is  
14 the amount by which other customers benefit and the value that should be used in the  
15 cost-of-service study as a rate base offset.

16 Q. DOES YOUR RECOMMENDATION INCLUDE MODIFYING THE PP&L-  
17 PROPOSED INTERRUPTIBLE RATE CHARGES?

18 A. No. I am only addressing the allocation of the value of interruptible service, not the  
19 credits given to interruptible customers.

20 OCA-Proposed Study

21 Q. HAVE YOU PERFORMED A CLASS COST-OF-SERVICE STUDY THAT  
22 INCORPORATES THE CHANGES YOU HAVE RECOMMENDED?

23 A. Yes. I have prepared a class cost-of-service study that incorporates the three  
24 adjustments that I have described. The results of that study are shown in  
25 Exhibit\_\_ (CEJ-1), Schedule 1.

1           The study shows that two rate classes have negative rates of return, specifically  
2 Residential Service - Thermal Storage (RTS) and Interruptible Service by Agreement  
3 (ISA). The rates of return for Large General Service - 69 kV or higher (LP-5),  
4 Space Heating (GH) and the Lighting class (SL/AL) are all below average. The rates  
5 of return for Small General Service (GS-1) and Standby are substantially higher than  
6 for any other class and the rates of return for Large General Service (GS-3), Large  
7 General Service - 12 kV or higher (LP-4) and Power Service to Electric Propulsion  
8 (LPEP) are slightly above average. For the Residential class (RS), the rate of return  
9 is very nearly equal to the overall system rate of return at current rates.

10 Q.           DO YOU PROPOSE TO USE THIS COST STUDY AS A BASIS FOR  
11           DETERMINING CLASS REVENUE LEVELS?

12 A.           Yes, but several comments are appropriate first. There are reasons that make the  
13 indicated rate of return for the RTS class an inappropriate basis for establishing the  
14 RTS class revenue. The cost-of-service allocations have been based on historic data  
15 and the RTS demands during the winter months have been contributing substantially  
16 to the system peak demand, because the system peak demand has been occurring in  
17 the tariff off-peak period.

18           I note that the winter peak demands usually occur either at 8 o'clock in the  
19 morning or at 6 or 7 p.m. The RTS contribution to the morning peak is quite  
20 modest, but the contributions to the evening peak is four to five times as great. It is  
21 my understanding that PP&L intends to install load control devices to prevent this  
22 class from making large contributions to the system peak demand. If that occurs, the  
23 rate of return in this study may be based on grossly overstated costs for the RTS rate  
24 schedule.

1           In addition, even if the rate of return actually were as low as indicated in my  
2 study, it would be grossly unfair to increase rates to these customers by a larger-  
3 than-average amount at this time. The customers in the RTS class have been  
4 encouraged by PP&L to install special equipment in their homes to take service under  
5 the RTS rate, and many believed that they were not only taking the economically  
6 correct action, but were taking the responsible civic action in agreeing to the  
7 inconvenience of the terms of the RTS rate in order to help their neighbors and PP&L  
8 reduce costs by avoiding contributing to the Company's peak demand. That the  
9 Company miscalculated in setting the terms of the RTS rate so that the Company's  
10 Winter peak demands now sometimes occur during the off-peak period of the RTS  
11 rate schedule when RTS demands are high is not reason to take punitive action against  
12 them without consideration as to the history of how we arrived at this point. This is  
13 ample justification for providing an average increase to the RTS rate schedule, but I  
14 will have more to say about the RTS rate in the rate design section of my testimony.

15           The second class with a negative rate of return is the ISA class. PP&L claims  
16 that the Commission-approved contract between it and the customer prevent it from  
17 increasing revenues by more than 0.15 percent. It is my understanding that the  
18 Commission did not make a determination that the rate was lawful, just and  
19 reasonable and that at the time of any subsequent rate proceeding, the Commission  
20 may increase the charges to that customer to an appropriate level. I see no  
21 justification for continuing to provide massive subsidies to this customer and  
22 recommend a reasonable increase in ISA charges.

23           However, it should be recognized that the revenues being used in my  
24 recommended class increases are those requested by the Company and are being  
25 presented here only for purposes of comparison with the PP&L class revenue

1 recommendations. They are not based on the level of revenues that will be  
2 recommended by the OCA. Therefore, the class revenue levels presented at this stage  
3 of the proceeding are not those that will ultimately be proposed by the OCA.

4 Q. WHAT OTHER CONSIDERATIONS HAVE YOU EMPLOYED IN  
5 DETERMINING CLASS REVENUE LEVELS?

6 A. In addition to cost of service, I have considered rate continuity, customer impacts,  
7 and gradualism. Specifically, I have restricted the increase to any one class to 1.33  
8 times the overall increase for my illustrative class increases.

9 Q. HAVE YOU PREPARED SPECIFIC REVENUE RECOMMENDATIONS?

10 A. Yes. The results of the class cost-of-service study I have prepared are the appropriate  
11 starting point for determining class revenue requirements. In Exhibit \_\_\_(CEJ-1),  
12 Schedule 2, I have calculated increases for each rate schedule that would produce the  
13 same revenue as requested by the Company. This should not be taken as an  
14 endorsement of the Company's requested revenue level, but is provided on the same  
15 basis to facilitate comparison with the Company proposal and proposals of intervenors  
16 who also present class revenue proposals at the Company-requested level.

17 If the Commission orders a different revenue level, the increase can be spread in  
18 proportion to the increase in total revenue in Schedule 4. These percentages are  
19 shown in Exhibit \_\_\_(CEJ-1), Schedule 3.

20 If a reduction in revenue is ordered by the Commission, the first priority would  
21 be to reduce revenues from the classes with the highest current rates of return. The  
22 GS-1 class should receive the largest decrease, followed by the GS-3, LP-4 and LPEP  
23 rate schedules. The rate reductions for the RS and RTS rate schedules should be  
24 equal to the overall reduction. Smaller-than-average rate reductions should be  
25 provided to the other classes.

1 Q. SHOULD THE PEAK AND AVERAGE DEMAND ALLOCATOR YOU  
2 DEVELOPED BE USED IN ALLOCATING THE CAPACITY COSTS IN THE  
3 ECR?

4 A. Yes. The D10 allocator developed for allocating production investment in the Peak  
5 and Average class cost of service study is the appropriate basis on which to allocate  
6 capacity costs in the ECR to the rate classes. Exhibit \_\_\_ (CEJ-1), Schedule 4 shows  
7 the percentages for the different rate categories from this allocator.

8 **IV. RATE DESIGN**

9 **Residential Customer Charge**

10 Q. HOW LARGE AN INCREASE HAS PP&L PROPOSED IN THE  
11 RESIDENTIAL CUSTOMER CHARGE?

12 A. PP&L has proposed increasing the residential customer charge from \$4.80 to \$7.20  
13 per month, an increase of 50 percent.

14 Q. IS THE INCREASE IN THE RESIDENTIAL CUSTOMER CHARGE  
15 JUSTIFIABLE?

16 A. No. The increase in the residential customer charge is not justifiable. Company  
17 witness Kasper has attempted to justify the increase by claiming that the allocated  
18 customer-related revenue requirements are \$17.51 per month for residential service  
19 and that if only billing, metering and services are included, the monthly revenue  
20 requirement is still as high as \$10.18. Both of these numbers include large amounts  
21 of allocated costs and are an inappropriate basis upon which to set customer charges.

22 Q. WHAT ALLOCATED COSTS ARE INCLUDED IN THE \$17.51 PER MONTH  
23 CUSTOMER-RELATED REVENUE REQUIREMENT?

1 A. All costs in the cost-of-service study that are allocated on the basis of customer  
2 numbers or directly assigned as customer costs are included in the \$17.51 per month  
3 value calculated by PP&L. It includes the return on meters, services, the portion of  
4 lines and transformers deemed by the Company to be customer related, allocated  
5 portions of intangible plant, general plant and working capital; all allocated operating  
6 and maintenance expenses; depreciation expense on the above plant; and taxes.  
7 PP&L provided a breakdown of these values in response to OTS-RS-4D. I have  
8 reproduced the values provided for rate schedule RS in the column headed All Costs  
9 Allocated on Customers of Exhibit\_\_\_(CEJ-1), Schedule 5.

10 Q. WHAT ALLOCATED COSTS ARE INCLUDED IN THE \$10.17 MONTHLY  
11 VALUE?

12 A. In the second column of Exhibit\_\_\_(CEJ-1), Schedule 5, headed Costs Excluding  
13 Lines and Transformers, I have reproduced the development of the \$10.18 monthly  
14 revenue requirements claimed by PP&L to represent the customer cost using billing  
15 metering and service only. What is not apparent from these values is that the \$10.18  
16 monthly cost claimed by the Company includes a lot more than billing, metering and  
17 services. It also contains an excessive amount of allocated O&M expenses.

18 On page 2 of Schedule 5, I have reproduced the allocated O&M costs from the  
19 cost-of-service study, Exhibit JMK-2. In column 1, the distribution O&M includes  
20 expenses for lines and transformers and the \$113,448,000 used in producing the  
21 Company's \$17.51 per month is exactly the O&M expense allocated to Rate Schedule  
22 RS in the PP&L cost study JMK-2. In column 2, I have replaced the O&M for lines  
23 and transformers with zero, and the total is \$100,477,000, only about \$8 million  
24 higher than the \$92,323,000 claimed by Mr. Kasper as the O&M costs using billing,

1 metering and services only. Thus, only \$8 million of all of the remaining allocated  
2 costs are not included in calculating the claimed \$10.18 per month residential cost.

3 The O&M for services, meters and customer installation only sum to about \$12  
4 million, and meter reading and all other customer accounting costs (except  
5 uncollectibles) only brings the total to under \$42 million. Included in PP&L's  
6 calculation is \$4 million in miscellaneous distribution expense, \$14 million in  
7 uncollectibles, \$16 million in customer services and information and \$27 million in  
8 allocated administrative and general expense. The Company's calculation clearly  
9 overstates the residential customer cost for metering, billing and services.

10 Q. WHAT IS THE APPROPRIATE RESIDENTIAL CUSTOMER COST ON  
11 WHICH TO BASE RATES?

12 A. The Commission has in the past used the costs of billing, metering and services as the  
13 cost basis for setting the residential customer charge. If we calculate the revenue  
14 produced by the current \$4.80 per month charge, it is about \$61 million.

15 The costs that are appropriate to be included are meter reading (\$7,863,000),  
16 O&M for services (\$3,482,000), O&M for meters (\$5,018,000) and some portion of  
17 other customer accounting (\$22,301,000), which total \$38,664,000. This is the total  
18 of the direct expenses for metering, services and billing. If the allocated return and  
19 depreciation expenses are included, that adds \$21,915,000, for a total of \$60,579,000,  
20 still less than the revenue produced by the current level of customer charge and  
21 requires a customer charge of only \$4.73 monthly.

22 Q. SHOULD ANY OF THE OTHER COSTS USED BY PP&L BE INCLUDED IN  
23 THE CALCULATION OF CUSTOMER CHARGES?

24 A. I am unwilling to concede that any other costs characterized by PP&L as "customer  
25 related" should be included in the calculation of the customer charge. They are

1 increasingly more removed from billing, metering and services and are either  
2 allocated on some basis or calculated under varying assumptions. In short, they are  
3 part of an allocated cost study and not the direct customer costs which I believe to be  
4 the appropriate basis for establishing customer charges and what has been the practice  
5 in Pennsylvania.

6 Based on this calculation, I conclude that the current residential customer charge  
7 is sufficient to recover the costs of billing, metering and services and need not be  
8 increased.

9 Q. HAVE YOU EXAMINED THE CUSTOMER COSTS FOR THE RTS RATE?

10 A. Yes. On the same basis as for the RS rate, the monthly customer cost is \$8.29.

11 Compared to the current RTS customer charge of \$10.95 per month, the current RTS  
12 customer charge is sufficient to recover the costs of billing, metering and services and  
13 need not be increased.

14 Q. HAVE YOU PERFORMED A DETERMINATION OF THE APPROPRIATE  
15 RESIDENTIAL RATE DESIGN?

16 A. Yes. The current residential service rate (Schedule RS) contains two energy blocks.  
17 The Company has proposed increasing the number of blocks to three. I recommend  
18 that the current energy charges be increased by the percentage necessary to satisfy the  
19 revenue target.

20 I recommend that the Commission reject the proposal of PP&L to increase the  
21 number of energy blocks to three. There is no valid reason to introduce an additional  
22 block in the residential rate. PP&L has proposed to reduce the number of blocks in  
23 the LP-4 and LP-5 rates to simplify them. PP&L's only justification for adding a  
24 third block to the RS rate was to recover additional customer costs in the initial  
25 blocks. However, PP&L's claim was based on the premise that all of the costs of the

1 minimum distribution system are customer related. As described in an earlier section  
2 of my testimony, components of the minimum distribution system have the capability  
3 of carrying substantial load. Therefore the costs of the minimum distribution system  
4 are not fully customer related, but partially demand related and do not need to be  
5 recovered in the initial blocks, as claimed by PP&L.

6 Additionally, the Company's proposed customer charge and the higher level of  
7 recovery in the initial blocks produce even greater revenue than the Company claimed  
8 was customer related. The proposed \$7.20 customer charge, combined with the  
9 higher recovery in the proposed initial two blocks, produces a monthly revenue of  
10 \$20.40, greater even than the overstated \$17.51 claimed as customer costs by PP&L.

11 Q. HAVE YOU EXAMINED PP&L'S PROPOSED RTS RATE?

12 A. Yes. As mentioned above, there is no justification for increasing the customer  
13 charge. Both the demand charge and the energy charges should be increased to  
14 recover the appropriate revenue.

15 In addition, it is appropriate to make some other changes in the terms and  
16 conditions of the RTS rate schedule. RTS is intended to be an off-peak rate and to  
17 provide lower prices to customers who are willing to incur the inconvenience of the  
18 tariff conditions in return for the lower-than-average costs these customers impose on  
19 the system. It has apparently not worked out that way and it is possible that these  
20 customers are now providing revenue less than their cost-of-service. PP&L should  
21 make some changes in the tariff to reduce the likelihood of any shortfall in revenue  
22 from RTS customers growing. In order to do that, PP&L should close the current  
23 rate to new customers and grandfather the existing locations (not simply the existing  
24 customers) in the rate so that there is no economic loss to those customers who, in  
25 good faith, signed up for service under RTS. Second, PP&L should endeavor to

1 modify the current rate and service so that the class avoids contributing large demands  
2 to the Company's winter monthly peak demands. If PP&L wishes to continue  
3 offering a thermal storage rate to new customers, it should develop an appropriate  
4 cost-based rate for review by the Commission and interested parties in a separate  
5 proceeding.

6 Q. HOW CAN THE RTS TARIFF BE CHANGED SO THE CLASS AVOIDS  
7 LARGE CONTRIBUTIONS TO THE SYSTEM WINTER PEAK DEMANDS?

8 A. There are several ways the Company might be able to do this. The suggestion during  
9 cross-examination of Company witnesses that load control devices be installed at the  
10 residences of RTS customers should be considered carefully. The off-peak period  
11 now extends for 10 hours, from 7 a.m. to 5 p.m., from 8 a.m. to 6 p.m., or from 9  
12 a.m. to 7 p.m. Placement of load control mechanisms on the customers might  
13 enhance the value of the rate to PP&L, but could result in further inconvenience to  
14 customers. PP&L should look into other ways the rate could be modified to avoid the  
15 large RTS contribution to peak demand. For example, since the Company's peak  
16 demands occur in the morning and evening, PP&L should examine the potential for  
17 allowing these customers to charge their thermal systems during the middle of the  
18 day. This may allow these customers to keep their heating load off the system at the  
19 times of the peak.

20 Secondly, the Commission should close the current rate prospectively so that no  
21 additional customers get caught in the same problems the current RTS customers face.  
22 As I noted above, however, existing locations with RTS service should be permitted  
23 to remain on the current RTS rate schedule as long as they have the existing thermal  
24 storage system on the premises. Generally, I would propose that future rate increases  
25 for this "frozen" class be approximately the same percentage as that received by Rate

1           RS customers. In this way, the differential between the RTS rate and the traditional  
2           electric heating rate which induced these customers to purchase thermal storage  
3           systems would be maintained.

4           Finally, if PP&L desires to propose a new thermal storage rate, such rate should,  
5           among other things, be strictly cost based and appropriately designed to avoid undue  
6           contributions to peak demands (or shifting peak demands). Current RTS customers  
7           and locations, however, must retain the option of remaining on the existing rate  
8           schedule even if a new thermal storage rate is offered by the Company in the future.

9    Q.           DOES THIS COMPLETE YOUR RATE DESIGN TESTIMONY?

10 A.           Yes.

BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION

PENNSYLVANIA POWER & LIGHT )  
COMPANY ) DOCKET NO. R-00943271  
.. )

SCHEDULES ACCOMPANYING THE  
DIRECT TESTIMONY  
OF  
DR. CHARLES E. JOHNSON  
ON CLASS COST OF SERVICE AND RATE DESIGN

ON BEHALF OF THE  
PENNSYLVANIA OFFICE OF CONSUMER ADVOCATE

APRIL 1995

---

**EXETER**

Associates, Inc.

12510 Prosperity Drive  
Suite 350  
Silver Spring, MD 20904

**PENNSYLVANIA POWER AND LIGHT COMPANY**  
**SUMMARY OF OCA COST OF SERVICE STUDY – TEST YEAR ENDED 9/30/95**

|   | Jurisdiction | RS        | RTS     | GS-1    | GS-3      | LP-4    |
|---|--------------|-----------|---------|---------|-----------|---------|
| OPERATING REVENUES AT PRESENT RATE LEVELS |              |           |         |         |           |         |
| SALE OF ELECTRICITY                       |              |           |         |         |           |         |
| 1 RATE REVENUE                            | 2,263,602    | 909,213   | 20,360  | 165,977 | 520,355   | 281,626 |
| 2 ENERGY/FUEL COST REVENUE                | (21,487)     | (7,008)   | (248)   | (1,005) | (4,491)   | (3,377) |
| 3 STATE TAX ADJ SURCHARGE                 |              |           |         |         |           |         |
| 4 SPEC BASE RATE CREDIT ADJ               | (38,084)     | (15,093)  | (338)   | (2,755) | (8,692)   | (4,896) |
| 5 TOTAL SALE OF ELECTRICITY               | 2,204,031    | 887,112   | 19,774  | 162,217 | 507,172   | 273,353 |
| 6 ANNUALIZATION                           | 7,074        | 3,508     | 27      | 1,314   | 1,528     | 377     |
| 7 LATE PAY CHARGES                        | 2,236,720    | 898,812   | 20,168  | 166,924 | 514,040   | 278,475 |
| 8 TOT ADJ'D SALE OF ELECTRIC              | 165,535      | 63,216    | 2,302   | 8,690   | 35,134    | 22,364  |
| 9 OTHER OPERATING REVENUES                | 2,402,255    | 962,028   | 22,470  | 175,614 | 549,175   | 300,839 |
| 10 TOTAL OPERATING REVENUES               |              |           |         |         |           |         |
| 11  |              |           |         |         |           |         |
| 12 OPERATING EXPENSE                      |              |           |         |         |           |         |
| 13  |              |           |         |         |           |         |
| 14 OPERATING AND MAINTENANCE EXPENSES     |              |           |         |         |           |         |
| 15 PRODUCTION                             |              |           |         |         |           |         |
| 16 FUEL                                   | 431,704      | 153,338   | 5,471   | 21,424  | 94,561    | 62,645  |
| 17 POWER PURCHASES                        | 252,511      | 89,939    | 3,231   | 12,538  | 55,279    | 36,557  |
| 18 OTHER PRODUCTION                       | 297,079      | 109,963   | 4,316   | 14,856  | 64,506    | 41,600  |
| 19 TOTAL PRODUCTION                       | 981,294      | 353,240   | 13,018  | 48,818  | 214,346   | 140,803 |
| 20 TRANSMISSION                           | 10,487       | 4,002     | 167     | 528     | 2,262     | 1,427   |
| 21 DISTRIBUTION                           | 92,936       | 44,726    | 2,795   | 6,889   | 21,342    | 5,720   |
| 22 OTHER OPER & MAINT EXP                 | 288,210      | 156,626   | 4,230   | 19,131  | 44,420    | 25,620  |
| 23 TOTAL OPER & MAINT EXPENSES            | 1,372,927    | 558,594   | 20,210  | 75,365  | 282,370   | 173,570 |
| 24  |              |           |         |         |           |         |
| 25 DEPRECIATION EXPENSE                   |              |           |         |         |           |         |
| 26 PRODUCTION                             | 231,599      | 88,392    | 3,695   | 11,650  | 49,947    | 31,525  |
| 27 TRANSMISSION                           | 7,753        | 2,972     | 124     | 392     | 1,679     | 1,060   |
| 28 DISTRIBUTION                           | 70,147       | 33,329    | 2,355   | 4,665   | 17,493    | 3,461   |
| 29 OTHER DEPREC EXP                       | 11,298       | 5,579     | 187     | 712     | 1,985     | 1,127   |
| 30 TOTAL DEPRECIATION EXPENSE             | 320,797      | 130,272   | 6,361   | 17,419  | 71,104    | 37,174  |
| 31 AMORTIZATION EXP (ACCT 406)            |              |           |         |         |           |         |
| 32 TOTAL DEPRECIATION AND                 |              |           |         |         |           |         |
| 33 AMORTIZATION EXPENSE                   | 320,797      | 130,272   | 6,361   | 17,419  | 71,104    | 37,174  |
| 34  |              |           |         |         |           |         |
| 35 MISC ALLOWABLE EXPENSES                | (29,674)     | (11,313)  | (472)   | (1,492) | (6,401)   | (4,043) |
| 36  |              |           |         |         |           |         |
| 37 TAXES                                  |              |           |         |         |           |         |
| 38 -OTHER CAPITAL STOCK                   | 30,553       | 13,791    | 602     | 1,826   | 6,522     | 3,288   |
| 39 -OTHER W/O CAP STOCK                   | 57,584       | 26,627    | 1,066   | 3,495   | 11,645    | 6,097   |
| 40 DEFERRED INCOME TAXES                  | (15,424)     | (3,061)   | (212)   | (396)   | (4,298)   | (3,026) |
| 41 NET INV TAX CR                         | (8,625)      | (3,913)   | (169)   | (518)   | (1,811)   | (912)   |
| 42 GROSS RECEIPTS TAX                     | 98,416       | 39,548    | 887     | 7,345   | 22,618    | 12,253  |
| 43 PA & FED INCOME TAXES                  | 209,079      | 61,512    | (3,108) | 27,008  | 67,267    | 32,147  |
| 44 TOTAL TAXES                            | 371,583      | 134,503   | (933)   | 38,760  | 101,943   | 49,846  |
| 45  |              |           |         |         |           |         |
| 46 TOTAL OPERATING EXP                    | 2,035,633    | 812,056   | 25,166  | 130,051 | 449,015   | 256,546 |
| 47  |              |           |         |         |           |         |
| 48 RETURN (LN 12 - 42)                    | 366,622      | 149,972   | (2,696) | 45,563  | 100,159   | 44,292  |
| 49  |              |           |         |         |           |         |
| 50 TOTAL RATE BASE                        | 5,017,178    | 2,052,905 | 108,111 | 274,533 | 1,155,058 | 562,763 |
| 51  |              |           |         |         |           |         |
| 52 RATE OF RETURN (LN 43 / RBX)           | 7.31%        | 7.31%     | -2.49%  | 16.60%  | 8.67%     | 7.87%   |
| 53  |              |           |         |         |           |         |
| 54 CLASS RATE IN % OF TOTAL               | 100.00%      | 99.97%    | -34.12% | 227.12% | 118.67%   | 107.71% |

**PENNSYLVANIA POWER AND LIGHT COMPANY**  
**SUMMARY OF OCA COST OF SERVICE STUDY – TEST YEAR ENDED 9/30/95**

|   | LP-5                               | LPEP    | ISA     | GH      | SLJAL  | STANDBY |
|---|------------------------------------|---------|---------|---------|--------|---------|
| OPERATING REVENUES AT PRESENT RATE LEVELS |                                    |         |         |         |        |         |
| SALE OF ELECTRICITY                       |                                    |         |         |         |        |         |
| 1   | 268,654                            | 8,665   | 21,238  | 44,746  | 21,591 | 1,177   |
| 2   | (4,364)                            | (116)   | (422)   | (375)   | (72)   | (9)     |
| 3   |                                    |         |         |         |        |         |
| 4   | (4,678)                            | (144)   | (367)   | (743)   | (358)  | (20)    |
| 5   | 259,612                            | 8,405   | 20,449  | 43,628  | 21,161 | 1,148   |
| 6   | 133                                | 0       | 0       | 135     | 52     | 0       |
| 7   | 264,718                            | 8,405   | 20,449  | 42,749  | 20,832 | 1,148   |
| 8   | 26,333                             | 691     | 2,472   | 3,002   | 1,274  | 56      |
| 9   | 291,051                            | 9,096   | 22,921  | 45,751  | 22,107 | 1,204   |
| 10  |                                    |         |         |         |        |         |
| 11  |                                    |         |         |         |        |         |
| 12  | OPERATING EXPENSE                  |         |         |         |        |         |
| 13  |                                    |         |         |         |        |         |
| 14  | OPERATING AND MAINTENANCE EXPENSES |         |         |         |        |         |
| 15  | PRODUCTION                         |         |         |         |        |         |
| 16  | 75,889                             | 1,973   | 7,159   | 7,616   | 1,475  | 154     |
| 17  | 44,225                             | 1,151   | 4,168   | 4,476   | 856    | 90      |
| 18  | 49,290                             | 1,313   | 4,582   | 5,632   | 905    | 116     |
| 19  | 169,404                            | 4,437   | 15,909  | 17,724  | 3,236  | 360     |
| 20  | 1,660                              | 45      | 152     | 209     | 29     | 4       |
| 21  | 2,539                              | 83      | 242     | 2,870   | 5,725  | 6       |
| 22  | 28,520                             | 766     | 2,619   | 4,248   | 1,960  | 71      |
| 23  | 202,123                            | 5,331   | 18,922  | 25,050  | 10,950 | 442     |
| 24  |                                    |         |         |         |        |         |
| 25  | DEPRECIATION EXPENSE               |         |         |         |        |         |
| 26  | 36,664                             | 997     | 3,366   | 4,625   | 640    | 97      |
| 27  | 1,233                              | 26      | 88      | 155     | 22     | 3       |
| 28  | 1,543                              | 46      | 145     | 2,301   | 4,805  | 4       |
| 29  | 1,219                              | 33      | 112     | 200     | 140    | 3       |
| 30  | 40,659                             | 1,102   | 3,710   | 7,282   | 5,607  | 107     |
| 31  | AMORTIZATION EXP (ACCT 406)        |         |         |         |        |         |
| 32  | TOTAL DEPRECIATION AND             |         |         |         |        |         |
| 33  | 40,659                             | 1,102   | 3,710   | 7,282   | 5,607  | 107     |
| 34  | AMORTIZATION EXPENSE               |         |         |         |        |         |
| 35  | (4,706)                            | (128)   | (432)   | (592)   | (82)   | (12)    |
| 36  |                                    |         |         |         |        |         |
| 37  | TAXES                              |         |         |         |        |         |
| 38  | 3,008                              | 101     | 200     | 718     | 489    | 9       |
| 39  | 5,906                              | 185     | 443     | 1,243   | 860    | 17      |
| 40  | (4,124)                            | (114)   | (416)   | (384)   | 618    | (10)    |
| 41  | (852)                              | (28)    | (61)    | (200)   | (159)  | (3)     |
| 42  | 11,648                             | 370     | 900     | 1,881   | 917    | 51      |
| 43  | 19,363                             | 924     | 532     | 3,552   | (375)  | 257     |
| 44  | 34,949                             | 1,438   | 1,597   | 6,810   | 2,350  | 321     |
| 45  |                                    |         |         |         |        |         |
| 46  | 273,025                            | 7,743   | 23,797  | 38,551  | 18,824 | 858     |
| 47  |                                    |         |         |         |        |         |
| 48  | 18,026                             | 1,353   | (875)   | 7,200   | 3,282  | 346     |
| 49  |                                    |         |         |         |        |         |
| 50  | 583,719                            | 15,618  | 51,903  | 119,797 | 91,222 | 1,550   |
| 51  |                                    |         |         |         |        |         |
| 52  | 3.09%                              | 8.66%   | -1.69%  | 6.01%   | 3.60%  | 22.34%  |
| 53  |                                    |         |         |         |        |         |
| 54  | 42.26%                             | 118.55% | -23.08% | 82.25%  | 49.24% | 305.76% |
| 55  |                                    |         |         |         |        |         |

PENNSYLVANIA POWER AND LIGHT COMPANY

|           | MWH        | CURRENT<br>RATE<br>REVENUE | EDI<br>CREDITS | IDI<br>CREDITS | SPECIAL<br>BASE RATE<br>CR ADJ<br>-2.30% | STAS<br>ROLL-IN<br>-0.49% | ENERGY<br>COST<br>RATE | TOTAL<br>REVENUE |
|-----------|------------|----------------------------|----------------|----------------|--|---------------------------|------------------------|------------------|
| RS        | 10,894,124 | 799,738,000                |                |                | (18,393,974)                             | (3,828,586)               | 111,032,912            | 888,548,352      |
| RTS       | 385,160    | 16,369,000                 |                |                | (376,487)                                | (78,363)                  | 3,925,551              | 19,839,700       |
| RTD       | 4,877      | 324,000                    |                |                | (7,452)                                  | (1,551)                   | 49,706                 | 364,703          |
| GS-1      | 1,496,385  | 150,958,000                |                |                | (3,472,034)                              | (722,681)                 | 15,212,250             | 161,975,535      |
| GS-3      | 6,709,042  | 455,826,000                | (1,964,000)    | (1,315,000)    | (10,483,998)                             | (2,166,109)               | 68,204,121             | 508,101,014      |
| LP-4      | 4,521,059  | 248,672,000                | (12,061,000)   | (1,258,000)    | (5,719,456)                              | (1,125,204)               | 45,612,964             | 274,121,304      |
| LP-5      | 5,587,275  | 223,703,000                | (12,333,000)   | (821,000)      | (5,145,169)                              | (1,006,479)               | 56,129,765             | 260,527,117      |
| LPEP      | 148,928    | 7,131,000                  |                |                | (164,013)                                | (34,138)                  | 1,496,131              | 8,428,979        |
| ISA       | 540,441    | 16,433,000                 | (872,000)      |                | (377,959)                                | (74,397)                  | 5,429,270              | 20,537,914       |
| IS-1      | 3,828      | 152,000                    |                |                | (3,496)                                  | (728)                     | 38,915                 | 186,692          |
| BL        | 5,508      | 438,000                    |                |                | (10,074)                                 | (2,097)                   | 55,994                 | 481,823          |
| SA        | 29,113     | 4,115,000                  |                |                | (94,645)                                 | (19,700)                  | 295,963                | 4,296,618        |
| SM        | 9,875      | 1,563,000                  |                |                | (35,949)                                 | (7,483)                   | 100,389                | 1,619,958        |
| SHS       | 58,745     | 14,595,000                 |                |                | (335,685)                                | (69,871)                  | 597,202                | 14,786,646       |
| SE        | 9,120      | 263,000                    |                |                | (6,049)                                  | (1,259)                   | 92,714                 | 348,406          |
| TS(R)     | 517        | 51,000                     |                |                | (1,173)                                  | (244)                     | 5,256                  | 54,839           |
| SI-1(R)   | 367        | 68,000                     |                |                | (1,564)                                  | (326)                     | 3,731                  | 69,841           |
| GH-1(R)   | 462,090    | 32,374,000                 |                |                | (744,602)                                | (154,984)                 | 4,697,607              | 36,172,021       |
| GH-2(R)   | 97,756     | 6,743,000                  |                |                | (155,089)                                | (32,281)                  | 993,787                | 7,549,418        |
| STANDBY   | 11,600     | 1,063,000                  |                |                | (24,449)                                 | (5,089)                   | 116,534                | 1,149,996        |
| TOTAL PUC | 30,975,810 | 1,980,579,000              | (27,230,000)   | (3,394,000)    | (45,553,317)                             | (9,331,568)               | 314,090,762            | 2,209,160,877    |

PENNSYLVANIA POWER AND LIGHT COMPANY

|           | CURRENT<br>RATE<br>REVENUE | SBRCA<br>ACE CREDIT<br>-0.64% | STAS<br>ROLL-IN | ECR<br>ROLL-IN<br>0.010836 | CURRENT<br>TOTAL<br>REVENUE<br>ROLLED-IN | EDI<br>CREDITS | IDI<br>CREDITS | SPECIAL<br>BASE RATE<br>CR ADJ<br>-1.66% |
|-----------|----------------------------|-------------------------------|-----------------|----------------------------|--|----------------|----------------|--|
| RS        | 799,738,000                | (5,118,323)                   | (3,828,586)     | 118,048,728                | 908,839,819                              | 0              | 0              | (15,086,741)                             |
| RTS       | 16,369,000                 | (104,762)                     | (78,363)        | 4,173,594                  | 20,359,469                               | 0              | 0              | (337,967)                                |
| RTD       | 324,000                    | (2,074)                       | (1,551)         | 52,847                     | 373,222                                  | 0              | 0              | (6,195)                                  |
| GS-1      | 150,958,000                | (966,131)                     | (722,681)       | 16,214,828                 | 165,484,015                              | 0              | 0              | (2,747,035)                              |
| GS-3      | 455,826,000                | (2,917,286)                   | (2,166,109)     | 72,699,179                 | 523,441,784                              | (1,964,000)    | (1,315,000)    | (8,689,134)                              |
| LP-4      | 248,672,000                | (1,591,501)                   | (1,125,204)     | 48,990,195                 | 294,945,490                              | (12,061,000)   | (1,258,000)    | (4,896,095)                              |
| LP-5      | 223,703,000                | (1,431,699)                   | (1,006,479)     | 60,543,712                 | 281,808,534                              | (12,333,000)   | (821,000)      | (4,678,022)                              |
| LPEP      | 7,131,000                  | (45,638)                      | (34,138)        | 1,613,784                  | 8,665,007                                | 0              | 0              | (143,839)                                |
| ISA       | 16,433,000                 | (105,171)                     | (74,397)        | 5,856,219                  | 22,109,651                               | (872,000)      | 0              | (367,020)                                |
| IS-1      | 152,000                    | (973)                         | (728)           | 41,480                     | 191,780                                  | 0              | 0              | (3,184)                                  |
| BL        | 438,000                    | (2,803)                       | (2,097)         | 59,685                     | 492,785                                  | 0              | 0              | (8,180)                                  |
| SA        | 4,115,000                  | (26,336)                      | (19,700)        | 315,468                    | 4,384,433                                | 0              | 0              | (72,782)                                 |
| SM        | 1,563,000                  | (10,003)                      | (7,483)         | 107,006                    | 1,652,520                                | 0              | 0              | (27,432)                                 |
| SHS       | 14,595,000                 | (93,408)                      | (69,871)        | 636,561                    | 15,068,282                               | 0              | 0              | (250,133)                                |
| SE        | 263,000                    | (1,683)                       | (1,259)         | 98,824                     | 358,882                                  | 0              | 0              | (5,957)                                  |
| TS(R)     | 51,000                     | (326)                         | (244)           | 5,602                      | 56,032                                   | 0              | 0              | (930)                                    |
| SI-1(R)   | 68,000                     | (435)                         | (326)           | 3,977                      | 71,216                                   | 0              | 0              | (1,182)                                  |
| GH-1(R)   | 32,374,000                 | (207,194)                     | (154,984)       | 5,007,207                  | 37,019,030                               | 0              | 0              | (614,516)                                |
| GH-2(R)   | 6,743,000                  | (43,155)                      | (32,281)        | 1,059,284                  | 7,726,848                                | 0              | 0              | (128,266)                                |
| STANDBY   | 1,063,000                  | (6,803)                       | (5,089)         | 125,698                    | 1,176,806                                | 0              | 0              | (19,535)                                 |
| TOTAL PUC | 1,980,579,000              | (12,675,706)                  | (9,331,568)     | 335,653,877                | 2,294,225,603                            | (27,230,000)   | (3,394,000)    | (38,084,145)                             |

## PENNSYLVANIA POWER AND LIGHT COMPANY

|           | ENERGY<br>COST<br>RATE | TOTAL<br>REVENUE | PROPOSED<br>RATE<br>ROLL-IN | EDI<br>CREDITS | IDI<br>CREDITS | SPECIAL<br>BASE RATE<br>CR ADJ | ENERGY<br>COST<br>RATE | TOTAL<br>REVENUE |
|-----------|------------------------|------------------|-----------------------------|----------------|----------------|--------------------------------|------------------------|------------------|
|           |                        |                  |                             |                |                | -1.66%                         |                        |                  |
| RS        | (7,004,922)            | 886,748,156      | 1,014,362,861               |                |                | (16,838,423)                   | (7,004,922)            | 990,519,516      |
| RTS       | (247,658)              | 19,773,844       | 22,712,557                  |                |                | (377,028)                      | (247,658)              | 22,087,870       |
| RTD       | (3,136)                | 363,891          | 416,526                     |                |                | (6,914)                        | (3,136)                | 406,475          |
| GS-1      | (1,001,082)            | 161,735,899      | 175,230,273                 |                |                | (2,908,823)                    | (1,001,082)            | 171,320,369      |
| GS-3      | (4,488,349)            | 506,985,301      | 580,151,549                 | (1,964,000)    | (1,315,000)    | (9,630,516)                    | (4,488,349)            | 562,753,684      |
| LP-4      | (3,377,231)            | 273,353,164      | 328,160,046                 | (13,015,227)   | (1,258,000)    | (5,447,457)                    | (3,377,231)            | 305,062,131      |
| LP-5      | (4,363,662)            | 259,612,850      | 323,038,764                 | (12,471,954)   | (821,000)      | (5,362,443)                    | (4,363,662)            | 300,019,705      |
| LPEP      | (116,313)              | 8,404,855        | 9,605,148                   |                |                | (159,445)                      | (116,313)              | 9,329,389        |
| ISA       | (422,084)              | 20,448,546       | 25,346,042                  | (872,000)      |                | (420,744)                      | (422,084)              | 23,631,214       |
| IS-1      | (2,561)                | 186,035          | 213,918                     |                |                | (3,551)                        | (2,561)                | 207,806          |
| BL        | (3,685)                | 480,920          | 541,688                     |                |                | (8,992)                        | (3,685)                | 529,012          |
| SA        | (19,477)               | 4,292,175        | 5,063,755                   |                |                | (84,058)                       | (19,477)               | 4,960,220        |
| SM        | (6,606)                | 1,618,482        | 1,908,677                   |                |                | (81,684)                       | (6,606)                | 1,870,386        |
| SHS       | (39,300)               | 14,778,848       | 17,407,331                  |                |                | (288,962)                      | (39,300)               | 17,079,069       |
| SE        | (6,101)                | 346,823          | 413,774                     |                |                | (6,869)                        | (6,101)                | 400,804          |
| TS(R)     | (346)                  | 54,756           | 64,698                      |                |                | (1,074)                        | (346)                  | 63,278           |
| SI-1(R)   | (246)                  | 69,788           | 82,261                      |                |                | (1,366)                        | (246)                  | 80,650           |
| GH-1(R)   | (309,138)              | 36,095,375       | 42,731,845                  |                |                | (709,349)                      | (309,138)              | 41,713,358       |
| GH-2(R)   | (65,399)               | 7,533,184        | 8,919,125                   |                |                | (148,057)                      | (65,399)               | 8,705,669        |
| STANDBY   | (9,060)                | 1,148,211        | 1,245,997                   |                |                | (20,684)                       | (9,060)                | 1,216,254        |
| TOTAL PUC | (21,486,355)           | 2,204,031,104    | 2,557,616,969               | (28,323,181)   | (3,394,000)    | (42,456,442)                   | (21,486,355)           | 2,461,956,991    |

## PENNSYLVANIA POWER AND LIGHT COMPANY

|           | TOTAL<br>REVENUE<br>INCREASE | %<br>REVENUE<br>INCREASE | BASE<br>REVENUE<br>INCREASE | %<br>REVENUE<br>INCREASE | PERCENT<br>OF TOTAL<br>REVENUE<br>INCREASE |
|-----------|------------------------------|--------------------------|-----------------------------|--------------------------|--|
| RS        | 103,771,360                  | 11.70%                   | 214,624,861                 | 26.84%                   | 40.2330%                                   |
| RTS       | 2,314,026                    | 11.70%                   | 6,343,557                   | 38.75%                   | 0.8972%                                    |
| RTD       | 42,584                       | 11.70%                   | 92,526                      | 28.56%                   | 0.0165%                                    |
| GS-1      | 9,584,469                    | 5.93%                    | 24,272,273                  | 16.08%                   | 3.7160%                                    |
| GS-3      | 55,768,383                   | 11.00%                   | 124,325,549                 | 27.27%                   | 21.6219%                                   |
| LP-4      | 31,708,967                   | 11.60%                   | 79,488,046                  | 31.97%                   | 12.2938%                                   |
| LP-5      | 40,406,854                   | 15.56%                   | 99,335,764                  | 44.41%                   | 15.6661%                                   |
| LPEP      | 924,534                      | 11.00%                   | 2,474,148                   | 34.70%                   | 0.3584%                                    |
| ISA       | 3,182,668                    | 15.56%                   | 8,913,042                   | 54.24%                   | 1.2339%                                    |
| IS-1      | 21,771                       | 11.70%                   | 61,918                      | 40.74%                   | 0.0084%                                    |
| BL        | 48,092                       | 10.00%                   | 103,688                     | 23.67%                   | 0.0186%                                    |
| SA        | 668,046                      | 15.56%                   | 948,755                     | 23.06%                   | 0.2590%                                    |
| SM        | 251,905                      | 15.56%                   | 345,677                     | 22.12%                   | 0.0977%                                    |
| SHS       | 2,300,220                    | 15.56%                   | 2,812,331                   | 19.27%                   | 0.8918%                                    |
| SE        | 53,981                       | 15.56%                   | 150,774                     | 57.33%                   | 0.0209%                                    |
| TS(R)     | 8,522                        | 15.56%                   | 13,698                      | 26.86%                   | 0.0033%                                    |
| SI-1(R)   | 10,862                       | 15.56%                   | 14,261                      | 20.97%                   | 0.0042%                                    |
| GH-1(R)   | 5,617,983                    | 15.56%                   | 10,357,845                  | 31.99%                   | 2.1781%                                    |
| GH-2(R)   | 1,172,485                    | 15.56%                   | 2,176,125                   | 32.27%                   | 0.4546%                                    |
| STANDBY   | 68,043                       | 5.93%                    | 182,997                     | 17.22%                   | 0.0264%                                    |
| TOTAL PUC | 257,925,888                  | 11.70%                   | 577,037,969                 | 29.13%                   | 100.0000%                                  |

## PENNSYLVANIA POWER &amp; LIGHT COMPANY

## Percentage of Revenue Increase

|           | <u>Percent of Total<br/>Revenue Increase</u> |
|-----------|--|
| RS        | 40.2330%                                     |
| RTS       | 0.8972                                       |
| RTD       | 0.0165                                       |
| GS-1      | 3.7160                                       |
| GS-3      | 21.6219                                      |
| LP-4      | 12.2938                                      |
| LP-5      | 15.6661                                      |
| LPEP      | 0.3584                                       |
| ISA       | 1.2339                                       |
| IS-1      | 0.0084                                       |
| BL        | 0.0186                                       |
| SA        | 0.2590                                       |
| SM        | 0.0977                                       |
| SHS       | 0.8918                                       |
| SE        | 0.0209                                       |
| TS(R)     | 0.0033                                       |
| SI-1(R)   | 0.0042                                       |
| GH-1(R)   | 2.1781                                       |
| GH-2(R)   | 0.4546                                       |
| STANDBY   | 0.0264                                       |
| TOTAL PUC | 100.0000                                     |

PENNSYLVANIA POWER & LIGHT COMPANY

Demand Allocator for ECR Qf Payments

39.8% for  $D_1$  (RS, RTS, RTD)

28.9% for  $D_2$  (GS-1, GS-3, GH-1, GH-2, BL, IS-1, SA, SM, SHS, SE, TS and SI-1)

13.6% for  $D_3$  (LP-4)

18.8% for  $D_4$  (LP-5, LPEP, ISA)

PENNSYLVANIA POWER & LIGHT COMPANY

Claimed Residential Customer Related Costs  
 Future Test Year  
 (\$1,000)

| <u>Line No.</u> |   | <u>All Costs Allocated On Customers</u> | <u>Costs Excluding Lines</u> |
|-----------------|---|---|------------------------------|
| 1               | Electric Plant in Service                       |   |                              |
| 2               | Distribution Plant Secondary Customer Component |   |                              |
| 3               | Overhead Lines                                  | 300,113                                 | 0                            |
| 4               | Underground Lines                               | 118,516                                 | 0                            |
| 5               | Line Transformers                               | 121,939                                 | 0                            |
| 6               | Services  | 205,271                                 | 205,271                      |
| 7               | Meters  | 39,574                                  | 39,574                       |
| 8               | Total Distribution                              | 785,413                                 | 244,845                      |
| 9               | General Plant Customer Component                | 49,222                                  | 38,617                       |
| 10              | Intangible Plant Customer Component             | 3,616                                   | 2,837                        |
| 11              | Total Electric Plant in Service                 | 838,251                                 | 286,299                      |
| 12              | Depreciation Reserve on Above                   | 300,479                                 | 125,915                      |
| 13              | Net Plant (Line 11 - Line 12)                   | 537,772                                 | 160,384                      |
| 14              | Adjustments to Rate Base                        | (41,706)                                | (14,269)                     |
| 15              | Working Capital                                 | 6,239                                   | 2,087                        |
| 16              | Total Customer Related Rate Base                | 502,305                                 | 148,202                      |
| 17              | Return at 10.17% (ROE = 13%)                    | 51,088                                  | 15,073                       |
| 18              | Operation & Maintenance Expense                 | 113,448                                 | 92,323                       |
| 19              | Depreciation Expense                            | 26,148                                  | 10,036                       |
| 20              | Taxes Other Than Income and Gross Receipts      | 10,150                                  | 4,649                        |
| 21              | Deferred Income Taxes                           | 4,038                                   | 1,380                        |
| 22              | Investment Tax Credit                           | (882)                                   | (301)                        |
| 23              | Other Operating Revenues-Credit                 | (5,371)                                 | (2,403)                      |
| 24              | Annualization and Late Payment Revenues         | (3,314)                                 | (1,928)                      |
| 25              | State and Federal Income Taxes                  | 18,836                                  | 5,695                        |
| 26              | Gross Receipts Tax                              | 10,009                                  | 5,820                        |
| 27              | Total Revenue Requirements (Lines 17 to 26)     | 224,150                                 | 130,344                      |
| 28              | Average Customers                               | 1,066,688                               | 1,066,688                    |
| 29              | Revenue Reqts/Cust/Month                        | \$ 17.51                                | \$ 10.18                     |

PENNSYLVANIA POWER & LIGHT COMPANY

Claimed Residential Customer Related Costs  
 Future Test Year  
 (\$000)

| <u>Page &amp;<br/>Line No.</u> | <u>Distribution Expense</u> | <u>All Costs<br/>Allocated<br/>On Customers</u> | <u>Costs<br/>Excluding<br/>Lines</u> |
|--------------------------------|-----------------------------|---|--------------------------------------|
| 14                             | OH Lines                    | 9,334   | 0                                    |
| 22                             | UG Lines                    | 1,622   | 0                                    |
| 26                             | Transformer                 | 2,015   | 0                                    |
| 30                             | Services                    | 3,482   | 3,482                                |
| 35                             | Meters                      | 5,018   | 5,018                                |
| 34                             | Misc                        | 3,822   |                                      |
| 37                             | Cust Inst                   | 3,078   |                                      |
| 40                             | Subtotal                    | 28,371  |                                      |
|                                | Customer Accounting         |   |                                      |
| 42                             | Meter Reading               | 7,863   | 7,863                                |
| 43                             | Uncollectibles              | 13,795  | 13,795                               |
| 44                             | Other                       | 22,301  | 22,301                               |
| 45                             | Subtotal                    | 43,959  | 43,959                               |
| 46                             | Customer Services & Info    | 15,693  | 15,693                               |
|                                | Sales                       | 0   | 0                                    |
|                                | Subtotal                    | 59,652  | 59,652                               |
|                                | Subtotal                    | 88,023  | 75,052                               |
|                                | A&G                         |   |                                      |
| 52                             | Regulatory                  | 805   | 805                                  |
| 9                              | Property Insurance          | 94  | 94                                   |
| 14                             | Employee Benefits           | 10,959  |                                      |
| 18                             | Other                       | 15,383  | 15,383                               |
| 22                             | Subtotal A&G                | 27,241  | 27,241                               |
|                                | Adjustments                 | 115,264   | 102,293                              |
| 31                             | Wage Exp                    | (284)   | (284)                                |
| 32                             | Employee Benefits           | 65  | 65                                   |
| 33                             | Rate Case Expense           | (364)   | (364)                                |
| 39                             | Voluntary Early Retirement  | (5,893)   | (5,893)                              |
| 42                             | Management Audit Costs      | 89  | 89                                   |
| 44                             | Social Programs             | 1,726   | 1,726                                |
| 49                             | Subtotal Adjustments        | (1,816)   | (1,816)                              |
| 53                             | TOTAL                       | 113,448   | 100,477                              |