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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

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SUPPLEMENTAL DIRECT/INTERVENOR TESTIMONY

OF

MAURY J. BLALOCK

ON BEHALF OF

PEOPLES GAS SYSTEM, INC.

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DOCKET NO. 950002-EG
ENERGY CONSERVATION COST RECOVERY

FILED: February 17, 1995

SUPPLEMENTAL DIRECT/INTERVENOR TESTIMONY

OF MAURY J. BLALOCK

FPSC DOCKET NO. 950002-EG

Q: Please state your name and business.

A: My name is Maury J. Blalock, and my business address is Blalock & Associates, Inc., Engineering Consultants, 763 Flamingo Drive, Apollo Beach, Florida 33572.

Q. By whom are you employed and in what position?

A. I am employed as President of Blalock & Associates, Inc., a consulting engineering firm providing services to various residential, commercial, and industrial clients regarding energy applications, cost-effectiveness analyses of various energy options, project development and financing, and related matters.

Q. Please summarize your educational background.

A. I received a Bachelor of Science degree in Electrical Engineering from the University of Florida in 1966. I have also completed several graduate level courses in Electrical Engineering at the University of South Florida. I have attended numerous seminars and short courses on electrical engineering, energy conservation, natural gas technologies, and related subjects in my career.

Q. Please summarize your work experience in the energy industry.

A. I was employed by Tampa Electric Company for 22 years, where I held several progressively responsible positions, including Manager, Conservation & Load Management from 1980 until 1987. My responsibilities in this position included managing the engineering, implementation, and field installation of direct load control for more than 50,000 TECO customers via VHF radio or power-line carrier communications systems. I also worked in distribution systems engineering, substation engineering and operations, distribution planning and operations, and transmission and power plant systems planning.

I founded Blalock and Associates, Inc. Engineering Consultants in 1987. I provide a variety of energy engineering and analytical services to our clients, including energy conservation and cost-effectiveness studies, utility rate analyses, cost/benefit analyses, systems design and construction, and other related services.

Q: Are you a registered professional engineer?

A: Yes, I have been a Registered Professional Engineer in the State of Florida since 1972.

Q: What is the purpose of your supplemental direct/intervenor testimony in this proceeding?

A: The purpose of this testimony is to comment on certain aspects of Tampa Electric Company's supplemental responses to the Commission Staff's interrogatories. These response relate to comparative data and information regarding electric and gas appliances and equipment.

Q: Are you sponsoring any exhibits to your supplemental direct/intervenor testimony?

A: Yes. I am sponsoring one composite exhibit, designated Exhibit ____ (MJB-1) consisting of eight pages.

Q: Have you reviewed TECO's supporting data and information relative to the comparison of electric and gas appliances and equipment?

A: Yes.

Q: Do you have any questions and/or comments regarding this supporting data and information?

A: Yes, the following are questions and comments which I have generated regarding this data and information:

1. Why was 3,017 KWh used as the annual electric consumption for the resistance water heater in the submittal to the FPSC instead of 2,788 KWh? TECO insists that PGS must consistently use 2,788 KWh for this application. Also, why was this 3,017 kWh value used when TECO's own brochures furnished to new

homeowners indicate monthly electric water heating usage of 365 kWh (4,380 kWh/year)? (See the last page of my Exhibit ____ (MJB-1)?

2. Why was the entire PGS service charge ($7.00/month) applied to the water heating application, while no portion of the TECO service charge ($8.50/month) was applied to the same application served by electricity? In low income housing and other similar low electric energy consumption residential circumstances, the water heating application can represent 50% of the total monthly electric energy consumption. When this is the case, the average incremental electric energy cost for the water heating application increases from the value TECO used of $0.072/KWh to $0.09/KWh. This represents a significant (25%) increase in average incremental electric energy cost (per unit cost) so this treatment of electric service cost would be necessary and appropriate. Also, the PGS service charge should be distributed over the <u>average</u> residential gas energy consumption value rather than the <u>specific</u> application (water heating) value -- this would be more representative of the <u>true</u> incremental gas operating cost for each specific energy use application.

3. Why is the $4.00/month (Prime Time Credit) subtracted from the resistance water heating cost if the customer

is participating in the Prime Time Program? This Prime Time Credit is collected monthly through the ECCR factor so new participating customers incrementally increase the ECCR factor, and at 100% Prime Time customer saturation, the ECCR factor will equal the Prime Time Credit of $4.00/month. As this level of saturation is approached, the net participating customer benefit (savings) approaches zero, so subtracting this credit is inappropriate. Also, since TECO has a 40% exclusion factor (i.e., the credit cannot exceed 40% of the monthly non-fuel energy charge), there is a likelihood that participating Prime Time customers will not receive the full credit every month as this analysis, falsely, implies.

4. Why is the TECO electric rate of $0.072/KWh applied to the water heating application in the "Electric Resistance W/Heat Recovery" analysis? As the amount of waste heat recovery increases the average monthly incremental cost of electric energy also increases because the service charge is distributed over a lower total KWh value. This causes the actual cost of supplying the supplemental water heating to increase on an incremental basis. The monthly electric operating cost for this application should include a representative prorated share of the service charge.

5. Why is the TECO electric rate of $0.072/KWh applied to the water heating application in the "Electric Heat Pump" analysis? The same concept as in #4, above, applies to this application. As total monthly KWh consumption decreases due to efficiency gains, the average incremental cost of electric energy increases so this should be factored into the analysis by re-allocating the service charge to the lower monthly KWh consumption value.

6. Why didn't TECO include $50/00/year or $4.17/month as maintenance costs in the analysis of the "Electric Heat Pump" water heater? Since this cost of maintenance associated with this electric appliance is well established in the industry (Exhibit __), this cost should, appropriately, be included in the operating cost analysis for this electric application.

7. Why did TECO use 1,866 KWh/year for resistance water heating with heat recovery in the comparative analysis of electric and gas (Exhibit __) and 2,238 KWh/year for the same electric application in the "Cost of Service Analysis" (Exhibit __)? This represents a 20% increase in electric energy consumption between the two analyses and results in a significantly misleading comparative analysis.

8. Why did TECO use 1,159 KWh/year for electric heat pump water heating in the comparative analysis of electric and gas (Exhibit __) and 1,776 KWh/year for the same electric application in the "Cost of Service Analysis" (Exhibit __)? This represents a 53% increase in electric energy consumption between the two analyses and results in a completely invalid comparative analysis. Furthermore, why did TECO use either of these values when its representative to the Arthur D. Little study reported annual energy usage of 2,853 kWh for heat pump water heaters?

9. Why does TECO attribute a 3.0 COP to the heat pump water heater, in the comparative analysis between electric and gas, when the manufacture's specification for the appliance is a 2.61 COP? This represents a false 15% improvement in electric appliance efficiency and results in a significantly misleading comparative analysis.

10. Why does the "EPRI Commercial Water Heating System Performance Analysis" (HOTCALC, Version 2.0) indicate the "Hour of Coincident Demand" being hour 16, when the "Volumetric Load Profile" indicates minimum usage at hour 16 (2 gal/hr) and maximum usage at hours 6, 19, and 20 (6 gal/hr)? This inconsistency in the water heating usage profile and the hour of coincident demand will significantly alter the electric system benefits which

are derived from the program.

11. Why does TECO use a hot water consumption value of 10 gallons per bath and 3 minutes per bath (Exhibit __) and the HOTCALC analysis uses a maximum rate of hot water consumption of 6 gallons per hour? If both TECO and EPRI are correct in their assessment of hot water usage, then the total bath time of 3 minutes must be spread over consecutive hours -- this is not realistic.

12. Why does the HOTCALC analysis use 1 gallon per minute as the flow rate in the electric resistance analysis and 2 gallons per minute as the flow rate in the gas analysis? The water heating piping is identical for the two systems and the usage profile is identical for the two applications, so the flow rate should be the same.

13. Why does the HOTCALC analysis use a tank heat loss factor of 0.5%/hr in the electric resistance example and 3.5%/hr in the gas example when the tank insulation K-factor is identical for the two hot water tanks (.25 Btuh-in/sq ft-(F))? This is an unrealistic input data difference between the two systems and will bias the comparative results in favor of the electric appliance.

14. How can the Refrigeration Heat Reclaim (RHR) analysis claim 76.4% of the gross water heating load when the

system operates only 7 months (58% of the time) during the year and the energy input data indicates a conflicting 66.6%? This entire analysis is unrealistic and completely invalid.

15. Why does the RHR analysis indicate that the RHR system accumulates more run time (unit hours) in the Winter months than in the Summer months, but the RHR system supplies <u>no</u> water heating energy during the Winter months?

16. Why does the RHR analysis indicate that the RHR system auxiliaries (pump and controls) consume more electric energy during the Winter months, when the RHR system isn't operating, than the supplemental resistance water heating unit consumes and the latter unit is supplying <u>all</u> of the hot water?

17. Why doesn't the RHR "Hourly Load Fraction Operation Schedule (% of peak)" coincide with the water heating energy usage profile? The former profile of percentage of peak hourly energy supplied by the RHR system is completely out of sync with the profile of hourly water heater usage. The result is that the RHR system is supplying 100% of the hourly demand for hot water when there is zero demand for hot water, and the RHR system is supplying less than 50% of the hourly demand for hot

water when the demand is maximum.

18. Why does the HOTCALC analysis for the Heat Pump Water Heater (HPWH) indicate 0.0% of the annual "cooling" load met by the HPWH and a value of $75/year attributable to "cooling" by the HPWH? This inconsistency generates false benefits and savings associated with the HPWH.

19. Why does the HOTCALC analysis indicate a value for "Cooling" during the Winter months, and why is the magnitude of this Winter value ($7/month) greater than the Summer value ($6/month)? This generates false benefits and savings which are credited to this electric appliance.

20. Why did TECO use "marginal fuel expense" (Production-Energy Unit Cost) of $0.00943/KWh in the Cost of Service Analysis associated with the various electric water heating technologies?

Q: Have you reviewed the Commercial equipment comparison analyses between electric and gas equipment?

A: Yes.

Q: Did you develop any questions or comments regarding these analyses by TECO?

A: Yes, the following are my questions and comments regarding the Commercial equipment comparative analyses:

1. The gas engine driven chiller example used a heat rate (KBtu/Ton) of 8.6. This translates to an overall COP of 1.4 for this vintage gas equipment. The latest gas technology of this nature which has been on the market and readily available for a number of years operates in an efficiency range of 1.7 to 2.0 COP. If TECO had used this more efficient equipment, the result would have been significantly different and the gas equipment would have been the least life-cycle cost equipment option.

2. TECO used a "Part-Load Curve" (Part-load efficiency table) which is not representative of the latest high efficiency gas equipment. The latest gas technology has a higher part-load efficiency rating, particularly between 30% and 80% loading, than the values which TECO used. Since this characteristic of gas equipment represents a primary advantage which gas equipment has relative to similar electric equipment, these diminished efficiency values at part-load flawed the comparative analysis and caused a very misleading result.

3. TECO conducted the comparative analysis utilizing their Commercial/Industrial "Time of Use" (TOU) rate

in combination with an unrealistically high monthly load factor. This skewed the operating cost dramatically in favor of the electric option by creating more low cost "Off-peak" operation than would commonly occur.

4. On an annual basis TECO allocated a capacity factor of 70% and 50% to On-peak and Off-peak water chiller operation, respectively; then, they allocated all (8,760 hours) hours of the year to either the ON-peak or Off-peak period conforming to the TOU rate. This indicates that the chiller equipment is expected by TECO to operate during every hour of both the Winter and the Summer at a minimum level of cooling of 50%. A BIN analysis using average weather information for the Tampa region will not support this energy use profile. The result of TECO using this unrealistic annual load profile is that the part-load advantage of the gas system is minimized and the TOU rate advantage of the electric system is maximized. The analysis yields false and very misleading conclusions.

5. The EPRI summary of typical installed cost comparisons between large electric and gas chiller equipment, which TECO included in the supporting information associated with their comparative analysis, indicates an installed cost differential of 38% (gas more

costly) between an electric centrifugal unit and a double-effect gas absorption unit. TECO used 80% difference in the analysis. This caused the installed capital cost of the gas system relative to the electric system to be unrealistically high and rendered the gas system non-cost-effective to the potential owner.

6. TECO uses the University of South Florida (USF) central chiller cooling system as an example of the operating savings which can be derived by replacing gas chiller equipment with electric chiller equipment. In the advertisements TECO states that USF has saved almost $2,000,000.00 by replacing gas chillers with high-efficiency electric chillers. In a summary table of USF energy use from 1990 to 1994 (gas equipment was replaced in 1991), which TECO included as supporting information in the chiller comparative analysis, no net operating savings is indicated. This is particularly noteworthy since the gas chiller equipment, which was replaced with electric equipment, was very old single-effect technology (low efficiency) and not the much higher efficiency and modern double-effect gas technology.

7. TECO included a number of emission comparisons between various electric power generating unit types and

various electric and gas end use equipment types. The particular electric generation units which were used by TECO in the comparative analyses represent less than 10% of the total TECO generation capacity, so the results of the comparisons are not useful as a practical, real world comparison. This is very misleading aspect of TECO's comparative analysis of electric versus gas energy use applications.

8. In the Commercial HVAC equipment example (Cypress Gardens), TECO used an installed cost differential between electric and gas equipment of <u>77</u>% (over $500/ton difference). The EPRI summary of installed cost differentials between similar gas and electric equipment, which TECO included as supporting information, indicates an average installed cost differential of <u>28</u>% (less than $200/ton difference). This caused the economic analysis relative to capital cost to dramatically favor the electric option as opposed to the gas option.

9. As in the large electric centrifugal examples (generic and USF), TECO used an unrealistic monthly and annual energy use profile in the HVAC example and this resulted in an extremely biased comparison in favor of the electric HVAC option. The comparative analysis became flawed in the same manner and to the same

degree as mentioned above.

Q: Does this conclude your supplemental direct/intervenor testimony?

A: Yes, it does.

superficial and seriously in error. Beginning with a fundamentally erroneous assumption that $655 is a retail price charged by a dealer or a contractor to a consumer for an E-Tech B-108 (in fact it was the factory direct price in 1990 for small quantity purchases -- the current price is $765), the price is reduced by 50% for distribution mark-ups (none are included in the factory-direct E-Tech price in the first place, and the basis for choosing 50% is not stated). Then the resulting number is multiplied by 60% to account for mass production economies of scale (again, no justification or explanation is provided for the choice of 60%). Finally, the 30% mark-up from factory to retail is only half of the already notoriously low mark-up for water heaters from factory to retail.

Given the potential magnitude of the adverse impacts of the proposed standard, thorough, in-depth analysis of the likely manufacturing cost and retail price is needed. For example, an estimate of the cost of an add-on HPWH in a mass production scenario can be built up from the "bottoms-up," accounting for component and material costs on a mass purchase basis, adding typical labor and indirect costs. Even with this general methodology, the costs estimated by different analysts are likely to cover a range. Even so, a transparent cost build-up results that can be refined as better cost data becomes available. Section 4 documents our "bottoms-up" cost analysis for a fully mature production scenario, assuming individual component costs to be comparable to those for similar or identical components in a window air conditioner; as such this represents a *highly optimistic* scenario and is likely to understate the price during the first years under the proposed standard. We estimate that the factory price of an add-on HPWH would be $360 and that the price to the consumer would be $540.

HPWH Installation Costs

Given the variety of installation situations that would be encountered, and absent a well developed infrastructure and significant sales volume for HPWH, it is difficult to establish a reliable estimate for the additional cost to install an add-on heat pump water heater. The experience in current utility field test programs is that installation costs are $300 to $400, for straightforward installations. This cost level doubtlessly reflects the limited experience that plumbing contractors have with the product, and in a mass market, installation costs might be lower. Our best attempt to include the impact of additional installation work required to handle tight spaces, remote condensate drains, required provisions for an adequate source air supply, noise attenuation, etc. suggest that $200 is the minimum figure for average installation cost of the add-on heat pump unit that should be used in the TSD analysis.

HPWH Maintenance Costs

As is the case with installation costs, there is no real world mass market experience upon which to base a prediction of maintenance and repair costs. We believe that an estimate of $50/year should be assumed, based on:

- Electric utility field test and market experience of costs well in excess of $50 per/year.
- $50/year is the cost of a typical maintenance and service contract for a room air conditioner, which is a mature product, which operates less than half the annual hours of an HPWH and has no water side maintenance issues, e.g. lime scale build-up.

It should be noted that there is no broad consensus on the likely maintenance cost level in a mature, mass market scenario. Past experience with older designs indicates maintenance and repair cost could exceed $50/year. Regular maintenance requirements have included air filter changes, and in areas with poor water quality, periodic removal of lime scale build-up. Failures have occurred due to leakage and compressor burnout. The recent EPRI/E-Tech WH-6 development efforts have been aimed at addressing these maintenance and reliability issues, with the expectation of simple air filter washing or replacement being the only required maintenance activity. However, these units have only recently begun to be installed in a wide range of locations; consequently, the operating experience that has been accumulated to date is insufficient to validate this expectation.

Simple Payback and Life Cycle Cost Comparison

When realistic estimates of energy cost savings, HPWH equipment and installation costs, and annual maintenance costs are used as the basis for calculating the payback and life-cycle costs, the economics for the national average case are shown to be highly unattractive to the consumer. Table E-1 summarizes the results of the payback and Life Cycle Cost (LCC) calculations that are presented in Section 6. Our best estimate of the simple payback to the average electric water heater owner is 20 years, along with an *increase* in the LCC of $475. The payback period and LCC are sensitive to the assumed annual maintenance cost; if zero annual maintenance costs are assumed, the payback is a rather unattractive 9 years and the LCC increases by $100. Even if the average installation cost of the add-on HPWH is assumed to $100, as was assumed in the TSD, the payback period is 7.4 years, and the LCC is comparable. The figures used in the TSD are included for comparison – as discussed above, both the installed equipment costs can be expected to be higher and the energy/operating cost savings can be expected to be lower than the levels assumed in the TSD.

Consumer Utility of HPWH

Under NAECA, heat pump water heaters can be considered as a design option for a single product class of electric storage water heaters only if they provide the same utility to consumers as electric resistance storage water heaters; if lesser or different consumer utility is provided, HPWH must be considered as a separate product class. The consumer utility is, in fact, different in two significant respects:

Electric Company) provided detailed data. Data covering a total of ~30 homes was provided, in each instance covering at least one full year of water heater use at one hour or finer intervals. Figure 2-2 plots a representative week at a site; a larger sample of these plots is provided in Appendix B. The plots show the typical double peak (morning and evening) in consumption.

Table 2-6: Summary of Electric Water Heater Energy Use Data Presented in Oral Testimony During the June 7, 8 Hearings

Utility	Spokesman	Annual Energy kWh	Comment
Alabama Power Company	Larry White	2650, 3675	For 2 & 3 person households, respectively
Potomac Edison	Alan J. Noia	<3,200	Decreased from approximately 5000 kWh in late 70's
American Electric Power Service Corporation	David H. Crabtree	3,100	
Potomac Electric Power Company	Dr. Eddie R. Mayberry	2649	D.C.
		2928	Maryland
Tampa Electric Company	Daniel N. Hart	2853	
Allegheny Power System	John F. Hose	3400	
Pennsylvania Power and Light Co.	Grayson E. McNair	—	12 gal. per day per person (1989 study of 27 homes)
General Public Utilities	Chris Siebens	2831	
Florida Power Corporation	J. Edgar Holt	2556	

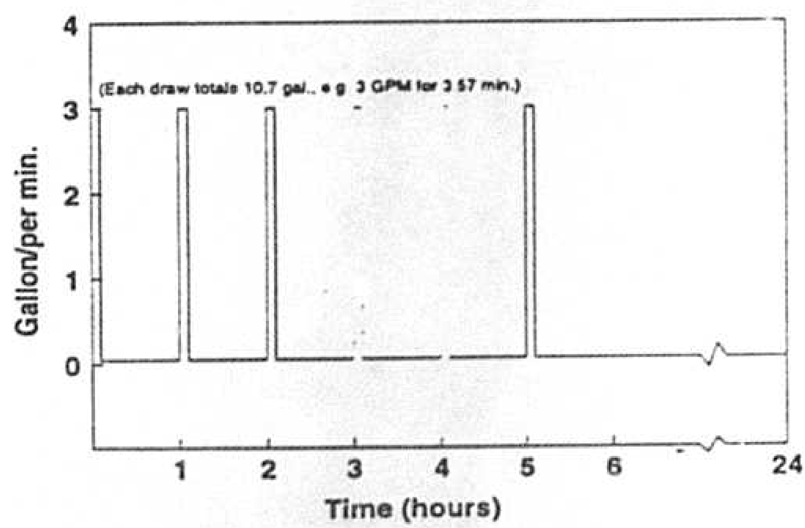

Figure 2-1: Hot Water Draw Profile of the DOE Test Procedure

as experience with a similar desuperheater program, Virginia Power has estimated the near term commercial installed cost increment (the cost in the time frame in which the proposed standards will take effect) to be about $800 to $1,000, assuming no major renovation or venting is required. This will significantly lengthen the payback calculated by DOE and push it well beyond the criteria of the rebuttal presumption."

Centerior Energy Corporation. Al Temple, Vice President, Marketing stated:

"The current wholesale cost of a heat pump water heater is $600 with simple installation adding another $400 (as quoted by several HVAC contractors in our service area). Add to these figures the cost of relocation, drainage for condensation, ventilation and renovation and we now are requiring customers to spend almost $1,300 without the storage tank. Using the DOE's figures, this results in a payback of over 10 years for customers without structural changes and over 15 years with structural changes."

Florida Power Corporation. The written statement of J. Edger Holt, Principal Marketing Engineer addressed installation and maintenance costs of HPWH:

"Synergic Resources Corporation (SRC) recently completed a study for the Florida Energy office titled "Electricity Conservation and Energy Efficiency in Florida." The objective of this study was to estimate the State of Florida's potential demand and energy savings available from the application of specific demand-side management measures. Included in these measures was the application of an add-on heat pump water heater. Exhibit 1 shows the estimates used by SRC in estimating the energy efficiency contributions of this technology. For both existing and new construction, SRC estimated that a heat pump water heater (without a storage tank) would cost $650. Installation would add $350 to the total cost of the system. SRC also includes a $50 annual maintenance cost for the unit. FPC believes that these estimates more accurately reflect the cost to a customer of installing a heat pump water heater."

National Association of Homebuilders. Gerald Eid, President Eid-Co Buildings, Inc. addressed the value of the interior space occupied or required by the HPWH:

"DOE's life cycle cost estimate is too low if it does not account for the extra floor space needed in some cases when moving the water heater inside. This could add as much as 15 square feet to the home, resulting in an increase of $750.00 in the cost of a new home using a conservative estimate of $50.00 per square foot. It is also too low if it does not include the cost of cleaning air filters, other maintenance costs and inspections of the heat pump units. These higher costs can be expected to put the heat pump payback well beyond DOE's stated 3 year payback."

Tampa Electric Company. In oral testimony on April 6, 1994, Daniel N. Hart, Manager, Strategic Marketing and Technology stated that HPWH installation costs were approximately $200 in field tests conducted by the company.

Table 6-2: Simple Payback Calculation – National Average, Trial Standard Level 4/5 versus Baseline

Calculation	WH Type	Installed Cost	Annual Energy	Maint/ Service*	Operating Cost	Payback years
This report	HPWH	1005	193	50	243	—
	Baseline	265	279	0	279	—
	Difference	740	—	—	-36	20
This report, but assuming no increase in maintenance costs	HPWH	1005	193	0	193	—
	Baseline	265	279	0	279	—
	Difference	740	—	—	-86	8.6
This report, but only $100 in incremental installation cost and no increase in maintenance costs	HPWH	905	193	0	193	—
	Baseline	265	279	0	279	—
	Difference	640	—	—	-86	7.4
TSD Trial Standard Level 4/5**	HPWH	659.69	172.64	0	172.64	—
	Baseline	265.31	379.77	0	379.77	—
	Difference	394.38	—	—	207.13	1.8
TSD Add-on HPWH only versus Baseline	HPWH	619.82	192.00	0	192.00	—
	Baseline	265.31	379.77	0	379.77	—
	Difference	354.51	—	—	187.77	1.9

* Maintenance and service costs associated with the electric resistance water heater tank are neglected, because these costs apply equally to either option.

** Baseline + reduced heat leaks, heat traps, add-on HPWH, and R-25 insulation.

servicing costs, the life cycle cost of an electric water heater meeting trial standard levels 4/5 is approximately $475 *higher* than the baseline electric water heater meeting current NAECA efficiency standards. Even if the increased maintenance costs associated with heat pump water heaters were neglected, the life cycle cost of the HPWH is $100 greater than the LCC of the baseline resistance water heater. If the TSD assumption of only $100 in incremental installation costs is used, the LCC of the HPWH is comparable to the baseline LCC.

Table A-15

City	Sample Size	Avg. # of people in household	Water Heating Equipment	kWh /day	kWh/yr	gals/day
Orlando	5	3.2	Elect. Resis	7.05	2,573.25	53
Orlando	5	4.2	Heat Pump	7.39	2,697.35	75
Palm Beach	4	3.6	Elect. Resis	7.3	2,664.50	47
Palm Beach	10	3.5	Heat Pump	5.4	1,971.00	74
Tampa	5	3.4	Elect. Resis	11.13	4,062.45	74
Tampa	3	4	Heat Pump	6.37	2,325.05	66
Jacksonville	3	3.8	Elect. Resis	9.88	3,606.20	75
Florida	19	3.5	Elect. Resis	7.99	2,916.35	57
Florida	18	3.8	Heat Pump	6.38	2,328.70	73

Source: Merrigan, Tim. Residential Conservation Demonstration: Domestic Hot Water Final Report. FSEC-CR-90-83. Florida Solar Energy Center. September, 1983.

A.25 Central Power and Light

In two different end use metering studies, Central Power and Light metered electric water heaters in single family Good Cents homes. The twelve month 1986-7 average was 2782 kWh/yr based on the average use of the 32 homes that were randomly selected for the study. Two of these homes had heat recovery systems. The 1984-5 average for 16 randomly selected Good Cents homes was 3039 kWh/year. The utility argued that the discrepancies between the two numbers were a result of colder winter temperatures in 1985.

A Good Cents Home must meet certain Btu/sq. ft., insulation, air conditioner efficiency, and caulking requirements and the water heater must have heat traps.

Source: 1987 South Texas End Use Study, Central Power and Light and conversations with David Koliba and Molly Ritchie of Central Power and Light.

A.26 Southwestern Public Service

The average customer at Southwestern uses between 320 and 350 kwh/month for water heating. This figure was obtained by taking the difference between the average electric bill for the general service customer for the past twelve months and the average electric bill for customers with electric water heating for the past twelve months. The company has no data on the average size of household for its customers but assumes that it is characteristic of the national average. This 320-350 kWh/month corresponds to 3840-4200 kwh/year for homes in the Northern part of Texas.

Source: Phone conversation with Tommy Smith of Southwestern Public Service.

Appliance	Typical Wattage	KWH for Typical Period of Use	Estimated Monthly Use	KWH Monthly Use
*Toaster	1,100	.036 for 2 mins.	2 times a day	2.16
*Toaster Oven	1,400	.7 for 30 mins.	2 hrs.	2.8
Toothbrush	7	.001 for 5 mins.	2 times a day	.03
Trash Compactor	400	.003 for 30 sec.	15 min	.09
Vacuum Cleaner	650	.325 for 30 mins.	2 hrs.	1.3
Vaporizer	480	.48 for 1 hr.	10 hrs.	4.8
Video Cassette Recorder	30	.03 for 1 hr.	30 hrs.	.9
*Waffle Iron	1,200	.6 for 30 mins.	2 hrs.	2.4
Washer: (12 gals. hot water used) Automatic (Warm Wash/Cold Rinse)	500	2.29 per load	30 loads	69
Wringer Type (Warm Wash/Cold Rinse)	280	2.18 per load	30 loads	65
Water-Distilled Drinking: (Residential Use) 3½ Hr. cycle yields 1 gal.	1100	1.1 per Hr.	8 hr./day	264
Yields 7 gal. per 24-hrs.	1100	26.4 per 24 hrs.	24 hr. day	792
*Waterbed Heater 1) Water heated to 85-90° / quilted comforter (no other heat on)	400	3.6 per day	Everyday usage	108
2) Same conditions as Case #1 except normal house heating at night	400	3 per day	Daily/monthly usage	90
3) Quilted comforter—heat on no thermostat on Waterbed Heater	400	9.6 per day	Daily/monthly usage	288
4) Unmade bedsheet only covering waterbed water heated to 85-90° left on all the time	400	4.8 per day	Daily/monthly usage	144
Water Heating You can heat one gallon of water from 70 degrees to 140 degrees for about .17 KWH. To determine the cost of hot water, multiply the number of gallons you use by .17 KWH used to heat. (Does not include pipe and tank loss equaling 66 KWH/month for a 40 gallon tank.)#				
Tub bath 15 gal. hot water (per person)		2.55 KWH	30 baths	76.5
Shower (no flow restrictor used) 10 gal. hot water 3 gal. per min. (per person/ie: 3 min. shower)		1.7 KWH	30 showers	51
Water Pump ½ HP	1,128	.90 per hr.	8 hr./day	216
¾ HP	1,584	1.26 per hr.	8 hr./day	302
1 HP	1,848	1.48 per hr.	8 hr./day	355
1½ HP	2,304	1.84 per hr.	8 hr./day	442
*Wok Pan	1,000	.5 for 30 mins.	2 hrs.	2.0

*Controlled by thermostat. KWH based on estimated appliance "on" time.
#Pipe and tank loss calculations
HTL = A x U x T.D.
HTL = 17.22 x .259 x 70° = 312 BTUs per hour x 720 hours per month =

224,640 BTUs per month = 66 KWH/month
3413 (BTUs per KW)

Family of 3 => 2028 k per yr

DOCKET NO. 950002-EG
CONSERVATION COST RECOVERY
WITNESS: BLALOCK
EXHIBIT ________ (MJB-1)
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Base Bill

WHAT IS A BASE BILL?

- A MONTH WITH NO HEATING AND NO COOLING USED.

WHAT MONTHS ARE INVOLVED?

- USUALLY MILDER WEATHER MONTHS ARE BASEBILL POSSIBILITIES: OCTOBER, NOVEMBER, MARCH, APRIL, OR MAY... BUT THEY CAN OCCUR IN ANY MONTH IF THE ABOVE IS TRUE!

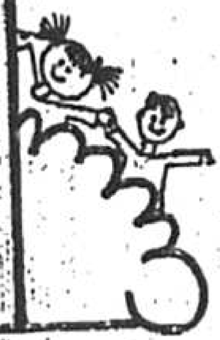
ASK:

- DOES THE BILLING HISTORY REFLECT A TRUE BASEBILL MONTH? OR WAS ANY AC OR HEAT USED DURING THE BILLING PERIOD?
- PROBLEMS OR MALFUNCTIONS WITH YOUR MAJOR APPLIANCES?
- REPAIR WORK DONE?
- CHANGES... NEW APPLIANCES? EXTRA PEOPLE?

ESTIMATED MONTHLY USAGE for a FAMILY OF FOUR (NO AC / NO HEAT)

2 4380 Kwh/yr

APPLIANCE	KWH/MONTH	COST*/MONTH
Water Heater	365	$30.00
Refrigerator	177	15.00
Washer(40 loads/mth@4-16¢/load)**	20- 80	$2.00- 7.00
Dryer(40 loads/mth@20-38¢/load)**	100-190	$8.00-16.00
Cooking	80	7.00
Small Appliances	65	6.00
Television (1½¢/hr.)	42	4.00
Lighting	40	3.00
	892-1,042	$72.00-84.00



*Based on 8¢/kilowatt hour (approx. cost)
**Varies based on Water Temp & Dryer Setting

Add Ons...	Based On	KWH/Month	Cost*/Month
Pool Pump	1 HP @8 hrs/day	360	$29.00
Well Pump	1 household	100	8.00
Waterbed Heater	Covered by quilt	90	7.00
Extra Refrigerator	19 cu.ft.Top Fzr Model**	147	12.00
Extra Freezer	16 cu.ft.Upright-Aut.Def	135	11.00
Ceiling Fans	2@12 hrs/day	63	5.00
Security Lighting	2x150 watts @12 hrs/day	108	9.00

ANYTHING ELSE?!

*Based on 8¢/kilowatt hour (approx. cost)
To calculate costs: Watts ÷ 1,000 = KWH x 8¢ = Cost/Hour
**Costs less than main refrigerator: opened less often

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing has been served by hand delivery (*) or by United States Mail, postage prepaid, on the following individuals this 17th day of February, 1995:

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