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February 21, 1995

HAND DELIVERED

IN REPLY REFER TO

Tallahassee

Ms. Blanca S. Bayo, Director
Division of Records and Reporting
Florida Public Service Commission
101 East Gaines Street
Tallahassee, Florida 32399-0850

Re: Conservation Cost Recovery Clause
FPSC Docket No. 950002-EG

Dear Ms. Bayo:

Enclosed for filing in the above docket, on behalf of Tampa Electric Company, are the original and fifteen (15) copies of each of the following:

02053-95 1. Prepared Rebuttal Testimony of John E. Currier.

02054-95 2. Prepared Rebuttal Testimony of Raymond E. Patenaude.

02055-95 3. Prepared Rebuttal Testimony of John T. Putnam.

Please acknowledge receipt and filing of the above by stamping the duplicate copy of this letter and returning same to this writer.

Thank you for your assistance in connection with this matter.

Sincerely,

James D. Beasley

JDB/pp
Enclosures

cc: All Parties of Record (w/enc.)

4+org

RECEIVED & FILED

FPSC-BUREAU OF RECORDS

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true copy of the foregoing Testimony, filed on behalf of Tampa Electric Company, has been furnished by U. S. Mail or hand delivery (*) on this 21st day of February, 1995 to the following:

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DOCKET NO. 950002-EG
TAMPA ELECTRIC COMPANY
SUBMITTED FOR FILING 2/20/95

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BEFORE THE PUBLIC SERVICE COMMISSION

PREPARED REBUTTAL TESTIMONY

OF

RAYMOND E. PATENAUDE

Q. Please state your name and business address.

A. My name is Raymond E. Patenaude and my business address is 702 North Franklin Street, Tampa, Florida 33602.

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

A. I am employed by Tampa Electric Company as a Consulting Engineer.

Q. Please summarize your educational background and business experience.

A. I received a Bachelor of Science degree in Engineering from the University of Florida in 1976. I have worked as a consulting engineer for 19 years. I have attended numerous seminars and courses on mechanical engineering as it relates to building design, air conditioning, heating, ventilation, refrigeration, plumbing and process piping design. I have designed numerous facilities throughout the

Q. Mr. Patenaude, what are your duties and responsibilities as a consulting engineer for Tampa Electric?

A. My duties and responsibilities are to analyze various mechanical systems as they relate to energy usage.

Q. Mr. Patenaude, what is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to respond to certain statements made by Maury J. Blalock on behalf of Peoples Gas System, Inc. in his Supplemental Direct/Intervenor Testimony filed on February 17, 1995. I will address Mr. Blalock's testimony on the subject matter of areas of my responsibility within Tampa Electric.

Q. What general areas of Mr. Blalock's supplemental testimony do you wish to address?

A. I would like to address the questions and answers that Mr. Blalock posed regarding water heating and the use of the EPRI software program HOTCALC.

Q. Please proceed with the first item on your list.

A. On page 3, in item 1, Mr. Blalock indicates that there were two different numbers used in the annual electric consumption for resistance water heating. One number is 3,017 KWh and another number of 2,788 KWh. The difference between the two numbers is that the 2,788 KWh was developed in the SRC study and reflects a average family size of 2.8 persons. The 3,017 KWh was used in our water heating brochure and is based on three people in the family as indicated on the footnotes for the charts. The difference between the two, of course, being .2 people and a little bit more hot water used per day (4 gallons/day).

In addition to that Mr. Blalock asked the question of why we did not use a number of 365 KWh per day or 4,380 KWh per year as published in a brochure that is furnished to new homeowners and he references an exhibit in his testimony. This "brochure" is actually a reference sheet and it is not published for customer circulation. It is used internally by customer service employees in trying to resolve customer

high bill complaints. The usage levels listed are high, representing high energy usage lifestyles or inefficient water heaters.

Q. Please proceed with the next item that you wish to respond to from Mr. Blalock's testimony.

A. On page 6, in item 6, Mr. Blalock asked the question why TECO did not include a $50 per year or $4.17 per month maintenance cost in the analysis of the electric heat pump water heater. He indicates that this cost of maintenance is well established in the industry and provides an exhibit that was written by Arthur D. Little. In the Arthur D. Little Exhibit, page E-6, it is stated that the maintenance of $50 per year was based upon an old model of the E-Tech unit which is Model No. B108. Our analysis is based on the new unit, the WH6B which Arthur D. Little states on page E-6 was developed with the expectation of simple air filter washing or replacement being the only required maintenance activity. Our research program will help validate this development.

Q. Please proceed with the next item that you wish to respond to from Mr. Blalock's testimony.

A. On page 6, in item 7, Mr. Blalock asked the question of why TECO used 1,866 KWh/year for resistance water heating with heat recovery in the comparative analysis and 2,238 KWh/year for the same electric application in the cost of service analysis. The 2,238 KWh/year was determined in the early 1980's in the FEO/SRC Florida DSM potential study. This data does not reflect advances that have occurred since that period of time. The 1,866 KWh/year represents advanced technology and is based on actual weather conditions within the Tampa Electric service area, as modeled by the EPRI HOTCALC software program. In our research program we anticipate to validate the 1,866 KWh/year in actual field testing.

Q. Please proceed with the next item that you wish to respond to from Mr. Blalock's testimony.

A. On page 7, in item 8, Mr. Blalock asks two questions in this item. He states that TECO used 1,159 KWh/year for electric heat pump water heating in the comparative analysis and 1,776 KWh/year for the same electric application in a cost of service analysis provided to the Public Service Commission. The 1,776 KWh was based on the old unit, the E-Tech B108, and the 1,159 KWh is based on the new WH6B which is the advanced model and has a higher

efficiency.

In addition to that, Mr. Blalock asked the question of why TECO used either of these values when its representative to the Arthur D. Little study reported an annual energy usage of 2,853 KWh for heat pump water heaters and again references the Arthur D. Little study, Table 2-6 as an exhibit. In actuality, Table 2-6 represents the energy usage for electric resistance and not for an electric heat pump water heater.

Q. Please proceed with the next item that you wish to respond to from Mr. Blalock's testimony.

A. On page 7, in item 9, Mr. Blalock indicates that TECO attributed a 3.0 COP to the heat pump water heater when the manufacture's specification for the appliance is a 2.61 COP. This is an incorrect statement. The 2.61 COP that the manufacturer specifies is actually a 2.61 energy factor as tested and rated by the Gas Appliance Manufacturers Association. The energy factor 2.61 is actually a seasonal COP and the 3.0 that Mr. Blalock refers to is a steady state environment, so the two are distinctly different.

Q. Please proceed with the next item that you wish to respond

to from Mr. Blalock's testimony.

A. I would like to respond to page 7, item number 10, regarding the EPRI Commercial Water Heating System Performance Analysis. Mr. Blalock indicates that the "Hour of Coincident Demand" is inconsistent in the water heating analysis. This inconsistency in the water heating usage profile, as Mr. Blalock states, will significantly alter the electric system benefits which are derived from the program. In actuality, the Hour of Coincident Demand is used as a cost factor in determining operating costs of the appliance and not the electric system benefits which Mr. Blalock refers to.

Q. Please continue on with the other areas of Mr. Blalock's testimony that you wish to respond to.

A. On page 8, in item number 11, Mr. Blalock indicates a disparity between the instantaneous hot water consumption values that are used in both the TECO and EPRI assessment of hot water usage. These values do not affect the corresponding energy usage for cost of operating the appliances since the total water consumption is the same.

On page 8, in item number 12, Mr. Blalock indicates a

disparity between the flow rate in the recirculating system for the electric resistance analysis versus the gas analysis. In the EPRI HOTCALC program the flow analysis in a circulation system is used for commercial recirculating systems. In a residential analysis there is no recirculation system and the length of the pipe and the corresponding energy usage would be zero. The flow numbers that are indicated are just to get the program to operate because the program uses this number to divide, and if you divide by zero you would get infinity. The gallon per minute usage in both the electric resistance and the gas analysis does not affect the operating cost.

On page 8, in item number 13, Mr. Blalock questions why the HOTCALC analysis uses a tank heat loss factor of .5% in the electric resistance example and 3.5% in the gas example. He states that the tank insulation factor is identical for the two hot water tanks and that this is an unrealistic heat loss factor. In actuality, the heat loss is different on both tanks because the gas tank does not have insulation on the bottom of the tank. If it did the heat from the fire would not be able to enter into the tank. In addition to that, the gas tank has a flue, which is not insulated and carries heat away from the water storage area. Actually the percentage losses in the gas is much higher

than in the electric and the percentages used in HOTCALC reflect that.

On page 8, in item number 14, Mr. Blalock indicates that the heat recovery system as shown by the HOTCALC output operates only seven months or 58% of the time. This is an incorrect statement and it undermines the validity of the conclusions reached by Mr. Blalock in this item.

On page 9, in item 15, Mr. Blalock indicates that the refrigerant heat recovery analysis accumulates more run time in the winter months than in the summertime, but the heat recovery system is supplying no water heating energy during the winter months. This statement is incorrect. The unit is operating during the winter months when air conditioning is needed and this error undermines the validity of the conclusion reached by Mr. Blalock.

On page 9, in item 16, Mr. Blalock indicates that the refrigerant heat recovery analysis consumed more electric energy during the winter months when the refrigerant heat recovery system isn't operating. Again, this statement is incorrect and because of this error the conclusion Mr. Blalock draws in this item is invalid.

On page 9, in item 17, Mr. Blalock asks the questions of why the heat recovery analysis hourly load fraction operating schedule does not coincide with the water heating energy usage profile. The hourly load fraction operating schedule is when the air conditioner would be operating. The water heating energy usage profile is when the water heating usage is needed and, in fact, they do not coincide with each other and should not coincide in a typical home. He indicates that the result is that the system is supplying 100% of the hourly demand for hot water when there is zero demand for hot water. What actually occurs is that the heat recovery unit will be supplying energy to the water heater when the water heater is not providing hot water to the home. In fact, the water heater has a 40 gallon storage device called the tank and this is where the energy is stored for later use when the hot water load is required within the home.

On page 10, in item number 18, Mr. Blalock states that the HOTCALC analysis shows a 0% annual cooling load met by the heat pump water heater and a $75 value attributed to the cooling by the heat pump water heater. This is correct in that the heat pump water heater will perform cooling. However, in this analysis the cooling numbers were not used to deduct from the operating costs indicating a savings for

cooling. The analysis correctly states that the heat pump water heater is not used for cooling, hence the 0% cooling. However, if the heat pump water heater was used for cooling, that value would be $75. The analysis does not generate false benefits and savings associated with the heat pump water heater as Mr. Blalock indicates. In fact, as may be determined in our research program, we may be able to use the benefits of this cooling from the residential heat pump water heater.

On page 10, in item 19, Mr. Blalock again states that the HOTCALC analysis indicates a value for cooling during the winter months and that the value is different than in the summer months. He states this generates false benefits in savings. Again, the heat pump water heater does provide a cooling effect, but the cooling effect in this analysis was not used to determine the annual operating costs of the appliance. Again, during our research, we are going to determine whether we can use this cooling benefit and it may actually reduce the operating costs of the heat pump water heater.

Q. Does that conclude your rebuttal testimony?

A. Yes it does.