BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

In the Matter of : **DOCKET NO. 981591-EG**

Petition for authority to implement Good Cents Conversion Program by Gulf Power Company

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PROCEEDINGS: **HEARING**

BEFORE: COMMISSIONER J. TERRY DEASON
COMMISSIONER SUSAN F. CLARK
COMMISSIONER E. LEON JACOBS, JR.

DATE: **Tuesday, October 12, 1999**

TIME: Commenced at 9:35 a.m.
Concluded at 12:20 p.m.

PLACE: Betty Easley Conference Center
Room 148
4075 Esplanade Way
Tallahassee, Florida

REPORTED BY: JOY KELLY, CSR, RPR
FPSC Chief, Bureau of Reporting
(850) 413-6732

APPEARANCES:

JEFFREY A. STONE and **RUSSELL BADDERS**, Beggs & Lane, 700 Blount Building, 3 West Garden Street, Post Office Box 12950, Pensacola, Florida 32576-2950, appearing on behalf of **Gulf Power Company (Gulf).**

ANSLEY WATSON, JR., **Macfarlane, Ferguson & McMullen,** P. O. Box 1531, 111 Madison Street, #2300 Tampa, Florida 33601, appearing on behalf of **Peoples Gas System (PGS).**

TIFFANY R. COLLINS, Florida Public Service Commission, Division of Legal Services, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0870, appearing on behalf of the **Commission Staff.**

I N D E X

WITNESSES

P R O C E E D I N G S

(Hearing convened at 9:35 a.m.)

COMMISSIONER DEASON: Call the hearing to order. Could I have the notice read, please?

MS. COLLINS: Pursuant to Notice issued September 15th, 1999, this time and place have been set for public hearing in Docket 981591-EG, petition for authority to implement Good Cents Conversion Program by Gulf Power Company.

COMMISSIONER DEASON: Thank you. Take appearances.

MR. BADDERS: Russell Badders and Jeffry Stone of the law firm of Beggs & Lane, 3 West Garden Street, Pensacola, Florida 32501, here on behalf of Gulf Power Company.

MR. WATSON: Ansley Watson, Jr., Macfarlane, Ferguson and McMullen, Post Office Box 1531, Tampa, Florida 33631, here for the intervenor, Peoples Gas System.

MS. COLLINS: Tiffany Collins on behalf of the Commission Staff.

COMMISSIONER DEASON: Thank you. Preliminary matters, Ms. Collins.

MS. COLLINS: There's one pending motion, Commissioner.

On September 7th, 1999, Peoples filed a Motion to Strike portions of Mr. Ted Spangenberg's testimony. I don't know if you want to address this motion now. The appropriate time to address it would probably would be when we get to the direct testimony of Mr. Spangenberg.

COMMISSIONER DEASON: Was this matter addressed at the prehearing conference?

MS. COLLINS: Yes, it was, Commissioner.

MR. WATSON: It was noted that the motion was pending but there was no ruling made.

COMMISSIONER DEASON: Okay. Is oral argument contemplated on this matter?

MS. COLLINS: This is within the discretion of the Commission.

COMMISSIONER DEASON: Commissioners, do you have a preference as to how we proceed?

COMMISSIONER CLARK: Did Gulf file in response to the Motion to Strike?

MR. BADDERS: Yes, we did.

COMMISSIONER DEASON: Are the parties prepared to briefly argue this motion.

MR. BADDERS: We are. I am.

MR. WATSON: Yes.

COMMISSIONER DEASON: Okay. Does Staff have an objection to hearing argument at this time?

MS. COLLINS: No, Commissioner.

MR. WATSON: This is my motion. I can start.

The grounds for the Motion to Strike portions of Mr. Spangenberg's testimony is directed to the testimony that appears beginning on Page 12 of his direct testimony, Line 4, and running through the sentence that ends on Line 4 on Page 13.

The grounds for People's motion are that the testimony is irrelevant and immaterial, constitutes or is based on hearsay. It contains conclusions of the witness with respect to advertising and promotional materials which the witness has not submitted as exhibits, chose not to submit as an exhibit with his Direct Testimony, in which the Commission and Peoples are, therefore, unable to view for purposes of forming their own conclusions regarding the nature of that advertising. We, therefore, deem it unduly prejudicial.

Relevant evidence is that which has a tendency to prove or disprove any fact which is relevant and material to the Commission's decision on any issue in this docket.

Now, this docket was opened on Gulf's

petition for approval of its proposed program for cost recovery under the Conservation Cost Recovery Clause. The program contains as one of its features an incentive, or an allowance, to an eligible customer. It's to the necessity for this incentive or allowance that Mr. Spangenberg's testimony, to which our motion is directed, goes. None of the issues identified by the parties in the Prehearing Order goes to either whether Gulf needs an allowance to make its program work or to the level of the allowance that it has chosen to put in the program.

Neither Peoples nor the Staff has raised either the necessity for or the level of the allowance as an issue. If the Commission were to determine that natural gas advertising in Gulf's service area was false and/or misleading, as the witness's testimony characterizes, would that finding have any relevance whatsoever on the issues in this docket? Because the primary ultimate issue is whether the program is cost-effective, and whether it is consistent with FEECA. I think the answer to that is no. Therefore, how ask the portion of Mr. Spangenberg's testimony, to which our Motion to Strike is directed, be deemed relevant?

I would add to the grounds set forth in the motion initially that the record, since Gulf chose not to offer the materials as exhibits, contains no predicate for the witness's opinion on the material, and I would, therefore, add the lack of a predicate as a further ground for striking the testimony.

Gulf has responded to our motion that Peoples can't complain of prejudice because it has the ads in its possession; that the materials are discoverable; that they were publicly disseminated and that the Commission, Peoples and the Staff can ask questions regarding the testimony and request that the information be provided as an exhibit during the hearing. This does not mean that the witness's statements, or the advertising to which the testimony refers, is relevant.

They argue, also, that no special skill, et cetera, is required for Mr. Spangenberg to render an opinion on the materials. And even if that's true, there's no predicate for that opinion. If Gulf wanted the witness to offer Gulf's opinion on the materials, the witness should have at a minimum submitted the materials as proposed exhibits at the time he filed his Direct Testimony. Having failed to do so, and having failed even to submit the materials as exhibits in his Rebuttal Testimony, I think the testimony should be stricken.

I would point out to the Commission that there is absolutely no prejudice to Gulf in striking the portion of the testimony that Peoples seeks to have stricken. The remainder of the witness's answer, to which our motion is not directed, will still convey to the Commission, even though we believe that also is irrelevant, why Gulf felt the need to include a $200 allowance in its program.

If the portion we seek to have stricken is stricken, the question is why does Gulf Power believe it is necessary to use incentive to encourage its customers to install energy-efficient electric heat pumps? And the answers would be I feel the $200 customer incentive that is an element of the Good Cents Conversion Program is needed in order to help get the individual consumer's attention long enough for them to understand the energy saving and household budget benefits from installing a highly efficient heat pump.

There's no prejudice to Gulf if the remainder of the testimony is stricken, as we believe it should be, because it's irrelevant and immaterial to the decision that the Commission needs to make in this docket.

COMMISSIONER DEASON: Thank you. Mr. Badders.

MR. BADDERS: Thank you. Clearly, we disagree with Mr. Watson's analysis. First and foremost, this information is relevant. It is relevant to Issues 1 and 2 which go to the cost-effectiveness of this program. This incentive and the level of the incentive are components of the cost-effectiveness analysis.

This appears in the direct testimony of Mr. Spangenberg. In that testimony he has to support this program and the components of the program. That is what he has done. Clearly you could stop where Mr. Watson would like us to stop and just say we believe it's necessary to overcome something in the marketplace. That this incentive is necessry to overcome something in marketplace. We've gone further and we've explained the reason and what it is we are overcoming in the marketplace with this incentive.

Clearly it is relevant to that topic and it's something the Commission can consider and it can weigh. There's no prejudice in this.

Staff and Peoples Gas can, and could have, conducted discovery, asked what articles were in question and cross examine the witness on that topic if they so chose. They did not. With full opportunity they chose not to. They've made arguments that this is hearsay and it's not admissible. Clearly, in this proceeding, an administrative proceeding, hearsay is admissible. We're not offering this to prove that this is misleading or false advertising. We're using this to show --

COMMISSIONER CLARK: Well, it struck me that that's what you said. You're saying here the testimony has been impeded by false and deceptive advertising about the benefits of it. And I took that to mean that you wanted us to take as evidence that it was false and it was deceptive, and, therefore, it is offered for that purpose, not just for the purpose that it was uttered.

MR. BADDERS: Our belief is that we needed to have a reasonable belief that this was false; that the utterances made were false.

COMMISSIONER CLARK: But you are offering it for that purpose.

MR. BADDERS: Only as far as a reasonable basis. We can be wrong. It's what our intent, what our belief was at the time when we read this and what affect it had on the testimony.

But continuing. We were offering this

solely to show that the utterance was made, and that based on that, our reasonable belief was that it was false. And as a result of that we have decided to use an incentive at a certain level in this program. And simply that is relevant. That is relevant to the cost-effectiveness in Issues 1 and 2. So we believe that the Motion to Strike should be dismissed -- or denied. I apologize.

COMMISSIONER DEASON: Mr. Watson, anything further?

MR. WATSON: I have nothing further.

COMMISSIONER DEASON: Questions, Commissioners?

COMMISSIONER JACOBS: The main weight of this testimony you would argue then does go to the cost-effectiveness analysis?

MR. BADDERS: We do. Or at least -- the existence of an incentive. This is the reason -- this is the reason that we've used an incentive, or a reason that we've used an incentive and the level of incentive used. And that is an input into the cost-effectiveness.

COMMISSIONER JACOBS: I can agree that the issue offering the incentive certainly goes to that. But it strikes me that the testimony would imply --

and I would seek your response to this -- the testimony would imply that the incentive is to overcome public response, or receptance -- or acceptance, of the false advertising.

MR. BADDERS: That is correct.

COMMISSIONER JACOBS: Well, how then -- you understand my point. The weight of your testimony seems to say that this incentive is not guided to making this program more cost-effective, but on the other hand, it's guided to overcoming a negative public perception of this program.

MR. BADDERS: I guess two-fold. I mean it does both. We've decided to use an incentive for that reason.

COMMISSIONER CLARK: For what reason?

MR. BADDERS: For the reason that we believe there was false misleading advertising in the market. That's our belief. Whether or not it is false or misleading --

COMMISSIONER CLARK: So you are offering it for the purpose of showing it was false and misleading.

MR. BADDERS: That we had a reasonable belief that it was. Yes.

COMMISSIONER CLARK: I don't understand the difference there. Are you offering it to show that it is false or deceptive or that you had a reasonable belief that it was?

MR. BADDERS: The second; the latter.

COMMISSIONER CLARK: How does that take it out of hearsay and make it simply to show it was uttered?

MR. BADDERS: Okay. If we just showed that the statement was made, that this utility was in the market, that's only half of it. It's what we drew from that; what conclusion we drew from the utterance that was made.

COMMISSIONER CLARK: Okay. I'm confused as to -- is there case law or other statute that, therefore, makes it an exception to the hearsay?

MR. BADDERS: I believe these are admissions by Peoples Gas, which would be an exception to the hearsay rule. And also in an administrative proceeding such as this, you are allowed to accept hearsay. It just cannot be the sole basis for your ruling on a specific point.

COMMISSIONER DEASON: Commissioners, I reviewed the motion and the response, and reviewed the testimony, heard the argument here today. I'm certainly willing to take any input and I'm prepared to rule on it.

COMMISSIONER CLARK: I'm prepared to live with your ruling, but it strikes me that I don't see the relevance of it, and --

COMMISSIONER DEASON: Well, I agree with you. My concern is the relevancy. I'm not so much concerned about the hearsay argument or the fact there were no exhibits filed to accompany it, or the fact that there's a question concerning the witness's ability to express the opinion. I'm not concerned about that. I'm concerned about the relevancy to the issues which are listed in the Prehearing Order and for that reason I'm going to grant the motion in part and deny the motion in part. I'm going to grant the motion as it relates to testimony which begins on Page 12, Line 4, through Line 21 to the "comma," after "marketplace." And then I would allow the response to continue from that point forward. I think from that point forward, the testimony is simply acknowledging that there are programs that are being provided by gas utilities in this part of the state; that it does not address whether there is or is not deceptive advertising concerning those programs, which I think goes beyond the relevancy issues.

COMMISSIONER CLARK: I think so. So it would be --

COMMISSIONER DEASON: The testimony that would stand would begin with the word "most" on Line 21, and would continue all the way -- all the way to the answer, that would be allowed. What would be stricken would be beginning on Line 4 and continuing through Line 21 to the "comma" after "marketplace."

COMMISSIONER JACOBS: I concur.

COMMISSIONER CLARK: I do too.

COMMISSIONER DEASON: That matter has been addressed. Are there other preliminary matters?

Mr. Badders, when you present this witness -- I mean, this ruling has been made and I would expect you to amend the testimony at that time.

MR. BADDERS: We will do so.

We have one other preliminary matter that we have discussed with the other parties. It has to do with the Order of Witnesses on rebuttal.

In reviewing the testimony, Mr. Spangenberg was to precede -- or actually was to precede Mr. Shell. In doing so, he would be discussing matters that Mr. Shell will be raising in his testimony, which seems to be out of order. After discussing this with the parties it would be best for us to do Mr. Shell first and then end with

Mr. Spangenberg, if there's no objection.

COMMISSIONER DEASON: Any objection.

MS. COLLINS: No objection.

MR. WATSON: No objection.

COMMISSIONER DEASON: Very well. Okay. Other preliminary matters?

MS. COLLINS: No, Commissioner Deason.

COMMISSIONER DEASON: Were opening statements contemplated at the prehearing?

MS. COLLINS: The parties are prepared to go ahead.

COMMISSIONER DEASON: No opening statements were requested.

MR. BADDERS: No.

COMMISSIONER DEASON: Very well. We will proceed then directly to testimony.

All witnesses who are present and have prefiled testimony, please stand and raise your right hand.

(Witnesses sworn collectively.)

MR. BADDERS: Gulf Power would like to call its first witness. Mr. Spangenberg, please take the stand.

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TED S. SPANGENBERG, JR.

was called as a witness on behalf of Gulf Power Company and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. BADDERS:

Q Please state your name and business address for the record.

A My name is Ted Spangenberg. My business address is Gulf Power Company, One Energy Place, Pensacola, Florida.

Q Are you the same Ted Spangenberg who prefiled 15 pages of Direct Testimony?

A Yes, I am.

Q Have you also filed revised Pages 4, 5 and 10 for that prefiled testimony?

A Yes, sir, I have.

Q Do you have any changes or corrections to that testimony as revised?

A None except for what the Commission just ruled on.

Q Right. Please note for the record that Page 12, Lines 4 through 21, has been struck from the record.

A Yes.

Q And on Line 21 that is only to the "comma"?

A That's correct.

Q If I were to ask you the same questions today, would your answers be the same?

A Yes, they would.

MR. BADDERS: Commissioner Deason, we ask that the prefiled testimony be inserted into the record as though read.

COMMISSIONER DEASON: Without objection, it shall be so inserted.

Q **(By Mr. Badders)** Mr. Spangenberg, did you have one exhibit attached to your testimony?

A Yes, sir, I did.

Q And have you filed a revised Page 9 of 9 to that testimony?

A Yes, I have.

Q Do you have any changes or corrections to that exhibit as revised?

A Not as revised, no.

MR. BADDERS: We ask that that exhibit be identified.

COMMISSIONER DEASON: It shall be identified as Exhibit 1.

(Exhibit 1 marked for identification.)

GULF POWER COMPANY

Before the Florida Public Service Commission
Direct Testimony of
T. S. Spangenberg, Jr.
Docket No. 981591-EG
Date of Filing: July 22, 1999

Q. Please state your name, business address, and occupation.

A. My name is T. S. (Ted) Spangenberg, Jr. My business address is One Energy Place, Pensacola, Florida 32520. I am employed by Gulf Power Company as its Residential Marketing Manager.

Q. Please summarize your educational and professional background.

A. I hold Bachelor's and Master's degrees in Electrical Engineering from Auburn University. I have worked for Gulf Power Company and its affiliates within the Southern Company for the past 23 years. My experience during that time frame includes positions and direct work involvement in the areas of load research, market research, demand forecasting, cogeneration, customer service, line service, distribution field engineering, transmission, executive administration, substation engineering, and residential marketing. I am licensed in several states, including Florida, as a Professional Engineer.

Q. Do you have an exhibit to which you will refer in your testimony?

A. Yes, I have an exhibit consisting of one schedule, (TSS-1) which is a written description of the GoodCents Conversion Program as filed with the Florida Public Service Commission (the Commission) for approval. This exhibit was prepared under my supervision and direction.

Counsel: We ask that Mr. Spangenberg's Schedule TSS-1 be marked as Exhibit 1.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to provide information about Gulf Power Company's proposed GoodCents Conversion Program (the Program) and to encourage the Commission to approve it as a conservation program eligible for cost recovery under the Energy Conservation Cost Recovery (ECCR) mechanism as provided by the Florida Energy Efficiency and Conservation Act (FEECA).

Q. What are the key elements of the GoodCents Conversion Program?

A. The GoodCents Conversion program proposes the use of cash incentives to encourage Gulf Power's residential customers to replace old and inefficient electric air conditioners and fossil-fueled combustion home heating devices with new, efficient, electric heat pumps. Customer participation in the Program will result in reduced annual electrical energy consumption and significantly reduced summer peak electric demand. Further, participating customers will also benefit as a result of significantly reducing the total energy requirements of their home. Customers who make this replacement under the Program would receive a $200 cash incentive, with their heating, ventilation and air conditioning (HVAC) dealer receiving a $50 cash incentive. The GoodCents <u>Conversion</u> name reflects the nature of the program, which is intended to encourage customers to convert from older, less efficient equipment to new, more efficient equipment. A more complete description of the elements of the GoodCents Conversion Program is contained in Schedule TSS-1. As noted in that exhibit, the expected change in peak kilowatt demand at the meter is a reduction of 1.90 kW per participant and the expected change in annual electrical energy consumption is a reduction of 1,030 kWh at the meter. When the reduction in the participant's natural gas requirements is included, the typical impact is the conservation of 33.7 million Btu's of energy per year per participant at the meter.

Q. Were any recognized methodologies used to assess the cost effectiveness of the GoodCents Conversion Program?

A. Yes. The Commission has an established, approved methodology for assessing the cost effectiveness of energy conservation programs. This approved methodology is described in the publication "Florida Public Service Commission Cost Effectiveness Manual for Demand Side Management Programs and Self-Service Wheeling Proposals" adopted by the Commission in Rule 25-17.008, Florida Administrative Code. The approved methodology was used in performing the assessments of the Program. The manual sets forth three critical cost-effectiveness tests, the Ratepayer Impact Measure (RIM) Test, the Participant's Test, and the Total Resource Cost (TRC) Test. In order to be cost-effective under any of these tests, a program must have a benefits to cost ratio greater than 1.0.

Q. Using the approved methodology just described, is the GoodCents Conversion Program cost effective?

A. Yes. As depicted in Schedule TSS-1, all three key measures were at least 1.00. In other words, the GoodCents Conversion Program passes all three tests of cost-effectiveness specified in the Commission's manual on cost effectiveness of conservation programs.

Q. Please describe the assumptions that have been incorporated in the cost-effectiveness analysis for the GoodCents Conversion Program.

A. The base home for modeling purposes is a 1680 square foot home with an inefficient central air conditioning unit having an effective Seasonal Energy Efficiency Ratio (SEER) of 7.0 and a central gas furnace with a 68% Annual Fuel Utilization Efficiency (AFUE). In Gulf's assumptions, the entire existing heating and cooling system has been removed and replaced with a heat pump having a SEER of 11.0 and a Heating Season Performance Factor (HSPF) of 7.4.

Q. Are the assumptions incorporated in the cost-effectiveness analysis regarding summer peak demand, winter peak demand and annual energy usage reasonable?

A. Yes. These cost effectiveness evaluations are the result of the aforementioned system assumptions input into the Residential Building Energy Program (RBEP), which is an engineering model developed by the Southern Company and used by Gulf Power on many occasions for regulatory filings. Results from the RBEP program have been previously accepted by the Commission.

Q. How is it that the GoodCents Conversion Program projects a reduction in annual kWh per participant when a non-electric heating source is being replaced by an electric one?

A. The typical efficiency rating of the equipment to be replaced under this proposed program is 7.0 SEER. In order to qualify for the Program incentive, the participant must install a heat pump with a rating of at least 11.0 SEER. For the typical home, this yields a reduction of 2,933 kWh for the cooling season, with an addition of 1,903 kWh for the home's heating needs. The net result is an expected reduction in annual electricity use of 1,030 kWh. This is in addition to the conservation of 302 therms of natural gas that is also achieved.

Q. What does FEECA require in terms of energy or demand impact and cost effectiveness in order for a program to be considered a qualifying conservation program?

A. Chapter 366.81, in its opening sentence, pronounces a legislative finding that "it is critical to utilize the most efficient and cost-effective energy conservation systems. . .". It is obvious from the electrical kWh and natural gas therm reductions just cited that encouraging the conversion of existing furnace and air conditioner combinations to new heat pumps promotes "the most efficient and cost-effective conservation systems." Further, Chapter 366.81 states that FEECA is to be "liberally construed" in order to increase the "efficiency and cost-effectiveness of electricity and natural gas use." There are two specific requirements in FEECA to which our Program applies. These are (1) reducing and controlling the growth rate of electric consumption; and (2) reducing the growth rate of weather-sensitive peak demand. An electrical program that achieves either one of these would qualify. The GoodCents Conversion Program reduces annual kWh consumption and qualifies on that count. It also reduces summer peak electric demand, which is when Gulf Power's annual peak demand occurs, so it would also qualify on that count. The proposed program also has the added benefit of reducing the growth rate of the weather-sensitive peak demand for natural gas, which in Northwest Florida is the winter peak demand for gas, hence, it would also qualify on that count.

Q. If this program did not produce a reduction in winter electrical demand, a reduction in peak natural gas demand, or a reduction in annual kWh but did cause a reduction in Gulf's peak electrical demand, would it qualify as a conservation program?

A. Absolutely. Any impact of this or any other Gulf Power program on winter electrical demand is irrelevant as far as FEECA is concerned so long as the summer demand is Gulf Power's weather-sensitive system peak demand. Gulf Power plans additional generating resources on the basis of reserves at the time of summer peak demand. While any program that can help reduce the growth rate of annual energy consumption, reduce weather-sensitive peak electrical demand or reduce weather sensitive natural gas peak demand brings added appeal, as long as one of these three criteria is addressed, it satisfies the requirements of FEECA.

Q. Is there any precedent before the Commission in which a program has been approved for cost recovery under the ECCR clause when there was not a reduction in more than one criterion e.g. weather-sensitive peak electrical demand and annual kWh?

A. Yes, there is. Several utilities have received approval for ECCR recovery load management programs that reduce peak demand with no reduction in annual energy consumption.

Q. Was this program designed simply as a sales tool for competing against natural gas?

A. No, it was not. Gulf Power Company has a long history of pioneering efforts to help customers conserve energy, dating at least as far back as the initiation of our nationally acclaimed GoodCents Home program in the 1970s. Continuing that tradition, we are constantly pursuing ideas for new programs to enhance energy efficiency. The HVAC system is the single largest energy user in a typical home. As the company went about planning a program to increase the energy efficiency of HVAC systems, thereby reducing summer electrical demand, the use of promotional incentives was considered because those seem to be one of the most effective tools in today's marketplace for encouraging consumer action. However, the company wanted to ensure that all promotional offerings to customers were cost-effective. In all our considerations for potential HVAC upgrade programs, with the natural exception of our geothermal initiatives, we assumed that the cooling aspect of existing and replacement systems would be the traditional refrigerant cycle with air-to-air heat exchange. For the heating cycle we analyzed electric resistance heat, gas furnaces, and air-to-air heat pumps. While knowing that 7.0 SEER was a good average for existing systems, we also considered higher SEER's, i.e. newer equipment, for the system being replaced, realizing that the higher SEER's would make the cost-effectiveness tests more difficult to pass. The company did everything reasonable to ensure rigor in its analyses. The cost effectiveness tests results for these other variations are shown in Schedule TSS-1 and indicate that the only combination that passed the necessary cost-effectiveness tests was going from a gas furnace, regardless of equipment vintage, to a heat pump. In short, an attempt was made to include the cooling-only upgrade with a gas furnace, as well as the change-out of an older heat pump, but these failed the cost-effectiveness tests. Leaving a gas furnace in place and replacing just the 7.0 SEER cooling equipment with 11.0 SEER equipment only achieves a savings of 10.0 million Btu's, or only 30% of the 33.7 million Btu's conserved with this proposed Program.

Q. Is there any precedent for the Commission approving a program for cost recovery under the ECCR clause when the program benefits the requesting company's product sales in lieu of a competing product?

A. Yes. In fact the Commission has approved electric replacement programs for ECCR treatment for natural gas distributors that provide significant cash rebates to participants only if they are replacing electric heating equipment with natural gas equipment. Given this established practice of the Commission, the company sees no reason why the GoodCents Conversion program should not also be approved. The Program as proposed results in cost-effective conservation by reducing the growth rates of weather-sensitive peak electrical demand and electric consumption.

Q. Why does Gulf Power believe it is necessary to use incentives to encourage its customers to install energy-efficient, electric heat pumps?

A. ~~The decision to install a high efficiency heat pump, either as a replacement to an older heat pump or as a replacement to a gas furnace, has been impeded by false and/or deceptive advertising about the benefits of natural gas use in Northwest Florida. This use of advertising and promotional materials has confused consumers by portraying the operating costs of heat pumps using national average heat pump efficiencies, national average electricity costs and national average natural gas costs. Typically, the above mentioned advertising and promotional materials falsely portray resistance heating efficiencies as typical electrical heating efficiencies, and/or base cost comparisons on Btu's entering the home without consideration for heat transfer equipment efficiencies, which must be considered in determining what customers will actually pay. In addition to the presence of such false and/or deceptive advertising in the marketplace,~~ most gas distributors in Northwest Florida have been providing cash incentives to consumers to replace heat pumps with gas furnaces. The costs of these incentives and the associated advertising are passed directly through to the general body of customers either through the ECCR mechanism or through rates that are not subject to review and approval by the Florida Public Service Commission. I feel the $200 customer incentive that is an element of the GoodCents Conversion Program is needed in order to help get the individual consumer's attention long enough for them to understand the energy saving and household budget benefits of installing a highly efficient heat pump.

Q. As a rule, are customers likely to replace existing inefficient HVAC equipment only when it fails?

A. No. The best quantitative data available for Northwest Florida on this issue is from a mid-1980's study of over 400 consumers who changed out their HVAC systems to heat pumps. Only 27.3% of those consumers gave "needed major repairs" as the reason for replacing their system. Other predominant reasons given included "operating cost too high"-18.2% and "rebate"-19.9%. Regardless of how likely consumers are to replace their equipment only when it fails absent a rebate or other promotional incentive, they are much less likely to replace it only for that reason when an effective incentive is available, such as the one included in our proposed Program. I believe the earlier 73.7% finding for replacing a system for reasons other than failure is generally representative of what could be expected with our proposed Program.

Q. Do you believe the Commission should approve this program for ECCR treatment?

A. Yes. Since this program, as demonstrated through the RIM test, provides benefits to all ratepayers, the ECCR funding mechanism provides a means for those ratepayers to financially contribute to its success. Absent ECCR, while it might remain cost-effective from a ratepayer perspective, the delay in a positive impact on the company's financial earnings and stockholder benefits make the program a difficult proposition for moving ahead under normal cost recovery mechanisms.

This Program reduces peak summer electrical demand, reduces annual kWh consumption, and is cost-effective under the RIM Test, Participant Test, and TRC Test. The GoodCents Conversion Program promotes energy-efficiency and reduces Florida's dependence on outside energy sources, all consistent with FEECA and good public policy. As an unintended benefit, it also reduces weather-sensitive peak natural gas demand. Because of the intended, expected results and the consistency with past practice, I believe the Commission should approve this Program.

Q. Does this conclude your testimony?

A. Yes.

Q (**By Mr. Badders**) Mr. Spangenberg, please summarize your testimony.

A The high efficiency heat pump is one of the most, if not the most, efficient system available today for home applications. For each unit of input, this technology transfers over three units of energy into or out of the home as the season requires.

We have filed with this Commission a program that pays the customer a $200 cash rebate as an incentive to replace their older, inefficient combustion heating equipment with a heat pump having a minimum efficiency of 11.0 seasonal energy-efficiency ratio or SEER. The results of the analysis of that program are shown as the base case on the chart we're placing before you now.

The results of the analysis of this proposed program show there the conclusions for every unit replaced under this program, we expect a typical weather-sensitive peak demand reduction of 1.9 kilowatts at the meters, and an annual reduction in electrical energy consumption of 1,030 kilowatt-hours.

With the added benefit of a reduction in natural gas consumption, the state of Florida will experience at the meter energy conservation of over

33 million Btus per participant. This program meets the Commission's cost-effectiveness criteria as each of the measure as 1.0 or higher.

This program was not designed as a competitive sales program. In fact, we attempted the inclusion of other forms of HVAC equipment efficiency upgrades, but as you see from analysis scenarios No. 7, No. 9 and No. 11, these do not pass the requisite cost-effectiveness test.

Past decisions of the Commission have established that the effect of a program might have on displacing a competitive fuel does not invalidate its classification as a conservation program.

We believe the Commission should approve this program and it's cost recovery under the authority provided by the Florida Energy Efficiency and Conservation Act, or FEECA. In passing FEECA, the Florida Legislature found it critical for our citizens to utilize the most efficient and cost-effective energy systems available. The legislature also declared that FEECA should be liberally construed in order to meet the complex energy problems that are faced by our state. This program promotes the most efficient HVAC technology, while meeting the umbrella requirement of FEECA that programs be cost-effective.

I'm not aware of any single program that has been approved or could be proposed to address all of the aims of FEECA. Rather, to be a valid program need address only one of the aims. The program that Gulf Power has proposed clearly addresses multiple aims of FEECA of reducing electric consumption, reducing weather-sensitive peak demand, increasing the efficiency of electricity use and increasing the efficiency of natural gas use.

Gulf Power's proposed program will provide the consumers with desperately needed credible information about the efficiency and benefits of today's high efficiency heat pumps. It will achieve stated aims of FEECA, while meeting the cost-effectiveness requirement. This program should be approved by the Commission.

MR. BADDERS: Commissioner Deason, we tender this witness for cross examination.

COMMISSIONER DEASON: Mr. Watson.

CROSS EXAMINATION

BY MR. WATSON:

Q Good morning, Mr. Spangenberg.

A Good morning.

Q Before I get into some of my other questions, let me go to one that remains after the ruling on the Motion to Strike. If you could look at Page 12 of your direct testimony, on Line 21, the sentence that now reads "most gas distributors in Northwest Florida have been providing cash incentives to consumers to replace heat pumps with gas furnaces." Could you identify for us which gas distributors in Northwest Florida would be providing those types of incentives?

A I'm fairly certain Energy Services of Pensacola has been doing that; Gulf Breeze Natural Gas, Milton Gas, Okaloosa Gas District, and to the extent that Peoples Gas has a builder program that also pays rebates for furnace in lieu of a heat pump, I'll tell you that the majority of the distributors provide that.

Q But Peoples' program would not actually provide an incentive to replace an existing heat pump with a gas furnace?

A Not an existing one, no. It pays to displace a new one that otherwise would have been put in.

Q Now, the cost-effectiveness analysis for Gulf's program as filed assumes removal of a 7 SEER air conditioner and a gas, or other combustion, furnace and replacing it with an 11 SEER?

A Yes, sir, 11 SEER or higher.

Q And that is what you refer to as your base case?

A Yes, sir, that's correct.

Q On what data does Gulf base its estimate that the cooling equipment that will be replaced with have a SEER of 7?

A It's on the data of looking at the vintage of heat pumps, particularly those that were being installed ten to 15 years ago, and looking at what the minimum energy efficiency requirements were in that market in that time frame. We can also look at equipment that's coming out, based on existing programs, even heat pumps, old heat pumps, and looking at the SEER ratings on those old heat pumps that are being replaced with the new heat pumps, and get a feel for the typical efficiencies in the marketplace.

Q Now, if this program is successful, what is the average SEER of the replacement heat pump that Gulf expects to be installed in lieu of the equipment removed?

A Under this program, which requires a minimum 11 SEER, which is higher than what's required under anything else, what we found, and particularly in 1998, was that the average heat pump that went in that was at least an 11 SEER averaged 12.8 SEER.

Q Okay. I recall your telling me at your deposition that in 1998, due to Gulf's past and current efforts, you found there were 843 heat pumps installed by your customers that were 11 SEER or higher, and that the average of those was 12.8 SEER?

A That's correct.

Q Could you describe for the Commission Gulf's past and current efforts to get customers to replace existing HVAC equipment with heat pumps?

A Particularly replacement, there hasn't been a lot of history in terms of replacement. We have often encouraged them through things like our Good Cents Home Program which is really more addressed at new home construction, and also as we perform energy audits and assist customers with what their energy needs are. We always encourage them to put in a higher efficiency system than what might be the normal. So while there's no name for those programs, our typical programs or our general programs assisting customers and installing efficiency would help push them towards higher efficiency equipment.

Q Now, how do your past and current efforts differ from those that are included in the Good Cents Conversion Program for which Gulf is seeking approval?

A Basically this current program would -- the biggest difference would be a cash incentive. We're not currently offering cash incentives in the marketplace to a consumer to get them to make the conversion. And what we found is a lot of apathy on the part of consumers about higher efficiency equipment. We found misinformation in the marketplace about the efficiency of a heat pump and the energy benefits of a heat pump. And so this program, it's more aggressive in trying to promote energy efficiency, and the aid of that comes with the $200 rebate that we provided as part of this program.

Q Well, now if the average SEER of the heat pumps of 11 SEER or higher that Gulf installed in 1998 due to its past and current efforts was 12.8, why does the conversion program specify a SEER of only 11?

A Because you have to pick some frame of reference in which -- becomes the minimum. And anytime you set a minimum, the average of those that are installed above that minimum, the average is always going higher than the minimum because the minimum is the entry point. If we had picked all heat pumps installed in our customers' homes this year, 1998, you'd certainly have a SEER that's a good bit lower than 12.8. So you always have to pick a minimum. We picked 11 because it was higher than the minimum which you can find in the marketplace, which is typically at 10. And it gave us a starting point. It allowed the program to be as inclusive as possible and really got us past the hump of so many people just putting in the minimum requirement of a 10.

Q And the minimum SEER for a heat pump today under the Building Code is a 10?

A Yes, sir, for new construction, that's correct, is a 10.

COMMISSIONER DEASON: I'm sorry, for what type of construction?

WITNESS SPANGENBERG: New construction.

COMMISSIONER CLARK: Let me ask you a question then. You have centers where you sell appliances, don't you? And do you sell heat pumps?

WITNESS SPANGENBERG: Commissioner, we do as appliance sales floors. We do not sell what you'd call unitary equipment or whole-house central heat pump equipment. We sell some window units, but none that are -- heat pumps that are contemplated by this program.

COMMISSIONER CLARK: Tell me this: Are you finding in the secondary market that units of less than a 10 SEER rating are even available?

WITNESS SPANGENBERG: There are some that are available but they are not predominant.

Commissioner, it's my understanding -- if I remember correctly now -- there is available units less than 10 but typically those are foreign manufactured and brought into the country. Or you can find some experienced units that might be where someone is remodeling a home and they take out an old two-ton unit that might have been a few years old, maybe a 9 SEER, still has a lot of life left on it, but the customer now needs a larger unit. And they may work with that HVAC dealer to now put in a larger unit, 3 ton unit. The dealer now has a 9 SEER unit that still has a lot of life in it. And there's nothing to preclude that dealer from then reselling it to another customer as long as they clarify that it's an experienced unit.

But we find very little of that. I'll tell you that 99% of the units that go in are 10 SEER or higher. But we have a huge block that are in that 10 to 11 SEER. That's where the predominant SEER ratings of the air conditioner are, are between 10 and 11. You have a lot that just meet that minimum 10 and that's it. That's as far as they'll go.

Q **(By Mr. Watson)** You must have looked at all of the heat pumps installed by your customers in 1998 to come up with the 843 that were 11 SEER or higher. What was the total number of heat pumps installed by Gulf's customers in 1998?

A Let me see if I have that. The ones we were able to track I know were several thousand in the replacement market. That would not include the new market. I guess I could total those up here also, if you'll give me just a moment. (Pause)

I know we tracked over 2000 that were actually installed. And keep in mind that particularly -- and that's just in the existing market -- there were another 8,000 -- excuse me, 6,000 installed in the new market. There would have been many, many others installed in the existing market that we would not have been aware of because we didn't -- you know, didn't have any involvement with the dealer on those particular ones and they went in as 10 SEER units so we would not have been as interested in tracking them because they were not higher efficiency units.

Q So the 843 that were 11 SEER or higher would have come out of the 2000 replacement units that you knew about?

A That's correct.

Q Did Gulf make any study of the customers in 1998 who replaced existing equipment with a heat pump to determine why they decided to change out their equipment?

A No, sir, we did not; not in 1998.

Q Have you made a study since then?

A None since then, no, sir.

Q You use in your base case a cost of $3,000 for the replacement heat pump?

A Yes, sir, that's correct. Excuse me, that's not replacement heat pump. It's the heat pump that replaces the gas furnace, just so we understand it's the conversion.

Q Gas furnace and central air conditioning.

A Yes.

Q Peoples asked in a interrogatory for an itemization of all costs comprising $3,000 initial heat pump used by Gulf in its analysis. And I believe your response was that no such itemization was available?

A That's correct. We do not have a itemization available.

Q Okay. Can you itemize all of the costs comprising the $1300 cost that you use in one of the calculations you made in going from a SEER 10 to a

SEER 11?

A No, sir, I cannot itemize that. But both of those numbers were based on contacts with an HVAC dealers in terms of quoting a lump sum bid for making the changeout rather than get an itemization. It's unusual working with HVAC dealer for them to provide an itemization of everything. What the customer is looking for is what my total cost is going to be. And so as we talked with HVAC dealers, we asked them about both scenarios.

One is to do a replacement of a gas furnace to a heat pump. Then we asked them, let's look at the cost of going from a gas furnace to a new unit, a 10 SEER air conditioner with a new gas furnace, and then look at the cost difference, the incremental cost difference to then instead of doing that, how much more would it then cost you to go to a new 11 SEER heat pump and that's where the $1300 came from.

Q Now, if you look at -- why would the customer in that example already by upgrading to a 10 SEER straight air and gas furnace combination?

A It could be a variety of reasons. Either their old equipment had failed or they were dissatisfied with the efficiency of their old equipment. They wanted to -- or were perhaps remodeling their home, and -- by the way, the failure could have been from either the unit becoming too old or it could have been struck by lightning, or their teenage daughter or son could have backed into it with the family car. You get a variety of reasons why the customers may be changing out their equipment.

Q Right. And on the chart that you handed out during your testimony, the 10 to 11 case would be optional base case Nos. 4 and 6 -- excuse me, 4 and 5?

A The one that would be most relevant, yes, would be No. 4.

Q What would the actual cost to the customer be of installing the 11 SEER heat pump?

A Compared to what?

Q Compared to the $1300 that you use in your analysis on that case?

A The actual cost to install it would be higher than the 1300. It would probably -- it be the $3,000, on average.

Q Now, are the sensitivities in these studies for the change from 10 to 11 SEER, they are shown on your exhibit TSS-1, or Exhibit 1, as well as in base cases 4 and 5 on the sheet you handed out. Are these the only ones were the assumption is that the customer would already being replacing existing equipment because of its mechanical failure?

A Well, again, there might be other reasons to replace it other than mechanical failure. But I believe Nos. 4 and 5 would be the only ones where they were replacing a gas furnace, or a gas-fired old system, with a new heating system. And, again, for those we used the $1300 because that's the incremental cost they would now have to now pay, just like we only claim the incremental benefits of putting in that unit.

Q What if they had changed for other reasons, would you still use only the incremental benefit? Or doesn't -- excuse me, the incremental cost. Doesn't using the incremental cost assume that the equipment has failed and they would have to replace it anyway?

A Yes. Because that's the scenario that we were asked to analyze in No. 4 and 5. We would say okay, what if the customer is going to be changing their equipment anyway? How much then -- what is the cost-effectiveness at that point?

And so we did this analysis at the request -- or the suggestion of Commission Staff before we ever filed our program to say, okay, let's look at the scenario of going from a 10 to 11. Let's assume that the customer was already going to do something for whatever reason. Then let's look at the incremental cost and the incremental benefit that would come out of doing such a changeout.

Q Okay. And in that case you feel that using the incremental cost of $1300 is appropriate. What are the assumptions underlying all the other lines on Exhibit 1, your exhibit TSS-1?

A No. 1, of course, assumes that they are changing out their equipment. You're taking the total cost -- on the base case, going from the total cost of going from their existing equipment to the new heat pump. No. 6, 7, 9 and 11 would be the same thing. No. 13 is a little bit different in that it assumes that they would otherwise have only gone to a -- they are doing a changeout anyway, that for some reason they decided to change out their equipment. But absent this program, they would have only put in a 10 SEER heat pump. And so No. 13 assumes that, okay. Let's get them to upgrade. Let's look at the situation. Where instead of going with a new 10 SEER heat pump they now go in with an 11 SEER heat pump. And we looked at the incremental cost of that and the incremental benefit in terms of conservation that you get out of that.

Q Is 13 one of the scenarios that is summarized on your Late-filed Exhibit 1 to your deposition?

A I'll have to look there for a moment and see.

Q Or is it something we've never seen?

(Pause)

A I believe it is No. 13 on the late-filed exhibit, yes.

Q But the assumption on cases 5 and 6 -- 4 and 5 on your handout are that the customer's equipment has failed so he's got to replace it anyway?

A No, sir. It's not that the equipment has failed. It's that they were going to replace it anyway. The replacement would otherwise have been a new gas furnace and a new air conditioner with a 10 SEER. And then our analysis says what would it take for us to get them to upgrade to a more efficient system?

Q Now, that is the $1300 cost. In all of the other cases you used a cost of $3,000?

A No, sir, we do not. On the late-filed exhibit, for instance, on No. 7 we only used a cost of $2200, and on No. 11 we only used 2,850, and on No. 13 we only used 150.

Q Okay. But in your base case, the program as originally filed, going from 7 to 11, what is the assumption regarding why the customer is replacing his equipment used in that case?

A The base case doesn't really look at why they are changing it out except that we know that the program is designed to encourage them to make a changeout, to encourage them to go to more efficient equipment. Therefore, we presumed that they would not otherwise immediately be replacing their equipment. Therefore, you pay them a rebate. You encourage them to make a change and you take the full cost of going from the existing equipment to the new equipment.

Q Would you consider those who were going to replace their equipment anyway free riders?

A Only if -- I guess no, sir, I would not. Because most of them who are going to replace their equipment anyway only go to 10 SEER equipment. In this case our program requires them to go to 11 SEER equipment.

Q What do you consider to be the typical life of a power plant?

A It depends on the type of power plant, but I think what's typically used is 30 years, I think. Some depreciation schedules even go to 40 years. 30 years is a good planning horizon for most plants.

Q What is the assumed life of Gulf's avoided generating unit using calculating the demand reduction benefits in the cost-effectiveness analysis in your base case?

A 30 years.

Q I recognize you don't agree with it, but what does the information published by ASHRAE, submitted as an exhibit by Mr. McCormick, indicate is the average life of an air conditioner?

A I believe it indicates 15 years.

Q What's your position with respect to the average life of this type of equipment?

A It's certainly much more than 15 years. It depends on whether you're talking equipment that was installed ten to 15 years ago or equipment being replaced today. Typically we see something in excess of 20 years and, I believe, in Mr. Shell's testimony we come to a very valid conclusion of 22 years where -- the equipment that our program targets.

Q But it would be less than 30 years?

A Yes, sir, it would.

COMMISSIONER CLARK: And the reason -- but you use 30 years in the cost-effectiveness test? What do you use 30 years for?

WITNESS SPANGENBERG: Commissioner, we use that because that is our planning horizon for new generation. And the reason it's still valid to use 30 years even though you're putting in equipment that may last only 22 or 24 years is because once a consumer has decided to go with high efficiency equipment, they tend to enjoy the economic benefits of that. What we find is that when that equipment will ultimately fail, they'll go back in with high efficiency equipment. So you could almost say we've perpetually won that consumer over. And so what we see being replaced in is more high efficiency equipment without us -- you know, unless there's some rebate program in place then, you don't have any additional cost of that.

COMMISSIONER CLARK: While I've interrupted, Mr. Watson, your estimate of 33.7 million Btus conserved with this proposed program, how did you come up with that number?

WITNESS SPANGENBERG: Okay. What you do is you take all of the electricity that has been conserved, basically the 1030 kilowatt-hours.

COMMISSIONER CLARK: Is that per unit or --

WITNESS SPANGENBERG: Yes, ma'am, that is per participant.

COMMISSIONER CLARK: And how many participants do you project, say, for each year of the first three years of the program?

WITNESS SPANGENBERG: In our program filing we used as a model a thousand units. We don't know whether that will be somewhere between 500 and 2000. I'd like for it to be 2,000 -- because we want to get that many. But let me make sure and add that the 33.7 million Btus includes the Btu savings we get out of the gas reductions, because you get tremendous gas reductions.

COMMISSIONER CLARK: Let me ask you this then. Is that a thousand in addition to the 843 you experienced in the one year you looked at, or does that include the 843?

WITNESS SPANGENBERG: Most of that would be additional. Let me clarify the 843.

The 843, Commissioner, would have included units that went from a old heat pump to a new heat pump. So most of those would not have been conversions. In fact, if I recall, I think only about 300 of those were conversions. Most of those were replacing an old heat pump with a new heat pump.

COMMISSIONER CLARK: Okay.

WITNESS SPANGENBERG: But it gave us a population in which to assess how much of high efficiency is going in now.

COMMISSIONER CLARK: Let me just understand that. So only about 300 of those would have been eligible for this program.

WITNESS SPANGENBERG: That's correct.

COMMISSIONER CLARK: Okay. And when you made your assumptions on savings, did you assume that 300 would continue to be made without any incentives?

WITNESS SPANGENBERG: We assumed that, in fact, those become free riders. And I have to tell you it's really less than --

COMMISSIONER CLARK: I'm sorry. They would become free riders?

WITNESS SPANGENBERG: Yes, ma'am. Because how do you track -- you have no way of knowing what customers would have otherwise, you know, made a conversion and otherwise gone to high efficiency heat pump. And I need to clarify that the 300 is the total number of customers that we track that converted from a gas furnace to a heat pump. Not all of those were high efficiency. In fact, I don't think I have the data on how many of those were 11 SEER or higher. I don't think we just cut the data that way. But you would have had less than 200 of those that were high efficiency and would have qualified for this program.

COMMISSIONER CLARK: I'm confused then. Are you saying you have not adjusted your data for free riders; you haven't, in effect, subtracted them out because they would have done it anyway.

WITNESS SPANGENBERG: That's correct.

COMMISSIONER CLARK: You've made no assumption on that.

WITNESS SPANGENBERG: We've not made any assumption. We did make a calculation what if there were as much as 25% free riders. And, of course, we believe that's a high number, particularly if I look at less than 150 in 1998 who did it compared to the 2000 upgrades or heat pumps that went in that we know about. And if you look --

COMMISSIONER CLARK: You've just confused me.

WITNESS SPANGENBERG: I'm sorry.

COMMISSIONER CLARK: Is it 300 or 150?

WITNESS SPANGENBERG: It's 150 or less that were actually conversions.

COMMISSIONER CLARK: Out of the 843?

WITNESS SPANGENBERG: Yes, out of the 843 that were conversions to high efficiency equipment. And I guess --

COMMISSIONER CLARK: And you're saying the other 150 that converted was not to high efficiency?

WITNESS SPANGENBERG: That's correct. They went with the straight 10 SEER equipment.

But we did file in, I guess, in our Late-filed Exhibit Option No. 1, and unfortunately it's not on our big chart here -- but Option No. 1 did take an assumption of 25% free riders, which we felt like was conservative. We didn't think it would ever get that high to make sure the program was still cost-effective for our ratepayers if we were to have that much free ridership, and the program did still have a very positive, very good RIM of 1.59, even with 25% free riders.

COMMISSIONER CLARK: Okay. Thank you.

Q **(By Mr. Watson)** Let me follow up before I get back to where I was going on something Commissioner Clark mentioned that I think you brought out in your summary.

In your summary you stated that this program increases the efficiency of natural gas use; is that not correct?

A Yes, sir, I did.

Q What it really does is it eliminates natural gas use in a gas combustion furnace?

A Yes, sir, it does. I consider that optimum efficiency.

Q As I understand it, the Commission's rule 25-17.008, the rule that adopts the cost-effectiveness manual spelling out the RIM, TRC and Participant's Test. Are you familiar with that rule?

A Yes, sir, I am.

Q My understanding is that that rule applies to all electric utilities whenever an evaluation of a cost-effective new demand-side management program is required?

A That sounds right, yes, sir.

Q And if you look at the -- either the Order adopting the rule -- and I can give this to you -- but basically in calculating demand reduction benefits for a cost-effectiveness analysis performed under the rule and under the manual, there's a requirement that the normal revenue requirements method is used except in the case where the life of the program is shorter than the life of the avoided unit. And in that case both the revenue requirements method and the value of deferral method are to be used.

How did Gulf calculate the demand reduction benefits in its cost-effectiveness analysis for this program?

WITNESS SPANGENBERG: I suspect, and I don't know that I can get a specific citation -- I suspect we use that normal revenue requirements methods -- I believe I'm correct in saying that's where the FIRE model is built around. And in that case we believe that's very appropriate because while we don't plan to continue paying rebates forever as you see in our program filing, the benefits of this program will continue on for the full 30 years, so, in effect, the program is still in place because you're still getting the benefits of the program.

Q But did you also calculate the cost-effectiveness analysis on a value of deferral basis?

A I'm not sure whether we did or not. Again, I'm not the expert in what the internals of the FIRE model -- I know that it's a model we've used with this Commission on many occasions, and has been thoroughly reviewed, but I don't recall right now.

Q All right. This gets back to a question that Commissioner Clark asked you. On Page 10 of your Direct Testimony, at Lines 3 to 7, you state that leaving a gas furnace in place and replacing just the 7 SEER cooling equipment with 11 SEER equipment would achieve a savings of only 10 million Btus, or only 30% of the 33.7 million Btus you indicate that Gulf's program in this docket would achieve.

Mr. Spangenberg, even if that statement is true, wouldn't leaving the gas furnace in place result in a lesser increase in winter peak demand?

A If you leave a gas furnace in place -- I'm sorry, we're still putting in the heat pump or not, in your scenario here?

Q You're going to leave the gas furnace in place and replace the 7 SEER cooling equipment with a 11 SEER heat pump.

A Okay. Yes, you would still -- to the extent that the -- now the gas furnace is going to provide the supplemental heating that might be required during a portion of the coldest hour during a winter demand. To the extent that the gas furnace contributes some of that heating, you're winter demand will not be as high as it otherwise would have been without the gas furnace.

Q And if you didn't operate the heat pump in the winter at all, there would be no increase in winter peak demand?

A That's correct. There would be no increase in winter demand nor would you have the energy savings you would achieve with this program.

Q Wouldn't it also result in less annual kWh consumption?

A Yes, sir, it would.

Q Now, the table on Page 9 of your exhibit TSS-1 that's been identified as Exhibit 1 shows a RIM test value of 2.45 for the case where an 8 SEER air conditioner is replaced by an 11 SEER heat pump. I don't believe you've included that in your handout.

A No, sir, I did not. But I have it here and am familiar with what you're talking about.

Q Isn't it true that the reason you get a better RIM test result in going from 8 SEER to an 11 SEER than you do going -- do going from a less efficient 7 SEER to an 11 SEER, that the energy conservation that occurs for Gulf's program is much less than the energy conservation that occurs in going from the more efficient 8 SEER equipment to 11 SEER equipment? In other words, your base case is 7 to 11.

A Correct.

Q And your 8 to 11, you get a better RIM test result, but isn't that because there's less conservation associated with that program?

A I don't know that I would characterize it as less conservation. You get less revenue erosion under that particular case. And right now when you lose revenue, our ratepayers, you know, lose out. And so to the extent that there are fewer kilowatt-hours saved, then you might say that there's less conservation, yes, sir.

Q And I think you told us in your deposition that in the 7 to 11 SEER case, the program as filed, there's a reduction of 1030 kWh per customer, and a kW demand reduction of 1.9; is that correct?

A Yes, sir, that's correct. And that's what's shown on the chart here before us.

Q And in the 8 to 11 SEER case, there's a reduction of only 21 kWh per customer and only a 1.2 kW reduction in demand?

A Yes, sir, that's correct.

Q And I think you just pointed it out in one of your earlier answers, but the reason the RIM test result is higher for the 8 to 11 SEER case is that there's not as much lost revenue due to lost electricity sales?

A Yes, sir, that's correct.

Q So doesn't this really show that replacing the more efficient 8 SEER equipment with 11 SEER equipment is more cost-effective under the RIM test fthan going from 7 to 11 SEER, but that there would be less energy conservation achieved as a result of the more cost-effective program?

A Yes, sir. That's absolutely correct. And for that reason, of course, 8 SEER units that are replaced are also eligible for our program as are 6 SEER units or 5 SEER units. The 7 SEER was used in the base case because we see that as kind of a typical SEER of the vintage units that people are beginning to think about, okay, is this equipment as efficient as it ought to be? Is it really what I ought to have in my home right now? And it's certainly the area that we'll try to be focussing customers on, customers would have equipment that is in vintage. So 7 SEER is eligible, 8 SEER is eligible, and so is 6 SEER or anything -- anything is eligible.

Q So although you've assumed that the equipment being replaced is 7 SEER, equipment with a SEER higher than 7 would be eligible to participate in this program?

A Yes, sir, it would, just as equipment with a lower SEER than 7.

Q If you look at Page 9 of 9 again of your exhibit TSS-1, couldn't we conclude taking all of the different scenarios that are summarized there, that it would be cost-effective for Gulf to pay allowances for a customer to remove his gas furnace and straight air and replace them with a heat pump, but it would not be cost-effective to pay the customer to remove his strip heating system and replace it with an energy-efficient heat pump?

A Yes, sir, that's correct.

Q If you put aside for the moment the issue of cost-effectiveness, which I know the Commission is not going to do --

A I hope not.

Q -- which of the following would result in the more favorable impact on Gulf's winter peak demands: Replacing an air conditioner and a gas furnace with a heat pump, or replacing an air conditioner and electric strip heat with a heat pump?

A And the original part of the question was what?

Q Aside from cost-effectiveness, under which scenario does Gulf get the more favorable impact on its winter peak demand?

A There will be a greater winter demand reduction, I think, by going from strip to heat pump than otherwise.

Q But that might not prove cost-effectiveness under the RIM test?

A In fact, it does not prove cost-effective.

Q Wouldn't replacing the electric strip heat also result in the greater reduction in annual kWh consumption?

A Yes, it would. As shown in scenario No. 9, there's a reduction of over 7,000 kilowatt-hours, which is one reason, by the way, why we continue to promote replacement of electric strip heat with heat pumps amongst our customers. But because we want to be good stewards of our ratepayer's money, we don't pay any incentives to do that, but we certainly encourage that in our marketplace and had a number of those occur last year.

MR. WATSON: I have no further questions at this time.

COMMISSIONER DEASON: Staff.

CROSS EXAMINATION

BY MS. COLLINS:

Q Good morning, Mr. Spangenberg.

A Good morning.

Q Please refer to Exhibit TSS-1 -- excuse me, I'm sorry. Before we start questioning, we have already distributed a copy of a set of interrogatories. Have you seen these before? And do you now have a copy?

A Yes, I have.

MS. COLLINS: I ask they be marked for identification.

COMMISSIONER DEASON: That will be identified as Exhibit 2.

(Exhibit 2 marked for identification.)

MS. COLLINS: Thank you.

Q **(By Ms. Collins)** Are you familiar with the content of this exhibit?

A Yes, I am.

Q Did you prepare the responses?

A I assisted in the preparation of the responses, and those that I didn't assist with were prepared under my supervision and direction and with the assistance of Margaret Neyman, whose name is also on here, but I'm the sponsor for all of these answers, yes.

Q Okay. Thank you.

Please refer to exhibit TSS-1, Page 7 of 9 of your Direct Testimony.

A Okay.

Q And go to Column 12 on this page. What does this column represent?

A This column represents the Cumulative Discounted Net Benefits. In other words, in the FIRE model, the model preferred by the Commission, under the Commission's rules we use to analyze programs, basically you look at all of the costs that you're laying out, you look at all of the benefits that come in after putting out those costs. You get the net benefits, which is in Column 11, and then you discount all of those net benefits and calculate them up so that you get a sense of where you stand throughout the program.

Q Does this column show that Cumulative Discounted Net Benefits do not go positive until the year 2012?

A Yes, that's correct.

Q Does this column then represent that program participants have a 13-year payback period to recoup their investments?

A The participants -- actually, I guess it would be a 12-year payback -- I'm sorry. Yes. Beginning in 1999 to 2012, yeah, it would be a 13-year.

Q Does Gulf inform the customers of this fact?

A I don't know that we point out the 13 years for them. What we do is we take each customer individually, and when they say, you know, "I want a better heating system," or "I'm looking at changing my heating system. What would you recommend?" We certainly help them in analyzing the cost-effectiveness for each of their own particular needs. On average, and what this shows is a typical average, you would wind up, yes, with a 13-year payback. We certainly point that out to the customer. We also point out to the customer the intangible benefits that they might get by making the installation of the high efficiency equipment. Some of those intangibles might be an improved comfort in the home. It might be a contribution to environmental stewardship. There's a lot of the other things that these costs just cannot capture. But we are up-front with them in terms of the direct tangible economic benefits that are captured by this program analysis.

Q How would the Commission know that this notification is being done?

A I don't know that there's any formal provision for making the Commission aware of this. We certainly encourage Commission staffers to go with us on energy audits, or when we help customers understand what their heating needs are. We've always been very open to Commission or Commission Staff involved in any of those proceedings. And I don't know that this is any different than other conservation programs that the Commission has approved. I mean, there's an oversight issue about how do you know about any of those?

But we certainly are open and always welcome to Commission involvement when we actually implement a program.

Q In your experience, what is the higher SEER rating commercially available on new air-to-air heat pump units?

A Air to air, I believe the highest would be somewhere around 15 or 16.

Q In your experience, what is the minimum SEER rating commercially available on new air-to-air heat pump units?

A Practically available, I'd say a 10 SEER.

Q In response to one of Mr. Watson's questions you stated that an 11 SEER was the minimum SEER required for participants in the Good Cents Conversion Program.

With that mind, assume that someone replaces existing 7 SEER A/C equipment with an 11 SEER heat pump. What is the differential in cost per customer to replace the same existing equipment with a 10 SEER heat pump?

A I believe that differential in cost would be somewhere in the order of $150 to $200. That's your incremental cost of going from a 10 SEER heat pump to a 11 SEER heat pump for a typical 2.5, 3 ton unit.

Q Then what would be the difference between the value just gave me and the incremental cost that you stated as $1300 in your rebuttal testimony? Could you please reconcile the values?

A Yes. The bigger difference is in the $1300. You're now having to go with a whole new indoor unit in terms of putting the wiring in place to do that and any flue changes that might need to occur, because you're taking out a gas furnace now and you're having to patch up all the holes you had sticking through the roof, and all of the things that are in place to operate gas. You're capping off gas piping and those types of things. So you have a big difference when you're going for a furnace to a heat pump rather than just going to higher efficiency heat pump. When you go to a higher efficiency heat pump, the reason that's only $150 is you're paying more for the extra efficiency of the compressor unit and that outdoor coil. There may be some slight changes in the indoor coil, and in some cases you may go to multispeed fan units or compressor units, but the $1300, you know, deals with all the opportunities to, again, patch up the flues and everything else in your roof and other things that are involved in changing out from a gas furnace to a heat pump.

Q Within that cost, does this only include equipment costs or does it also include labor and things of that nature?

A It would include all costs. That is a turnkey price from a contractor.

Q The $1300 cost?

A Yes. And remember, that $1300 cost is really a cost difference between two scenarios. One in which they are upgrading their air conditioner from a 7 SEER to a 10 SEER, and the difference between that and changing out their gas furnace, a old 7 SEER air conditioner to an 11 SEER heat pump. So you wouldn't get a contractor's quote that says $1300. What you would have is one contractor's quote that says $3,000 for making the change versus the $1700 that it might cost you just to upgrade the air conditioning and the old gas furnace to a similar gas furnace.

COMMISSIONER JACOBS: Right. I thought I heard you say earlier it was about 3,000 to do the total upgrade, right?

WITNESS SPANGENBERG: Yes, sir, that's correct.

Q **(By Ms. Collins)** In response to one of Mr. Watson's questions you stated the total cost to be $3,000 to replace existing equipment. Are you then saying that the Good Cents Conversion Program would cause Gulf's customers to take a $200 incentive to spend $3,000 to replace a perfectly good operating air conditioning system?

A Yes, I am.

Q And why is that?

A Because of the benefits that they will get out of that replacement. They'll get a lower energy bill. Not only do they get a lower electric bill because they are now saving over thousand kilowatt-hours a year, they are also saving -- I forgot the exact cost, and it varies, but they are saving the gas bill that goes along with 302 therms of usage. Typically, they are also getting increased comfort and those type of things. They now also have a brand-new unit that's high efficiency. So there's a lot of other benefits that go with that. And so the $200 is there to help them make that decision and go with the higher efficiency equipment.

Q In your opinion, will the customers be willing to wait 13 years for payback of these benefits?

A Yes. Again, the 13 years is just the tangible benefits we have cited. In fact, we already saw 150 customers at least go into high efficiency equipment. Really 300 customers making a conversion last year without any incentives because they wanted some of the benefits that go with energy savings and with higher efficiency.

Q In your direct testimony on Page 9, Lines 14 through 16 --

A While I'm turning there, I might point out too, of course, we're not forcing customers to do this. If customers want that 13-year payback or their presumed payback with the other benefits they get, they can participate. And if the vast majority of our customers don't feel like that that's a good deal for them, then we won't hit the thousand units and we won't be paying out the rebates.

Q Once again, we were at Page 9 of your Direct Testimony, Lines 14 through 16. You testified that the proposed Good Cents Conversion Program was not designed simply as a sales tool for competing against natural gas.

In your opinion, does this program in any way cause electricity to compete with natural gas?

A Yes, it does. There's no question that any program that comes in with a higher efficiency, new technology, whatever it is, is going to compete with older, less efficient technology. So there is going to be a natural competitive effect that occurs here. Just like it's also going to have a natural competitive effect as we promote higher efficiency heat pumps, we're going to have a carryover effect from those who still have the old strip heat furnaces. They won't get a rebate, but we will have brough to their attention the benefits of a high efficiency heat pump and we'll get conversions there also from strip heat over to a heat pump. But there's no question there's a natural competitive effect.

Q Does Gulf currently have a program which gives away free electric water heaters to customers to replace existing natural gas water heaters?

A Yes, we do. I might add that that comes with the timer. There's a timer involved that has to come with that.

Q And when did this program begin?

A It began early, I believe, in 1998.

Q In your deposition you testified that one of this program's cost, that being the water heater program, had been recovered through the ECCR clause. Does your answer remain the same today?

A I don't believe that's a proper characterization of my answer there. That program was never designed to have any recovery through the ECCR.

And I don't think if you look now that you'd find any recovery through ECCR for a water heater conversion program.

Q Do you have a copy of your -- the transcript from your deposition? I would ask you to turn to Page 27, beginning at Line 5, ending on Line 8.

A Yes.

Q Would you please read that?

A "I guess I need to add something here. As part of an ECCR review audit, we may have found some errors where some --" I don't think the word is intended to be "order" -- "where some of the heating rebate monies may have inadvertently gotten charged to ECCR, we're in the process of reversing all of those. That was never intentional and I believe there's a separate docket going on that addresses that."

And I might add that error was later found to be very small and the corrections were made and it's were somebody put out a wrong account number.

COMMISSIONER DEASON: Was that as a result of an internal audit or was that the PSC auditors which found that?

WITNESS SPANGENBERG: I can't remember which found it first, Commissioner. I think Commission auditing may have found it first. But as it turns out, as the Commission auditors looked at it, we found through another process that our folks had already -- had found it also and were already in the process of making the correction.

Q **(By Ms. Collins)** Has any of this program's cost been recovered through base rates or surveillance purposes during 1998 or 1999?

A Yes.

Q Could you clarify for which years? For both years or one or the other?

A They were -- for surveillance purposes, I believe they were included in what we called the base rate of jurisdictional cost for 1999, but I don't believe they were for 1998.

Q Why for 1999 and not 1998?

A In 1998 as we launched the program we had looked at the balance of benefits to those and looked at where we should make the charges. And, basically, when we looked at the stockholder benefits, we wanted to move ahead and do the program, so we lost the program, if you will, on a pilot basis. And then as we began to look at the benefits that came from that to the ratepayers, we decided that in 1999, because it passed RIM test, was a good program, that there's no reason not to have it be included in base rates for surveillance purposes because it had benefits to the ratepayer. It had a positive or greater than 1.0 RIM. So we moved, we began at that point to make the charges jurisdictionally out of base rates for surveillance purposes.

Q What two appliances are the largest annual consumers of natural gas in the home?

A Based on the typical home that has gas appliances, if you assume that everything that could be gas is gas, the two largest would be a gas furnace and a water heater.

Q Therefore, if a customer were encouraged to participate in the Good Cents Conversion Program, how could the Commission be assured that Gulf was not also marketing the free electric water heater program to that same customer?

A I don't know that the Commission could be assured, nor do I know that they would need to be assured. We would be working with a customer who wants to change out a gas furnace to a high efficiency heat pump. We would work with them to do that. If as part of that they were aware of our water heater program, we might even mention it to them because of the positive benefits it would give to the customers and the benefits it would give to our ratepayers. We believe we have that obligation to the rest of our ratepayers to do those things that are cost-effective. And so at the same time we might also mention to them the availability of our water heater conversion program.

Q But then wouldn't that cause the two programs in combination to eliminate natural gas appliances?

A No, not necessarily. Oftentimes, we'll also find the customer has a gas range or gas dryer or gas fireplace. And if it did -- if that happened to be the only two, then, yes, those two have been removed. Our ratepayers have been benefitted and we kind of have to say so what if that removes the gas appliances in the home? The customer has been benefited. Our ratepayers have been benefited. It looks like a win-win game all the way around for what our interests should be.

Q In your deposition you testified that Gulf's Electric Water Heater Conversion Program encourages electricity to compete with natural gas. Does your answer remain the same today?

A I'm sorry, would you phrase that again to make sure I understood it properly, or say it again?

Q In your deposition you testified that Gulf's

Electric Water Heater Conversion Program encourages electricity to compete with natural gas. Does your answer remain the same today?

A Yes, it does.

Q Why do you believe the proposed Good Cents Conversion Program is consistent with the requirements of FEECA when it increases winter peak demand?

A I believe it's consistent because winter peak demand is not Gulf's peak demand. Gulf's peak demand is a summer demand. We're different from the rest of Florida in that regard. And I'd say largely because we have been successful in having heat pumps go in in Northwest Florida rather than resistant strip heat, which we see in the rest of Florida. That's what causes the winter peaking situation in the rest of Florida.

We have been very successful with energy efficiency through heat pumps. It has kept our winter demand much less than our summer demand. We do not plan additional generation based on a winter peak. We plan it based on a need to meet a summer peak. And I believe that's consistent with FEECA, because FEECA, particularly at the time it was passed, was trying to deal with need for new electric generating capacity in the state. And some of that generation, particularly in Peninsular Florida was being built to meet a winter peak. And you also had a scenario in that time frame when the cost of the new generation was much higher than the cost of embedded generation. Neither of those situations apply for Gulf Power today. That's why this program is good for Gulf Power.

COMMISSIONER JACOBS: You'd agree, though, that there are perhaps some benefits to be gained by balancing the use of gas with more efficiency in the heat pumps, wouldn't you?

WITNESS SPANGENBERG: Yes, sir, in terms of balance, I guess I would agree with you. I think it's particularly true if the gas consumption can help avoid new electrical generation in those areas of the state where that's the issue. And I wouldn't at all ever question that type of balance. But it's pretty clear from what we see in our planning requirements in Northwest Florida that as this program calculates out -- in our case, it's much more -- it's much better for our ratepayers, as shown by the cost-effectiveness calculations, to promote heat pumps in lieu of gas furnaces. That's why we have a concern with gas distributors in Northwest Florida who promote gas furnaces instead of heat pumps because, you know, that doesn't calculate out to be good for the citizens of

Florida.

COMMISSIONER JACOBS: In a instance where -- I guess you don't have probably this, but I'm thinking in an area where you'd have a lot of new construction, and there's an option to do something like a gas fireplace, you'd have to do a different analysis in that instance as opposed to an instance in this case where you were replacing old inefficient equipment. There you have pretty much a clean slate and you can look at how to best balance those two types of sources.

WITNESS SPANGENBERG: Yes, sir. You could look at those on a case-by-case basis, or really kind of a generic basis, and you could have a situation where, again, if some form of gas heating, whether it's a gas furnace or gas fire logs can indeed help defer new electrical generation, that might be a smart thing to do. We just don't see that scenario in Northwest Florida.

COMMISSIONER JACOBS: Thank you.

Q **(By Ms. Collins)** Does FEECA state in any way that increasing on-peak demand is okay?

A No, I don't believe it does. If I recall FEECA, what it says is, is one of the aims of FEECA is to reduce peak demand, and for Gulf Power Company, peak demand is our summer demand. And that's why we're very certain, of course, this program achieves that aim because as you see, a 1.9 kW reduction per participant at the meter -- of course, that's even higher at the generator -- there's no question that this program accomplishes that aim of FEECA.

Q I believe FEECA states seasonal peak demand, does that not mean just one season, not just the utility's one weather-sensitive peak, but also summer as well as winter?

A I'm sorry. Would you point that out to me? I have FEECA here in front of me.

Q Okay.

A I wouldn't want to admit to something if I wasn't sure that was the case. I know I have references to weather-sensitive peak demand and for Gulf that's certainly our summer demand.

Q I'm focussing particularly on the portion that reads "to reduce the growth rates of weather-sensitive peak demand." I guess my question was not clear. In your opinion, do you think that that means only one season; is it just summer, winter or both based on your interpretation of the statute?

A Well, my interpretation of the statute I think you take a plain reading. You take what is that utility's weather-sensitive peak demand. And that plain reading says that Gulf's weather-sensitive peak demand for us is a summer demand.

Q Are you aware of any other DSM programs approved by the Commission for ECCR recovery which increase seasonal peak demand?

A I'm sorry. You said any other one. I don't know that this one increases our weather-sensitive peak demand, but no I'm not.

Q Are you aware of any other -- excuse me. Are you aware of any DSM programs approved by the Commission for ECCR recovery which increase any peak demand?

A No, I'm not. Again, DSM programs are, as by definition -- are demand-side management programs and so they specifically target the utility's peak demand. So I'm not aware of the Commission having come across, or anyone else having filed, a program that would increase a demand; certainly not one that would increase, you know, weather-sensitive peak demand nor does this one increase our weather-sensitive peak demand.

Q You mentioned earlier to Commissioner Clark that Gulf's appliance sales operation does not sell whole-house HVAC units. Is there anything preventing

Gulf from selling these units in the future?

A No, I don't know of anything that would prevent us from doing that. Appliance sales is a common practice. You do get into some different skills when you start talking about whole-house stuff. Most of our appliance sales operations are basically -- I'll use the term "cash and carry." You can come in with your pickup truck or in the back seat of your car, you load up a window air contioner or you can have a range or refrigerator delivered to your home and it rolls in and it plugs in. It's that type of consumer-based or -- I guess a package-type of installation.

When you go to a heat pump system, a central HVAC heat pump system, you've got to think about the wiring in the home; you've got to usually redo the duct system. If you're replacing a gas furnace, again, there's patching up of the gas flues, and capping off gas pipelines and all that type of stuff. And it's just a very different operation.

I don't know of anything that legally precludes us from doing that, just like there's nothing that precludes us right now from selling refrigerators as long as we, you know, do the proper thing in terms of treating that as a separate business entity and keeping all those costs separated from our regulated business; just like there's gas companies in Northwest Florida that sell gas equipment, you know, and, again, hopefully they are keeping those books separated.

Q Doesn't Gulf sell electric water heaters through its appliance stores?

A Yes, we do.

MS. COLLINS: That's all we have. No further questions.

COMMISSIONER DEASON: Commissioners?

COMMISSIONER CLARK: I just wanted to clarify something. Did you answer the question that -- the Staff asked about demand-side management. I would like you to answer do you know of any other conservation program that we have approved but for ECCR recovery where it has the effect of increasing the demand in a particular season, even if that's not your peak demand time. Do you know of any program we've approved?

WITNESS SPANGENBERG: Commissioner, I do not. There are some programs where you might create some secondary peak demands. Any of your direct load control programs might focus on the peak demand, you know, that is your focus, what you're building generation for. And even a program like that, for instance, will add annual energy. So to the extent that it's -- everything else other than that peak time you are increasing some other demands, now whether that carries over to the next seasonal demand or whatever, I doubt it -- but there are clearly programs that this Commission has approved that look at reducing the company's peak demand, utility's peak than, and because of that, adds energy or adds hourly demands at other times.

COMMISSIONER CLARK: Okay. Thanks.

COMMISSIONER DEASON: Let me follow up. Does an increase in winter peak demand for Gulf Power increase Gulf Power's cost of providing service?

WITNESS SPANGENBERG: That's really one, Commissioner -- I'm not trying to be evasive -- but you really can't answer that yes or no. I could contrive you some scenarios where it would, and I can certainly contrive some where it would not. So there's not really a generic answer that can be given to that. A lot of that depends on each year, you know, what happens to be the marginal, you know, cost of generation at any particular hour.

On the whole, I would say no, there's no significant increase in the cost to Gulf's customers.

I think that's characterized very well by the RIM test that is used as part of this calculation. I think if it had created a cost on the company and the company's other ratepayers that was greater than the benefit to be derived, then you'd have a RIM calculation here that came out less than one.

COMMISSIONER DEASON: I have a question about the Participants' Test's and Page 7 of your Exhibit 1.

WITNESS SPANGENBERG: Yes, sir.

COMMISSIONER DEASON: I'm looking at Columns 2 and 3. Column 2 is the customer equipment cost and Column 3 is customer O&M cost. Can you explain to me what those represent and why the pattern exists as far as the magnitude of those amounts from year to year?

WITNESS SPANGENBERG: Yes, sir, I can. If you look, for instance, at 1999, we hoped we would have this program approved by mid-year so that our ratepayers could go ahead and capture benefits in 1999. So what you had there is assume that it got approved halfway through, there was 500 units in the program. You take those 500 units times $3,000 of installation cost, and so your customer equipment cost there comes out 1.5 million, or $3,000 per customer. The O&M costs, then, are largely the reduction in their energy bill, both their electric bill and their gas bill. Then as you step to Year 2, the 2000, that comes out 3,092 per customer rather than 3,000, because you have assumed some inflation in the equipment cost. So you have inflation. That's why those climb gradually; 3,092, 3,187, et cetera.

Going to the year 2004 where, again, you assume that's the last half of the year because it assumes, I guess, a full five-year program. And, again, in those customer O&M costs, as you have more customers who are now on line with this higher efficiency equipment, each year you have greater and greater energy cost savings, both in the electric bill because of the conservation of kilowatt-hours, and in the gas bill because of the conservation of gas cost.

COMMISSIONER DEASON: Okay. And you're assuming how many installations per year?

WITNESS SPANGENBERG: The first full year, year 2000, would be 1,000 installations. And I believe we keep that 1,000 for each of those years, 2000, 2001, '2 and '3, and then in year 2004 you have that other half of year that you didn't have in 1999. So you have, in effect, a full five years. You have the four full years and the half year on each end of it.

COMMISSIONER DEASON: So if we go to Column 12, the cumulative discounted net benefits do not turn positive for the program as a whole until year 2012, which is the 13th year.

WITNESS SPANGENBERG: Yes, sir. I think if you took --

COMMISSIONER DEASON: Well, just let me ask my questions, okay?

WITNESS SPANGENBERG: I'm sorry.

COMMISSIONER DEASON: Now, I think there were some questions that characterized that for a customer, that a customer would not see a benefit until the 13th year. But this is for the program as a whole. And my question is for just one customer, and if he's one of those initial 500 in the year 1999 he would see -- or she -- would see net benefits, positive benefits before the year 2012, would they not?

WITNESS SPANGENBERG: Yes, sir, they would. I may have misunderstood her question. I was looking at the program in a whole.

But, yes the individual payback -- and I don't know if we have that calculation -- I may be able to check and find that. Certainly for an individual customer that made the investment, their particular payback might be less than that. And that's why it so important, as I responded to Ms. Collins' question, it's important that each individual customer say "Okay. What is my scenario? What am I paying for my electricity? What am I paying for my gas? What is it going to cost me to make the conversion?" Their home may only be 2000. And it may be 4,000. And then look at my individual payback.

Typically, yes, we would expect the payback to be less than the 13 years that characterizes the program as a whole.

COMMISSIONER DEASON: Redirect.

MR. BADDERS: Yes, we have one question.

REDIRECT EXAMINATION

BY MR. BADDERS:

Q Earlier you were asked -- or actually you made the statement that replacing a gas furnace reaches optimal efficiency. Would you please explain why?

A Because if you look at the information that we filed here, there's no question that when you take out a gas furnace and replace it with a heat pump, not only have we saved annual kilowatt-hours, not only have we saved energy costs combining electricity and gas, we've also reduced ground source Btus for the state. And, therefore, that's why we feel certain this is good for the state. Not only is it good for our customers, for our company, but for the general public because we're getting a reduction in ground source Btus.

MR. BADDERS: Thank you. We have no further questions.

COMMISSIONER JACOBS: You've looked at the potential market for this, and you've determined that your projections for hookups per year is a reasonable projection?

WITNESS SPANGENBERG: Yes, sir, we have, Commissioner. If you look at -- there are several thousand every year of equipment changeouts that are occurring, and as we pointed out earlier, we're only getting a very few of those that are converting from, you know, gas furnaces to high efficiency heat pumps. So I have no doubt that when we properly implement this program, we can achieve these numbers.

COMMISSIONER JACOBS: Now, if I recall the maximum benefits will be obtained by a customer who has both the inefficient heat pump and the gas furnace; is that correct?

WITNESS SPANGENBERG: Yes, sir, I believe. And so we don't confuse terms, it's where the gas furnace and inefficient air conditioner that would go with that as kind of a combined package.

COMMISSIONER JACOBS: I understand.

WITNESS SPANGENBERG: Yes, that is where get the most benefit.

COMMISSIONER JACOBS: Do you have an idea of what portion of the population you're looking to convert fits that profile?

WITNESS SPANGENBERG: That's an excellent question, Commissioner.

No, I don't, not in terms of our entire population. We have 313,000 residential customers. We know that about 90,000 of those operate inefficient gas furnaces. Now, how many of those are going to be open to a change every year, you know, could be debateable and part of why we do marketing. But with a 90,000 population out there, we feel like there's some wonderful opportunities for the state of Florida in terms of rolling this program out.

COMMISSIONER JACOBS: Thank you.

COMMISSIONER DEASON: Exhibits?

MR. BADDERS: Yes. We'd like to move TSS-1 into the record.

COMMISSIONER DEASON: That's Exhibit 1. Without objection, Exhibit 1 is admitted.

MS. COLLINS: We'd like to move the Staff interrogatories into the record.

COMMISSIONER DEASON: That was Exhibit 2. Without objection, show then Exhibit 2 is admitted.

(Exhibits 1 and 2 received in evidence.)

We will take a 15-minute recess at this time.

(Brief recess taken.)

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COMMISSIONER DEASON: Call the hearing back to order. Mr. Watson.

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JOSEPH W. McCORMICK

was called as a witness on behalf of TECO Energy, Inc. and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. WATSON:

Q Would you state your name and business address?

A My name is Joseph W. McCormick. Business address is TECO Energy, Incorporated, P. O. Box 111, Tampa, Florida 33601.

Q What is your position with TECO Energy, Incorporated?

A I'm Director of Regulatory Policy Analysis.

Q Mr. McCormick, did you prefile Direct Testimony consisting of 11 pages in this docket to which you later filed a revised Page 1?

A Yes, I did.

Q Do you have any corrections to that testimony?

A Yes, I have one. On Page 9, Line 18, after the sentence that ends "or approximately 28%" insert the following, "To indicate the magnitude of the impact of the customer charge, I simply used the 74.2 cents per therm shown on Gulf's exhibit filed with its response to Staff's Interrogatory No. 7. Peoples Gas's actual average rate for 1998, however, was 72.74 cents per therm. When using the actual average rate the impact is 22.3 cents per therm or 31%."

Q Thank you. As corrected, do you adopt your prefiled testimony as your own for this proceeding today?

A I do.

MR. WATSON: Mr. Chairman, we would ask that Mr. McCormick's prefiled Direct Testimony as corrected be inserted into the record as though read.

COMMISSIONER DEASON: Without objection, it shall be so inserted.

Q **(By Mr. Watson)** Mr. McCormick, did you also prepare and prefile an exhibit entitled JWM-1?

A Yes, I did.

Q Do you have any corrections to make to that exhibit?

A No, I don't.

Q Tender the witness for -- oh, excuse me. Would you please summarize your testimony?

COMMISSIONER DEASON: Do you wish to have that exhibit identified?

MR. WATSON: Yes, please.

COMMISSIONER DEASON: That would be Exhibit 3. You may now summarize.

(Exhibit 3 marked for identification.)

Q. Please state your name and business address.

A. My name is Joseph W. McCormick. 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 TECO Energy, Inc. as Director of Regulatory Policy Analysis. My responsibilities include identification and analysis of emerging regulatory policy trends in Congress, in state legislatures and in federal and state administrative agencies, advising TECO Energy companies on potential impacts, and coordinating corporate responses.

Q. Please summarize your educational background and experience.

A. I hold a Bachelor of Science in Psychology from Viterbo College and a Master of Business Administration from the University of Wisconsin-LaCrosse. I served in the United States Army for five years, attaining the rank of Captain before being retired for service-related disability. After completing my degrees, I taught business and management at the University of Wisconsin-LaCrosse for two years. From 1981 to 1995, I served on the staff of the Florida Public Service Commission (Commission). From 1982 to 1986, I held various positions in the Commission's System Planning and Conservation group, including Planning and Research Economist, Economic Analyst and various supervisory roles in which I supervised energy analysts, economists and engineers. In those positions, I was involved in initial rulemaking to establish the Commission's Conservation Cost Recovery Cost Effectiveness Test. I also analyzed and supervised the analyses of electric and gas utility filings of proposed conservation plans and programs and made recommendations to the Commission regarding program approval. I participated in numerous rulemaking and other dockets regarding electric and gas utility energy conservation and demand side management activities, including establishment of conservation goals, review of electric utility ten-year site plans and Energy Conservation Cost Recovery Hearings. On behalf of the Commission, I testified on Florida energy conservation actions before the United States Congress House of Representatives Committee on Energy and served as technical advisor to the Florida Legislature on issues related to energy and energy code when requested to do so by the chairs of various legislative committees.

In 1986, I was appointed as Bureau Chief of the newly formed Bureau of Gas Regulation, and remained in that position until leaving the Commission in March 1995. As bureau chief, I was the staff person primarily responsible for all aspects of regulation of Florida's natural gas industry, including managing rate case proceedings, recommending regulatory policy to the Commission and overseeing energy conservation activities of the investor-owned natural gas utility industry. In that capacity, I supervised accountants, engineers and economists.

In March 1995, I was employed by Peoples Gas System, Inc. as Director of Regulatory Affairs. Since the acquisition of Peoples by TECO Energy, Inc., I have continued to be involved in regulatory matters in various capacities throughout the corporation.

Q. Do you have any exhibits to which you will refer in your testimony?

A. Yes. I have one composite exhibit, Exhibit No. ____ (JWM-1). The exhibit includes pertinent pages from several reference documents: 1. Air Conditioning and Refrigeration Institute (ARI) consumer information brochure: "Keep Your Cool and Save Cold Cash: Here are answers to 42 questions that consumers often ask the Air-Conditioning & Refrigeration Institute"; 2. 1999 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Handbook: Heating, Ventilating and Air-Conditioning Applications; 3. State of Florida Energy Efficiency Code for Building Construction, 1997 Edition; 4. Copy of Gulf's Water Heating Conversion materials for free water heater or $140 incentive; 5. Gulf's response to Staff Interrogatory No 18, and; 6. Gulf's response to Staff Interrogatory No. 7.

Q. Have you reviewed the Commission's Proposed Agency Action Order No. PSC-99-0684-FOF-EG, issued on April 7, 1999, and Gulf Power Company's (Gulf's) Petition for Formal Proceeding on Proposed Agency Action filed in this docket on April 28, 1999?

A. Yes, I have.

Q. Have you reviewed the direct testimony and Exhibit _/_ (TSS-1) submitted by Mr. Ted S. Spangenberg on July 22, 1999 in support of Gulf's petition?

A. Yes. I am familiar with Mr. Spangenberg's direct testimony and the exhibit he has sponsored on behalf of Gulf.

Q. Do you agree with the assumptions used by Gulf in analyzing the cost effectiveness of its proposed Good Cents Conversion Program?

A. No. There are several assumptions used by Gulf with which I disagree, and which – if corrected – would result in the program's failure to meet the Commission's tests for approval of the program for cost recovery through the energy conservation cost recovery ("ECCR") clause.

Q. Please identify the assumptions used by Gulf which you believe are incorrect.

A. First, the benefits of the proposed conversion program are overstated due to Gulf's assumed reductions in summer peak demand and annual kWh consumption resulting from replacing an electric air conditioning unit with an effective Seasonal Energy Efficiency Ratio ("SEER") of 7.0 with a heat pump with a SEER of 11.0.

Second, the benefits of the proposed conversion program are overstated due to the apparent lack of recognition in Gulf's analysis that the replacement heat pump's average life is only 15 years.

Third, Gulf's inclusion of the monthly customer charge in the average gas price used in its cost effectiveness analysis overstates the cost of gas used in that analysis.

Finally, Gulf's analysis assumes a decrease in summer peak demand. For reasons I will address later in my testimony, I believe approval of this program, when viewed in conjunction with other Gulf programs, will result in the replacement of additional gas appliances with electric appliances. This will diminish and perhaps entirely eliminate Gulf's calculated reduction in summer peak demand and further increase winter peak demand and annual energy consumption.

Q. Please explain why you disagree with Gulf's calculation of benefits under the proposed program based on reductions in summer peak demand and energy consumption attributable to the change in the SEERs of the involved equipment from an assumed 7.0 to an assumed 11.0.

A. As recognized by the Commission in its Order No. 99-0684-FOF-EG, whether or not Gulf implements its proposed conversion program, the heat pump installed by any customer in Gulf's service area as a replacement for an existing air conditioning unit must, under Florida's Energy Efficiency Code for Building Construction (Building Code), have a SEER of not less than 10.0. The Building Code adopts those standards to be consistent with the National Appliance Energy Conservation Act of 1987 (NAECA), which establishes the national minimum standard efficiency as 10.0 for heat pumps. (See Exhibit JWM-1, p. 10-12.)

Thus, any savings in summer peak demand (or in annual electric energy consumption) derived from a customer's conversion of these appliances is attributable not to Gulf's program, but to the Building Code. Gulf's analysis incorrectly includes all of the savings attributable to the change from an assumed 7.0 SEER air conditioning unit to an 11.0 SEER heat pump. The analysis should use in its assumptions only those savings associated with a change from a 10.0 SEER heat pump to a heat pump with a SEER of 11.0.

We believe Gulf's program will not so much cause the early replacement of old, inefficient heating and air conditioning equipment as it will cause replacement of non-electric heating systems with heat pumps at the end of the air conditioning system's normal useful life.

In its Petition for Formal Proceeding on Proposed Agency Action, Gulf says it "seeks a formal proceeding to show that residential customers are likely to replace functioning, though inefficient, existing equipment and not just equipment that fails." Gulf's own filings in this docket, however, indicate this program is designed only to replace systems near the end of their useful lives. In response to Staff's Interrogatory No. 18 (see Exhibit JWM-1, p. 16), Gulf stated: "The targeted program participants have existing equipment installations that are 10 to 15 years old." The ARI consumer brochure: How to Keep Your Cool and Save Cold Cash, (see Exhibit JWM-1, p. 1-7) gives the average useful life of a central air conditioning unit as 15 years and of a heat pump as 14 years. The 1999 ASHRAE Handbook Heating, Ventilating and Air-Conditioning Applications estimates the service of a residential central air-conditioning unit or heat pump as 15 years. (See Exhibit JWM-1, p. 8-9.) Gulf's proposed program is, therefore, targeted to replace existing electric air conditioners very nearly at the end of their normal useful lives. ARI states that "By 1994, the average SEER for all units shipped by manufacturers in the U. S. improved to 10.61 for central air conditioners and 10.94 for central heat pumps." For cooling load, which affects summer peak kW demand and kWh consumption, the analysis should then be limited to, at most, the difference between the SEER 10.0 and 11.0 cooling unit. Even that difference is conservative, based on the ARI data indicating that the average efficiency of all heat pumps shipped by manufacturers five years ago was a SEER of approximately 11.0.

On the heating side, Gulf's proposed program provides an incentive to discard non-electric heating systems coincident with the end of the electric air conditioning systems' normal useful lives. The proposed program would replace them with heat pumps that have back up resistance heating coils, adding significant winter peak demand and significant electric energy consumption for heating .

The Commission was correct in its order in stating:

> "... [I]n reality, Gulf's Program will capture only the demand and energy savings associated with upgrading from 10.0 SEER to 11.0 SEER. Based on this realistic assumption, Gulf estimates that the Program will decrease total summer peak demand by 1.5MW (0.3 kW per participant). Total annual energy consumption under this scenario, however is estimated to <u>increase</u> by 6950 MWh (1,390 kWh per participant). There would be no change in the forecasted winter peak demand increase under this scenario because it, like Gulf's base case assumption, requires the replacement of

a natural gas heating system with an electric heat pump." (Order PSC-99-0684-FOF-EG, page 3)

Q. Please explain why you disagree with Gulf's assumed 30-year life for the replacement heat pump envisioned by its conversion program.

A. I disagree with that assumption because ARI and ASHRAE data indicate the average life of a heat pump to be only 14 to15 years. Gulf has calculated the cost effectiveness of its proposed program using an average life of twice that indicated by ARI as useful life. If ARI's average life of the replacement heat pump is to be used, the cost effectiveness analysis must include a benefit stream of only 15 years. Correcting the cost effectiveness analysis in this way would significantly reduce the savings assumed by Gulf in its analysis.

Q. What is the impact on the cost effectiveness results calculated by Gulf for this program if the correct assumptions are used?

A. Gulf has provided these calculations. As shown on page 9 of Exhibit 1 (TSS-1), if the program life is reduced to 15 years, and the assumed change in the efficiency of the cooling equipment is correctly stated as increasing only from a 10.0 SEER to a SEER of 11.0, the proposed program fails both the Participant Test and the Total Resource Cost (TRC) Test with results of 0.80 and 0.75, respectively, both of which are well below the desired result of 1.0 or greater. This proposed program fails two of the three cost effectiveness tests. The RIM test result drops to 1.19. (Spangenberg Exhibit TSS-1, Page 9 of 9.) The positive RIM test result could be diminished or reversed if this program leads to the addition of electric load through replacement of additional gas appliances. It should, therefore, not be approved.

Q. Please explain how Gulf's inclusion of the monthly customer charge in the average gas price used in its cost effectiveness analysis overstates the cost of gas used in that analysis.

A. A natural gas utility's service rates include a monthly customer charge, which is a flat rate the customer pays regardless of the level of gas consumption during a given month, and a delivered rate per therm for gas actually consumed. We believe Gulf's analysis inappropriately includes the customer charge in its calculation of the average gas price of $0.95 per therm. The customer charge should not be included in the average gas price if the customer – after replacing its gas furnace with a heat pump as envisioned by Gulf – continues to use gas for any other appliances. If the customer charge is not included in the average cost of gas, the appropriate per-therm charge on Peoples' system would be $0.742 per therm as shown in Gulf's response to Staff's Interrogatory No. 7. (See Exhibit JWM-1, p. 17-18). Thus, at least as to customers on Peoples' system, Gulf's assumed average cost of gas overstates the cost of gas by about $0.21 per therm, or approximately 28 percent. *See Page 104A here for additional response.

Q. Please explain how Gulf's proposed program could bring about conversion of other gas appliances from gas to electric and how that would diminish or eliminate Gulf's calculated reduction in summer peak demand and could, in fact, increase summer peak demand.

*Insert after "28 percent" on Line 18, Page 104 of prefiled testimony:

"To indicate the magnitude of the impact of the customer charge, I simply used the 74.2 cents per therm shown on Gulf's exhibit filed with its response to Staff's Interrogatory No. 7. Peoples Gas's actual average rate for 1998, however, was 72.74 cents per therm. When using the actual average rate the impact is 22.3 cents per therm or 31%."

A. If Gulf's proposed program causes the removal of the existing gas furnace, the effective per-therm cost of gas for remaining appliances increases. This results from the fixed monthly customer charge ($7 per month in Peoples' service territory) being spread over a smaller number of therms. The resulting higher unit cost of gas creates a significant likelihood that the customer will replace additional gas appliances with electric ones.

Adding to the likelihood of conversion of other appliances, Gulf currently has a program which gives a customer a free electric resistance water heater (including a timer) if it will replace an existing gas water heater (or provides a $140 rebate). (See Exhibit JWM-1, p. 13-15). Addition of the demand requirements of the electric resistance water heater (and ultimately the additional electricity required if any other gas appliances are replaced with electric ones) will offset the slim 0.3 kW per participant reduction in summer peak demand which Gulf has calculated as savings associated with conversion of 10.0 SEER cooling equipment to equipment with an 11.0 SEER. Replacement of gas water heaters with electric ones will also further increase Gulf's calculated 4.4 kW increase in its winter peak demand and kWh consumption attributable to this proposed program.

Q. Do you believe the Commission should approve Gulf's proposed program for recovery of the program costs through the ECCR clause?

A. No. Peoples believes that if input assumptions are changed to reflect the average life of heating and cooling equipment and the Building Code equipment efficiency requirements (SEER 10.0) are used to calculate demand and energy changes, Gulf's proposed program fails both the Participant Test and the TRC Test.

The proposed program increases weather sensitive peak demand in the winter, increases annual kWh consumption, and, at best, minimally decreases summer peak demand. When viewed in conjunction with Gulf's water heater program, this proposed program may, in fact, increase summer demand. The proposed program, therefore, appears to violate all Florida Energy Efficiency and Conservation Act (FEECA) requirements.

Regardless of whether summer peak demand increases with further increases in kWh consumption in the event all gas appliances are replaced, this proposed program would undeniably increase winter peak demand and annual kWh consumption. The Commission must consider that, absent this proposed program, the additional of 4.4 kW of winter peak demand per participating customer (22 MW total system) would not exist. Stated conversely, if the Commission approves this program, it will result in a 22 MW increase in winter peak demand and significantly increased electricity consumption that would not otherwise occur absent the program. Approval of the proposed program would be inconsistent with the plain language contained in the FEECA. The Commission, therefore, should not approve Gulf's proposed program.

Q. Does this conclude your testimony?

A. Yes.

A My prefiled testimony shows that the Commission should, once again, deny Gulf's proposed program based on several interrelated points. These points taken together indicate that Gulf's evaluation of the program's cost-effectiveness is questionable, and that the program does not meet the objectives of the Florida Energy Efficiency and Conservation Act, or FEECA.

My testimony supports the Commission's original decision to deny approval of the program for cost recovery through the Energy Conservation Cost Recovery Clause.

Gulf believes the program qualifies for cost recovery since it believes the program meets the Commission's cost-effectiveness test. However, Peoples believes Gulf has overstated the programs cost-effectiveness, and that if it is determined to be cost-effective, this program is still not appropriate.

First, Gulf credits this program with causing customers to replace a combination of older, less efficient air conditioners, having an average seasonal energy efficiency rating, or SEER, of 7, 0 and existing combustion furnaces with new electric heat having a SEER of 11.

Most of the credit for that efficiency gain should go for the state's building code, the Florida Energy Efficiency Codes for building and construction and to the National Energy Efficiency Standards, which require air conditioning equipment to be at least 10.0 SEER.

American Refrigerator, or ARI data -- American Refrigeration Institute, ARI, data show that five years ago, in 1994, the average efficiency of heat pumps being shipped by manufacturers was 10.94. So the rest of the credit should go to the market, leaving the true benefit of this program at nearly zero.

The equipment Gulf has targeted for replacement is 10 to 15 years old, or near the average age of replacement of air conditioners. According to data made available to the public by both the ARI and the American Society of Heating Refrigerating and Air Conditioning Engineers, al known as ASHRAE.

So Gulf's program is designed to provide incentives to customers who would be replacing aging electric cooling equipment anyway. At the same time it needlessly replaces functioning gas furnaces.

The program directly causes an unnecessary increase in both weather-sensitive winter peak electric demand and an annual electricity consumption beyond that which would be required to serve only air conditioning load.

Second, Gulf has assumed 30-year benefit stream for this program, although according to ARI and ASHRAE, heat pumps have an average life of 15 years.

Third, Gulf has overstated the gas rate paid by Peoples customers which overstates the Participants' Test result in People's service territory.

Finally, this proposed program will not operate in isolation but in conjunction with Gulf's non-ECCR programs. The Commission, therefore, should not consider the proposed program's approval in isolation.

If approved and successfully implemented by Gulf Power, this program will cause a removal of a gas furnace from the homes of Peoples Gas customers.

Peoples has a monthly service charge of $7 a month. Without on furnace, the monthly service charge will be spread over fewer therms, effectively increasing the price per therm.

If the only other appliance in the house, gas appliance, is a water heater, and customers could remove their gas water heater and replace it with an electric resistance water heater, they might choose to do so except for the cost of replacement. This would completely remove gas from the home.

Gulf operates a program to replace gas water heaters with electric resistance water heaters at little or no cost to the customer. The Commission should consider the effect of the two programs together because they will, in reality, function together to remove gas from customer's homes and increase reliance on electricity.

In my testimony I assert that Gulf's proposed program does not meet the standards of FEECA. This proposed program considered alone needlessly increases winter-sensitive winter peak demand by causing the removal of functioning natural gas furnaces.

Gas furnaces place no demand on the electric system except for a small fan load. By Gulf's own analysis, the program causes an increase to winter peak demand of 4.4 kW for participating customer.

The program also increases annual electricity consumption beyond that which would occur if customers simply replaced their old SEER 7 air conditioners with new air conditioners of average market efficiency at the average expected age of replacement.

According to the ARI data again, the average SEER of air conditioners shipped by manufacturers in 1994 was 10.61. As mentioned earlier, the average life or average age of replace -- at replacement of central air conditioners built in the 1970s and 1980s was 15 years.

If Gulf's program causes customers to remove their gas furnaces, and the resulting increase in the per-unit cost of gas resulting from Peoples' $7 per-month customer charge being spread over fewer therms causes additional or all gas appliances to be removed, which Peoples believes is likely, the end result will be additional increases to electric peak demands, both winter and summer, and increases to annual electric consumption.

When considered in conjunction with Gulf Power's existing program to replace gas water heaters with electric resistance models, the likelihood of such an event -- such an end result appears almost certain.

For these reasons, whether or not this program is calculated to be cost-effective it is inconsistent with the requirements, and certainly with the spirit of FEECA and should not be approved. Peoples urges the Commission to reaffirm its earlier decision to deny the approval.

This completes my summary.

MR. WATSON: Tender the witness for cross, and subject to cross examination, move the admission of Exhibit 3.

COMMISSIONER DEASON: Okay. I'll take up your motion after the conclusion of cross examination to move the exhibit.

Gulf.

CROSS EXAMINATION

BY MR. BADDERS:

Q Good morning, Mr. McCormick. Actually, I can't see you so I can't maintain eye contact.

A Let me move over one.

(Witness McCormick changes seats.)

Q Thank you.

Please turn to Page 9 of your testimony.

A Yes. I'm there.

Q At Page 9 of your testimony you indicate your opinion that Gulf's Cost-Effectiveness Analysis overstates the cost of gas; is that correct?

A For Peoples Gas customers, yes, that's correct.

Q And your basis is because it includes a monthly customer charge?

A I didn't know what it included. It was simply 95 cents per therm shown on the spreadsheet that Gulf had attached, and our rate is not 95 cents. I didn't know what was included in the 95 cents.

Q Okay. But you were not -- Peoples is not the only gas utility who serves customers in Gulf's service territory is it?

A No. My response was only with Peoples Gas price.

Q Okay. Thank you.

Looking at the same page you discuss a Table of Equipment Service Life.

A I'm sorry, I didn't hear the --

Q At Page 9 you discuss -- actually it's Page 9 of your exhibit you have a Table of Equipment Life?

A Yes.

Q And this table is the basis for the 15-year service life that you reference in your testimony, correct?

A Yes, it is. I think there's some confusion. Because I'm not an engineer, I think I picked up a term of art and used it incorrectly. And I think there's a lot of testimony about that issue.

The term that I was referring to in the

service life of appliances is the average age of replacement or the average service life of an appliance, and that's what is represented in the ARI table, or the ASHRAE, whichever one you are referring to there.

Q Okay. Actually this table is based on a survey that was conducted in 1986, wasn't it?

A Yes.

Q And that survey used units that were manufactured during the 1970s and 1980s?

A Yes. It was the latest data that I found.

Q If you turn to Page 2 of your exhibit, it's the ARI Q-and-A, No. 5.

A Yes.

Q Doesn't this question answer indicate that units newer than those installed in the 1970s and '80s were expected to last even longer that the 15 years --

A Yes. But they didn't give an expectation.

Q Okay. But it's longer?

A Yes.

Q I think it would be reasonable to expect that HVAC systems being installed today would have a life expectency or -- a service life well in excess of 15 years?

A I think the ARI statement would be interpreted that way, yes.

Q Does Peoples Gas offer any rebates to customers for replacement of electric heating equipment with natural gas fueled equipment?

A Yes, we do.

Q And you receive ECCR dollars for those programs?

A Yes. Those are to replace electric resistance heating.

Q Okay. Can I have just a second?

(Pause)

Under these programs, you do pay rebates to replace heat pumps with a gas furnace?

A No, we do not.

Q You do not.

A No.

Q Are you familiar with the Builder Program?

A Yes.

Q In that program do you pay rebates for that, for the replacement of heat pumps with a gas furnace?

A There's no replacement in the Builder Program. There are incentives to the home builder to use gas appliances in the home as initially installed appliances. There's no replacement involved.

Q But it would replace what would have

otherwise gone in?
A You can't replace something that doesn't exist. It would go in in place of a different appliance, yes.
Q Okay.
MR. BADDERS: We have no further questions.
COMMISSIONER DEASON: Staff.
MS. COLLINS: We have no questions.
COMMISSIONER DEASON: Commissioners.
COMMISSIONER CLARK: Mr. Chairman, I have two questions, but they are questions regarding Mr. Spangenberg's rebuttal testimony that I wanted Mr. McCormick to respond to. And I guess I would ask Gulf Power if that would be appropriate and give Mr. Spangenberg, when he gets back on the stand, the opportunity to respond.
MR. BADDERS: That would be fine.
COMMISSIONER CLARK: And I'll be happy to tell you what they are.
I wanted Joe to respond to the change from 3,000 to 1,300 on Page 7, I think, of the Rebuttal Testimony.
I guess I would ask you to comment on that change with respect to the equipment cost.
WITNESS McCORMICK: The dollars are real but

it seems that the difference in the 1300 has more to do with the increase in the electric efficiency side and is more of an electric-to-an-electric allowance. The customer is still going to face a $3,000 cost to change out their system, and that whole decision process is more or less one decision process.

Give me just a moment to think about an analogy as to how that plays out.

COMMISSIONER CLARK: Well, do you understand this to be relevant to the Participants' Test?

WITNESS McCORMICK: Yes. But -- yes. But when you're looking at the RIM test, I believe, all of those costs go in there also, and that would be subject to clarification by Mr. Spangenberg.

It would be hard to tell where in the decision process the customer makes the decision to go from a SEER 10 air conditioner, leaving their gas furnace in place, and where they are influenced by the decision to go to an 11 SEER or higher heat pump. And I think it would always be questionable whether that was a customer's call or whether the incentive was paid. And you're looking at just that portion, that incremental portion of the $1300, or whether the entire customer's decision was based on the incentive and under Gulf's program, and replaced the whole system all at once.

It's a situation we have if we were going to replace a -- if a utility has a program in which they replace a heat pump but not electric resistance heat, and the customer said, "Well, I'm going to replace my old broken heat pump. I'm just going to put in strip heat." So instead, the utility goes in and gives an incentive for a heat pump. That would not be appropriate because you're replacing heat pump with heat pump. I think it becomes difficult to find where the decision process is made and I don't think the $1300 is the appropriate amount to calculate.

COMMISSIONER CLARK: With respect to Page 14 where Mr. Spangenberg indicates that he thinks the savings would be greater in Northwest Florida than New Jersey, Ohio and Illinois because of their heat pumps' higher average heating efficiency. Do you agree with that observation?

WITNESS McCORMICK: That heat pumps in Florida would have a higher operating efficiency than they would on a national average. I agree with that piece, yes.

COMMISSIONER CLARK: Okay.

WITNESS McCORMICK: There's another portion that says gas furnaces would have a lower efficiency.

I believe that's based upon assumptions of sizing of gas furnaces that are -- are not correct.

Gas furnaces are sized appropriately to Florida's loads now. They were not several years ago. But they are now sized appropriately. So I think the efficiency of gas appliances is not lower than would be reported by GAMA. GAMA is the Gas Appliance Manufacturers Association.

COMMISSIONER CLARK: Thank you.

COMMISSIONER JACOBS: I have a brief question. If I understand your line of reasoning, part of the driving factor in replacement of the gas water heaters is that the price of gas would be escalating, and ultimately result in a very logical decision by the customer to replace that; is that correct?

WITNESS McCORMICK: The application of the $7-a-month customer charge across fewer therm sales, on an annual basis, if you removed the furnace, your effective rate per therm -- or price per therm is going to go up. And, therefore, I think the customer will look at -- if you have only a gas water heater left, that whole $7 customer charge goes to that water heater every month, and makes your effective per unit cost of fuel for the water heater more expensive, and, therefore, you would look at replacing that, especially when you can get another one for free.

COMMISSIONER JACOBS: And the overall effectiveness -- the overall impact on cost-effectiveness would be?

WITNESS McCORMICK: The overall cost-effectiveness on Gulf's customers has to take into account that an electric water heater is going to increase summer peak, winter peak and annual energy usage, even if the water heater has a timer on it. The timers are only as good as the last time they were set. And as soon as they are off for whatever reason, outages or whatever, the electric water heater will put a summer demand on the electric system. And so that's not calculated anywhere in the cost-effectiveness. We don't have any numbers calculated in the cost-effectiveness of a water heater changeout program.

COMMISSIONER JACOBS: I see. Thank you.

COMMISSIONER DEASON: Redirect. I'm sorry -- I'm looking at the wrong individual. Redirect.

MR. WATSON: I have no redirect and we move the admission of Exhibit 3.

COMMISSIONER DEASON: Without objection,

Exhibit 3 is admitted.

(Exhibit 3 received.)

Thank you, Mr. McCormick. You may be excused.

Gulf.

(Witness McCormick excused.)

- - - - -

MR. BADDERS: We'd like to call our next witness; that would be David Shell.

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DAVID A. SHELL

was called as a rebuttal witness on behalf of Gulf Power Company and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. BADDERS:

Q Mr. Shell, have you been sworn?

A Yes, sir, I have.

Q Please state your name and your business address for the record.

A My name is David A. Shell. My business address is One Energy Place, Pensacola, Florida 32520.

Q Are you the same David Shell who prefiled 15 pages of Rebuttal Testimony?

A Yes, sir, I am.

Q Do you have any changes or corrections to that testimony?

A No, I don't.

Q If I were to ask you the same questions today, would your answers be the same?

A Yes, sir.

MR. BADDERS: We ask that the prefiled testimony of David Shell be inserted into the record as though read.

COMMISSIONER DEASON: Without objection, it shall be so inserted.

Q **(By Mr. Badders)** Mr. Shell, did you have one exhibit attached to your testimony?

A Yes, sir, I did.

Q Do you have any changes or corrections to that exhibit?

A No.

MR. BADDERS: We ask that that exhibit be identified for record, please.

COMMISSIONER DEASON: It shall be identified as Exhibit 4.

(Exhibit 4 marked for identification.)

Gulf Power Company

Before the Florida Public Service Commission
Rebuttal Testimony of
David A. Shell
Docket No. 981591-EG
Date of Filing: August 26, 1999

Q. Please state your name, business address, and occupation.

A. My name is David A. Shell. My business address is One Energy Place, Pensacola, Florida 32520. I am employed by Gulf Power Company as a Residential Market Specialist.

Q. Please describe your background, job responsibilities and experience.

A. I have a Bachelor's degree in Marketing from the University of West Florida. I have been employed by Gulf Power Company for 12 years during which time I have held positions working with residential customers; heating, ventilation, and air conditioning (HVAC) contractors; home builders; and others dealing with energy conservation, home comfort, and efficiency. During my career I have received a substantial amount of training including the following: heating and cooling system operation and diagnostics; residential load calculation; commercial load calculation; HVAC equipment selection; HVAC duct design; and HVAC performance testing. I have spent considerable time working with HVAC contractors to insure proper HVAC equipment sizing, selection, and operation for our common customers. I have often been called upon by these contractors to provide technical assistance in resolving problems related to HVAC equipment performance, durability, efficiency and homeowner comfort. In my current position as Residential Market Specialist I am responsible for program planning and implementation as well as support of Gulf Power Company's Residential Energy Consultants working with Gulf's residential customers, HVAC contractors and builders. I regularly provide technical assistance to these groups and individuals.

Q. Do you have any exhibits to include with your testimony?

A. Yes. I have one exhibit, Exhibit No. 4 (DAS-1). This exhibit contains the following:

1. Survey of Residential Air-to-Air Heat Pump Service Life and Maintenance Issues referred to herein as the Easton study.
2. A Study of Heat Pump Service Life referred to herein as the Hiller and Lovvorn study.
3. Presentation of a method for modeling HVAC units

in service and failure probability by age.

Q. Have you reviewed the direct testimony and Exhibit JWM-1 submitted by Mr. Joseph W. McCormick on August 5, 1999 on behalf of Peoples Gas System?

A. Yes, I have.

Q. What is the purpose of your testimony in this docket?

A. The purpose of my testimony is to provide information that will show that the positions taken in Mr. McCormick's testimony with respect to HVAC systems are flawed. Specifically, I find fault with Mr. McCormick's reliance on the HVAC service life information taken from the ASHRAE and ARI sources discussed in his testimony. It appears that he also believes "service life", as presented by the ASHRAE table, to be the same as "useful life" or functional life.

Q. Please describe the terms "HVAC" and "HVAC system" as you will use them in your testimony.

A. For the purposes of my testimony, the use of the term "HVAC" or "HVAC system" will refer to a "split system" central air conditioner and combustion furnace combination or heat pump utilizing an outdoor, air-to-air condenser or heat exchanger. These are, by far, the most common types of systems utilized for heating and cooling residential dwellings in Northwest Florida.

Q. Would you please discuss why you disagree with Mr. McCormick's interpretation and application of ASHRAE information on HVAC service life?

A. Mr. McCormick relies upon the ASHRAE table contained on Exhibit JWM-1, page 9 to support the use of 15 year HVAC service life. The ASHRAE table understates actual service life for HVAC systems in that time period because the table represents a compromise by a committee divided over two studies.

- The first of these, the Easton study (referenced by the table), was seriously flawed and proposed a point estimate for heat pump service life of 12 years. The Easton study utilized simply a survey of HVAC dealers which queried, through telephone interviews, the age of units removed for any reason, including energy costs, remodeling, etc., not just those that had experienced debilitating mechanical failure. This inclusion of all units, including those removed for operating cost reasons during a period of rapidly increasing energy costs, in addition to the failure to consider units still in service, caused the Easton study to greatly understate useful life. It estimated the average age of units removed from service based on dealer opinions without considering the age of units still in service. It was replete with significant bias in that the data, the interview responses, were only as good as the information the interviewees encountered and how well they absorbed and processed it subconsciously.

- The second, the Hiller and Lovvorn study (also referenced by the table) of 1984, provides much more credible data based upon actual heat pump installations, not opinions. This study tracked the history of 1,689 specific units installed in Alabama from 1964 to 1974 and indicates a median service life of approximately 20 years. In support of this determination, Hiller and Lovvorn noted two key elements in their conclusion. The first was that "A large percentage of the original known heat pump sample are still in operation, with more than 50% of the units 20 years old still in active use, 75% of the units 15 years old, and nearly 100% for units 10 years old." And second, they found that nearly 50% of the relatively small number of units that were replaced were still <u>fully operational</u> at the time of replacement. They went on to say "Such replacements appear to have been motivated both by the perception of expected life, and by marketing and promotional efforts of dealer/contractors and the local utility." Pages 17 through 23 of Exhibit DAS-1 contain a copy of the Hiller and Lovvorn study.

The ASHRAE table, in addition to the previous flaw noted, understates service life for systems in Northwest Florida because it provides data (flawed as it is) for intended application to HVAC systems in service nation-wide. Whereas:

- The NW Florida climate is milder than the national average.
- National average wider temperature extremes exact a harsher toll on compressors (including straight a/c compressors), solenoids, condenser coils, joints, fittings, outdoor electronic controls, etc.
- HVAC systems operating in Northwest Florida can reasonably be expected to have a service life that is somewhat greater than the national average.

The ASHRAE table also understates service life for systems being installed from 1985-1990, and in 2000 and beyond. In other words, it is out of date.

- The studies on which the table is based analyzed actual units manufactured between 1964 and 1974 and the opinions of HVAC dealers in 1985.
- HVAC manufacturers have been continuously improving service life in addition to efficiency. ARI statements included in Mr. McCormick's exhibit support this. On page 2 of Mr. McCormick's Exhibit JWM-1, the ARI Q&A #5 states that "Newer units [than those built in the 1970's and 1980's] are expected to last even longer."
- A reasonable estimation of the general trend in these improvements would indicate a 10% longer service life for units manufactured from 1985-1990, compared to the population of units used for the preparation of the table.
- The general trend in these improvements would also indicate an even longer expected service life for units manufactured in 2000 and beyond compared to the population of units used for the preparation of the table.

Q. Would you please discuss why the ARI source should not be relied on for determining HVAC service life?

A. The ARI Q&A #5 that references a 14 year life was not, according to Dave Martz, ARI Vice President of

Administration and Statistics, recent information and was most likely based upon an informal survey of ARI members. It is ARI's own position that this equipment life study is old and based upon non-scientific data.

Q. What errors are introduced in Mr. McCormick's testimony by the use of "service" life from the ASHRAE table or the ARI reference as the "normal useful life?"

A. "Service life", as reported by these dated industry sources, was the age at which 50% of the units had been removed from service for <u>any</u> reason. While, in many instances, that reason would have been major mechanical failure, in many other instances the unit would have been replaced due to a desire on the part of the homeowner for lower energy costs via higher efficiency equipment, a need for more or less capacity due to remodeling or thermal envelope improvements, or even unexpected unit damage (as opposed to "failure") due to such events as lightning. Replacements due to energy cost concerns were particularly prevalent during the period relevant to the studies as this was the time when the energy industry was experiencing as much as double digit percentage increases in energy costs each year. In all of these instances the units were replaced for reasons other than an expected actuarial-type failure and for reasons other than an expectation that the unit would be failing in the very near future. Mr. McCormick's misuse or oversight of this aspect of the definition of service life as presented by the table invalidates his conclusions.

Q. What length of expected service life for an HVAC system should be used in lieu of the 15-year life proposed by Mr. McCormick?

A. For HVAC systems manufactured during 1985-1990 and installed and utilized in Northwest Florida, the 20-year median service life found in the Hiller and Lovvorn study provides the best starting point. That 20 years can be increased by 10% as noted earlier for the improvement in service life over time from the vintage of HVAC systems studied by Hiller and Lovvorn versus those produced in the late 1980's. While the expected service life could be further increased for applications in Northwest Florida versus the climates considered by Hiller and Lovvorn, I disregarded this factor in order to maintain a clear element of conservatism with respect to this issue. The 10% increase for this later vintage, when applied to 20 years, yields an expected service life of 22 years for units manufactured in the late 1980's. For HVAC systems currently being manufactured, installed, and utilized in Northwest Florida, the 20-year median service life found in the Hiller and Lovvorn study should be increased by 15% for the improvement in service life over time and the same nominal 5% for applications in Northwest Florida versus the climates considered by Hiller and Lovvorn. This total of a 20% increase, when applied to 20 years, yields an expected service life of 24 years for units currently being manufactured. However, to be conservative in service life assumptions, the 22 years could be utilized for all considerations in this particular proceeding.

Q. How has Mr. McCormick's dependence on the ASHRAE and ARI service life information misguided the positions presented in his testimony?

A. First, it is apparent that Mr. McCormick's presumption of a 15-year <u>service</u> life is the basis for his position that the 10 to 15 year old units targeted by Gulf's proposed program are effectively at the end of their "normal useful life." When the proper definition of "service life" and the much more accurate service life figure of 22 years are considered, his position that they would otherwise be replaced at the same time absent this program is totally without merit. In the year 2000, the systems manufactured and installed in 1985 would have only a 5.0% probability of failure within the following 12 months, as indicated on page 24 of Exhibit DAS-1. With a probability of short term failure this low, customers with this vintage equipment contemplating participation in Gulf's proposed program would not reasonably consider their HVAC system to be at or near the end of its "normal useful life." Similarly, a customer with a system installed in 1990 would have only a 4.0% probability of system failure within the following 12 months and, again, would not reasonably consider their system to be worn out. That's a perspective of the two ends of the spectrum of the 10-15 year age, with all unit vintages in between falling between these two probabilities. Naturally, the continuing improvement in service life would continue for this program's application in 2001, 2002, etc., with the associated decreases in the probabilities of failure. Next, Mr. McCormick's flawed presumption of a 15 year useful life appears to be the basis for his position that Gulf's program analysis period should be limited to 15 years. This clearly would not be a responsible limitation. Any program evaluation for Northwest Florida that is utilizing new-unit HVAC service life as an analysis parameter in any fashion should, with ample conservatism, use an expected service life of 22 years. Any use of a service life less than 22 years is being unreasonably conservative and any life significantly less than that, such as the 15 years proposed by Mr. McCormick, is seriously and erroneously understating the capabilities of today's HVAC systems operating in Northwest Florida's climate.

Q. Would you please explain the development and application of page 24 of Exhibit DAS-1 as referenced in your testimony?

A. That page contains a chart which depicts the creation of a simple linear model that can be used to calculate the portion of HVAC units of a certain vintage that could be expected to remain functional at various ages or years in service. The model development began by taking a plot of the data from the Hiller and Lovvorn study and expanding it for a median service life of 22 years as previously explained. That yielded the "Expected results" line of the chart. The "Expected results" line was then modeled as closely as possible, by the dashed straight line labeled "Modeled results". The depiction of the Hiller and Lovvorn based data with the straight lines allows simple calculations of expected HVAC populations and failure probabilities by vintage with excellent accuracy, particularly in the range of 10 years to 34 years of life. In that range, it is reasonable to expect that, for any particular vintage, approximately 3.8% of the original units would fail during each year. At any particular age for that vintage, the probability of a unit failing during a 12 month period is simply the 3.8% expected to fail divided by the percentage of the original units still in service at that time.

Q. Is this model usable for unit ages less than 10 years old or greater than 33 years?

A. No, it is not. In these ranges of unit life the straight line approximation, the "modeled results", is not a close enough fit to the observed data, i.e. the "expected results", to be useful. As an example, at age 34 the model would indicate a 100% probability of failure within the next 12 months, however, from a purely statistical approach that expectation is unreasonable. In the qualified range of 10 to 33 years, however, the model provides an excellent match to observed data and the probabilities it yields are the best available.

Q. Could this same modeling method be used to determine the expected probabilities of failure for HVAC units if a 15-year service life is presumed?

A. Again, the presumption of a 15-year service life or utilization of service life for useful life is, in and of itself, not at all responsible. However, if it is presumed, albeit erroneously, this same modeling approach can be used. This is done by, once again, setting the departure point from 100% in service point at 9 years, the 50% in service point at 15 years, and the 0% in service point at 21 years. In this case, the model will be reasonably accurate in the range of 10 to 19 years. Using the same modeling process and calculations as before, the 12-month probability of failure for a 10-year old unit will be 8.3%, and for a 15-year old unit the probability would be 16.7%.

Logically, for a 15-year service life the beginning departure point from 100% in service could be set at less than 9 years, e.g. 8 years, with a correspondingly longer time to reach 0% in service, but this would produce even smaller probabilities for failure within 12-months than the figures given above. Once again, we have chosen the more conservative approach.

Based on my experience of actually working with residential customers in their considerations of the health of their current HVAC system, these probabilities would still not point to a reasonable conclusion that their unit was at or near the end of its "normal useful life."

Q. In your past years of field experience have you had occasion to observe the equipment replacement decisions of customers, who, having once made a significant change in their HVAC equipment, years later experience the failure of that equipment?

A. Yes, I have. The vast majority of these customers, after having experienced the energy economies and enhanced comfort of a high-efficiency heat pump, choose to replace that heat pump with the latest and greatest high-efficiency heat pump at that time rather than revert back to their former type of equipment.

Q. Does that conclude your testimony?

A. Yes, it does.

Q **(By Mr. Badders)** Please summarize your testimony?

A Yes, thank you.

The positions taken in the Intervenors' testimony with respect to HVAC systems are flawed and have resulted in improper conclusions about the service life, and, therefore, the efficiencies that should be utilized in the analyses of this program.

The Intervenor relies on HVAC service life information taken from a ASHRAE source, and applies this data to installations in Northwest Florida.

The ASHRAE Table understates actual service life for HVAC systems during the study period because of a compromise by a committee divided over two studies. The Easton Study, which utilized the telephone survey of HVAC dealer opinions, was seriously flawed. This study greatly understated useful life of equipment because its service life estimate of 12 years assumed that all equipment replacement was due to mechanical failure.

In actuality, this study failed to recognize other reasons for equipment replacement, including remodeling activity and operating costs during a period of rapidly increasing energy costs.

Conversely, the Hiller and Lovvorn Study provides the best service data available. This study is based upon actual heat pump installations, not opinions, and indicates a median service life of approximately 20 years.

The ASHRAE Table further understates service life for HVAC systems in use in Northwest Florida because the data is based upon a nationwide study. The Northwest Florida climate is milder than the national average, and equipment should be expected to yield a longer service life in this climate than in the more extreme environments that make up the national average.

In addition, the studies on which the ASHRAE tables are based are out of date. HVAC manufacturers have been continuously improving service life and efficiency, which would indicate longer equipment service life for units manufactured in late 1980s and even into the future.

The gas company also makes the assumption that service life, as presented by the ASHRAE Table, is the same as useful life or functional life. However, replacement due to reasons other than failure, or the expectation of failure, is a significant component of the ASHRAE Table in its calculation of service life.

This fact has been ignored or overlooked into the Intervenors' interpretation, and has resulted in a significant understatement of the actual service life.

The Hiller and Lovvorn Study is the best starting point for determining the service life for systems utilized in Northwest Florida. This study found a 20-year median service life for installations occurring in the state of Alabama from 1964 to 1974. Significant improvements in technology and service by manufacturers for units built in the late 1980s through today have led us to the conclusion that a 22-year service life is a very reasonable and conservative assumption for all considerations in this proceeding.

The chart before you depicts a linear model used to calculate expected failure rate of units in our Northwest Florida area. In any particular year, we can calculate the probability of failure of that particular vintage unit within the next 12 months.

For example, in the year 2000, the systems manufactured and installed in 1990 would have only a 4% probability of failure. In the same manner, a unit that is 15 years old has a 5% probability of failure during the coming year.

Based on my experience working with residential customers, in consideration of the health of their current HVAC system, these probabilities of failure for 10- to 15-year old systems would not point to a reasonable conclusion that their unit was at or near the end of its normal useful life. Nor would this failure rate indicate that Gulf Power should be utilizing a 15-year program life for the purposes of calculating the cost-effectiveness of this program.

In support of this extended time period for program analysis, I would also point to the tendency of residential customers to maintain a consistent behavior with respect to the decisions they have made in the past.

Specifically, once a customer has chosen a heat pump system and experienced its comfort and economic benefit for an extended period of time, this customer is most likely to replace that system with a similar system at the time of its failure rather than revert back to their former type of equipment.

In conclusion, the gas company has failed to rely on the best data available, which has led to faulty conclusions. The units that will be the focus of this program are not reasonably expected to be at or near the end of their useful service life. Also, the units to be installed as a result of this program should certainly be expected to have a service life of more than 15 years.

Gulf Power's assumptions in the development of this program with respect to program life and equipment efficiency are appropriate and correct.

And that concludes my testimony.

MR. WATSON: I have no questions.

COMMISSIONER DEASON: Staff.

MS. COLLINS: No questions.

COMMISSIONER DEASON: Commissioners.

MR. BADDERS: We'd like to move his -- oh, I apologize.

COMMISSIONER CLARK: I just had a question on Page 5 of your testimony.

You allege that the Easton Study had significant bias. Is the bias you're referring to the fact that it was a survey, the reasons listed here?

WITNESS SHELL: Yes.

COMMISSIONER CLARK: Is that what created the bias?

WITNESS SHELL: That's a portion of that bias, correct.

COMMISSIONER CLARK: And then another reason why it wasn't a good survey is that because it was a survey, and you could not be sure what information the HVAC dealers may have had in responding to it.

WITNESS SHELL: That's correct. The dealers were just simply asked their opinions. They were not asked to point to any specific information.

COMMISSIONER CLARK: Okay.

COMMISSIONER JACOBS: Does it indicate how effective an incentive -- the amount of an incentive, what impact that has on the decision? In other words, would this incentive be effective to convince consumers to do the upgrade?

WITNESS SHELL: I don't believe either one of the studies, the Easton Study or Hiller and Lovvorn Study, addressed the actual incentive issue and what level of incentive would be appropriate in a case of this matter.

COMMISSIONER DEASON: Exhibits.

MR. BADDERS: We'd like to move Exhibit 4 into the record.

COMMISSIONER DEASON: Without objection, show Exhibit 4 admitted. You may be excused.

(Exhibit 4 received in evidence.)

(Witness Shell excused.)

WITNESS SHELL: Thank you.

COMMISSIONER DEASON: Gulf, you may call your next witness.

MR. BADDERS: We call Ted Spangenberg back to the stand for his rebuttal testimony.

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TED S. SPANGENGERG

was called as a rebuttal witness on behalf of Gulf Power Company and, having been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. BADDERS:

Q Please state your name and your business address for the record.

A My name is Ted Spangenberg. My business address is Gulf Power Company, One Energy Place, Pensacola, Florida 32520.

Q Are you the same Ted Spangenberg who prefiled 23 pages of Rebuttal Testimony?

A Yes, I am.

Q Do you have any changes or corrections to that testimony?

A No, I do not.

Q If I were to ask you the same questions today would your answers be the same?

A Yes, sir, they would.

MR. BADDERS: We ask that the prefiled

Rebuttal Testimony of Ted Spangenberg be inserted into the record as though read.

COMMISSIONER DEASON: Without objection it shall be so inserted.

Q **(By Mr. Badders)** Mr. Spangenberg, do you have one exhibit attached to that testimony?

A Yes, I do.

Q Do you have changes or corrections to that exhibit?

A No, I do not.

MR. BADDERS: We ask that exhibit be identified.

COMMISSIONER DEASON: It shall be identified as Exhibit 5.

(Exhibit 5 marked for identification.)

GULF POWER COMPANY

Before the Florida Public Service Commission
Rebuttal Testimony of
T. S. Spangenberg, Jr.
Docket No. 981591-EG
Date of Filing: August 26, 1999

Q. Please state your name, business address, and occupation.

A. My name is T. S. (Ted) Spangenberg, Jr. My business address is One Energy Place, Pensacola, Florida 32520. I am employed by Gulf Power Company as its Residential Marketing Manager.

Q. Are you the same Ted Spangenberg that presented direct testimony in this Docket?

A. Yes, I am.

Q. Do you have an exhibit to which you will refer in your testimony?

A. Yes, I have an exhibit consisting of one schedule, (TSS-2). This exhibit consists of two pages and contains the following:

1. Table of approved utility conservation programs and analysis life.
2. Copy of page 35.2 from the 1999 edition of the <u>ASHRAE HVAC Applications Handbook</u>.

Q. Have you reviewed the direct testimony and Exhibit __ (JWM-1) submitted by Mr. Joseph W. McCormick on August 5, 1999 on behalf of Peoples Gas System in opposition to Gulf's petition in this Docket?
A. Yes, I have.

Q. Do you disagree with any of the positions or statements of Mr. McCormick in that testimony?
A. Yes. Mr. McCormick cites four assumptions used by Gulf with which he disagrees. His claim is that, if these four assumptions are "corrected", the program would fail the Commission's tests for program approval. Those assumptions of Gulf are as follows:

1. Basing the electrical impacts on replacing 7 SEER HVAC equipment with 11 SEER equipment.
2. Not utilizing a replacement heat pump life of 15 years.
3. Inclusion of the monthly customer charge in the assumption for the cost of gas.
4. The program contributing to a decrease in summer demand.

In addition to those assumptions, he cites aspects of electrical system impact relative to his understanding of the requirements of FEECA as reasons for rejection of this proposed program by the Commission. It is my position that for only one of the four assumptions objected to by Mr. McCormick does he also present valid reasons for objection which should be given any consideration by the Commission; that is the one dealing with the gas cost utilized by Gulf in its analysis. The remainder of his objections are without merit.

Q. What is your response to his discussions regarding the appropriate equipment efficiency changes for use in Gulf's analysis?

A. As noted earlier, Mr. McCormick disagrees with Gulf's basing the expected electrical impacts of its proposed program on replacing 7 SEER HVAC equipment with 11 SEER equipment. He indicates a belief that HVAC equipment in the age range of 10 to 15 years is "at very nearly the end of their useful service lives."

His claim of a 10 to 15 year age correlating to equipment being at the end of its normal life appears to be based totally on an ASHRAE table of service life which he has included in his exhibit. He does not appear to have understood the studies and the data behind the table, nor does his testimony appear to properly consider the concept of "median" service life, the definition of "service life", or the past and continuing improvement in expected service life. A thorough discussion of the errors in Mr. McCormick's testimony about HVAC service life is contained in the rebuttal testimony of Gulf's witness, Mr. David Shell, which has also been filed in this Docket.

Mr. Shell's testimony makes it clear that the low efficiency units which would be candidates for replacement by Gulf's program are not "at very nearly the end of their normal useful lives" and would not be expected, with any reasonable degree of probability, to otherwise be replaced by the customer. Additionally, Gulf expects its program to specifically encourage customers to change out their equipment prior to the end of its functional life. The $200 customer rebate that will be offered as part of this program, in many cases, will be the very thing that encourages customers to go ahead and make the change to higher efficiency. This is specifically the case for those customers who wish to improve energy efficiency solely for the sake of energy efficiency itself, those who aspire to reduced energy costs, those who want the more uniform heating effect of a heat pump, or those who are concerned about the environment and would consider the change as an act of environmental stewardship. This program will clearly encourage these prospective but hesitant participants to go ahead and make the change and, for all of those instances, the appropriate SEER change for analysis is undeniably the SEER of the unit coming out versus the SEER of the unit going in as the replacement unit.

Gulf took a conservative approach in regard to the SEER assumptions that it used. Participation in Gulf's proposed program requires the installation of a heat pump system with a minimum efficiency of 11.0 SEER in the cooling cycle. In fact, although the program requires 11.0 SEER as a minimum, the average SEER installed under the program is expected to be well in excess of this level. For instance, in response to our past and current efforts to encourage customers to install high efficiency heat pump equipment, we are aware of 843 heat pumps installed by Gulf's customers in 1998 as a replacement for an existing heat pump or air conditioner, with the new equipment having an efficiency of at least 11.0 SEER. The average efficiency of those 843 systems was actually 12.8 SEER. In other words, Gulf could have legitimately used the greater annual kilowatt-hour and demand savings of substituting 12.8 SEER equipment for the old 7.0 SEER equipment, but chose to stay with the 11.0 SEER assumption in order to continue to present a conservative estimate of the savings to be achieved. These reasons and the true service life characteristics are all reasons why Gulf filed its program with the Commission using the SEER assumptions that it did.

Q. Are there other applications in which you disagree with Mr. McCormick's use of a 15 year normal useful life for heat pumps?

A. Yes, there are. Mr. McCormick utilizes the 15 year heat pump normal useful life assumption as the sole reason for his contention that the period of Gulf's program analysis should be limited to 15 years. As indicated in Mr. Shell's testimony, a 15 year service life assumption is even more flawed when applied to heat pumps currently being installed than it is in its application to previously installed HVAC equipment. These errors are further exacerbated by Mr. McCormick's confusion of "service life" with "useful life". As Mr. Shell points out, analyses using expected service life as a parameter should use something more in the order of at least 22 years rather than 15 years. Should the Commission take the position that program analysis life should be limited to initial equipment <u>service</u> life, the utilization of a 22-year analysis period would yield cost effectiveness test results that demonstrate that Gulf's program is cost effective from both a ratepayer perspective and a participant perspective.

Q. Were there any errors in the cost effectiveness data Gulf originally provided and Mr. McCormick's testimony relied upon for recommending rejection of this program?

A. Yes. One set of cost effectiveness numbers on Gulf's Exhibit TSS-1, page 9 of 9, was originally provided by Gulf and have since been found by Gulf to be in error. When the cost effectiveness calculation for the assumption of a SEER change from 10 to 11 and a 15 year analysis period was initially performed, the customer's expected equipment cost was incorrectly assumed to still be $3,000 as it was in the 7 SEER to 11 SEER scenario. In fact, under this particular scenario the applicable assumption is that the customer would already be upgrading their equipment to a minimum of 10 SEER. The incremental equipment cost to go beyond the 10 SEER air conditioner and gas furnace to an 11 SEER heat pump is expected to be $1,300. When this correction is made, as noted on the corrected Page 9 of Exhibit TSS-1, the program passes all three of the cost effectiveness tests as follows: RIM = 1.19, Participants = 1.39, TRC = 1.88. Even if Mr. McCormick's assumption recommendations are followed, the program still easily passes the Commission's cost effectiveness tests.

Q. Do you agree with the assertion in Mr. McCormick's testimony that RIM results are decreased if load is added?

A. No. Beginning at line 23 on page 8 Mr. McCormick's testimony cites the RIM test result of 1.19 for his preferred set of assumptions and then indicates that this "positive RIM test result could be diminished or reversed if this program leads to the addition of electric load through replacement of additional gas appliances." I assume that his testimony refers to annual kilowatt-hour consumption, since none of those other loads have any impact on weather sensitive peak demand. It would appear from his testimony that there is a misunderstanding of the economies of today's electric utility industry. During the time when the Commission's cost effectiveness rules were being developed it was likely the case that an addition of kilowatt-hours resulted in a decreased RIM result. That was during a time when the cost of incremental generation tended to exceed the cost of embedded generation. In fact when the set of assumptions noted above is analyzed with the addition of, for example, 500 kWh per participant with all else remaining equal the RIM result <u>increases</u> from 1.19 to 1.32.

Q. Is Mr. McCormick correct in his presumption that program analysis life should be set equal to HVAC service life?

A. No. That presumption is not consistent with the past practice of this Commission in regard to the approval of other conservation programs of electric utilities in Florida. Page 1 of Exhibit TSS-2 contains a table showing the Docket Number, utility, program name, and program analysis life of several programs that have been approved by the Commission. Several of these are programs focused on HVAC equipment, yet none of them uses an analysis period as short as what Mr. McCormick suggests. It is my understanding that all of these programs utilized a program life related to an avoided or deferred utility resource, not the participant's expected equipment life.

An HVAC program analysis related to a program that defers or avoids utility facilities might be very conservatively limited to the expected useful life of the HVAC equipment in only one scenario. That is if there is a clear showing that the initial equipment is not likely to be replaced with similar advanced technology once it ultimately fails but, instead, is most likely to be replaced by equipment that reverts back to the former technology that the subject equipment originally replaced. As discussed by Mr. Shell's testimony, that scenario is just not a reasonable expectation given the preponderant characteristic of customers to stick with a particular type of advanced (or even further advanced) technology once the switch has been made.

In making his recommendation for using HVAC service life Mr. McCormick not only ignored the past practice of the Commission, he also ignored the ASHRAE Handbook's reference to the very table that he relied upon for his 15 year contention. A copy of page 35.2 of the Handbook is included as page 2 of Exhibit TSS-2. It specifically addresses analysis periods for analyses of HVAC equipment and further indicates that "… the analysis period is often unrelated to the [HVAC] equipment depreciation period or service life…". It goes on to state that these [depreciation life or service life] may be important in the analysis, but, as Mr. Shell points out in his testimony, once a participant has installed a high-efficiency heat pump, there is a very high probability that he will replace it with similar, higher-efficiency equipment once the original equipment does reach the end of its service life.

Gulf's petition and the program analysis supporting its request for program approval properly utilizes the economic life of avoided utility facilities. Mr. McCormick's contention that it should be based on HVAC service life is not correct, much less his contention that it should be a service life of only 15 years.

Q. Do you have any observations with regard to that portion of Mr. McCormick's testimony that discusses the cost of gas that Gulf used in its program analysis?

A. Yes. Mr. McCormick states that "We believe Gulf's analysis inappropriately includes the customer charge in its calculation of the average gas price of $0.95 therm." He goes on to indicate that this overstates the cost of gas, particularly for those customers who have other gas appliances in addition to a gas furnace. Because there are many gas furnace customers who also have other gas appliances, the inclusion of the customer charge results in some liberalism in the gas cost assumption.

Gulf's gas cost assumption was intended to focus on all combustion furnace applications throughout

Northwest Florida, or, more specifically, any Gulf Power customer who was currently utilizing an older, inefficient combustion fuel appliance as their primary heating source. This presents the greatest opportunity for energy conservation and demand reduction through substitution with a heat pump. There are eight natural gas distributors offering residential service in Northwest Florida through the use of 13 different residential rate schedules. The additional rate schedules are due to the practice of some distributors, specifically those owned by a municipality, of offering different pricing to customers inside versus outside of their municipal boundaries. Only four of the eight distributors and six of the 13 rate schedules include a customer charge on their monthly billing to residential customers. These charges range from $4 to $7 per month. So, to be more precise, Gulf's failure to remove the customer charge from the gas cost only introduced liberalism to the extent of multiple gas appliance customers on those 6 of the 13 rate schedules.

However, to the extent that there are customers who have only a gas furnace, it is conservative, and in all other respects Gulf's gas cost assumption was conservative.

Q. In what ways was Gulf's gas cost assumption conservative?

A. First, Gulf's gas cost figures do not factor in the cost of propane for Gulf's customers who have a propane fueled heating appliance. A second area of conservatism is in the total therms of gas savings assumed by Gulf in its analysis.

Q. How did the exclusion of propane costs understate the weighted average gas cost?

A. As noted on page 18 of Mr. McCormick's exhibit, propane costs for the three more populated areas of Northwest Florida range from $1.089 to $1.375 per therm. Additionally, propane costs in the smaller towns and rural areas along the I-10 corridor are in this same general range. Inclusion of these costs in the calculation of a Northwest Florida weighted average cost of combustion fuels would, without question, yield a higher figure than what Gulf utilized, all other things being equal.

Q. How did the assumption about the therms of gas to be conserved understate the gas cost savings the typical customer would experience?

A. In the determination of energy savings, Gulf utilized, as indicated on page 9 of Exhibit TSS-1, an Average Fuel Utilization Efficiency (AFUE) of 68% for the gas heating equipment to be displaced. This AFUE rating is the type of rating used to characterize furnace efficiencies as reported by the Gas Appliance Manufacturers Association (GAMA) and rates the furnace for use in an annual climate with 2,080 heating load hours, in other words, the heating load expected in states like New Jersey, Ohio, and Illinois. Heat pumps will have a higher average heating efficiency than their national rating when used in Northwest Florida, due to the higher average outdoor ambient temperature for heat exchange. Gas furnaces, on the contrary, will have a lower efficiency than that reported by GAMA when used in our region. We experience less than half of the rated heating load hours. Our higher average outdoor ambient winter temperatures cause much more cycling on and off and much less average run time for furnaces compared to applications in sustained, colder climates, thus, yielding a significantly lower actual realized furnace efficiency than the rating assigned by GAMA. Once again, in order to be conservative in our analysis of cost effectiveness Gulf chose to ignore the resulting understatement of the therms of gas that would be conserved.

Q. Is it your belief that the elements of conservatism just noted balance out the liberalism of the inclusion of the customer charge in those situations where applicable?

A. Yes. However, I have analyzed the effect of removal of the customer charges for these six rate schedules on the average natural gas price in Northwest Florida. Removal of the customer charge results in a reduction in the weighted average cost of natural gas for the eight Northwest Florida distributors from 95.0 cents per therm to 86.4 cents per therm. Although for Peoples Gas the average price per therm would be reduced to 74.2 cents per therm as stated in the testimony of Mr. McCormick, it is important to remember that this would only be applicable to Peoples Gas customers and only to those who have other gas appliances in addition to a gas heating device.

Q. How would this change in the assumed average gas price affect the cost effectiveness calculations of this program?

A. The lower weighted average price would result in slightly lower energy bill savings to a customer converting from a 7.0 SEER A/C and gas furnace to an 11.0 SEER heat pump, thereby reducing the benefit/cost ratio of the Participant's test and the TRC test. The three cost effectiveness tests all remain well above 1.0 with the precise results as follows:

RIM Test = 1.74
Participant's Test = 1.52
TRC Test = 1.99

Q. Did you also perform the analysis using Peoples Gas rates?

A. Yes. We analyzed the effect of these calculations with gas cost savings calculated at Peoples Gas price of $0.724 per therm. Again, the resulting numbers were all above 1.0 and are as follows:

RIM Test = 1.74
Participant's Test = 1.35
TRC Test = 1.72

In other words, even though there are several respects in which a gas price of 86.4 cents, and, even more so, a gas price of 74.2 cents understates the average expected gas fuel cost, when either of these figures is utilized Gulf's proposed program is still cost effective.

Q. Is Mr. McCormick's testimony correct in the assertion that the demand reduction benefits will be diminished or reversed if this program leads to the replacement of additional gas appliances?

A. No. To start with, this program is certainly not targeted at any other gas uses in the home. Additionally, Mr. McCormick bases his argument on the change in average gas cost when the gas furnace is no longer there to help absorb the economic impact of the gas customer charge. He would have us remove the customer charge for the purposes of Gulf's program analysis, but wishes it included in a customer's consideration of whether to keep any other gas appliances in the home. His customer charge argument in this particular application is valid only to the extent customers decide to totally and immediately remove all gas uses in their home. In the case of gas cooking and gas drying, rarely was the customer's decision to utilize gas for those applications made solely on the basis of the cost of fuel. The amount of a typical customer's monthly household budget that is spent on these applications is relatively small compared to the cost that would be incurred to make the wiring changes necessary to replace this equipment with electric equipment. More often than not, decisions to make such a replacement are driven by safety or other concerns rather than monthly energy cost concerns.

Q. Does this HVAC program include water heating as a part of the program?

A. No. Mr. McCormick's testimony references a water heating program that Gulf has in place and suggests that a customer converting a water heater from gas to electric under that program would offset the demand reductions the proposed GoodCents Conversion program for HVAC equipment. In the first place, the water heater program is not a subject of this docket. In this case we are dealing with an <u>HVAC</u> energy efficiency and conservation program that is proposed for ECCR treatment. These two programs do not have any programmatic linkages between them.

Although Mr. McCormick's testimony made note that Gulf's water heating program requires the installation of a timer, it failed to mention the purpose of the timer - that is to help ensure that the installation of a water heater under that program does not make any contribution to the growth rate of Gulf's summer peak demand. In reviewing installations of those water heaters Gulf's Residential Energy Consultants make personal inspections of timer settings to ensure they are set so as to avoid being "on" during the normal expected hours of Gulf's summer peak demand. Further, in claiming that the HVAC program's demand reduction will be offset by the addition of more water heaters, Mr. McCormick has presumed the Commission would accept his flawed premise of a 0.3 kW reduction in HVAC demand rather than the 1.9 kW reduction it will actually achieve. He inappropriately characterizes a 0.3 kW demand reduction as "slim", and then would have the Commission believe that the coincident demand of a water heater is greater than this 0.3 kW. This is not the case.

Third, just as is often the case for cooking and drying, should a customer decide to replace their gas water heater with an electric one, it is often on the basis of safety concerns or the desire for a faster recovery to a usable hot water temperature, rather than on the basis of the monthly energy cost of operating one versus the other.

Q. What elements of Mr. McCormick's discussion of electrical system impact relative to FEECA do you believe to be in error?

A. On line 11 of page 11 of his testimony Mr. McCormick commences a sentence in which he, first, would have the Commission believe that an increase in annual kilowatt-hour consumption due to this program is undeniable. That simply is not the case. His statement is based precariously upon the premise that the Commission would find that Gulf's assumption of a change from 7.0 SEER to 11.0 SEER is incorrect. On the contrary, Mr. Shell's discussion of expected service life and my own testimony in that regard indicate that, not only is the assumption of 7 SEER to 11 SEER correct, it has an element of conservatism in it. I believe if the Commission is concerned about the advisability of allowing the assumption of 7 SEER to 11 SEER, it should look to its own prior decisions and the "liberally construed" language within FEECA for encouragement in its attempts to make as many cost-effective energy efficiency and conservation programs available to the citizens of Florida as practical. The assumption of 7 SEER to 11 SEER should be allowed and the result is a 1390 kWh per participant per year <u>decrease</u> in electrical energy consumption, in addition to the decrease of 302 therms or more of gas consumption.

Second, Mr. McCormick's testimony suggests that the Commission should not approve any program that, while reducing peak system demand, either increases off-peak weather sensitive demand and/or annual kWh consumption. That approach is contrary to the Commission's past actions in this regard. Typically, any direct load control program involving HVAC systems, including those approved by the Commission and listed on page 1 of Exhibit TSS-2, involve increases in annual energy consumption. These increases tend to be small relative to the demand reduction, are always off-peak, and are believed to be due to the customer's "reactive" behavioral response associated with the loss of comfort during the period of load control. Mr. McCormick's interpretation of FEECA would seem to preclude the allowance of such programs simply on the basis of a logical and reasonable expectation of some increase in annual electrical energy consumption.

Additionally, the Commission has encouraged the consideration of off-peak thermal storage programs. Due to the less than 100% efficiency of energy storage and energy transfer technologies that must be utilized by such systems, any reduction in demand will always result in an increase in off-peak energy and a net increase in annual energy. Mr. McCormick's interpretation of FEECA would also seem to preclude the allowance of these demand-side management programs.

It is ironic that Mr. McCormick would have the Commission reject Gulf's program on the basis of an expected increase in Gulf's off-peak weather sensitive demand and/or on the basis of, though falsely presumed, an expected increase in annual kilowatt-hour consumption, while making no acknowledgement of the program's additional benefits of reducing the peak weather-sensitive demand for natural gas or the reduction in annual consumption of natural gas and ground-source Btu's. Such rigid and restrictive interpretation, even absent erroneous assertions about the impact of Gulf's program, is not consistent with the stated intent of FEECA. The only restrictive language within FEECA is that pertaining to the requirement that a program be cost effective. The rest of the language in FEECA is structured to be permissive. If a program meets any aspect of FEECA, thereby improving the efficiency of energy utilization in Florida, it should be approved by this Commission as long as it is cost effective.

As noted earlier in my testimony, additional load, though not the focus, purpose, or expected result of Gulf's proposed program, in fact, yields positive results for Gulf's general body of ratepayers as long as it is not accompanied by an inordinate amount, if any, of increased peak demand. The cost of many forms of new electrical generation today is often less than the cost of embedded generation. FEECA is still applicable under these conditions because it encourages efficiency programs that put the focus where it should be, on the reduction of system peak demand. This is the case even in instances (e.g. direct load control, thermal energy storage, other off-peak load shifting, etc.) where there might otherwise be a temptation towards accusations of load building or towards complaining because of the natural competitive impact of any efficiency program.

It is also our belief that FEECA should be fairly applied with respect to electric utilities versus gas utilities. We believe Gulf's proposed program to be at least as consistent with FEECA as the approved ECCR programs of gas utilities such as Peoples Gas.

Q. Does that conclude your testimony?
A. Yes, it does.

Q **(By Mr. Badders)** Mr. Spangenberg, would you please summarize your testimony.

A Yes. The Intervenors' testimony states that the Commission should not approve Gulf's program because of a claim it fails the Commission's test for program approval. That claim is based on disagreement with four of Gulf's program assumptions, and their opinion regarding the requirements of FEECA.

First, the gas company purports that Gulf's use of an efficiency of 7 SEER for the replaced equipment was in error. That position is based on a misunderstanding of a concept of service life, a misguided reliance on the ASHRAE Table without understanding its history or development, and a flawed assumption about the applicability of national data to the very different climate of Northwest Florida.

My testimony and Mr. Shell's show the errors on each of these points with the responsible conclusion that Gulf has used the appropriate SEER assumption for the unit being replaced. Interestingly enough, even if the gas position had merit, Analysis No. 4 in the chart before you indicates that the program would still achieve the aim of a reduction weather-sensitive peak demand and would still meet the requirement of being cost-effective.

Next, the Intervenor purports that Gulf's failure to use a replacement heat pump life of 15 years was in error. Again, they were wrong, but again even if the gas company's claims are adopted and are compounded with the earlier errors about equipment efficiencies, the calculations as shown in Analysis No. 5 on the chart clearly indicate the program would still achieve the aim of a reduction of weather-sensitive peak demand, and would still meet the requirement of being cost-effective.

The Intervenor also takes issues with Gulf's treatment of a gas customer charge for those few occasions when that is applicable. This liberalism in the assumption about gas cost savings is more than balanced out by the general conservatism of the remaining gas assumptions. However, again, even if we make those changes to the gas cost, once again the program still achieves the aims of FEECA and it's still cost-effective.

The last of Gulf's assumptions objected to by the Intervenor is that of the program contributing to a decrease in summer demand. The gas company claims that this program has linkages to water heating equipment changes. However, not only are there no programatic linkages between the proposed program and any water heating issues, their testimony ignores the required timer that is designed to preclude any contribution to Gulf's summer demand.

Even if there was a contribution to summer demand, that contribution would be less than the reduction to be achieved by the proposed program. And additionally, any demand contribution from a water heater is beyond the purview of FEECA as it is not a weather-sensitive demand, nor does Gulf receive any ECCR water treatment for water heating.

Finally, the Intervenor utilizes its earlier misguided assertions to reach a conclusion that the proposed program would lead to a increase in annual kilowatt-hour consumption.

As I've already indicated, the premises behind this conclusion are in error, hence the conclusion itself is in error.

This program leads to a decrease in annual electricity consumption, in addition to its decrease in natural gas consumption, a decrease in ground source Btus, and a decrease in weather-sensitive peak demand.

However, if we once again take a "what if" approach, and say what if we change all of the assumptions to suit the gas company, the proposed program would still lead to a reduction in weather-sensitive peak demand, and that is one of the aims of FEECA. The gas company would have this Commission reach a decision that unless a program meets every single one of the aims of FEECA that it violates FEECA. If that were the case, the prior Commission decision and Commission actions that gave approval of, or support to a program involving direct load control of residential appliances or thermal energy storage, or any other program that all used off-peak energy to help avoid on-peak demand has been in violation of FEECA. A further extension of that approach would mean that a program that reduced energy and demand but didn't encourage cogeneration and conserve fuels was also in violation.

I don't believe the Commission has been in violation of FEECA with those earlier actions. I believe the Commission properly, liberally construed FEECA to apply to those types of programs, and it should be consistent in its current actions.

Rather than approaching the question is does it meet all of the aims of FEECA? the Commission has properly taken the approach of does it meet any of the aims of FEECA? However, once Intervenors' errors with regard to equipment efficiency and service life are recognized, a policy issue about whether electrical energy consumption is the sole supreme mandate of FEECA becomes moot with regard to this program.

In conclusion, the assertions of the gas company are clearly in error, and even if they weren't, this program would still achieve multiple aims of FEECA and still meets the requirement to be cost-effective. This program should be approved by the Commission.

And that concludes my summary.

MR. BADDERS: We tender this witness for cross examination at this time.

COMMISSIONER DEASON: Mr. Watson.

CROSS EXAMINATION

BY MR. WATSON:

Q Mr. Spangenberg, you mentioned early on in your summary something about Mr. McCormick's opinion with respect to the requirements of FEECA.

Would I be correct in assuming that the statements in your Rebuttal Testimony, your Direct Testimony, and in the summary you've just given are also your opinions with respect to the requirements' meaning or interpretation of FEECA?

A Yes.

Q Okay. With respect to the heat pumps installed by Gulf's customers during 1998, did Gulf make any study to determine the SEER of the equipment being replaced?

A The only study we made analyzed as part of the preparation for this and questions that we knew this hearing would raise, we looked at what the average SEER was for all of those units that went in that there were at least 11 SEER or higher, and that's the only analysis that I know of that we did.

Q I'm talking about the equipment that's coming out. Was any study made in the case of a combustion furnace or in the case of a central straight cool air conditioner or a heat pump that was being replaced with respect to the SEER or AFUE of the equipment that was coming out?

A No, we did not.

Q In connection with your non-ECCR, if you want to call it that, water heater replacement program, you stated in your rebuttal testimony and in your summary that this equipment is equipped with timers?

A Yes, it is.

Q Is the purpose of the timer to ensure that the water heaters don't operate during peak hours?

A Yes, sir. That is one of the purposes. It also gives the customer some additional energy savings in terms of how they operate their water heater.

Q Do these timers have a battery backup to retain correct time during power outages?

A No, sir, they do not.

Q Can customers turn the timers off or reset them?

A Yes, sir, they can. It's hard for us to see why they would have any incentive to do it because the demand for water heating -- the need for hot water is very low during the time of our system peak. In fact, even without a timer you'd get a very small contribution to our system demand during those times. So there's no incentive for them to do it. As long as long as they are getting plenty of hot water, all of our load research data shows that they have plenty of hot water during that time. The whole water heater does not need to operate, except every now and then it might come on to overcome losses, tank losses. And again the timer helps preclude that. As long as the customer has plenty of hot water, they have no need to override it.

Q But if a timer is turned off, reset or indicates the correct time due to a power outage, it's at least possible that that water heater will be operating during peak hours?

A It's possible that for some portion, yes, it could come on. It's improbable but it's possible, yes.

Q If a Gulf customer were to retain its existing gas furnace, but replace its old inefficient air conditioner with a new energy-efficient one, would that customer contribute to a reduction in annual electricity consumption?

A Yes, they would.

Q Would the same be true if the old furnace was left in place and the old air conditioner was replaced with an energy-efficient heat pump?

A Yes, they would.

Q Wouldn't both these scenarios also contribute to a reduction in summer peak demand because of the increased efficiency of the new air conditioner or heat pump as the case may be?

A Yes, they would.

Q And in both scenarios, isn't it true that the customers would not contribute to any increase in winter peak demand as is present in Gulf's proposed program?

A I'm sorry, we're talking about -- in one case you said they were replacing an air conditioner with a heat pump?

Q No. They are keeping their gas furnace and they are replacing their old inefficient air conditioner with either a new energy-efficient air conditioner or a new energy-efficient heat pump.

A If they used their furnace to provide their heating requirements, then in neither case would you have contribution to winter demand.

Q Although Gulf's summer peak demand exceeds its winter peak demand, and Gulf uses its summer peak demand for planning purposes, Gulf does have a winter peak, does it not?

A We've a demand in the winter months that's higher than the fall and spring months, if you want to define that as peak. But our peak is really the summer demand.

Q But you have a seasonal demand in the wintertime?

A Yes. There is a seasonal demand in the wintertime.

Q And there is a high point to that?

A Yes, there is.

Q If the Good Cents Conversion Program is approved by the Commission, it's true that Gulf's seasonal high point in the wintertime is going to increase?

A Yes, that's correct.

Q Is that seasonal high point in the wintertime weather sensitive?

A Yes, it is.

Q As I understand your testimony and your rebuttal testimony, Gulf's definition of weather-sensitive peak demand is the summer peak?

A Absolutely. Because that's the peak that we plan generation for. It is our peak demand or Gulf Power Company. So the focus of our programs is around that summer peak. There is a higher demand that occurs in the wintertime that's weather sensitive. In analyzing this program we said, "Okay. Here's what this program does in the winter demand; here's what it does to our peak demand in the summer." The FIRE model analyzes that to the detriment of the customers, of our ratepayers. And we get the results out of that that shows that it's not.

Q Well, under this definition -- let's take the scenario where a customer removes a gas furnace and a 7 SEER air conditioner and replaces them with a 11 SEER air conditioner and electric resistance furnace. Would that increase or reduce Gulf's summer peak?

A I guess it would decrease -- if it takes out the furnace and the old inefficient air conditioner and replaces it with an 11 SEER air conditioner and an electric furnace --

Q Excuse me --

A -- it would decrease the summer peak demand. But we never see that occurring. We just don't have electric furnaces going in anymore, to speak of.

Q Well, I'm talking about strip heat.

A Sure. Strip heat. I understand. Strip heat doesn't operate during Gulf's peak demand.

Q Would this scenario increase or reduce Gulf's annual kWh sales?

A I'm not sure. I haven't done that calculation. Again, it's so odd for someone to install an electric resistance furnace these days. I don't know that we've done the actual calculations. I don't have the numbers here at my disposal to say whether or not annual consumption actually goes up or goes down. I know you get a tremendous kilowatt-hour reduction through taking out the old air conditioner and putting in high efficiency air conditioning in the summertime. I don't know exactly how that balances out with their heating requirements out of an electric furnace, strip --

Q But you'd have strip heat versus a gas furnace in the wintertime for heating?

A Yes, you would. You would also have a higher efficiency air conditioner in the summer instead of the old inefficient 7 SEER air conditioner. And, again, I don't know what the balance of those two would be on an annual electricity consumption. It's just so improbable.

Q Would this scenario increase or reduce Gulf's winter peak?

A It would increase our winter demand.

Q Okay. But under your definition of weather-sensitive peak demand as the summer peak Gulf uses for planning purposes, wouldn't it be correct to say that you would not consider the increase in winter peak demand relevant under FEECA?

A That's correct. I would. And we don't have any reason to consider it because those scenarios just don't occur. We don't see that happening in today's marketplace, nor would we ever encourage such a thing to incur.

As pointed out by this program, our encouragement focuses the customer on high efficiency heat pumps because that is the most efficient heating and cooling system available on the market today. And

FEECA clearly says that we want to focus on the most efficient systems available.

Q In modeling the cost-effectiveness of this scenario, would you include any incremental cost of generation or transmission or distribution in your cost-effectiveness analysis?

A Not that I know of. I know we would input the winter demand of such an odd scenario into the FIRE model, and the FIRE model takes that into account. I guess the only time that would occur, if you had so many thousands of those types of situations occurring that you caused Gulf's peak to shift, be a winter peaking scenario, then you would obviously, you know, factor that in and see whether or not you had a cost-effective system. And at that point that becomes our system peak demand, and in my interpretation of FEECA, something we would certainly avoid.

Q And even in the base case for the program as filed, there was no consideration given in the cost-effectiveness analysis to the increase in winter peak demand?

A That's correct. There was none because it would not impact Gulf's system demand, peak demand. We calculated the cost effects of the program based on the requirements of the Commission's rules on how you calculate cost-effectiveness. So we did it per the Commission's rules, applied it as it should be applied and the numbers all show that it's cost-effective for our customers, you know, our ratepayers, and so that's why we filed the program.

MR. WATSON: I have no further questions.

COMMISSIONER DEASON: Staff.

CROSS EXAMINATION

BY MS. COLLINS:

Q In response to a question from Mr. Watson you testified that Gulf's summer peak demand is greater than Gulf's winter peak demand. What is the megawatt difference?

A First, let me say I don't think I ever testified that it was greater than our winter peak demand. I think it's greater than our winter demand. And I do make the distinction on what's our peak.

I don't have those numbers off the top of my head but it's in the order of many megawatts; it's in the order or somewhere between 50 and 100 megawatts. I can dig that out if you'd like, but it's in that order of magnitude. It's tens of megawatts.

Q We'd like you to find that if you have that information with you. Thank you.

A Okay. (Pause) We're looking for that.

In the meantime, let me give you an answer that I hope maybe will satisfy the need here.

What we did is if we assumed -- we did the analysis. Took our winter demand as it currently is. We took our summer peak demand. And then we said what if we are totally successful with this program, and had these numbers of conversions and looked at what that did in terms of adding to our winter demand and we looked to see did that ever increase Gulf's winter demand above our summer peak, and that never occurred. And that was without giving any consideration in terms of how we're tied into the Southern electric system and the rest of the generators and the rest of the Southern Company system being very much summer peaking; more so than Gulf Power is. But at no point did that winter demand ever go higher than the summer peak demand.

And I'm sorry, I don't -- it appears we may not have that with us. We'd be happy to provide that as a late-filed exhibit. It may be available in our Ten Year Site Planning stuff that's filed recently. I don't know.

MS. COLLINS: That's fine.

Could we get an exhibit number for that late-filed exhibit?

COMMISSIONER DEASON: Yes. It would be Exhibit 6.

MS. COLLINS: Thank you.

(Late-Filed Exhibit 6 identified.)

A And as I understand, you want what our current winter demand is versus our summer peak demand?

Q For each year.

A Of what time frame?

Q The ten year planning.

A Okay. We'll certainly do that.

I guess I need to ask one other clarifier. Would you like that with or without this program approved?

Q Without the program being approved with the third column. Summer without, winter without.

A Okay.

Q And the megawatts from the program.

A Certainly.

MS. COLLINS: That's all we have, Commissioner Deason.

COMMISSIONER DEASON: Commissioners? Redirect?

MR. BADDERS: We have no redirect.

COMMISSIONER DEASON: Exhibits.

MR. BADDERS: We'd like to move Exhibit 5 into the record.

COMMISSIONER DEASON: Without objection, Exhibit 5 is admitted.

(Exhibit 5 received in evidence.)

COMMISSIONER DEASON: Thank you. You may be excused.

That's the last witness, correct?

MR. BADDERS: Actually, moving back, I believe there was a question that Commissioner Clark had asked that she wanted to also ask of this witness dealing the 1300 to 3,000.

COMMISSIONER CLARK: No. If he cared to respond to what Mr. McCormick said, that would be fine.

WITNESS SPANGENBERG: I think I would, because I think that left a lot of mud in the water.

We used the $3,000 -- and I won't try to clear that up. If it cost you a total of $3,000 to go from the gas furnace and an old air conditioner to a brand-new high efficiency heat pump, any other scenario that says what if the customers otherwise are going to spend money for this, you're always going to have a cost for that other scenario. It's going to be less than $3,000. And if you look at all of the improvements that have been made, $1300 is a very reasonable estimate. And we got that from the HVAC dealers, from what they would have otherwise spent to get a new furnace, a new air conditioner, compared to what they are now going to spend to go to a new heat pump. $1300 is a very reasonable number. We certainly have not heard any other numbers offered here that would tell us, you know, that there's anything wrong with that number. But that's the distinction there between those costs. You always know that cost is going to be $3,000. And given the other things you've got to do, you actually know if you have any knowledge of HVAC market, you know it's going to be significantly less than the $3,000.

COMMISSIONER DEASON: Any further questions by any party? You may now be excused.

(Witness Spangenberg excused.)

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Is there a briefing schedule?

MS. COLLINS: Yes, Commissioner Deason. The parties' briefs are due November 9th, 1999. Transcripts of this proceeding are due October 26th, 1999. The Staff recommendation is due December 9th, 1999. The agenda is set for December 21st, 1999. The Order is due January 14th, 2000. And the close of this docket is February 14th, 2000.

COMMISSIONER DEASON: Okay. Any further matters to come before the Commission at this time? Hearing none, this hearing I adjourned. Thank you all for your participation.

(Thereupon, the hearing concluded at 12:20 p.m.)

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STATE OF FLORIDA)
: CERTIFICATE OF REPORTER
COUNTY OF LEON)

I, JOY KELLY, CSR, RPR, Chief, Bureau of Reporting, Official Commission Reporter,

DO HEREBY CERTIFY that the Hearing in Docket No. 981591-EG was heard by the Florida Public Service Commission at the time and place herein stated; it is further

CERTIFIED that I stenographically reported the said proceedings; that the same has been transcribed by me; and that this transcript, consisting of 187 pages, constitutes a true transcription of my notes of said proceedings. ,and the insertion of the prescribed prefiled testimony of the witnesses.

DATED this 15th day of October, 1999.

JOY KELLY, CSR, RPR
Chief, Bureau of Reporting
Official Commission Reporter
(850) 413-6732

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GoodCents® *Conversion Program*

Program Description

The objective of the **GoodCents**® *Conversion Program* is to provide Gulf Power Company's residential customers and equipment contractors an incentive to replace inefficient gas furnace and air conditioning systems with high efficiency heat pump systems. This program will encourage earlier replacement of these equipment types resulting in immediate energy savings for the customer, an increase in ground source efficiency, and energy and peak demand reductions benefiting Gulf Power Company and its general body of customers.

Gulf Power will identify potential program participants through the Residential Energy Audit Program as well as through educational and promotional activities.

Program Guidelines

In order to qualify for participation in the **GoodCents**® *Conversion Program*, customers must have an On-site Energy Audit performed by a Gulf Power Residential Energy Consultant. Each Energy Audit will result in written recommendations to the customer, which may include lifestyle factors, improvements to the home's thermal envelope, and mechanical equipment upgrades/modifications. In addition, the Energy Consultant may provide detailed computer analysis of the customer's home in order to determine proper equipment sizing and demonstrate potential savings to the customer.

All heat pump installations must meet mechanical code requirements and have a minimum Seasonal Energy Efficiency Rating (SEER) of 11.0. Described heat pump installations replacing primary heating systems fueled by gas, propane, or fuel oil will qualify the customer for a rebate of $200 and the installing heating and cooling contractor or salesperson an incentive of $50 per system. Installations occurring without the necessary Gulf Power Energy Audit will not qualify for any incentive.

Qualifying installations will be reported by the Gulf Power Residential Energy Consultant to the appropriate support personnel located in Gulf Power's Corporate Office Residential Marketing Department in order to facilitate payment. A sample rebate form is included on page 4 of this exhibit.

Participa Rescan in DN 12738-99

The **Good** s available to all residential customers within Gulf Pow xisting combustion furnace as the primary source of heating nd heating equipment contractors performing work for t

Benefits and Costs

Participating customers will benefit from reduced energy consumption in their homes resulting in lower energy bills. Energy calculations indicate an expected or average annual reduction of 1,030 kWh and 302 therms of natural gas. Additional benefits related to cost of maintenance and repair of customers' cooling and heating systems will be realized by early retirement of this equipment and replacement with new heat pump systems. Our environment will benefit by these customer actions because of a 39% reduction in ground source BTU consumption.

For Gulf Power Company, benefits include kWh reduction, kW demand savings, consumer education, and customer satisfaction. The kWh and kW demand savings are based on Residential Building Energy Program (RBEP) computer simulations. This analysis assumes that a customer in an average home of 1,680 square feet replaces a three ton air conditioner with a Seasonal Energy Efficiency Rating (SEER) of 7.0 and a 68% Annual Fuel Utilization Efficiency (AFUE) gas furnace with a heat pump having a SEER of 11.0 and a Heating Season Performance Factor (HSPF) of 7.4. RBEP comparisons based on these assumptions indicate that these installations will result in an annual energy reduction of 1,030 kWh and a summer demand reduction of 1.9 kW.

Monitoring and Evaluation

Gulf Power will monitor this program through its existing Gulf Account Reporting System (GARS) which will enable the tracking of homes making this equipment change. Gulf Power will validate engineering analysis of energy and demand savings with billing data and sample metering of customer equipment.

Cost Effectiveness

This program is cost effective using the Commission's approved methodology (Rule 25-17.008). The cost-effectiveness calculation is included on pages 5 – 8.

While the assumptions used in calculating the cost effectiveness of the program as filed were the most logical and most probable, other scenarios were analyzed as a matter of interest and rigor. The results of those analyses are shown on page 9.

GoodCents® *Conversion Program*

$200 Customer Rebate

____
Customer Name

____
Installation Address

____
Gulf Power Account Number

____
Social Security Number

____
Mailing Address

____
City, State & Zip Code

$50 Salesman Rebate

____
HVAC Dealer Name

____
Salesman/Rebate Payee

____
Social Security Number

____
Mailing Address

____
City, State & Zip Code

____
Equipment Installation Date

____
Equipment Model Number (Outdoor Unit)

____
Efficiency Rating (SEER)

____
Gulf Power Energy Consultant

____
Date

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.90	kW/Cus
(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(1,109)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(1,030)	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	4.40	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	($287.00)	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	**
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	
Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$7,153	$21,592
NPV Costs ($000s)	$4,114	$13,094
NPV Net Benefits ($000s)	$3,039	$8,498
Benefit:Cost Ratio	1.739	1.649

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual
** The relevant avoidable generation unit is a combustion turbine peaking unit. Since the kilowatt savings occur at the time of the system peak, this is the appropriate unit against which to measure cost savings.

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,357	$0	$0	($35)	$0	($11)	$1,432	$46	($1,385)	($1,385)
2000	$0	$155	$2,648	$0	$0	($106)	($79)	($36)	$2,803	$221	($2,582)	($3,755)
2001	$0	$159	$2,424	$0	$0	($185)	($126)	($60)	$2,584	$371	($2,212)	($5,618)
2002	$0	$164	$2,184	$0	$0	($263)	($169)	($86)	$2,349	$518	($1,830)	($7,032)
2003	$0	$169	$1,928	$0	$0	($348)	($209)	($112)	$2,097	$669	($1,428)	($8,045)
2004	$0	$87	$76	$0	$0	($400)	($222)	($126)	$163	$748	$585	($7,664)
2005	$0	$0	($1,720)	$0	$0	($413)	($214)	($129)	$0	$2,475	$2,475	($6,186)
2006	$0	$0	($1,772)	$0	$0	($422)	($205)	($130)	$0	$2,530	$2,530	($4,799)
2007	$0	$0	($1,827)	$0	$0	($431)	($197)	($135)	$0	$2,590	$2,590	($3,497)
2008	$0	$0	($1,883)	$0	$0	($441)	($189)	($139)	$0	$2,652	$2,652	($2,273)
2009	$0	$0	($1,940)	$0	$0	($454)	($181)	($141)	$0	$2,717	$2,717	($1,122)
2010	$0	$0	($2,000)	$0	$0	($467)	($173)	($144)	$0	$2,783	$2,783	($40)
2011	$0	$0	($2,061)	$0	$0	($480)	($165)	($149)	$0	$2,854	$2,854	$978
2012	$0	$0	($2,124)	$0	$0	($494)	($157)	($154)	$0	$2,928	$2,928	$1,936
2013	$0	$0	($2,189)	$0	$0	($507)	($148)	($156)	$0	$3,000	$3,000	$2,837
2014	$0	$0	($2,256)	$0	$0	($521)	($140)	($153)	$0	$3,071	$3,071	$3,684
2015	$0	$0	($2,325)	$0	$0	($535)	($133)	($154)	$0	$3,147	$3,147	$4,480
2016	$0	$0	($2,396)	$0	$0	($549)	($129)	($151)	$0	$3,225	$3,225	$5,228
2017	$0	$0	($2,470)	$0	$0	($564)	($126)	($150)	$0	$3,309	$3,309	$5,933
2018	$0	$0	($2,545)	$0	$0	($580)	($122)	($159)	$0	$3,406	$3,406	$6,599
2019	$0	$0	($2,623)	$0	$0	($603)	($119)	($163)	$0	$3,508	$3,508	$7,228
2020	$0	$0	($2,703)	$0	$0	($627)	($115)	($168)	$0	$3,614	$3,614	$7,823
2021	$0	$0	($2,786)	$0	$0	($652)	($112)	($174)	$0	$3,724	$3,724	$8,386
2022	$0	$0	($2,872)	$0	$0	($672)	($109)	($179)	$0	$3,831	$3,831	$8,917
2023	$0	$0	($2,959)	$0	$0	($692)	($106)	($184)	$0	$3,942	$3,942	$9,418
2024	$0	$0	($3,050)	$0	$0	($713)	($102)	($190)	$0	$4,056	$4,056	$9,892
2025	$0	$0	($3,144)	$0	$0	($735)	($99)	($196)	$0	$4,173	$4,173	$10,339
2026	$0	$0	($3,240)	$0	$0	($757)	($96)	($202)	$0	$4,294	$4,294	$10,761
2027	$0	$0	($3,339)	$0	$0	($780)	($93)	($208)	$0	$4,420	$4,420	$11,160
2028	$0	$0	($3,441)	$0	$0	($803)	($90)	($214)	$0	$4,549	$4,549	$11,536
Nominal		$810	($49,047)			($15,228)	($4,124)	($4,355)	$11,426	$83,371	$71,945	
NPV		$655	($5,038)			($4,260)	($1,613)	($1,280)	$9,587	$21,124	$11,536	
Discount Rate =		8.97%										
Benefit/Cost Ratio =		2.20										

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Customer Equip Costs ($000s)	(3) Customer O&M Costs ($000s)	(4) Other Costs ($000s)	(5) Other Benefits ($000s)	(6) Change in Participants' Electric Bills ($000s)	(7) Tax Credits ($000s)	(8) Utility Paid Rebates & Incentives ($000s)	(9) Total Costs ($000s)	(10) Total Benefits ($000s)	(11) Total Net Benefits ($000s)	(12) Cumulative Discounted Net Benefits ($000s)
1999	$1,500	($144)	$0	$0	($29)	$0	$100	$1,500	$272	($1,228)	($1,228)
2000	$3,092	($444)	$0	$0	($85)	$0	$200	$3,092	$728	($2,364)	($3,397)
2001	$3,187	($762)	$0	$0	($135)	$0	$200	$3,187	$1,097	($2,089)	($5,156)
2002	$3,284	($1,100)	$0	$0	($195)	$0	$200	$3,284	$1,495	($1,789)	($6,539)
2003	$3,385	($1,457)	$0	$0	($244)	$0	$200	$3,385	$1,901	($1,484)	($7,591)
2004	$1,744	($1,669)	$0	$0	($278)	$0	$100	$1,744	$2,047	$303	($7,394)
2005	$0	($1,720)	$0	$0	($278)	$0	$0	$0	$1,998	$1,998	($6,201)
2006	$0	($1,772)	$0	$0	($281)	$0	$0	$0	$2,053	$2,053	($5,076)
2007	$0	($1,827)	$0	$0	($288)	$0	$0	$0	$2,114	$2,114	($4,013)
2008	$0	($1,883)	$0	$0	($287)	$0	$0	$0	$2,169	$2,169	($3,011)
2009	$0	($1,940)	$0	$0	($290)	$0	$0	$0	$2,230	$2,230	($2,067)
2010	$0	($2,000)	$0	$0	($293)	$0	$0	$0	$2,292	$2,292	($1,176)
2011	$0	($2,061)	$0	$0	($296)	$0	$0	$0	$2,357	$2,357	($335)
2012	$0	($2,124)	$0	$0	($299)	$0	$0	$0	$2,423	$2,423	$458
2013	$0	($2,189)	$0	$0	($302)	$0	$0	$0	$2,491	$2,491	$1,206
2014	$0	($2,256)	$0	$0	($306)	$0	$0	$0	$2,562	$2,562	$1,912
2015	$0	($2,325)	$0	$0	($309)	$0	$0	$0	$2,634	$2,634	$2,579
2016	$0	($2,396)	$0	$0	($313)	$0	$0	$0	$2,709	$2,709	$3,207
2017	$0	($2,470)	$0	$0	($316)	$0	$0	$0	$2,786	$2,786	$3,801
2018	$0	($2,545)	$0	$0	($320)	$0	$0	$0	$2,865	$2,865	$4,361
2019	$0	($2,623)	$0	$0	($324)	$0	$0	$0	$2,947	$2,947	$4,890
2020	$0	($2,703)	$0	$0	($328)	$0	$0	$0	$3,031	$3,031	$5,389
2021	$0	($2,786)	$0	$0	($332)	$0	$0	$0	$3,118	$3,118	$5,860
2022	$0	($2,872)	$0	$0	($336)	$0	$0	$0	$3,208	$3,208	$6,304
2023	$0	($2,959)	$0	$0	($341)	$0	$0	$0	$3,300	$3,300	$6,724
2024	$0	($3,050)	$0	$0	($346)	$0	$0	$0	$3,396	$3,396	$7,121
2025	$0	($3,144)	$0	$0	($351)	$0	$0	$0	$3,494	$3,494	$7,495
2026	$0	($3,240)	$0	$0	($356)	$0	$0	$0	$3,596	$3,596	$7,848
2027	$0	($3,339)	$0	$0	($361)	$0	$0	$0	$3,700	$3,700	$8,182
2028	$0	($3,441)	$0	$0	($367)	$0	$0	$0	$3,806	$3,808	$8,498
Nominal	$16,191	($65,239)			($8,584)		$1,000	$16,191	$74,822	$58,631	
NPV	$13,094	($18,132)			($2,646)		$813	$13,094	$21,592	$8,498	

Discount Rate = 8.97%
Benefit/Cost Ratio = 1.65

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($29)	($35)	$0	($11)	$0	$0	$204	$46	($158)	($158)
2000	$0	$155	$200	($85)	($106)	($79)	($36)	$0	$0	$439	$221	($218)	($356)
2001	$0	$159	$200	($135)	($185)	($126)	($60)	$0	$0	$495	$371	($123)	($462)
2002	$0	$164	$200	($195)	($263)	($169)	($86)	$0	$0	$559	$518	($41)	($493)
2003	$0	$169	$200	($244)	($348)	($209)	($112)	$0	$0	$613	$669	$56	($454)
2004	$0	$67	$100	($278)	($400)	($222)	($126)	$0	$0	$466	$748	$282	($270)
2005	$0	$0	$0	($278)	($413)	($214)	($129)	$0	$0	$278	$756	$478	$15
2006	$0	$0	$0	($281)	($422)	($205)	($130)	$0	$0	$281	$758	$477	$277
2007	$0	$0	$0	($288)	($431)	($197)	($135)	$0	$0	$288	$763	$476	$516
2008	$0	$0	$0	($287)	($441)	($189)	($139)	$0	$0	$287	$770	$483	$739
2009	$0	$0	$0	($290)	($454)	($181)	($141)	$0	$0	$290	$777	$487	$945
2010	$0	$0	$0	($293)	($467)	($173)	($144)	$0	$0	$293	$784	$491	$1,136
2011	$0	$0	$0	($296)	($480)	($165)	($149)	$0	$0	$296	$793	$497	$1,313
2012	$0	$0	$0	($299)	($494)	($157)	($154)	$0	$0	$299	$804	$505	$1,478
2013	$0	$0	$0	($302)	($507)	($148)	($156)	$0	$0	$302	$812	$509	$1,631
2014	$0	$0	$0	($306)	($521)	($140)	($153)	$0	$0	$306	$815	$509	$1,771
2015	$0	$0	$0	($309)	($535)	($133)	($154)	$0	$0	$309	$822	$512	$1,901
2016	$0	$0	$0	($313)	($549)	($129)	($151)	$0	$0	$313	$829	$516	$2,021
2017	$0	$0	$0	($316)	($564)	($126)	($150)	$0	$0	$316	$840	$523	$2,132
2018	$0	$0	$0	($320)	($580)	($122)	($159)	$0	$0	$320	$861	$541	$2,238
2019	$0	$0	$0	($324)	($603)	($119)	($163)	$0	$0	$324	$885	$561	$2,339
2020	$0	$0	$0	($328)	($627)	($115)	($168)	$0	$0	$328	$911	$583	$2,435
2021	$0	$0	$0	($332)	($652)	($112)	($174)	$0	$0	$332	$937	$606	$2,526
2022	$0	$0	$0	($336)	($672)	($109)	($179)	$0	$0	$336	$960	$624	$2,613
2023	$0	$0	$0	($341)	($692)	($106)	($184)	$0	$0	$341	$982	$641	$2,694
2024	$0	$0	$0	($346)	($713)	($102)	($190)	$0	$0	$346	$1,005	$660	$2,771
2025	$0	$0	$0	($351)	($735)	($99)	($196)	$0	$0	$351	$1,030	$679	$2,844
2026	$0	$0	$0	($356)	($757)	($96)	($202)	$0	$0	$356	$1,055	$699	$2,913
2027	$0	$0	$0	($361)	($780)	($93)	($208)	$0	$0	$361	$1,081	$719	$2,978
2028	$0	$0	$0	($367)	($803)	($90)	($214)	$0	$0	$367	$1,107	$741	$3,039
Nominal		$810	$1,000	($8,584)	($15,228)	($4,124)	($4,355)			$10,393	$23,707	$13,314	
NPV		$655	$813	($2,646)	($4,260)	($1,613)	($1,280)			$4,114	$7,153	$3,039	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.74

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Cost Effectiveness Analysis
Cooling and Heating Efficiency Enhancement Program

Existing System			New System		Cost Effectiveness		
Heating	Cooling		Heating	Cooling	RIM	PART	TRC
68% AFUE Gas Furnace	**7 SEER A/C**		**7.4 HSPF Heat Pump**	**11 SEER Heat Pump**	**1.74**	**1.65**	**2.20**
68% AFUE Gas Furnace	7 SEER A/C	25% Free Riders	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.59	1.60	2.12
68% AFUE Gas Furnace	7 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.49	1.09	1.30
68% AFUE Gas Furnace	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	2.45	1.45	1.85
68% AFUE Gas Furnace	10 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	1.41	1.14	1.32
68% AFUE Gas Furnace	10 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.19	0.80	0.75
Gas or Resistance Heat	7 SEER A/C		Gas or Resistance Heat	11 SEER A/C	1.06	0.87	0.93
Gas or Resistance Heat	8 SEER A/C		Gas or Resistance Heat	11 SEER A/C	0.95	0.60	0.60
Resistance Heat	7 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.75	1.46	1.07
Resistance Heat	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.66	1.26	0.82

Cost Effectiveness Analysis
Cooling and Heating Efficiency Enhancement Program

Existing System Heating	Existing System Cooling		New System Heating	New System Cooling	Cost Effectiveness RIM	Cost Effectiveness PART	Cost Effectiveness TRC
68% AFUE Gas Furnace	**7 SEER A/C**		**7.4 HSPF Heat Pump**	**11 SEER Heat Pump**	**1.74**	**1.65**	**2.20**
68% AFUE Gas Furnace	7 SEER A/C	25% Free Riders	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.59	1.60	2.12
68% AFUE Gas Furnace	7 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.49	1.09	1.30
68% AFUE Gas Furnace	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	2.45	1.45	1.85
68% AFUE Gas Furnace	10 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	1.41	1.14	1.32
68% AFUE Gas Furnace	10 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.19	1.39	1.88
Gas or Resistance Heat	7 SEER A/C		Gas or Resistance Heat	11 SEER A/C	1.06	0.87	0.93
Gas or Resistance Heat	8 SEER A/C		Gas or Resistance Heat	11 SEER A/C	0.95	0.60	0.60
Resistance Heat	7 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.75	1.46	1.07
Resistance Heat	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.66	1.26	0.82

Florida Public Service Commission
Docket No. 981591_EG
Gulf Power Company
Witness: T.S.Spangenberg
Exhibit No.__ (TSS-1)
Page 9 of 9

Revised 08/25/99

Docket No. 981591-EG

Gulf Power Company
Petition for Authority to Implement
Good Cents Conversion Program

Exhibit No. ________
Proffered by the Commission Staff

FLORIDA PUBLIC SERVICE COMMISSION
DOCKET
NO. 981591-EG EXHIBIT NO. 2
COMPANY/
WITNESS: [illegible]
DATE: 10-12-99

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for Authority to Implement Good Cents Conversion Program by Gulf Power Company	))))	Docket No. 981591-EG

Gulf Power Company's Response to
Staff's First Set of Interrogatories
No. 1-19

The official respondent to the interrogatories is:

Margaret D. Neyman
Market Services Manager
Gulf Power Company
One Energy Place
Pensacola FL 32520-0231

1. **Please discuss why Gulf has petitioned for Commission approval of a DSM program that increases winter peak demand when Gulf is not close to meeting its winter demand goals set by the Commission in October, 1994.**

Answer: Gulf Power is not aware of any cost-effective DSM program options available to it to meet winter demand goals other than those already underway. While this proposed program increases winter peak, it will be very effective in reducing summer peak and annual energy. Gulf Power Company's resource planning criteria, as it relates to the Southern electric system (SES), is to meet a 13.5% target summer reserve margin for the entire SES. Any load that can be shifted or removed from the summer peak period will go toward reducing the future capacity resource additions needed to meet our planning criteria and thereby, save money for the customers by avoiding those costs. Finally, at this time, the SES has sufficient winter peak period reserves to accommodate additional winter demands.

2. Page 2, first paragraph, second sentence of *Gulf's filing refers to expected* per-participant annual savings of 1030 kWh of electricity and 302 therms of natural gas. Describe in detail how the proposed Program can reduce annual energy consumption given that the proposed program is forecasted to increase winter demand by 4.40 kW per customer. Please provide all assumptions and, if available, all supporting documentation or data.

Answer: The summer energy savings associated with replacement of a 7 SEER air conditioner with an 11 SEER heat pump outweighs the addition of heat pump heating kWh sales. Gulf's Residential Building Energy Program (RBEP), a computer simulation program, was utilized to calculate the estimated cooling and heating energy and demand and provided the following results: Cooling kWh are reduced by 2,933 kWh from 7,171 for the 7 SEER air conditioning to 4,238 kWh for the 11 SEER heat pump. The heating kWh increase from 104 kWh for the gas furnace fan to 2007 kWh for the heat pump providing the addition of 1,903 kWh. The net result of the heating and cooling season actions is a decrease of 1,030 kWh per year per participant.

3. **Page 2, first paragraph, third sentence of Gulf's filing states:**

"Additional benefits related to cost of maintenance and repair of customers' cooling and heating systems will be realized by early retirement of this equipment and replacement with new heat pump systems."

Was this benefit quantified in any cost – effectiveness test? Is there data to back up Gulf's statement? If so, how and where is such data taken into account? Please provide all available supporting documentation or data, which supports Gulf's statement.

Answer: This additional benefit has not been quantified through empirical research and therefore was not included in any of the cost-effectiveness tests. Although, Gulf Power does not have specific data to back up this statement, it is a logical and intuitive conclusion based on normal and natural market responses. We believe that this program, coupled with our competitive rates will result in eligible customers replacing their aging equipment prior to the expiration of its useful life. This would certainly result in the saving of service and repair costs and customer inconvenience and discomfort related to equipment failure.

4. Page 2, first paragraph, last sentence of Gulf's filing states:

"Our environment will benefit by these customer actions because of a 39% reduction in ground source BTU consumption"

Please provide all available supporting documentation or data, which supports Gulf's statement.

Answer: See attachment "A", which contains the derivation of ground source Btu savings.

Attachment "A"

GROUND SOURCE EFFICIENCIES
HEAT PUMP VS GAS FURNACE
Gulf Power Company

At house Btu consumption:

HEAT PUMP HEATING BTU USAGE:
2007 kwh used by (3.2 COP, 7.4 HSPF, 11.0 SEER heat pump) x 3413 btus/kwh = **6,849,891** Btu input by heat pump

NATURAL GAS FURNACE BTU USAGE:
302 therms used by 68% AFUE furnace x 100,000 btu/therm +(104 fan kwhs*10436)= **31,285,344** Btu's input by furnace

Ground Source Btu consumption:

HEAT PUMP HEATING BTU USAGE AT GROUND SOURCE BTU'S:
2007 kwhs, (3.2 COP, 7.4 HSPF, 11.0 SEER heat pump) x 10436 source btus/kwh = **20,945,052** Btu input by heat pump
10436 btu's/kwh thermal efficiency, Dec. 1997 Operating Report, Gulf Power

NATURAL GAS FURNACE BTU USAGE:
302 therms used by 68% AFUE furnace x 100,000 btu/therm x 91.2 delivery efficiency + (104 fan kwh x 10436) = **34,199,379** Btu's input by furnace

Heat Pump Savings: **13,254,327**
Heat Pump % Btu savings: **38.8%**

THESE NUMBERS ARE CONSERVATIVE. THE EFFICIENCY RATING OF BOTH GAS FURNACE AND HEAT PUMPS ARE RATED IN THE DEPARTMENT OF ENERGY'S (DOE) WEATHER ZONE 4, WHICH IS OHIO, INDIANA, ILLINOIS, NEBRASKA ETC. IN FLORIDA, THE HEAT PUMP OPERATES MORE EFFICIENTLY IN OUR ZONE 2 AND ZONE 1 AREAS. ZONE 4 HAS 2000 T0 2500 WINTER HEATING LOAD HOURS. PENSACOLA FLORIDA'S ZONE 2 HAS ABOUT 1000 TO 1100 WINTER HEATING LOAD HOURS(DOE). THE NATURAL GAS FURNACE IS LESS EFFICIENT IN FLORIDA DUE TO INCREASED CYCLING LOSSES. FLORIDA'S WEATHER IS IDEAL FOR HEAT PUMPS. THE AVERAGE WINTER TEMPERATURE IN PENSACOLA IS 53 DEGREES F.

<u>GROUND SOURCE EFFICIENCY ACCORDING TO AMERICAN GAS ASSOCIATION(1)</u>

<u>HEAT PUMP BTU USAGE:</u>

2007 kwh used by 3.2 COP, 7. 4 HSPF, 11.0 SEER heat pump x (3413/.268 cul. eff.)= **25,559,295** Btu's

<u>NATURAL GAS FURNACE BTU USAGE:</u>

302 therms used by 68% AFUE furnace x 100,000 btu/therm X .912 efficiency = **33,114,035** Btu's

Heat Pump Savings: **7,554,740**
Heat Pump % Btu savings: **22.8%**

(1) The following assumptions are used for the heat pump and gas furnace calculations:
American Gas Association (AGA)'s Gas Energy Review, Feb. 1994, Table 2, Energy Trajectory Efficiencies, pg. 22
(trajectory efficiency refers to energy used or lost, from the point of extraction to the residential meter.)
- natural gas cumulative efficiency or delivery efficiency is 91.2%
- electricity cumulative efficiency for coal generation is 26.8%, according to AGA, nationally.

Gulf Power Btu heat factor(all plants) is 10436. 3413/10436 = 32.7% cumulative efficiency.
Building Specifications:
- Energy usage based on RBEP2, Residential Building Energy Program. The home is a typical 1680 sq. ft. home, family of 4, with r11 wall, and r19 attic insulation, single pane windows; a 68% efficient gas furnace vs. a typical 11.0 SEER, 7.4 HSPF, 3.2 COP electric heat pump.

5. Please describe the difference between the "utility nonrecurring cost per customer" contained on page 4, section III.(1) of Gulf's filing, and the "utility nonrecurring rebate/incentive contained on page 4, section III.(14). Describe how these two terms are different, and why the dollar amounts are different.

Answer: The "Utility Nonrecurring Cost Per Customer" of $150 is the actual program cost associated with the implementation and operation of this program and includes such items as labor, materials, supplies, advertising, and an incentive of $50 per installed unit paid to the installing dealer. The "Utility Nonrecurring Rebate/Incentive" of $200 is the rebate amount payable to the customer. This amount on line 14 goes to reduce the participant's costs as shown on page 6 column 8 and therefore must exclude any incentive not paid to the actual participant.

6. **Please explain the source for the $3000 "customer equipment cost" contained on page 4, Section III. (4) of Gulf's filing. If available, provide supporting documentation or data for the "customer equipment cost" value.**

Answer: The "Customer Equipment Cost" of $3,000 was estimated using the experience of Gulf Power representatives familiar with heat pump installations and having worked with customers to provide financing packages on some of these installations. This estimate was tested for reasonableness using Means Building Construction Cost Data. In the latest edition available, 1994 edition, Division 157 Line 160 1520 describes a 2 ton heat pump with supplementary electric heat with a total cost of $2,775 and a 4 ton unit for $4,175. These units provide an average cost per ton of $1158. After adjusting for "City Cost Indexes" of 85.5% to 88.3% as indicated for the five Cities in the State of Florida (Means page 438), a 3 ton heat pump should cost $2,970 to $3,067.

7. **Please explain the cause of the decrease in "customer O&M cost" contained on page 4, section III. (6) of Gulf's filing. If available, provide supporting documentation or data for the "customer O&M cost" value.**

Answer: The "Customer O & M Cost" decrease of $287 is the customer operating cost savings resulting from the removal of the gas furnace. This figure was arrived at by using Gulf's Residential Building Energy Program (RBEP) and the average price of natural gas across Gulf's service area. Estimated cost savings ranged from $227 in DeFuniak Springs where Gulf's customers experience the lowest cost for natural gas to $359 in the portion of Santa Rosa County surrounding the City of Milton, which has the highest cost for natural gas. The homeowner will pay less to heat with a heat pump than with natural gas in Florida. Natural gas in Northwest Florida costs about $.95 per therm while the national average is $.604 per therm. Electricity average cost is $.0695 per kWh at Gulf Power versus $.0841 per kWh national Average (GAMA Consumers' Directory of Certified Efficiency Ratings, April, 1998). The rate schedules of area gas distributors are included as Attachment "B".

PEOPLES GAS - WFGAS (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$7.42	$0.00742	$0.7423	74.2	$0.924	34.1%

$7.00 CUSTOMER CHARGE EVERY MONTH

Normal weather rate. Does not include Weather Normalization Charge in winter.

CHIPLEY - CHPGASOT (OUTSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
UNDER 2,500 CU FT	25	$10.59	$0.01059	$1.0587	105.9		
OVER 2,500 CU FT	25	$10.45	$0.01045	$1.0450	104.5	$1.052	52.6%

$1.10 MINIMUM BILL

CHIPLEY - CHPGASIN (INSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
UNDER 2,500 CU FT	25	$7.70	$0.00770	$0.7700	77.0		
OVER 2,500 CU FT	25	$7.60	$0.00760	$0.7600	76.0	$0.765	11.0%

$1.00 MINIMUM BILL

DE FUNIAK SPRINGS - DFUNKOUT.RAT (OUTSIDE CITY)

(MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$7.13	$0.00713	$0.7130	71.3	$0.827	20.1%

$4.40 CUSTOMER CHARGE EVERY MONTH

DE FUNIAK SPRINGS - DFUNKIN.RAT (INSIDE CITY)

(MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$6.48	$0.00648	$0.6482	64.8	$0.752	9.2%

$4.00 CUSTOMER CHARGE EVERY MONTH

WEIGHTED AVERAGE PRICE CUSTOMERS PAY FOR NATURAL GAS IN NWF IN AN EFFICIENT HOME:	**$0.950**	**37.9%**
% CHANGE IN PRICE VS 6/1/94($.945/therm):	**0.6%**	
NATIONAL AVERAGE NATURAL GAS PRICE PER THERM (DOE/EIA est. 1997:	**$0.689**	

(1996 avg. = $0.634) ***(Yellow Energy Guide = $.604)***

LP GAS PRICES - GALLONS AND THERMS		**PER/THERM**
PENSACOLA	$0.99000 PER GALLON	$1.089
PANAMA CITY	$1.25000 PER GALLON	$1.375
FT WALTON BEACH	$0.99000 PER GALLON	$1.089
NATIONAL AVERAGE (DOE/FTC/Gan	$0.98300 PER GALLON	$1.081

NATIONAL AVERAGE ELECTRIC PRICE PER KWH (DOE/EIA) 1997:	**price per KWH**	**$0.0846**	
GULF POWER AVERAGE ANNUAL ELECTRIC PRICE 1997:	**price per KWH**	**$0.0674**	**-25.5%**
GULF POWER MARGINAL ELECTRIC PRICE April, 1998:	**price per KWH**	**$0.0538**	

NOTES:

ELECTRICITY PRICE % LOWER THAN NATIONAL AVERAGE: 20.3%

THE EFFECTIVE OR ANNUALIZED COST PER THERM INCLUDES THE MONTHLY CUSTOMER CHARGE OR HIGH COST-LOW USAGE STEPS OF THE RATES WHERE APPLICABLE. THESE CHARGES CAUSE THE ACTUAL CUSTOMER CHARGE PER THERM TO BE HIGHER THAN THE PER THERM COST ON THE RATE SCHEDULE. ALL DOE COSTS INCLUDE CUSTOMER CHARGES.

THE RESIDENTIAL BUILDING ENERGY PROGRAM (RBEP2) WAS USED IN CALCULATING EFFECTIVE COST. THE CALCULATED USAGE IS 462 THERMS OF NATURAL GAS ANNUALLY AND BASED ON AN 1800 SQ. FT. ENERGY EFFICIENT HOUSE WITH AN 80% AFUE GAS FURNACE AND A 56% ENERGY FACTOR WATER HEATER.

THE HOUSE HAS R13 WALLS, R38 CEILING INSULATED DOORS AND WINDOWS, AND THE HOME MEETS ENERGY CODE.

RATES TAKEN FROM RATE SCHEDULES AND/OR VERIFIED BY PHONE FROM EACH GAS DISTRIBUTOR.

HOT WATER USAGE (19500 GALLONS, 194 THERMS) REFLECTS THE ENERGY CONSUMPTION FOR WATER HEATING OF THREE PEOPLE.

THE AVERAGE HOUSEHOLD SIZE IN NORTHWEST FLORIDA IS ABOUT 2.6 PEOPLE.

National avg. estimated naturlal gas price is from DOE/EIA Natural Gas Monthly, April 1998. 1996 price is final.

FTC = FEDERAL TRADE COMMISSION

National avg. estimated Electricity prices is from DOE?EIA Electric Power Monthly, April 1998. 1996 price final.

The FTC Yellow Energy Guide cost is from Oct. 1997, GAMMA's Consumers' Directory of Certified Efficiency Ratings

Natural gas total usage in therms: 462

NATURAL GAS QUANTITY NOMENCLATURE:

CF=CU.FT.=CUBIC FEET= APPROX. 1,000 BTU'S

100 CU FT = 1 CCF = 1 THERM = 100,000 BTU'S

ONE GALLON OF LP = 91,500 BTU'S AND 1.1 GALLONS OF LP = 1 THERM

Residential Marketing, Gulf Power rev.1/98(GS3PR498)

RESIDENTIAL NATURAL GAS RATES OF NORTHWEST FLORIDA DISTRIBUTORS

RATES IN EFFECT April 2, 1998

FAMILY OF THREE

RATE SCHEDULES

(1) Effective or Avg. Annualized cost per Therm for Heating and Water Heating in an Efficient Home — PERCENT ABOVE THE NATIONAL AVERAGE

PENSACOLA FLORIDA - PGASOUT (OUTSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
FIRST 500 CU FT	5	$22.24	$0.02224	$2.2240	222.4		
NEXT 2500 CU FT	25	$10.42	$0.01042	$1.0420	104.2		
OVER 3000 CU FT	30	$7.15	$0.00715	$0.7150	71.5	$1.045	51.7%
		$3.99 MINIMUM BILL					

PENSACOLA FLORIDA - PGASIN (INSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
FIRST 500 CU FT	5	$18.54	$0.01854	$1.8540	185.4		
NEXT 2500 CU FT	25	$8.68	$0.00868	$0.8680	86.8		
OVER 3000 CU FT	30	$5.97	$0.00597	$0.5970	59.7	$0.872	26.5%
		$3.99 MINIMUM BILL					

CENTURY - CENTGAS (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
FIRST 500 CU FT	5.4	A	$6.50 charge for first five therms				
Over 5 Cu FT	over 5.4	$7.50	$0.00750	$0.7500	75.0		
						$0.821	19.2%
		$6.50 MINIMUM BILL					

GULF BREEZE - GBGASOUT (OUTSIDE CITY) (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
UNDER 50,000 CU FT	500	$7.50	$0.00750	$0.7500	75.0		
OVER 50,000 CU FT	500	$7.00	$0.00700	$0.7000	70.0	$0.932	35.2%
		$7.00 CUSTOMER CHARGE EVERY MONTH					

GULF BREEZE - GBGASIN (INSIDE CITY) (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
UNDER 50,000 CU FT	500	$6.25	$0.00625	$0.6250	62.5		
OVER 50,000 CU FT	500	$5.83	$0.00583	$0.5830	58.3	$0.781	13.3%
		$6.00 CUSTOMER CHARGE EVERY MONTH					

MILTON - MILGASOT (OUTSIDE CITY) (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
First 5 Cu Ft	First 5	A $7.46 charge for first 5 therms					
Over 5 Cu FT	over 5	$10.12	$0.01012	$1.0120	101.2	$1.190	72.6%
	Plus BTU charge of 1.075, and a PGA of $.03591 per therm(can change monthly)						
Ex. for 40 cuft: ((($7.46+(35*$1.012))*1.075)+(40*.03591)) = $46.24/40 therms = $1.188 per therm for month.							
		$7.46 MINIMUM BILL					

MILTON - MILGASIN (INSIDE CITY) (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
First 5 Cu Ft	First 5	A $6.38 charge for first 5 therms					
Over 5 Cu FT	over 5	$8.58	$0.00858	$0.8580	85.8	$1.015	47.4%
	Plus BTU charge of 1.075, and a PGA of $.03591 per therm(can change monthly)						
Ex. for 40 cu ft: ((($6.38+(35*$.858))*1.075)+(40*.03591)) = $39.28/40 therms = $1.01 per therm for month.							
		$6.38 MINIMUM BILL					

OKALOOSA GAS - OKGAS

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM	(1)	PERCENT
ALL CU FT	ALL THERMS	$7.19	$0.00719	$0.7192	71.9	$0.901	30.8%
		$7.00 CUSTOMER CHARGE EVERY MONTH					

8. **Please explain the derivation of the $20.70/kW/yr "incremental purchased capacity cost" contained on page 4, section IV. (18) of Gulf's filing. If available, provide supporting documentation or data for the "incremental purchased capacity cost" value.**

Answer: The $20.70/kW/yr for incremental capacity cost is derived from internal planning documents provided by Southern Company Services. The amount represents the total economic carrying cost for a combustion turbine less operating and maintenance cost adders in 1999 dollars. As stated in the footnote of the cost effectiveness report, this is supplemental information and is not used in any of the subsequent analysis.

9. **In the Total Resource Cost – Effectiveness analysis provided on page 5 of Gulf's filing, the "utility's program costs" in column 3 suddenly go to zero in the year 2005. Does this mean that the Program will be offered only until the year 2005? If this is true, why does Gulf expect to add more program participants until the year 2005 given that the in-service date for incremental generation is 2001 (page 4, section IV. (2)?**

Answer: As currently envisioned, the program would have a seven-year life. The program would be monitored and evaluated over this period. Results of the monitoring and evaluation would determine the program's future. Program costs and customer acceptance would be the driving determinants in program continuance. The marketing of the program (participation) and the program life are independent of the in-service date of peaking capacity. The avoidance of peaking capacity will continue to exist throughout the life of the heat pump units installed and further dampen projected system peaking requirements.

10. In the Total Resource Cost-Effectiveness analysis provided on page 5 of Gulf's filing, please explain why the "participants' program costs" in column 4 suddenly go negative in the year 2005.

Answer: The "Participants' Program Costs" go negative as the result of "Customer O & M Cost" annual savings of $287. This figure did not go negative until 2005 because of the "Customer Equipment Cost" expenditures outweighing the savings.

11. **In the Participants' Cost-Effectiveness analysis provided on page 6 of Gulf's filing, it appears that the program is not expected to incur any costs (column 9) starting in the year 2005. Explain whether Gulf expects to incur any costs, beyond the year 2005, associated with monitoring the sustainability of forecasted demand and energy savings. If there are such costs not included in Gulf's analyses, please provide revised cost-effectiveness spreadsheets incorporating these costs.**

Answer: Gulf Power does not expect to incur any costs in the years 2005 and beyond. Gulf will complete our monitoring and associated analysis prior to the end of this program.

12. In the Participants' Cost-Effectiveness analysis provided on page 6 of Gulf's filing, it appears that the program does not become cost-effective to program participants (column 12) for 14 years, until the year 2012. Please discuss whether Gulf plans to inform prospective program participants of this fact.

Answer: This program becomes cost effective to the entire body of rate payers in the 14th year. However, individual participating customers will receive economic payback related to their installation in a period averaging less than nine years. (The investment is $3,000; the gas savings is $287; the electric savings is $58.) Gulf Power energy consultants will utilize payback as well as other benefits and cost analyses as necessary to support this promotion process.

13. **In the Ratepayers' Impact Cost-Effectiveness analysis provided on page 7 of Gulf's filing, it appears that "incremental generation capacity costs (column 6) continue to decrease throughout the 30-year analysis period. Please explain how generation capacity costs can decrease when the proposed Program causes a 4.4 kW per customer increase in winter peak demand.**

Answer: The relevant avoidable generation occurs at the time of the system peak which is during the summer. The Southern electric system at this time is not planning to build any peaking units or to purchase additional peaking capacity on a committed basis to serve the winter peak. Therefore, adding additional load in the winter does not require any additional capital expansion. The Southern system can meet the projected increase in demand with existing resources. If Gulf and Southern were to become a winter peaking system such that it would affect the system resource planning process, the program would be re-evaluated for cost-effectiveness.

14. **Please provide the input data and cost-effectiveness calculations, like those included in pages 4-7 of Gulf's filing, for each scenario contained on page 8 of Gulf's filing.**

Answer: See Attachment "C".

Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($171)	($22)	$0	($66)	$0	$0	$346	$88	($257)	($257)
2000	$0	$155	$200	($502)	($67)	($50)	($216)	$0	$0	$857	$332	($525)	($739)
2001	$0	$159	$200	($805)	($117)	($80)	($357)	$0	$0	$1,164	$554	($610)	($1,253)
2002	$0	$164	$200	($1,160)	($166)	($107)	($514)	$0	$0	$1,524	$787	($737)	($1,823)
2003	$0	$169	$200	($1,448)	($220)	($132)	($664)	$0	$0	$1,817	$1,016	($801)	($2,390)
2004	$0	$87	$100	($1,655)	($252)	($141)	($748)	$0	$0	$1,842	$1,141	($701)	($2,846)
2005	$0	$0	$0	($1,653)	($261)	($135)	($768)	$0	$0	$1,653	$1,163	($490)	($3,139)
2006	$0	$0	$0	($1,668)	($267)	($130)	($774)	$0	$0	$1,668	$1,170	($498)	($3,412)
2007	$0	$0	$0	($1,711)	($272)	($125)	($801)	$0	$0	$1,711	$1,198	($513)	($3,670)
2008	$0	$0	$0	($1,706)	($279)	($119)	($827)	$0	$0	$1,706	$1,225	($480)	($3,892)
2009	$0	$0	$0	($1,723)	($287)	($114)	($841)	$0	$0	$1,723	$1,242	($481)	($4,095)
2010	$0	$0	$0	($1,741)	($295)	($109)	($857)	$0	$0	$1,741	$1,261	($480)	($4,282)
2011	$0	$0	$0	($1,759)	($303)	($104)	($885)	$0	$0	$1,759	$1,292	($467)	($4,449)
2012	$0	$0	$0	($1,778)	($312)	($99)	($914)	$0	$0	$1,778	$1,324	($454)	($4,598)
2013	$0	$0	$0	($1,798)	($320)	($94)	($928)	$0	$0	$1,798	$1,342	($456)	($4,735)
2014	$0	$0	$0	($1,818)	($329)	($89)	($911)	$0	$0	$1,818	$1,329	($489)	($4,869)
2015	$0	$0	$0	($1,838)	($338)	($84)	($913)	$0	$0	$1,838	$1,335	($503)	($4,997)
2016	$0	$0	$0	($1,859)	($347)	($81)	($899)	$0	$0	$1,859	$1,327	($532)	($5,120)
2017	$0	$0	$0	($1,880)	($356)	($79)	($891)	$0	$0	$1,880	$1,327	($554)	($5,238)
2018	$0	$0	$0	($1,903)	($368)	($77)	($943)	$0	$0	$1,903	$1,386	($516)	($5,339)
2019	$0	$0	$0	($1,925)	($381)	($75)	($972)	$0	$0	$1,925	$1,428	($498)	($5,428)
2020	$0	$0	$0	($1,949)	($396)	($73)	($1,002)	$0	$0	$1,949	$1,470	($478)	($5,507)
2021	$0	$0	$0	($1,973)	($412)	($71)	($1,032)	$0	$0	$1,973	$1,515	($458)	($5,576)
2022	$0	$0	$0	($1,997)	($424)	($69)	($1,064)	$0	$0	$1,997	$1,557	($440)	($5,637)
2023	$0	$0	$0	($2,025)	($437)	($67)	($1,096)	$0	$0	$2,025	$1,600	($425)	($5,691)
2024	$0	$0	$0	($2,055)	($450)	($65)	($1,130)	$0	$0	$2,055	$1,645	($410)	($5,739)
2025	$0	$0	$0	($2,085)	($464)	($63)	($1,165)	$0	$0	$2,085	$1,691	($393)	($5,781)
2026	$0	$0	$0	($2,115)	($478)	($61)	($1,200)	$0	$0	$2,115	$1,739	($377)	($5,818)
2027	$0	$0	$0	($2,147)	($492)	($59)	($1,237)	$0	$0	$2,147	$1,788	($359)	($5,850)
2028	$0	$0	$0	($2,180)	($507)	($57)	($1,275)	$0	$0	$2,180	$1,839	($341)	($5,879)
Nominal		$810	$1,000	($51,026)	($9,617)	($2,605)	($25,889)			$52,836	$38,111	($14,725)	
NPV		$655	$813	($15,729)	($2,690)	($1,019)	($7,609)			$17,197	$11,318	($5,879)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.66

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	$0	$0	$0	($171)	$0	$100	$1,500	$271	($1,229)	($1,229)
2000	$3,092	$0	$0	$0	($502)	$0	$200	$3,092	$702	($2,389)	($3,422)
2001	$3,187	$0	$0	$0	($805)	$0	$200	$3,187	$1,005	($2,182)	($5,259)
2002	$3,284	$0	$0	$0	($1,160)	$0	$200	$3,284	$1,360	($1,924)	($6,747)
2003	$3,385	$0	$0	$0	($1,448)	$0	$200	$3,385	$1,648	($1,737)	($7,978)
2004	$1,744	$0	$0	$0	($1,655)	$0	$100	$1,744	$1,755	$10	($7,972)
2005	$0	$0	$0	$0	($1,653)	$0	$0	$0	$1,653	$1,653	($6,984)
2006	$0	$0	$0	$0	($1,668)	$0	$0	$0	$1,668	$1,668	($6,070)
2007	$0	$0	$0	$0	($1,711)	$0	$0	$0	$1,711	$1,711	($5,209)
2008	$0	$0	$0	$0	($1,706)	$0	$0	$0	$1,706	$1,706	($4,422)
2009	$0	$0	$0	$0	($1,723)	$0	$0	$0	$1,723	$1,723	($3,692)
2010	$0	$0	$0	$0	($1,741)	$0	$0	$0	$1,741	$1,741	($3,016)
2011	$0	$0	$0	$0	($1,759)	$0	$0	$0	$1,759	$1,759	($2,388)
2012	$0	$0	$0	$0	($1,778)	$0	$0	$0	$1,778	$1,778	($1,806)
2013	$0	$0	$0	$0	($1,798)	$0	$0	$0	$1,798	$1,798	($1,266)
2014	$0	$0	$0	$0	($1,818)	$0	$0	$0	$1,818	$1,818	($765)
2015	$0	$0	$0	$0	($1,838)	$0	$0	$0	$1,838	$1,838	($300)
2016	$0	$0	$0	$0	($1,859)	$0	$0	$0	$1,859	$1,859	$131
2017	$0	$0	$0	$0	($1,880)	$0	$0	$0	$1,880	$1,880	$532
2018	$0	$0	$0	$0	($1,903)	$0	$0	$0	$1,903	$1,903	$904
2019	$0	$0	$0	$0	($1,925)	$0	$0	$0	$1,925	$1,925	$1,249
2020	$0	$0	$0	$0	($1,949)	$0	$0	$0	$1,949	$1,949	$1,570
2021	$0	$0	$0	$0	($1,973)	$0	$0	$0	$1,973	$1,973	$1,868
2022	$0	$0	$0	$0	($1,997)	$0	$0	$0	$1,997	$1,997	$2,145
2023	$0	$0	$0	$0	($2,025)	$0	$0	$0	$2,025	$2,025	$2,403
2024	$0	$0	$0	$0	($2,055)	$0	$0	$0	$2,055	$2,055	$2,642
2025	$0	$0	$0	$0	($2,085)	$0	$0	$0	$2,085	$2,085	$2,866
2026	$0	$0	$0	$0	($2,115)	$0	$0	$0	$2,115	$2,115	$3,074
2027	$0	$0	$0	$0	($2,147)	$0	$0	$0	$2,147	$2,147	$3,267
2028	$0	$0	$0	$0	($2,180)	$0	$0	$0	$2,180	$2,180	$3,448
Nominal	$16,191				($51,026)		$1,000	$16,191	$52,026	$35,835	
NPV	$13,094				($15,729)		$813	$13,094	$16,542	$3,448	

Discount Rate = 8.97%
Benefit/Cost Ratio = 1.26

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Year	Change in Electric Supply Costs ($000s)	Utility's Program Costs ($000s)	Participants' Program Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Incremental Generation Cap Costs ($000s)	Incremental T&D Cap Costs ($000s)	Incremental Prog Induced Fuel Costs ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,500	$0	$0	($22)	$0	($66)	$1,575	$88	($1,487)	($1,487)
2000	$0	$155	$3,092	$0	$0	($67)	($50)	($216)	$3,246	$332	($2,914)	($4,161)
2001	$0	$159	$3,187	$0	$0	($117)	($80)	($357)	$3,346	$554	($2,792)	($6,512)
2002	$0	$164	$3,284	$0	$0	($166)	($107)	($514)	$3,448	$787	($2,661)	($8,569)
2003	$0	$169	$3,385	$0	$0	($220)	($132)	($664)	$3,554	$1,016	($2,538)	($10,369)
2004	$0	$87	$1,744	$0	$0	($252)	($141)	($748)	$1,831	$1,141	($690)	($10,818)
2005	$0	$0	$0	$0	$0	($261)	($135)	($768)	$0	$1,163	$1,163	($10,123)
2006	$0	$0	$0	$0	$0	($267)	($130)	($774)	$0	$1,170	$1,170	($9,482)
2007	$0	$0	$0	$0	$0	($272)	($125)	($801)	$0	$1,198	$1,198	($8,879)
2008	$0	$0	$0	$0	$0	($279)	($119)	($827)	$0	$1,225	$1,225	($8,314)
2009	$0	$0	$0	$0	$0	($287)	($114)	($841)	$0	$1,242	$1,242	($7,788)
2010	$0	$0	$0	$0	$0	($295)	($109)	($857)	$0	$1,261	$1,261	($7,298)
2011	$0	$0	$0	$0	$0	($303)	($104)	($885)	$0	$1,292	$1,292	($6,837)
2012	$0	$0	$0	$0	$0	($312)	($99)	($914)	$0	$1,324	$1,324	($6,403)
2013	$0	$0	$0	$0	$0	($320)	($94)	($928)	$0	$1,342	$1,342	($6,000)
2014	$0	$0	$0	$0	$0	($329)	($89)	($911)	$0	$1,329	$1,329	($5,634)
2015	$0	$0	$0	$0	$0	($338)	($84)	($913)	$0	$1,335	$1,335	($5,297)
2016	$0	$0	$0	$0	$0	($347)	($81)	($899)	$0	$1,327	$1,327	($4,988)
2017	$0	$0	$0	$0	$0	($356)	($79)	($891)	$0	$1,327	$1,327	($4,706)
2018	$0	$0	$0	$0	$0	($366)	($77)	($943)	$0	$1,386	$1,386	($4,435)
2019	$0	$0	$0	$0	$0	($381)	($75)	($972)	$0	$1,428	$1,428	($4,179)
2020	$0	$0	$0	$0	$0	($396)	($73)	($1,002)	$0	$1,470	$1,470	($3,937)
2021	$0	$0	$0	$0	$0	($412)	($71)	($1,032)	$0	$1,515	$1,515	($3,708)
2022	$0	$0	$0	$0	$0	($424)	($69)	($1,064)	$0	$1,557	$1,557	($3,492)
2023	$0	$0	$0	$0	$0	($437)	($67)	($1,096)	$0	$1,600	$1,600	($3,288)
2024	$0	$0	$0	$0	$0	($450)	($65)	($1,130)	$0	$1,645	$1,645	($3,096)
2025	$0	$0	$0	$0	$0	($464)	($63)	($1,165)	$0	$1,691	$1,691	($2,915)
2026	$0	$0	$0	$0	$0	($478)	($61)	($1,200)	$0	$1,739	$1,739	($2,744)
2027	$0	$0	$0	$0	$0	($492)	($59)	($1,237)	$0	$1,788	$1,788	($2,583)
2028	$0	$0	$0	$0	$0	($507)	($57)	($1,275)	$0	$1,839	$1,839	($2,431)
Nominal		$810	$16,191			($9,617)	($2,605)	($25,889)	$17,001	$38,111	$21,110	
NPV		$665	$13,094			($2,690)	($1,019)	($7,609)	$13,749	$11,318	($2,431)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.82

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses		
(1) Change in Peak kW Customer at meter	-1.20	kW/Cus
(2) Change in Peak kW per Customer at generator	-1.55	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(6,594)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(6,123)	kWh/Cus/Yr
*(8) Change in Winter kW per Cust at meter	-4.60	kW/Cus

II. Economic Life and K-Factors		
(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
*(6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs		
(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	$0.00	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
*(8) Customer Tax Credit Per Installation	$0.00	$/Cus
*(9) Customer Tax Credit Escalation Rate	3.06%	
*(10) Change in Supply Costs	$0.00	$/Cus/Year
*(11) Supply Costs Escalation Rate	3.06%	
*(12) Utility Discount Rate	8.97%	
*(13) Utility AFUDC Rate	10.30%	
*(14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
*(15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
*(16) Utility Rebate/Incentive Escalation Rate	0.00%	

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

IV. Incremental Generation, Transmission, & Distribution Costs		
(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	
Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost in Customer Bill (Base Year)		
(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$11,318	$16,542
NPV Costs ($000s)	$17,197	$13,094
NPV Net Benefits ($000s)	($5,879)	$3,448
Benefit:Cost Ratio	0.658	1.263

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($199)	($35)	$0	($77)	$0	$0	$374	$112	($262)	($262)
2000	$0	$155	$200	($585)	($106)	($79)	($251)	$0	$0	$940	$436	($504)	($724)
2001	$0	$159	$200	($937)	($185)	($126)	($416)	$0	$0	$1,297	$727	($569)	($1,204)
2002	$0	$164	$200	($1,351)	($263)	($169)	($599)	$0	$0	$1,715	$1,031	($684)	($1,733)
2003	$0	$169	$200	($1,686)	($348)	($209)	($774)	$0	$0	$2,055	$1,331	($724)	($2,246)
2004	$0	$87	$100	($1,927)	($400)	($222)	($871)	$0	$0	$2,114	$1,493	($621)	($2,651)
2005	$0	$0	$0	($1,926)	($413)	($214)	($894)	$0	$0	$1,926	$1,521	($405)	($2,893)
2006	$0	$0	$0	($1,943)	($422)	($205)	($901)	$0	$0	$1,943	$1,529	($414)	($3,120)
2007	$0	$0	$0	($1,993)	($431)	($197)	($933)	$0	$0	$1,993	$1,562	($431)	($3,336)
2008	$0	$0	$0	($1,987)	($441)	($189)	($964)	$0	$0	$1,987	$1,594	($393)	($3,518)
2009	$0	$0	$0	($2,007)	($454)	($181)	($979)	$0	$0	$2,007	$1,615	($393)	($3,684)
2010	$0	$0	$0	($2,028)	($467)	($173)	($998)	$0	$0	$2,028	$1,637	($391)	($3,836)
2011	$0	$0	$0	($2,049)	($480)	($165)	($1,031)	$0	$0	$2,049	$1,675	($374)	($3,969)
2012	$0	$0	$0	($2,071)	($494)	($157)	($1,064)	$0	$0	$2,071	$1,714	($357)	($4,086)
2013	$0	$0	$0	($2,094)	($507)	($148)	($1,080)	$0	$0	$2,094	$1,736	($358)	($4,194)
2014	$0	$0	$0	($2,117)	($521)	($140)	($1,061)	$0	$0	$2,117	$1,723	($394)	($4,302)
2015	$0	$0	$0	($2,141)	($535)	($133)	($1,063)	$0	$0	$2,141	$1,731	($410)	($4,406)
2016	$0	$0	$0	($2,165)	($549)	($129)	($1,047)	$0	$0	$2,165	$1,725	($440)	($4,508)
2017	$0	$0	$0	($2,190)	($564)	($126)	($1,038)	$0	$0	$2,190	$1,728	($463)	($4,607)
2018	$0	$0	$0	($2,216)	($580)	($122)	($1,098)	$0	$0	$2,216	$1,801	($415)	($4,688)
2019	$0	$0	$0	($2,243)	($603)	($119)	($1,132)	$0	$0	$2,243	$1,854	($389)	($4,758)
2020	$0	$0	$0	($2,270)	($627)	($115)	($1,167)	$0	$0	$2,270	$1,909	($361)	($4,817)
2021	$0	$0	$0	($2,298)	($652)	($112)	($1,202)	$0	$0	$2,298	$1,966	($332)	($4,867)
2022	$0	$0	$0	($2,326)	($672)	($109)	($1,239)	$0	$0	$2,326	$2,020	($306)	($4,910)
2023	$0	$0	$0	($2,359)	($692)	($106)	($1,277)	$0	$0	$2,359	$2,075	($284)	($4,946)
2024	$0	$0	$0	($2,393)	($713)	($102)	($1,316)	$0	$0	$2,393	$2,132	($262)	($4,976)
2025	$0	$0	$0	($2,428)	($735)	($99)	($1,356)	$0	$0	$2,428	$2,190	($238)	($5,002)
2026	$0	$0	$0	($2,464)	($757)	($96)	($1,398)	$0	$0	$2,464	$2,251	($213)	($5,023)
2027	$0	$0	$0	($2,501)	($780)	($93)	($1,441)	$0	$0	$2,501	$2,313	($188)	($5,040)
2028	$0	$0	$0	($2,539)	($803)	($90)	($1,485)	$0	$0	$2,539	$2,378	($162)	($5,053)
Nominal		$810	$1,000	($59,435)	($15,228)	($4,124)	($30,155)			$61,244	$49,507	($11,737)	
NPV		$656	$813	($18,321)	($4,260)	($1,613)	($8,863)			$19,789	$14,736	($5,053)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.74

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	$0	$0	$0	($199)	$0	$100	$1,500	$299	($1,201)	($1,201)
2000	$3,092	$0	$0	$0	($585)	$0	$200	$3,092	$785	($2,307)	($3,318)
2001	$3,187	$0	$0	$0	($937)	$0	$200	$3,187	$1,137	($2,049)	($5,044)
2002	$3,284	$0	$0	$0	($1,351)	$0	$200	$3,284	$1,551	($1,733)	($6,383)
2003	$3,385	$0	$0	$0	($1,686)	$0	$200	$3,385	$1,886	($1,498)	($7,446)
2004	$1,744	$0	$0	$0	($1,927)	$0	$100	$1,744	$2,027	$283	($7,262)
2005	$0	$0	$0	$0	($1,926)	$0	$0	$0	$1,926	$1,926	($6,111)
2006	$0	$0	$0	$0	($1,943)	$0	$0	$0	$1,943	$1,943	($5,046)
2007	$0	$0	$0	$0	($1,993)	$0	$0	$0	$1,993	$1,993	($4,044)
2008	$0	$0	$0	$0	($1,987)	$0	$0	$0	$1,987	$1,987	($3,127)
2009	$0	$0	$0	$0	($2,007)	$0	$0	$0	$2,007	$2,007	($2,277)
2010	$0	$0	$0	$0	($2,028)	$0	$0	$0	$2,028	$2,028	($1,489)
2011	$0	$0	$0	$0	($2,049)	$0	$0	$0	$2,049	$2,049	($758)
2012	$0	$0	$0	$0	($2,071)	$0	$0	$0	$2,071	$2,071	($80)
2013	$0	$0	$0	$0	($2,094)	$0	$0	$0	$2,094	$2,094	$549
2014	$0	$0	$0	$0	($2,117)	$0	$0	$0	$2,117	$2,117	$1,133
2015	$0	$0	$0	$0	($2,141)	$0	$0	$0	$2,141	$2,141	$1,674
2016	$0	$0	$0	$0	($2,165)	$0	$0	$0	$2,165	$2,165	$2,177
2017	$0	$0	$0	$0	($2,190)	$0	$0	$0	$2,190	$2,190	$2,643
2018	$0	$0	$0	$0	($2,216)	$0	$0	$0	$2,216	$2,216	$3,077
2019	$0	$0	$0	$0	($2,243)	$0	$0	$0	$2,243	$2,243	$3,479
2020	$0	$0	$0	$0	($2,270)	$0	$0	$0	$2,270	$2,270	$3,853
2021	$0	$0	$0	$0	($2,298)	$0	$0	$0	$2,298	$2,298	$4,200
2022	$0	$0	$0	$0	($2,326)	$0	$0	$0	$2,326	$2,326	$4,522
2023	$0	$0	$0	$0	($2,359)	$0	$0	$0	$2,359	$2,359	$4,822
2024	$0	$0	$0	$0	($2,393)	$0	$0	$0	$2,393	$2,393	$5,102
2025	$0	$0	$0	$0	($2,428)	$0	$0	$0	$2,428	$2,428	$5,362
2026	$0	$0	$0	$0	($2,464)	$0	$0	$0	$2,464	$2,464	$5,604
2027	$0	$0	$0	$0	($2,501)	$0	$0	$0	$2,501	$2,501	$5,830
2028	$0	$0	$0	$0	($2,539)	$0	$0	$0	$2,539	$2,539	$6,040
Nominal	$16,191				($59,435)		$1,000	$16,191	$60,435	$44,243	
NPV	$13,094				($18,321)		$813	$13,094	$19,134	$6,040	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.46

Total Resource Cost-Effectiveness Measure

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,500	$0	$0	($35)	$0	($77)	$1,575	$112	($1,463)	($1,463)
2000	$0	$156	$3,092	$0	$0	($106)	($79)	($251)	$3,246	$436	($2,811)	($4,042)
2001	$0	$159	$3,187	$0	$0	($185)	($126)	($416)	$3,346	$727	($2,619)	($6,247)
2002	$0	$164	$3,284	$0	$0	($263)	($169)	($599)	$3,448	$1,031	($2,418)	($8,116)
2003	$0	$169	$3,385	$0	$0	($348)	($209)	($774)	$3,554	$1,331	($2,223)	($9,692)
2004	$0	$87	$1,744	$0	$0	($400)	($222)	($871)	$1,831	$1,493	($338)	($9,912)
2005	$0	$0	$0	$0	$0	($413)	($214)	($894)	$0	$1,521	$1,521	($9,004)
2006	$0	$0	$0	$0	$0	($422)	($205)	($901)	$0	$1,529	$1,529	($8,166)
2007	$0	$0	$0	$0	$0	($431)	($197)	($933)	$0	$1,562	$1,562	($7,380)
2008	$0	$0	$0	$0	$0	($441)	($189)	($964)	$0	$1,594	$1,594	($6,645)
2009	$0	$0	$0	$0	$0	($454)	($181)	($979)	$0	$1,615	$1,615	($5,961)
2010	$0	$0	$0	$0	$0	($467)	($173)	($998)	$0	$1,637	$1,637	($5,324)
2011	$0	$0	$0	$0	$0	($480)	($165)	($1,031)	$0	$1,675	$1,675	($4,727)
2012	$0	$0	$0	$0	$0	($494)	($157)	($1,064)	$0	$1,714	$1,714	($4,166)
2013	$0	$0	$0	$0	$0	($507)	($148)	($1,080)	$0	$1,736	$1,736	($3,644)
2014	$0	$0	$0	$0	$0	($521)	($140)	($1,061)	$0	$1,723	$1,723	($3,170)
2015	$0	$0	$0	$0	$0	($535)	($133)	($1,063)	$0	$1,731	$1,731	($2,732)
2016	$0	$0	$0	$0	$0	($549)	($129)	($1,047)	$0	$1,725	$1,725	($2,331)
2017	$0	$0	$0	$0	$0	($564)	($126)	($1,038)	$0	$1,728	$1,728	($1,963)
2018	$0	$0	$0	$0	$0	($580)	($122)	($1,098)	$0	$1,801	$1,801	($1,611)
2019	$0	$0	$0	$0	$0	($603)	($119)	($1,132)	$0	$1,854	$1,854	($1,279)
2020	$0	$0	$0	$0	$0	($627)	($115)	($1,167)	$0	$1,909	$1,909	($964)
2021	$0	$0	$0	$0	$0	($652)	($112)	($1,202)	$0	$1,966	$1,966	($667)
2022	$0	$0	$0	$0	$0	($672)	($109)	($1,239)	$0	$2,020	$2,020	($387)
2023	$0	$0	$0	$0	$0	($692)	($106)	($1,277)	$0	$2,075	$2,075	($124)
2024	$0	$0	$0	$0	$0	($713)	($102)	($1,316)	$0	$2,132	$2,132	$125
2025	$0	$0	$0	$0	$0	($735)	($99)	($1,356)	$0	$2,190	$2,190	$360
2026	$0	$0	$0	$0	$0	($757)	($96)	($1,398)	$0	$2,251	$2,251	$581
2027	$0	$0	$0	$0	$0	($780)	($93)	($1,441)	$0	$2,313	$2,313	$790
2028	$0	$0	$0	$0	$0	($803)	($90)	($1,485)	$0	$2,378	$2,378	$987
Nominal		$810	$16,191			($15,228)	($4,124)	($30,155)	$17,001	$49,507	$32,506	
NPV		$655	$13,094			($4,260)	($1,613)	($8,863)	$13,749	$14,736	$987	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.07

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.038 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.90	kW/Cus
(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cus
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(7,681)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(7,132)	kWh/Cus/Yr
*(8) Change in Winter kW per Cust at meter	-4.60	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
*(6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	$0.00	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
*(8) Customer Tax Credit Per Installation	$0.00	$/Cus
*(9) Customer Tax Credit Escalation Rate	3.06%	
*(10) Change in Supply Costs	$0.00	$/Cus/Year
*(11) Supply Costs Escalation Rate	3.06%	
*(12) Utility Discount Rate	8.97%	
*(13) Utility AFUDC Rate	10.30%	
*(14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
*(15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
*(16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	

Stop Revenue Loss at In-Service Year? (Y=1, N=0) 0

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5)Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$14,736	$19,134
NPV Costs ($000s)	$19,789	$13,094
NPV Net Benefits ($000s)	($5,053)	$6,040
Benefit:Cost Ratio	0.745	1.461

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced *Fuel Costs* ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($54)	($22)	$0	($21)	$0	$0	$229	$43	($186)	($186)
2000	$0	$155	$200	($158)	($67)	($50)	($68)	$0	$0	$512	$184	($328)	($487)
2001	$0	$159	$200	($253)	($117)	($80)	($112)	$0	$0	$612	$309	($303)	($742)
2002	$0	$164	$200	($364)	($168)	($107)	($162)	$0	$0	$729	$434	($294)	($970)
2003	$0	$169	$200	($455)	($220)	($132)	($209)	$0	$0	$824	$561	($264)	($1,157)
2004	$0	$87	$100	($520)	($252)	($141)	($235)	$0	$0	$707	$628	($79)	($1,208)
2005	$0	$0	$0	($520)	($261)	($135)	($241)	$0	$0	$520	$637	$117	($1,138)
2006	$0	$0	$0	($524)	($267)	($130)	($243)	$0	$0	$524	$639	$115	($1,075)
2007	$0	$0	$0	($538)	($272)	($125)	($252)	$0	$0	$538	$649	$111	($1,019)
2008	$0	$0	$0	($536)	($279)	($119)	($260)	$0	$0	$536	$658	$122	($963)
2009	$0	$0	$0	($541)	($287)	($114)	($264)	$0	$0	$541	$665	$124	($910)
2010	$0	$0	$0	($547)	($295)	($109)	($269)	$0	$0	$547	$673	$126	($861)
2011	$0	$0	$0	($553)	($303)	($104)	($278)	$0	$0	$553	$685	$132	($814)
2012	$0	$0	$0	($559)	($312)	($99)	($287)	$0	$0	$559	$698	$139	($769)
2013	$0	$0	$0	($565)	($320)	($94)	($291)	$0	$0	$565	$705	$141	($726)
2014	$0	$0	$0	($571)	($329)	($89)	($288)	$0	$0	$571	$704	$133	($690)
2015	$0	$0	$0	($578)	($338)	($84)	($287)	$0	$0	$578	$709	$131	($657)
2016	$0	$0	$0	($584)	($347)	($81)	($283)	$0	$0	$584	$711	$127	($627)
2017	$0	$0	$0	($591)	($356)	($79)	($280)	$0	$0	$591	$716	$125	($601)
2018	$0	$0	$0	($598)	($366)	($77)	($296)	$0	$0	$598	$740	$142	($573)
2019	$0	$0	$0	($605)	($381)	($75)	($305)	$0	$0	$605	$761	$156	($545)
2020	$0	$0	$0	($612)	($398)	($73)	($315)	$0	$0	$612	$783	$171	($517)
2021	$0	$0	$0	($620)	($412)	($71)	($324)	$0	$0	$620	$807	$187	($488)
2022	$0	$0	$0	($628)	($424)	($69)	($334)	$0	$0	$628	$827	$200	($461)
2023	$0	$0	$0	($636)	($437)	($67)	($345)	$0	$0	$636	$848	$212	($434)
2024	$0	$0	$0	($646)	($450)	($65)	($355)	$0	$0	$646	$870	$224	($408)
2025	$0	$0	$0	($655)	($464)	($63)	($366)	$0	$0	$655	$892	$237	($382)
2026	$0	$0	$0	($665)	($478)	($61)	($377)	$0	$0	$665	$916	$251	($357)
2027	$0	$0	$0	($675)	($492)	($59)	($389)	$0	$0	$675	$940	$265	($334)
2028	$0	$0	$0	($685)	($507)	($57)	($401)	$0	$0	$685	$965	$280	($310)
Nominal		$810	$1,000	($16,034)	($9,617)	($2,605)	($8,135)			$17,843	$20,357	$2,514	
NPV		$655	$813	($4,942)	($2,690)	($1,019)	($2,391)			$8,411	$8,100	($310)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.96

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Customer Equip Costs ($000s)	(3) Customer O&M Costs ($000s)	(4) Other Costs ($000s)	(5) Other Benefits ($000s)	(6) Change in Participants' Electric Bills ($000s)	(7) Tax Credits ($000s)	(8) Utility Paid Rebates & Incentives ($000s)	(9) Total Costs ($000s)	(10) Total Benefits ($000s)	(11) Total Net Benefits ($000s)	(12) Cumulative Discounted Net Benefits ($000s)
1999	$1,100	$0	$0	$0	($54)	$0	$100	$1,100	$154	($946)	($946)
2000	$2,267	$0	$0	$0	($158)	$0	$200	$2,267	$358	($1,909)	($2,699)
2001	$2,337	$0	$0	$0	($253)	$0	$200	$2,337	$453	($1,884)	($4,285)
2002	$2,408	$0	$0	$0	($364)	$0	$200	$2,408	$564	($1,844)	($5,710)
2003	$2,482	$0	$0	$0	($455)	$0	$200	$2,482	$655	($1,827)	($7,008)
2004	$1,279	$0	$0	$0	($520)	$0	$100	$1,279	$620	($659)	($7,435)
2005	$0	$0	$0	$0	($520)	$0	$0	$0	$520	$520	($7,125)
2006	$0	$0	$0	$0	($524)	$0	$0	$0	$524	$524	($6,837)
2007	$0	$0	$0	$0	($538)	$0	$0	$0	$538	$538	($6,567)
2008	$0	$0	$0	$0	($536)	$0	$0	$0	$536	$536	($6,320)
2009	$0	$0	$0	$0	($541)	$0	$0	$0	$541	$541	($6,090)
2010	$0	$0	$0	$0	($547)	$0	$0	$0	$547	$547	($5,878)
2011	$0	$0	$0	$0	($553)	$0	$0	$0	$553	$553	($5,680)
2012	$0	$0	$0	$0	($559)	$0	$0	$0	$559	$559	($5,498)
2013	$0	$0	$0	$0	($565)	$0	$0	$0	$565	$565	($5,328)
2014	$0	$0	$0	$0	($571)	$0	$0	$0	$571	$571	($5,170)
2015	$0	$0	$0	$0	($578)	$0	$0	$0	$578	$578	($5,024)
2016	$0	$0	$0	$0	($584)	$0	$0	$0	$584	$584	($4,889)
2017	$0	$0	$0	$0	($591)	$0	$0	$0	$591	$591	($4,763)
2018	$0	$0	$0	$0	($598)	$0	$0	$0	$598	$598	($4,646)
2019	$0	$0	$0	$0	($605)	$0	$0	$0	$605	$605	($4,538)
2020	$0	$0	$0	$0	($612)	$0	$0	$0	$612	$612	($4,437)
2021	$0	$0	$0	$0	($620)	$0	$0	$0	$620	$620	($4,343)
2022	$0	$0	$0	$0	($628)	$0	$0	$0	$628	$628	($4,256)
2023	$0	$0	$0	$0	($636)	$0	$0	$0	$636	$636	($4,175)
2024	$0	$0	$0	$0	($646)	$0	$0	$0	$646	$646	($4,100)
2025	$0	$0	$0	$0	($655)	$0	$0	$0	$655	$655	($4,030)
2026	$0	$0	$0	$0	($665)	$0	$0	$0	$665	$665	($3,964)
2027	$0	$0	$0	$0	($675)	$0	$0	$0	$675	$675	($3,903)
2028	$0	$0	$0	$0	($685)	$0	$0	$0	$685	$685	($3,847)
Nominal	$11,874				($16,034)		$1,000	$11,874	$17,034	$5,160	
NPV	$9,602				($4,942)		$813	$9,602	$5,756	($3,847)	

Discount Rate = 8.97%
Benefit/Cost Ratio = 0.60

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,100	$0	$0	($22)	$0	($21)	$1,175	$43	($1,132)	($1,132)
2000	$0	$155	$2,267	$0	$0	($67)	($50)	($68)	$2,422	$184	($2,238)	($3,186)
2001	$0	$159	$2,337	$0	$0	($117)	($80)	($112)	$2,496	$309	($2,187)	($5,028)
2002	$0	$164	$2,408	$0	$0	($166)	($107)	($162)	$2,573	$434	($2,138)	($6,680)
2003	$0	$169	$2,482	$0	$0	($220)	($132)	($209)	$2,651	$561	($2,091)	($8,163)
2004	$0	$87	$1,279	$0	$0	($252)	($141)	($235)	$1,366	$628	($738)	($8,643)
2005	$0	$0	$0	$0	$0	($261)	($135)	($241)	$0	$637	$637	($8,263)
2006	$0	$0	$0	$0	$0	($267)	($130)	($243)	$0	$639	$639	($7,912)
2007	$0	$0	$0	$0	$0	($272)	($125)	($252)	$0	$649	$649	($7,586)
2008	$0	$0	$0	$0	$0	($279)	($119)	($260)	$0	$658	$658	($7,282)
2009	$0	$0	$0	$0	$0	($287)	($114)	($264)	$0	$665	$665	($7,000)
2010	$0	$0	$0	$0	$0	($295)	($109)	($269)	$0	$673	$673	($6,739)
2011	$0	$0	$0	$0	$0	($303)	($104)	($278)	$0	$685	$685	($6,494)
2012	$0	$0	$0	$0	$0	($312)	($99)	($287)	$0	$698	$698	($6,266)
2013	$0	$0	$0	$0	$0	($320)	($94)	($291)	$0	$705	$705	($6,054)
2014	$0	$0	$0	$0	$0	($329)	($89)	($286)	$0	$704	$704	($5,860)
2015	$0	$0	$0	$0	$0	($338)	($84)	($287)	$0	$709	$709	($5,681)
2016	$0	$0	$0	$0	$0	($347)	($81)	($283)	$0	$711	$711	($5,516)
2017	$0	$0	$0	$0	$0	($356)	($79)	($280)	$0	$716	$716	($5,363)
2018	$0	$0	$0	$0	$0	($366)	($77)	($296)	$0	$740	$740	($5,219)
2019	$0	$0	$0	$0	$0	($381)	($75)	($305)	$0	$761	$761	($5,082)
2020	$0	$0	$0	$0	$0	($396)	($73)	($315)	$0	$783	$783	($4,953)
2021	$0	$0	$0	$0	$0	($412)	($71)	($324)	$0	$807	$807	($4,831)
2022	$0	$0	$0	$0	$0	($424)	($69)	($334)	$0	$827	$827	($4,717)
2023	$0	$0	$0	$0	$0	($437)	($67)	($345)	$0	$848	$848	($4,609)
2024	$0	$0	$0	$0	$0	($450)	($65)	($356)	$0	$870	$870	($4,507)
2025	$0	$0	$0	$0	$0	($464)	($63)	($366)	$0	$892	$892	($4,412)
2026	$0	$0	$0	$0	$0	($478)	($61)	($377)	$0	$916	$916	($4,322)
2027	$0	$0	$0	$0	$0	($492)	($59)	($389)	$0	$940	$940	($4,237)
2028	$0	$0	$0	$0	$0	($507)	($57)	($401)	$0	$965	$965	($4,157)
Nominal		$810	$11,874			($9,617)	($2,605)	($8,135)	$12,683	$20,357	$7,674	
NPV		$855	$9,602			($2,690)	($1,019)	($2,391)	$10,257	$6,100	($4,157)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.59

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.20	kW/Cus
(2) Change in Peak kW per Customer at generator	-1.55	kW Gen/Cus
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(2,072)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(1,924)	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	0.00	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$2,200.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	$0.00	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	

Stop Revenue Loss at In-Service Year? (Y=1, N=0) 0

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5)Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$6,100	$5,756
NPV Costs ($000s)	$6,411	$9,602
NPV Net Benefits ($000s)	($310)	($3,847)
Benefit:Cost Ratio	0.952	0.599

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($82)	($35)	$0	($32)	$0	$0	$257	$67	($190)	($190)
2000	$0	$155	$200	($241)	($106)	($79)	($103)	$0	$0	$595	$288	($307)	($472)
2001	$0	$159	$200	($385)	($165)	($126)	($171)	$0	$0	$745	$482	($262)	($693)
2002	$0	$164	$200	($555)	($263)	($169)	($246)	$0	$0	$920	$678	($241)	($880)
2003	$0	$169	$200	($693)	($348)	($209)	($318)	$0	$0	$1,062	$875	($187)	($1,012)
2004	$0	$87	$100	($792)	($400)	($222)	($358)	$0	$0	$980	$980	$1	($1,012)
2005	$0	$0	$0	($792)	($413)	($214)	($368)	$0	$0	$792	$994	$202	($891)
2006	$0	$0	$0	($799)	($422)	($205)	($371)	$0	$0	$799	$998	$199	($782)
2007	$0	$0	$0	($819)	($431)	($197)	($384)	$0	$0	$819	$1,012	$193	($685)
2008	$0	$0	$0	($817)	($441)	($189)	($396)	$0	$0	$817	$1,027	$210	($588)
2009	$0	$0	$0	($825)	($454)	($181)	($403)	$0	$0	$825	$1,038	$213	($498)
2010	$0	$0	$0	($834)	($467)	($173)	($410)	$0	$0	$834	$1,050	$216	($414)
2011	$0	$0	$0	($842)	($480)	($165)	($424)	$0	$0	$842	$1,068	$226	($333)
2012	$0	$0	$0	($852)	($494)	($157)	($437)	$0	$0	$852	$1,087	$236	($256)
2013	$0	$0	$0	($861)	($507)	($148)	($444)	$0	$0	$861	$1,100	$239	($184)
2014	$0	$0	$0	($870)	($521)	($140)	($436)	$0	$0	$870	$1,098	$227	($122)
2015	$0	$0	$0	($880)	($535)	($133)	($437)	$0	$0	$880	$1,105	$225	($65)
2016	$0	$0	$0	($890)	($549)	($129)	($431)	$0	$0	$890	$1,108	$218	($14)
2017	$0	$0	$0	($900)	($564)	($126)	($427)	$0	$0	$900	$1,117	$216	$32
2018	$0	$0	$0	($911)	($580)	($122)	($452)	$0	$0	$911	$1,154	$243	$79
2019	$0	$0	$0	($922)	($603)	($119)	($465)	$0	$0	$922	$1,187	$265	$127
2020	$0	$0	$0	($933)	($627)	($115)	($480)	$0	$0	$933	$1,222	$289	$174
2021	$0	$0	$0	($945)	($652)	($112)	($494)	$0	$0	$945	$1,258	$313	$222
2022	$0	$0	$0	($956)	($672)	($109)	($509)	$0	$0	$956	$1,290	$334	$268
2023	$0	$0	$0	($970)	($692)	($106)	($525)	$0	$0	$970	$1,323	$353	$313
2024	$0	$0	$0	($984)	($713)	($102)	($541)	$0	$0	$984	$1,356	$373	$356
2025	$0	$0	$0	($998)	($735)	($99)	($558)	$0	$0	$998	$1,391	$393	$398
2026	$0	$0	$0	($1,013)	($757)	($96)	($575)	$0	$0	$1,013	$1,427	$414	$439
2027	$0	$0	$0	($1,028)	($780)	($93)	($592)	$0	$0	$1,028	$1,465	$437	$479
2028	$0	$0	$0	($1,044)	($803)	($90)	($610)	$0	$0	$1,044	$1,503	$459	$517
Nominal		$810	$1,000	($24,434)	($15,228)	($4,124)	($12,397)			$28,243	$31,749	$5,505	
NPV		$855	$813	($7,532)	($4,260)	($1,613)	($3,644)			$9,000	$9,516	$517	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.06

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Customer Equip Costs ($000s)	(3) Customer O&M Costs ($000s)	(4) Other Costs ($000s)	(5) Other Benefits ($000s)	(6) Change in Participants' Electric Bills ($000s)	(7) Tax Credits ($000s)	(8) Utility Paid Rebates & Incentives ($000s)	(9) Total Costs ($000s)	(10) Total Benefits ($000s)	(11) Total Net Benefits ($000s)	(12) Cumulative Discounted Net Benefits ($000s)
1999	$1,100	$0	$0	$0	($82)	$0	$100	$1,100	$182	($918)	($918)
2000	$2,267	$0	$0	$0	($241)	$0	$200	$2,267	$441	($1,827)	($2,595)
2001	$2,337	$0	$0	$0	($385)	$0	$200	$2,337	$585	($1,751)	($4,070)
2002	$2,408	$0	$0	$0	($555)	$0	$200	$2,408	$755	($1,653)	($5,347)
2003	$2,482	$0	$0	$0	($893)	$0	$200	$2,482	$893	($1,589)	($6,474)
2004	$1,279	$0	$0	$0	($792)	$0	$100	$1,279	$892	($387)	($6,726)
2005	$0	$0	$0	$0	($792)	$0	$0	$0	$792	$792	($6,253)
2006	$0	$0	$0	$0	($799)	$0	$0	$0	$799	$799	($5,815)
2007	$0	$0	$0	$0	($819)	$0	$0	$0	$819	$819	($5,403)
2008	$0	$0	$0	$0	($817)	$0	$0	$0	$817	$817	($5,026)
2009	$0	$0	$0	$0	($825)	$0	$0	$0	$825	$825	($4,676)
2010	$0	$0	$0	$0	($834)	$0	$0	$0	$834	$834	($4,352)
2011	$0	$0	$0	$0	($842)	$0	$0	$0	$842	$842	($4,052)
2012	$0	$0	$0	$0	($852)	$0	$0	$0	$852	$852	($3,773)
2013	$0	$0	$0	$0	($861)	$0	$0	$0	$861	$861	($3,515)
2014	$0	$0	$0	$0	($870)	$0	$0	$0	$870	$870	($3,275)
2015	$0	$0	$0	$0	($880)	$0	$0	$0	$880	$880	($3,052)
2016	$0	$0	$0	$0	($890)	$0	$0	$0	$890	$890	($2,845)
2017	$0	$0	$0	$0	($900)	$0	$0	$0	$900	$900	($2,654)
2018	$0	$0	$0	$0	($911)	$0	$0	$0	$911	$911	($2,475)
2019	$0	$0	$0	$0	($922)	$0	$0	$0	$922	$922	($2,310)
2020	$0	$0	$0	$0	($933)	$0	$0	$0	$933	$933	($2,157)
2021	$0	$0	$0	$0	($945)	$0	$0	$0	$945	$945	($2,014)
2022	$0	$0	$0	$0	($956)	$0	$0	$0	$956	$956	($1,881)
2023	$0	$0	$0	$0	($970)	$0	$0	$0	$970	$970	($1,758)
2024	$0	$0	$0	$0	($984)	$0	$0	$0	$984	$984	($1,643)
2025	$0	$0	$0	$0	($998)	$0	$0	$0	$998	$998	($1,536)
2026	$0	$0	$0	$0	($1,013)	$0	$0	$0	$1,013	$1,013	($1,436)
2027	$0	$0	$0	$0	($1,028)	$0	$0	$0	$1,028	$1,028	($1,344)
2028	$0	$0	$0	$0	($1,044)	$0	$0	$0	$1,044	$1,044	($1,257)
Nominal	$11,874				($24,434)		$1,000	$11,874	$25,434	$13,560	
NPV	$9,602				($7,532)		$813	$9,602	$8,345	($1,257)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.87

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,100	$0	$0	($36)	$0	($32)	$1,175	$67	($1,108)	($1,108)
2000	$0	$155	$2,267	$0	$0	($106)	($79)	($103)	$2,422	$288	($2,134)	($3,067)
2001	$0	$159	$2,337	$0	$0	($185)	($126)	($171)	$2,496	$482	($2,014)	($4,763)
2002	$0	$164	$2,408	$0	$0	($263)	($169)	($246)	$2,573	$678	($1,894)	($6,227)
2003	$0	$169	$2,482	$0	$0	($348)	($209)	($318)	$2,651	$875	($1,776)	($7,486)
2004	$0	$87	$1,279	$0	$0	($400)	($222)	($358)	$1,366	$980	($386)	($7,738)
2005	$0	$0	$0	$0	$0	($413)	($214)	($368)	$0	$994	$994	($7,144)
2006	$0	$0	$0	$0	$0	($422)	($205)	($371)	$0	$998	$998	($6,597)
2007	$0	$0	$0	$0	$0	($431)	($197)	($384)	$0	$1,012	$1,012	($6,088)
2008	$0	$0	$0	$0	$0	($441)	($189)	($396)	$0	$1,027	$1,027	($5,614)
2009	$0	$0	$0	$0	$0	($454)	($181)	($403)	$0	$1,038	$1,038	($5,174)
2010	$0	$0	$0	$0	$0	($467)	($173)	($410)	$0	$1,050	$1,050	($4,768)
2011	$0	$0	$0	$0	$0	($480)	($165)	($424)	$0	$1,068	$1,068	($4,385)
2012	$0	$0	$0	$0	$0	($494)	($157)	($437)	$0	$1,087	$1,087	($4,029)
2013	$0	$0	$0	$0	$0	($507)	($148)	($444)	$0	$1,100	$1,100	($3,699)
2014	$0	$0	$0	$0	$0	($521)	($140)	($436)	$0	$1,098	$1,098	($3,396)
2015	$0	$0	$0	$0	$0	($535)	($133)	($437)	$0	$1,105	$1,105	($3,117)
2016	$0	$0	$0	$0	$0	($549)	($129)	($431)	$0	$1,108	$1,108	($2,860)
2017	$0	$0	$0	$0	$0	($564)	($126)	($427)	$0	$1,117	$1,117	($2,622)
2018	$0	$0	$0	$0	$0	($580)	($122)	($452)	$0	$1,154	$1,154	($2,396)
2019	$0	$0	$0	$0	$0	($603)	($119)	($465)	$0	$1,187	$1,187	($2,183)
2020	$0	$0	$0	$0	$0	($627)	($115)	($480)	$0	$1,222	$1,222	($1,982)
2021	$0	$0	$0	$0	$0	($652)	($112)	($494)	$0	$1,258	$1,258	($1,792)
2022	$0	$0	$0	$0	$0	($672)	($109)	($509)	$0	$1,290	$1,290	($1,613)
2023	$0	$0	$0	$0	$0	($692)	($106)	($525)	$0	$1,323	$1,323	($1,445)
2024	$0	$0	$0	$0	$0	($713)	($102)	($541)	$0	$1,356	$1,358	($1,287)
2025	$0	$0	$0	$0	$0	($735)	($99)	($558)	$0	$1,391	$1,391	($1,138)
2026	$0	$0	$0	$0	$0	($757)	($96)	($575)	$0	$1,427	$1,427	($997)
2027	$0	$0	$0	$0	$0	($780)	($93)	($592)	$0	$1,465	$1,465	($865)
2028	$0	$0	$0	$0	$0	($803)	($90)	($610)	$0	$1,503	$1,503	($741)
Nominal		$810	$11,874			($15,228)	($4,124)	($12,397)	$12,683	$31,749	$19,066	
NPV		$655	$9,602			($4,260)	($1,613)	($3,644)	$10,257	$9,516	($741)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.93

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INPUT DATA – PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.90	kW/Cus
(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(3,158)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(2,932)	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	0.00	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

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III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$2,200.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	$0.00	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	
Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost In Customer Bill (Base Year)

(1) Non-Fuel Cost In Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$9,516	$8,345
NPV Costs ($000s)	$9,000	$9,602
NPV Net Benefits ($000s)	$517	($1,257)
Benefit:Cost Ratio	1.057	0.869

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	$39	($6)	$0	$15	$0	$0	$190	$44	($146)	($146)
2000	$0	$155	$200	$114	($17)	($12)	$49	$0	$0	$404	$143	($260)	($385)
2001	$0	$159	$200	$183	($29)	($20)	$81	$0	$0	$440	$232	($209)	($560)
2002	$0	$164	$200	$263	($41)	($27)	$117	$0	$0	$481	$331	($149)	($676)
2003	$0	$169	$200	$329	($55)	($33)	$151	$0	$0	$520	$417	($103)	($749)
2004	$0	$87	$100	$376	($63)	($35)	$170	$0	$0	$357	$474	$117	($673)
2005	$0	$0	$0	$375	($65)	($34)	$174	$0	$0	$174	$474	$300	($494)
2006	$0	$0	$0	$379	($67)	($32)	$176	$0	$0	$176	$478	$302	($328)
2007	$0	$0	$0	$388	($68)	($31)	$182	$0	$0	$182	$488	$306	($175)
2008	$0	$0	$0	$387	($70)	($30)	$188	$0	$0	$188	$487	$299	($37)
2009	$0	$0	$0	$391	($72)	($29)	$191	$0	$0	$191	$491	$301	$91
2010	$0	$0	$0	$395	($74)	($27)	$194	$0	$0	$194	$496	$302	$208
2011	$0	$0	$0	$399	($76)	($26)	$201	$0	$0	$201	$501	$300	$315
2012	$0	$0	$0	$404	($78)	($25)	$207	$0	$0	$207	$506	$299	$413
2013	$0	$0	$0	$408	($80)	($23)	$211	$0	$0	$211	$512	$301	$503
Nominal		$810	$1,000	$4,830	($860)	($384)	$2,308			$4,116	$6,074	$1,959	
NPV		$656	$813	$2,501	($435)	($210)	$1,174			$2,642	$3,145	$503	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.19

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	($144)	$0	$0	$39	$0	$100	$1,539	$244	($1,295)	($1,295)
2000	$3,092	($444)	$0	$0	$114	$0	$200	$3,206	$644	($2,562)	($3,647)
2001	$3,187	($762)	$0	$0	$183	$0	$200	$3,369	$962	($2,407)	($5,674)
2002	$3,284	($1,100)	$0	$0	$263	$0	$200	$3,547	$1,300	($2,248)	($7,411)
2003	$3,385	($1,457)	$0	$0	$329	$0	$200	$3,713	$1,657	($2,056)	($8,869)
2004	$1,744	($1,669)	$0	$0	$376	$0	$100	$2,120	$1,769	($351)	($9,098)
2005	$0	($1,720)	$0	$0	$375	$0	$0	$375	$1,720	$1,344	($8;295)
2006	$0	($1,772)	$0	$0	$379	$0	$0	$379	$1,772	$1,394	($7,531)
2007	$0	($1,827)	$0	$0	$388	$0	$0	$388	$1,827	$1,438	($6,808)
2008	$0	($1,883)	$0	$0	$387	$0	$0	$387	$1,883	$1,495	($6,117)
2009	$0	($1,940)	$0	$0	$391	$0	$0	$391	$1,940	$1,549	($5,461)
2010	$0	($2,000)	$0	$0	$395	$0	$0	$395	$2,000	$1,604	($4,838)
2011	$0	($2,061)	$0	$0	$399	$0	$0	$399	$2,061	$1,661	($4,245)
2012	$0	($2,124)	$0	$0	$404	$0	$0	$404	$2,124	$1,720	($3,682)
2013	$0	($2,189)	$0	$0	$408	$0	$0	$408	$2,189	$1,781	($3,147)
Nominal	$16,191	($23,089)			$4,830		$1,000	$21,022	$24,089	$3,067	
NPV	$13,094	($11,634)			$2,501		$813	$15,595	$12,447	($3,147)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.80

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,357	$0	$0	($6)	$0	$15	$1,447	$6	($1,441)	($1,441)
2000	$0	$155	$2,648	$0	$0	($17)	($12)	$49	$2,852	$29	($2,823)	($4,031)
2001	$0	$159	$2,424	$0	$0	($29)	($20)	$81	$2,665	$49	($2,616)	($6,234)
2002	$0	$164	$2,184	$0	$0	($41)	($27)	$117	$2,465	$68	($2,397)	($8,087)
2003	$0	$169	$1,928	$0	$0	($55)	($33)	$151	$2,248	$88	($2,160)	($9,618)
2004	$0	$87	$76	$0	$0	($63)	($35)	$170	$333	$98	($234)	($9,771)
2005	$0	$0	($1,720)	$0	$0	($65)	($34)	$174	$174	$1,819	$1,644	($8,789)
2006	$0	$0	($1,772)	$0	$0	($67)	($32)	$176	$176	$1,871	$1,696	($7,859)
2007	$0	$0	($1,827)	$0	$0	($68)	($31)	$182	$182	$1,926	$1,744	($6,982)
2008	$0	$0	($1,883)	$0	$0	($70)	($30)	$188	$188	$1,982	$1,794	($6,154)
2009	$0	$0	($1,940)	$0	$0	($72)	($29)	$191	$191	$2,040	$1,850	($5,371)
2010	$0	$0	($2,000)	$0	$0	($74)	($27)	$194	$194	$2,101	$1,906	($4,630)
2011	$0	$0	($2,061)	$0	$0	($76)	($26)	$201	$201	$2,163	$1,962	($3,930)
2012	$0	$0	($2,124)	$0	$0	($78)	($25)	$207	$207	$2,227	$2,019	($3,269)
2013	$0	$0	($2,189)	$0	$0	($80)	($23)	$211	$211	$2,292	$2,082	($2,644)
Nominal		$810	($6,896)			($860)	($384)	$2,306	$13,733	$18,759	$5,026	
NPV		$855	$1,460			($435)	($210)	$1,174	$10,761	$8,117	($2,644)	

Discount Rate =	8.97%
Benefit/Cost Ratio =	0.75

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-0.30	kW/Cus
(2) Change in Peak kW per Customer at generator	-0.39	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	1,497	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	1,390	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	4.40	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	15	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	($287.00)	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.26%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	1.91%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	
Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$3,145	$12,447
NPV Costs ($000s)	$2,642	$15,595
NPV Net Benefits ($000s)	$503	($3,147)
Benefit:Cost Ratio	1.191	0.798

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change In Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	$39	($6)	$0	$15	$0	$0	$190	$44	($146)	($146)
2000	$0	$155	$200	$114	($17)	($12)	$49	$0	$0	$404	$143	($260)	($385)
2001	$0	$159	$200	$183	($29)	($20)	$81	$0	$0	$440	$232	($209)	($560)
2002	$0	$164	$200	$263	($41)	($27)	$117	$0	$0	$481	$331	($149)	($676)
2003	$0	$169	$200	$329	($55)	($33)	$151	$0	$0	$520	$417	($103)	($749)
2004	$0	$87	$100	$376	($63)	($35)	$170	$0	$0	$357	$474	$117	($673)
2005	$0	$0	$0	$375	($65)	($34)	$174	$0	$0	$174	$474	$300	($494)
2006	$0	$0	$0	$379	($67)	($32)	$176	$0	$0	$176	$478	$302	($328)
2007	$0	$0	$0	$388	($68)	($31)	$182	$0	$0	$182	$488	$306	($175)
2008	$0	$0	$0	$387	($70)	($30)	$188	$0	$0	$188	$487	$299	($37)
2009	$0	$0	$0	$391	($72)	($29)	$191	$0	$0	$191	$491	$301	$91
2010	$0	$0	$0	$395	($74)	($27)	$194	$0	$0	$194	$496	$302	$208
2011	$0	$0	$0	$399	($76)	($26)	$201	$0	$0	$201	$501	$300	$315
2012	$0	$0	$0	$404	($78)	($25)	$207	$0	$0	$207	$506	$299	$413
2013	$0	$0	$0	$408	($80)	($23)	$211	$0	$0	$211	$512	$301	$503
2014	$0	$0	$0	$413	($82)	($22)	$207	$0	$0	$207	$517	$310	$589
2015	$0	$0	$0	$417	($84)	($21)	$207	$0	$0	$207	$523	$316	$669
2016	$0	$0	$0	$422	($87)	($20)	$204	$0	$0	$204	$529	$325	$744
2017	$0	$0	$0	$427	($89)	($20)	$202	$0	$0	$202	$536	$333	$815
2018	$0	$0	$0	$432	($92)	($19)	$214	$0	$0	$214	$543	$329	$879
2019	$0	$0	$0	$437	($95)	($19)	$221	$0	$0	$221	$551	$330	$939
2020	$0	$0	$0	$442	($99)	($18)	$227	$0	$0	$227	$560	$332	$993
2021	$0	$0	$0	$448	($103)	($18)	$234	$0	$0	$234	$568	$334	$1,044
2022	$0	$0	$0	$453	($106)	($17)	$241	$0	$0	$241	$577	$335	$1,090
2023	$0	$0	$0	$460	($109)	($17)	$249	$0	$0	$249	$586	$337	$1,133
2024	$0	$0	$0	$466	($113)	($16)	$257	$0	$0	$257	$595	$339	$1,173
2025	$0	$0	$0	$473	($116)	($16)	$264	$0	$0	$264	$605	$340	$1,209
2026	$0	$0	$0	$480	($119)	($15)	$272	$0	$0	$272	$615	$342	$1,243
2027	$0	$0	$0	$487	($123)	($15)	$281	$0	$0	$281	$625	$344	$1,274
2028	$0	$0	$0	$495	($127)	($14)	$289	$0	$0	$289	$636	$347	$1,302
Nominal		$810	$1,000	$11,584	($2,404)	($651)	$5,877			$7,687	$14,639	$6,962	
NPV		$655	$813	$3,571	($673)	($255)	$1,727			$3,195	$4,498	$1,302	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.41

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	($144)	$0	$0	$39	$0	$100	$1,539	$244	($1,295)	($1,295)
2000	$3,092	($444)	$0	$0	$114	$0	$200	$3,206	$644	($2,562)	($3,647)
2001	$3,187	($762)	$0	$0	$183	$0	$200	$3,369	$962	($2,407)	($5,674)
2002	$3,284	($1,100)	$0	$0	$263	$0	$200	$3,547	$1,300	($2,248)	($7,411)
2003	$3,385	($1,457)	$0	$0	$329	$0	$200	$3,713	$1,657	($2,056)	($8,869)
2004	$1,744	($1,669)	$0	$0	$376	$0	$100	$2,120	$1,769	($351)	($9,098)
2005	$0	($1,720)	$0	$0	$375	$0	$0	$375	$1,720	$1,344	($8,295)
2006	$0	($1,772)	$0	$0	$379	$0	$0	$379	$1,772	$1,394	($7,531)
2007	$0	($1,827)	$0	$0	$388	$0	$0	$388	$1,827	$1,438	($6,808)
2008	$0	($1,883)	$0	$0	$387	$0	$0	$387	$1,883	$1,495	($6,117)
2009	$0	($1,940)	$0	$0	$391	$0	$0	$391	$1,940	$1,549	($5,461)
2010	$0	($2,000)	$0	$0	$395	$0	$0	$395	$2,000	$1,604	($4,838)
2011	$0	($2,061)	$0	$0	$399	$0	$0	$399	$2,061	$1,661	($4,245)
2012	$0	($2,124)	$0	$0	$404	$0	$0	$404	$2,124	$1,720	($3,682)
2013	$0	($2,189)	$0	$0	$408	$0	$0	$408	$2,189	$1,781	($3,147)
2014	$0	($2,256)	$0	$0	$413	$0	$0	$413	$2,256	$1,843	($2,639)
2015	$0	($2,325)	$0	$0	$417	$0	$0	$417	$2,325	$1,908	($2,157)
2016	$0	($2,396)	$0	$0	$422	$0	$0	$422	$2,396	$1,974	($1,698)
2017	$0	($2,470)	$0	$0	$427	$0	$0	$427	$2,470	$2,043	($1,263)
2018	$0	($2,545)	$0	$0	$432	$0	$0	$432	$2,545	$2,113	($850)
2019	$0	($2,623)	$0	$0	$437	$0	$0	$437	$2,623	$2,186	($458)
2020	$0	($2,703)	$0	$0	$442	$0	$0	$442	$2,703	$2,261	($86)
2021	$0	($2,786)	$0	$0	$448	$0	$0	$448	$2,786	$2,338	$268
2022	$0	($2,872)	$0	$0	$453	$0	$0	$453	$2,872	$2,418	$603
2023	$0	($2,959)	$0	$0	$460	$0	$0	$460	$2,959	$2,500	$921
2024	$0	($3,050)	$0	$0	$466	$0	$0	$466	$3,050	$2,584	$1,222
2025	$0	($3,144)	$0	$0	$473	$0	$0	$473	$3,144	$2,670	$1,509
2026	$0	($3,240)	$0	$0	$480	$0	$0	$480	$3,240	$2,760	$1,780
2027	$0	($3,339)	$0	$0	$487	$0	$0	$487	$3,339	$2,851	$2,037
2028	$0	($3,441)	$0	$0	$495	$0	$0	$495	$3,441	$2,946	$2,281
Nominal	$16,191	($65,239)			$11,584		$1,000	$27,775	$66,239	$38,464	
NPV	$13,094	($18,132)			$3,571		$813	$16,665	$18,946	$2,281	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.14

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Year	Change in Electric Supply Costs ($000s)	Utility's Program Costs ($000s)	Participants' Program Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Incremental Generation Cap Costs ($000s)	Incremental T&D Cap Costs ($000s)	Incremental Prog Induced Fuel Costs ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,357	$0	$0	($6)	$0	$15	$1,447	$6	($1,441)	($1,441)
2000	$0	$155	$2,646	$0	$0	($17)	($12)	$49	$2,852	$29	($2,823)	($4,031)
2001	$0	$159	$2,424	$0	$0	($29)	($20)	$81	$2,665	$49	($2,616)	($6,234)
2002	$0	$164	$2,184	$0	$0	($41)	($27)	$117	$2,465	$68	($2,397)	($8,087)
2003	$0	$169	$1,928	$0	$0	($55)	($33)	$151	$2,248	$88	($2,160)	($9,618)
2004	$0	$87	$76	$0	$0	($63)	($35)	$170	$333	$98	($234)	($9,771)
2005	$0	$0	($1,720)	$0	$0	($65)	($34)	$174	$174	$1,819	$1,644	($8,789)
2006	$0	$0	($1,772)	$0	$0	($67)	($32)	$176	$176	$1,871	$1,696	($7,859)
2007	$0	$0	($1,827)	$0	$0	($68)	($31)	$182	$182	$1,926	$1,744	($6,982)
2008	$0	$0	($1,883)	$0	$0	($70)	($30)	$188	$188	$1,982	$1,794	($6,154)
2009	$0	$0	($1,940)	$0	$0	($72)	($29)	$191	$191	$2,040	$1,850	($5,371)
2010	$0	$0	($2,000)	$0	$0	($74)	($27)	$194	$194	$2,101	$1,906	($4,630)
2011	$0	$0	($2,061)	$0	$0	($76)	($26)	$201	$201	$2,163	$1,962	($3,930)
2012	$0	$0	($2,124)	$0	$0	($78)	($25)	$207	$207	$2,227	$2,019	($3,269)
2013	$0	$0	($2,189)	$0	$0	($80)	($23)	$211	$211	$2,292	$2,082	($2,644)
2014	$0	$0	($2,256)	$0	$0	($82)	($22)	$207	$207	$2,360	$2,154	($2,050)
2015	$0	$0	($2,325)	$0	$0	($84)	($21)	$207	$207	$2,431	$2,223	($1,488)
2016	$0	$0	($2,396)	$0	$0	($87)	($20)	$204	$204	$2,503	$2,299	($954)
2017	$0	$0	($2,470)	$0	$0	($89)	($20)	$202	$202	$2,579	$2,376	($448)
2018	$0	$0	($2,545)	$0	$0	($92)	($19)	$214	$214	$2,656	$2,442	$29
2019	$0	$0	($2,623)	$0	$0	($95)	($19)	$221	$221	$2,737	$2,516	$481
2020	$0	$0	($2,703)	$0	$0	($99)	($18)	$227	$227	$2,821	$2,593	$906
2021	$0	$0	($2,786)	$0	$0	($103)	($18)	$234	$234	$2,907	$2,673	$1,311
2022	$0	$0	($2,872)	$0	$0	($106)	($17)	$241	$241	$2,995	$2,753	$1,693
2023	$0	$0	($2,959)	$0	$0	($109)	($17)	$249	$249	$3,085	$2,837	$2,054
2024	$0	$0	($3,050)	$0	$0	($113)	($16)	$257	$257	$3,179	$2,922	$2,395
2025	$0	$0	($3,144)	$0	$0	($116)	($16)	$264	$264	$3,275	$3,011	$2,718
2026	$0	$0	($3,240)	$0	$0	($119)	($15)	$272	$272	$3,374	$3,102	$3,023
2027	$0	$0	($3,339)	$0	$0	($123)	($15)	$281	$281	$3,477	$3,196	$3,311
2028	$0	$0	($3,441)	$0	$0	($127)	($14)	$289	$289	$3,582	$3,293	$3,584
Nominal		$810	($49,047)			($2,404)	($651)	$5,877	$17,303	$62,720	$45,416	
NPV		$656	($5,038)			($673)	($255)	$1,727	$11,315	$14,896	$3,584	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.32

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-0.30	kW/Cus
(2) Change in Peak kW per Customer at generator	-0.39	kW Gen/Cus
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	1,497	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	1,390	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	4.40	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

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III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	($287.00)	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	

Stop Revenue Loss at In-Service Year? (Y=1, N=0) 0

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$4,498	$18,946
NPV Costs ($000s)	$3,195	$16,665
NPV Net Benefits ($000s)	$1,302	$2,281
Benefit:Cost Ratio	1.408	1.137

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($1)	($22)	$0	($0)	$0	$0	$176	$22	($153)	($153)
2000	$0	$155	$200	($2)	($67)	($50)	($1)	$0	$0	$356	$117	($239)	($373)
2001	$0	$159	$200	($3)	($117)	($80)	($1)	$0	$0	$362	$198	($164)	($511)
2002	$0	$164	$200	($4)	($166)	($107)	($2)	$0	$0	$368	$275	($94)	($583)
2003	$0	$169	$200	($5)	($220)	($132)	($2)	$0	$0	$374	$354	($20)	($596)
2004	$0	$87	$100	($6)	($252)	($141)	($3)	$0	$0	$193	$395	$203	($466)
2005	$0	$0	$0	($6)	($261)	($135)	($3)	$0	$0	$6	$396	$393	($231)
2006	$0	$0	$0	($6)	($267)	($130)	($3)	$0	$0	$6	$399	$393	($16)
2007	$0	$0	$0	($6)	($272)	($125)	($3)	$0	$0	$6	$400	$394	$182
2008	$0	$0	$0	($6)	($279)	($119)	($3)	$0	$0	$6	$401	$395	$365
2009	$0	$0	$0	($6)	($287)	($114)	($3)	$0	$0	$6	$404	$398	$533
2010	$0	$0	$0	($6)	($295)	($109)	($3)	$0	$0	$6	$407	$401	$689
2011	$0	$0	$0	($6)	($303)	($104)	($3)	$0	$0	$6	$410	$404	$833
2012	$0	$0	$0	($6)	($312)	($99)	($3)	$0	$0	$6	$414	$408	$967
2013	$0	$0	$0	($6)	($320)	($94)	($3)	$0	$0	$6	$417	$411	$1,090
2014	$0	$0	$0	($6)	($329)	($89)	($3)	$0	$0	$6	$421	$415	$1,204
2015	$0	$0	$0	($6)	($338)	($84)	($3)	$0	$0	$6	$425	$419	$1,310
2016	$0	$0	$0	($6)	($347)	($81)	($3)	$0	$0	$6	$431	$425	$1,409
2017	$0	$0	$0	($6)	($356)	($79)	($3)	$0	$0	$6	$439	$432	$1,501
2018	$0	$0	$0	($7)	($368)	($77)	($3)	$0	$0	$7	$447	$440	$1,587
2019	$0	$0	$0	($7)	($381)	($75)	($3)	$0	$0	$7	$459	$452	$1,668
2020	$0	$0	$0	($7)	($396)	($73)	($3)	$0	$0	$7	$472	$465	$1,745
2021	$0	$0	$0	($7)	($412)	($71)	($4)	$0	$0	$7	$486	$479	$1,817
2022	$0	$0	$0	($7)	($424)	($69)	($4)	$0	$0	$7	$497	$490	$1,885
2023	$0	$0	$0	($7)	($437)	($67)	($4)	$0	$0	$7	$508	$501	$1,949
2024	$0	$0	$0	($7)	($450)	($65)	($4)	$0	$0	$7	$519	$512	$2,009
2025	$0	$0	$0	($7)	($464)	($63)	($4)	$0	$0	$7	$531	$523	$2,065
2026	$0	$0	$0	($7)	($478)	($61)	($4)	$0	$0	$7	$543	$535	$2,117
2027	$0	$0	$0	($7)	($492)	($59)	($4)	$0	$0	$7	$555	$548	$2,167
2028	$0	$0	$0	($7)	($507)	($57)	($4)	$0	$0	$7	$568	$561	$2,213
Nominal		$810	$1,000	($175)	($9,617)	($2,605)	($89)			$1,965	$12,311	$10,326	
NPV		$655	$813	($54)	($2,690)	($1,019)	($26)			$1,522	$3,735	$2,213	

Discount Rate =	8.97%
Benefit/Cost Ratio =	2.45

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	($144)	$0	$0	($1)	$0	$100	$1,500	$244	($1,256)	($1,256)
2000	$3,092	($444)	$0	$0	($2)	$0	$200	$3,092	$645	($2,446)	($3,501)
2001	$3,187	($762)	$0	$0	($3)	$0	$200	$3,187	$965	($2,222)	($5,372)
2002	$3,284	($1,100)	$0	$0	($4)	$0	$200	$3,284	$1,304	($1,980)	($6,902)
2003	$3,385	($1,457)	$0	$0	($5)	$0	$200	$3,385	$1,662	($1,723)	($8,124)
2004	$1,744	($1,669)	$0	$0	($6)	$0	$100	$1,744	$1,774	$30	($8,104)
2005	$0	($1,720)	$0	$0	($6)	$0	$0	$0	$1,725	$1,725	($7,074)
2006	$0	($1,772)	$0	$0	($6)	$0	$0	$0	$1,778	$1,778	($6,100)
2007	$0	($1,827)	$0	$0	($6)	$0	$0	$0	$1,832	$1,832	($5,178)
2008	$0	($1,883)	$0	$0	($6)	$0	$0	$0	$1,888	$1,888	($4,306)
2009	$0	($1,940)	$0	$0	($6)	$0	$0	$0	$1,946	$1,946	($3,482)
2010	$0	($2,000)	$0	$0	($6)	$0	$0	$0	$2,006	$2,006	($2,703)
2011	$0	($2,061)	$0	$0	($6)	$0	$0	$0	$2,067	$2,067	($1,965)
2012	$0	($2,124)	$0	$0	($6)	$0	$0	$0	$2,130	$2,130	($1,268)
2013	$0	($2,189)	$0	$0	($6)	$0	$0	$0	$2,195	$2,195	($609)
2014	$0	($2,256)	$0	$0	($6)	$0	$0	$0	$2,262	$2,262	$15
2015	$0	($2,325)	$0	$0	($6)	$0	$0	$0	$2,331	$2,331	$604
2016	$0	($2,396)	$0	$0	($6)	$0	$0	$0	$2,403	$2,403	$1,162
2017	$0	($2,470)	$0	$0	($6)	$0	$0	$0	$2,476	$2,476	$1,689
2018	$0	($2,545)	$0	$0	($7)	$0	$0	$0	$2,552	$2,552	$2,188
2019	$0	($2,623)	$0	$0	($7)	$0	$0	$0	$2,630	$2,630	$2,660
2020	$0	($2,703)	$0	$0	($7)	$0	$0	$0	$2,710	$2,710	$3,106
2021	$0	($2,786)	$0	$0	($7)	$0	$0	$0	$2,793	$2,793	$3,528
2022	$0	($2,872)	$0	$0	($7)	$0	$0	$0	$2,878	$2,878	$3,927
2023	$0	($2,959)	$0	$0	($7)	$0	$0	$0	$2,966	$2,966	$4,305
2024	$0	($3,050)	$0	$0	($7)	$0	$0	$0	$3,057	$3,057	$4,661
2025	$0	($3,144)	$0	$0	($7)	$0	$0	$0	$3,151	$3,151	$4,999
2026	$0	($3,240)	$0	$0	($7)	$0	$0	$0	$3,247	$3,247	$5,318
2027	$0	($3,339)	$0	$0	($7)	$0	$0	$0	$3,346	$3,346	$5,620
2028	$0	($3,441)	$0	$0	($7)	$0	$0	$0	$3,449	$3,449	$5,906
Nominal	$16,191	($65,239)			($175)		$1,000	$16,191	$66,414	$50,222	
NPV	$13,094	($18,132)			($54)		$813	$13,094	$19,000	$5,906	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.45

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change In Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,357	$0	$0	($22)	$0	($0)	$1,432	$22	($1,409)	($1,409)
2000	$0	$155	$2,648	$0	$0	($67)	($50)	($1)	$2,803	$117	($2,685)	($3,874)
2001	$0	$159	$2,424	$0	$0	($117)	($80)	($1)	$2,584	$198	($2,386)	($5,863)
2002	$0	$164	$2,184	$0	$0	($166)	($107)	($2)	$2,349	$275	($2,074)	($7,466)
2003	$0	$169	$1,928	$0	$0	($220)	($132)	($2)	$2,097	$354	($1,743)	($8,722)
2004	$0	$87	$76	$0	$0	($252)	($141)	($3)	$163	$395	$233	($8,570)
2005	$0	$0	($1,720)	$0	$0	($261)	($135)	($3)	$0	$2,118	$2,118	($7,305)
2006	$0	$0	($1,772)	$0	$0	($267)	($130)	($3)	$0	$2,171	$2,171	($6,115)
2007	$0	$0	($1,827)	$0	$0	($272)	($125)	($3)	$0	$2,226	$2,226	($4,996)
2008	$0	$0	($1,883)	$0	$0	($279)	($119)	($3)	$0	$2,284	$2,284	($3,942)
2009	$0	$0	($1,940)	$0	$0	($287)	($114)	($3)	$0	$2,344	$2,344	($2,949)
2010	$0	$0	($2,000)	$0	$0	($295)	($109)	($3)	$0	$2,406	$2,406	($2,013)
2011	$0	$0	($2,061)	$0	$0	($303)	($104)	($3)	$0	$2,471	$2,471	($1,132)
2012	$0	$0	($2,124)	$0	$0	($312)	($99)	($3)	$0	$2,538	$2,538	($302)
2013	$0	$0	($2,189)	$0	$0	($320)	($94)	($3)	$0	$2,606	$2,606	$481
2014	$0	$0	($2,256)	$0	$0	($329)	($89)	($3)	$0	$2,677	$2,677	$1,219
2015	$0	$0	($2,325)	$0	$0	($338)	($84)	($3)	$0	$2,750	$2,750	$1,915
2016	$0	$0	($2,396)	$0	$0	($347)	($81)	($3)	$0	$2,827	$2,827	$2,571
2017	$0	$0	($2,470)	$0	$0	($356)	($79)	($3)	$0	$2,908	$2,908	$3,190
2018	$0	$0	($2,545)	$0	$0	($366)	($77)	($3)	$0	$2,992	$2,992	$3,775
2019	$0	$0	($2,623)	$0	$0	($381)	($75)	($3)	$0	$3,082	$3,082	$4,328
2020	$0	$0	($2,703)	$0	$0	($396)	($73)	($3)	$0	$3,176	$3,176	$4,851
2021	$0	$0	($2,786)	$0	$0	($412)	($71)	($4)	$0	$3,272	$3,272	$5,345
2022	$0	$0	($2,872)	$0	$0	($424)	($69)	($4)	$0	$3,368	$3,368	$5,812
2023	$0	$0	($2,959)	$0	$0	($437)	($67)	($4)	$0	$3,467	$3,467	$6,253
2024	$0	$0	($3,050)	$0	$0	($450)	($65)	($4)	$0	$3,569	$3,569	$6,670
2025	$0	$0	($3,144)	$0	$0	($464)	($63)	($4)	$0	$3,674	$3,674	$7,064
2026	$0	$0	($3,240)	$0	$0	($478)	($61)	($4)	$0	$3,782	$3,782	$7,436
2027	$0	$0	($3,339)	$0	$0	($492)	($59)	($4)	$0	$3,894	$3,894	$7,787
2028	$0	$0	($3,441)	$0	$0	($507)	($57)	($4)	$0	$4,010	$4,010	$8,119
Nominal		$810	($49,047)			($9,617)	($2,605)	($89)	$11,426	$71,975	$60,549	
NPV		$655	($5,038)			($2,690)	($1,019)	($26)	$9,587	$17,706	$8,119	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.85

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

	(1) Change in Peak kW Customer at meter	-1.20	kW/Cus
	(2) Change in Peak kW per Customer at generator	-1.55	kW Gen/Cus
	(3) kW Line Loss Percentage	12.60%	
	(4) Change in KWh per Customer at generator	(23)	kWh/Cus/Yr
	(5) kWh Line Loss Percentage	7.70%	
	(6) Group Line Loss Multiplier	1.0014	
	(7) Annual Change in Customer kWh at Meter	(21)	kWh/Cus/Yr
*	(8) Change in Winter kW per Cust at meter	4.70	kW/Cus

II. Economic Life and K-Factors

	(1) DSM Program Study Period	30	Years
	(2) Economic Life of Incremental Generation	40	Years
	(3) Economic Life of Incremental T&D	30	Years
	(4) K-Factor for Generation	1.4493	
	(5) K-Factor for T&D	1.4394	
*	(6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

	(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
	(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
	(3) Utility Cost Escalation Rate	3.06%	
	(4) Customer Equipment Cost	$3,000.00	$/Cus
	(5) Customer Equipment Cost Escalation Rate	3.06%	
	(6) Customer O&M Cost	($287.00)	$/Cus/Year
	(7) Customer O&M Cost Escalation Rate	3.06%	
*	(8) Customer Tax Credit Per Installation	$0.00	$/Cus
*	(9) Customer Tax Credit Escalation Rate	3.06%	
*	(10) Change in Supply Costs	$0.00	$/Cus/Year
*	(11) Supply Costs Escalation Rate	3.06%	
*	(12) Utility Discount Rate	8.97%	
*	(13) Utility AFUDC Rate	10.30%	
*	(14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
*	(15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
*	(16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

	(1) Base Year	1999	
	(2) In-Service Year For Incremental Generation	2001	
	(3) In-Service Year For Incremental T & D	2000	
	(4) Base Year Incremental Generation Cost	$234.85	$/kW
	(5) Base Year Incremental Transmission Cost	$58.75	$/kW
	(6) Base Year Incremental Distribution Cost	$33.00	$/kW
	(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
	(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
	(9) Generator Fixed O&M Escalation Rate	2.99%	
	(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
	(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
	(12) T&D Fixed O&M Escalation Rate	2.56%	
	(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
	(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
	(15) Incremental Gen Capacity Factor	3.40%	
	(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
	(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
*	(18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
*	(19) Incremental Capacity Cost Esc Rate	2.56%	
	Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost In Customer Bill (Base Year)

	(1) Non-Fuel Cost In Customer Bill (Base Year)	$0.0352	$/kWh
	(2) Non-Fuel Escalation Rate	Per Table	
	(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
	(4) Demand Charge Escalation Rate	Per Table	
*	(5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$3,735	$19,000
NPV Costs ($000s)	$1,522	$13,094
NPV Net Benefits ($000s)	$2,213	$5,906
Benefit:Cost Ratio	2.454	1.451

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Year	Change in Electric Supply Costs ($000s)	Utility's Program Costs ($000s)	Utility Paid Rebates & Incentives ($000s)	Change in Electric Revenues ($000)	Incremental Generation Cap Costs ($000s)	Incremental T&D Cap Costs ($000s)	Incremental Prog Induced Fuel Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits to All Customers ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$100	($29)	($35)	$0	($11)	$0	$0	$204	$46	($158)	($158)
2000	$0	$155	$200	($85)	($106)	($79)	($36)	$0	$0	$439	$221	($218)	($358)
2001	$0	$159	$200	($135)	($185)	($126)	($60)	$0	$0	$495	$371	($123)	($462)
2002	$0	$164	$200	($195)	($263)	($169)	($86)	$0	$0	$559	$518	($41)	($493)
2003	$0	$169	$200	($244)	($348)	($209)	($112)	$0	$0	$613	$669	$56	($454)
2004	$0	$67	$100	($278)	($400)	($222)	($126)	$0	$0	$466	$748	$282	($270)
2005	$0	$0	$0	($278)	($413)	($214)	($129)	$0	$0	$278	$756	$478	$15
2006	$0	$0	$0	($281)	($422)	($205)	($130)	$0	$0	$281	$758	$477	$277
2007	$0	$0	$0	($288)	($431)	($197)	($135)	$0	$0	$288	$763	$476	$516
2008	$0	$0	$0	($287)	($441)	($189)	($139)	$0	$0	$287	$770	$483	$739
2009	$0	$0	$0	($290)	($454)	($181)	($141)	$0	$0	$290	$777	$487	$945
2010	$0	$0	$0	($293)	($467)	($173)	($144)	$0	$0	$293	$784	$491	$1,136
2011	$0	$0	$0	($296)	($480)	($165)	($149)	$0	$0	$296	$793	$497	$1,313
2012	$0	$0	$0	($299)	($494)	($157)	($154)	$0	$0	$299	$804	$505	$1,478
2013	$0	$0	$0	($302)	($507)	($148)	($156)	$0	$0	$302	$812	$509	$1,631
Nominal		$810	$1,000	($3,579)	($5,446)	($2,434)	($1,709)			$5,389	$9,589	$4,200	
NPV		$656	$813	($1,863)	($2,756)	($1,327)	($870)			$3,321	$4,952	$1,631	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.49

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Year	Customer Equip Costs ($000s)	Customer O&M Costs ($000s)	Other Costs ($000s)	Other Benefits ($000s)	Change in Participants' Electric Bills ($000s)	Tax Credits ($000s)	Utility Paid Rebates & Incentives ($000s)	Total Costs ($000s)	Total Benefits ($000s)	Total Net Benefits ($000s)	Cumulative Discounted Net Benefits ($000s)
1999	$1,500	($144)	$0	$0	($29)	$0	$100	$1,500	$272	($1,228)	($1,228)
2000	$3,092	($444)	$0	$0	($85)	$0	$200	$3,092	$728	($2,364)	($3,397)
2001	$3,187	($762)	$0	$0	($135)	$0	$200	$3,187	$1,097	($2,089)	($5,156)
2002	$3,284	($1,100)	$0	$0	($195)	$0	$200	$3,284	$1,495	($1,789)	($6,539)
2003	$3,385	($1,457)	$0	$0	($244)	$0	$200	$3,385	$1,901	($1,484)	($7,591)
2004	$1,744	($1,669)	$0	$0	($278)	$0	$100	$1,744	$2,047	$303	($7,394)
2005	$0	($1,720)	$0	$0	($278)	$0	$0	$0	$1,998	$1,998	($6,201)
2006	$0	($1,772)	$0	$0	($281)	$0	$0	$0	$2,053	$2,053	($5,076)
2007	$0	($1,827)	$0	$0	($288)	$0	$0	$0	$2,114	$2,114	($4,013)
2008	$0	($1,883)	$0	$0	($287)	$0	$0	$0	$2,169	$2,169	($3,011)
2009	$0	($1,940)	$0	$0	($290)	$0	$0	$0	$2,230	$2,230	($2,067)
2010	$0	($2,000)	$0	$0	($293)	$0	$0	$0	$2,292	$2,292	($1,176)
2011	$0	($2,061)	$0	$0	($296)	$0	$0	$0	$2,357	$2,357	($335)
2012	$0	($2,124)	$0	$0	($299)	$0	$0	$0	$2,423	$2,423	$458
2013	$0	($2,189)	$0	$0	($302)	$0	$0	$0	$2,491	$2,491	$1,206
Nominal	$16,191	($23,089)			($3,579)		$1,000	$16,191	$27,668	$11,477	
NPV	$13,094	($11,634)			($1,853)		$813	$13,094	$14,300	$1,206	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.09

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$75	$1,357	$0	$0	($35)	$0	($11)	$1,432	$46	($1,385)	($1,385)
2000	$0	$155	$2,648	$0	$0	($106)	($79)	($36)	$2,803	$221	($2,582)	($3,755)
2001	$0	$159	$2,424	$0	$0	($185)	($126)	($60)	$2,584	$371	($2,212)	($5,618)
2002	$0	$164	$2,184	$0	$0	($263)	($169)	($86)	$2,349	$518	($1,830)	($7,032)
2003	$0	$169	$1,928	$0	$0	($348)	($209)	($112)	$2,097	$669	($1,428)	($8,045)
2004	$0	$87	$76	$0	$0	($400)	($222)	($126)	$163	$748	$585	($7,664)
2005	$0	$0	($1,720)	$0	$0	($413)	($214)	($129)	$0	$2,475	$2,475	($6,186)
2006	$0	$0	($1,772)	$0	$0	($422)	($205)	($130)	$0	$2,530	$2,530	($4,799)
2007	$0	$0	($1,827)	$0	$0	($431)	($197)	($135)	$0	$2,590	$2,590	($3,497)
2008	$0	$0	($1,883)	$0	$0	($441)	($189)	($139)	$0	$2,652	$2,652	($2,273)
2009	$0	$0	($1,940)	$0	$0	($454)	($181)	($141)	$0	$2,717	$2,717	($1,122)
2010	$0	$0	($2,000)	$0	$0	($467)	($173)	($144)	$0	$2,783	$2,783	($40)
2011	$0	$0	($2,061)	$0	$0	($480)	($165)	($149)	$0	$2,854	$2,854	$978
2012	$0	$0	($2,124)	$0	$0	($494)	($157)	($154)	$0	$2,928	$2,928	$1,936
2013	$0	$0	($2,189)	$0	$0	($507)	($148)	($156)	$0	$3,000	$3,000	$2,837
Nominal		$810	($6,898)			($5,446)	($2,434)	($1,709)	$11,426	$27,103	$15,677	
NPV		$655	$1,460			($2,756)	($1,327)	($870)	$9,587	$12,425	$2,837	

Discount Rate = 8.97%
Benefit/Cost Ratio = 1.30

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.90	kW/Cus
(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(1,109)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(1,030)	kWh/Cus/Yr
*(8) Change in Winter kW per Cust at meter	4.40	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	15	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
*(6) Switch: Rev Req (0) or Val-of-Def (1)	0	

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III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	($287.00)	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
*(8) Customer Tax Credit Per Installation	$0.00	$/Cus
*(9) Customer Tax Credit Escalation Rate	3.06%	
*(10) Change in Supply Costs	$0.00	$/Cus/Year
*(11) Supply Costs Escalation Rate	3.06%	
*(12) Utility Discount Rate	8.97%	
*(13) Utility AFUDC Rate	10.30%	
*(14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
*(15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
*(16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.26%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	1.91%	
*(18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
*(19) Incremental Capacity Cost Esc Rate	2.56%	
Stop Revenue Loss at In-Service Year? (Y=1, N=0)	0	

V. (1) Non-Fuel Cost In Customer Bill (Base Year)

(1) Non-Fuel Cost In Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
*(5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$4,952	$14,300
NPV Costs ($000s)	$3,321	$13,094
NPV Net Benefits ($000s)	$1,631	$1,206
Benefit:Cost Ratio	1.491	1.092

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

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Ratepayers' Impact Cost-Effectiveness Measure

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Utility Paid Rebates & Incentives ($000s)	(5) Change in Electric Revenues ($000)	(6) Incremental Generation Cap Costs ($000s)	(7) Incremental T&D Cap Costs ($000s)	(8) Incremental Prog Induced Fuel Costs ($000s)	(9) Other Costs ($000s)	(10) Other Benefits ($000s)	(11) Total Costs ($000s)	(12) Total Benefits ($000s)	(13) Total Net Benefits to All Customers ($000s)	(14) Cumulative Discounted Net Benefits ($000s)
1999	$0	$56	$75	($22)	($26)	$0	($8)	$34	$0	$187	$35	($153)	($153)
2000	$0	$116	$150	($63)	($80)	($59)	($27)	$69	$0	$399	$166	($233)	($366)
2001	$0	$119	$150	($102)	($139)	($95)	($45)	$70	$0	$441	$278	($162)	($503)
2002	$0	$123	$150	($146)	($197)	($127)	($65)	$71	$0	$490	$389	($101)	($581)
2003	$0	$127	$150	($183)	($261)	($156)	($84)	$71	$0	$531	$502	($29)	($602)
2004	$0	$65	$75	($209)	($300)	($167)	($94)	$36	$0	$385	$561	$176	($488)
2005	$0	$0	$0	($209)	($310)	($160)	($97)	$0	$0	$209	$567	$358	($274)
2006	$0	$0	$0	($210)	($317)	($154)	($98)	$0	$0	$210	$568	$358	($78)
2007	$0	$0	$0	($216)	($324)	($148)	($101)	$0	$0	$216	$573	$357	$102
2008	$0	$0	$0	($215)	($331)	($142)	($104)	$0	$0	$215	$577	$362	$269
2009	$0	$0	$0	($217)	($341)	($136)	($106)	$0	$0	$217	$583	$365	$423
2010	$0	$0	$0	($220)	($350)	($130)	($108)	$0	$0	$220	$588	$368	$567
2011	$0	$0	$0	($222)	($360)	($123)	($112)	$0	$0	$222	$595	$373	$700
2012	$0	$0	$0	($224)	($370)	($117)	($115)	$0	$0	$224	$603	$378	$823
2013	$0	$0	$0	($227)	($380)	($111)	($117)	$0	$0	$227	$609	$382	$938
2014	$0	$0	$0	($229)	($391)	($105)	($115)	$0	$0	$229	$611	$382	$1,043
2015	$0	$0	$0	($232)	($401)	($100)	($115)	$0	$0	$232	$616	$384	$1,141
2016	$0	$0	$0	($235)	($412)	($97)	($113)	$0	$0	$235	$622	$387	$1,230
2017	$0	$0	$0	($237)	($423)	($94)	($112)	$0	$0	$237	$630	$393	$1,314
2018	$0	$0	$0	($240)	($435)	($92)	($119)	$0	$0	$240	$646	$406	$1,393
2019	$0	$0	$0	($243)	($452)	($89)	($123)	$0	$0	$243	$664	$421	$1,469
2020	$0	$0	$0	($246)	($470)	($87)	($126)	$0	$0	$246	$683	$437	$1,541
2021	$0	$0	$0	($249)	($489)	($84)	($130)	$0	$0	$249	$703	$454	$1,609
2022	$0	$0	$0	($252)	($504)	($82)	($134)	$0	$0	$252	$720	$468	$1,674
2023	$0	$0	$0	($256)	($519)	($79)	($138)	$0	$0	$256	$737	$481	$1,735
2024	$0	$0	$0	($259)	($535)	($77)	($143)	$0	$0	$259	$754	$495	$1,793
2025	$0	$0	$0	($263)	($551)	($74)	($147)	$0	$0	$263	$772	$509	$1,848
2026	$0	$0	$0	($267)	($568)	($72)	($151)	$0	$0	$267	$791	$524	$1,899
2027	$0	$0	$0	($271)	($585)	($70)	($156)	$0	$0	$271	$810	$539	$1,948
2028	$0	$0	$0	($275)	($603)	($67)	($161)	$0	$0	$275	$831	$556	$1,994
Nominal		$607	$750	($6,438)	($11,421)	($3,093)	($3,266)	$351		$8,146	$17,780	$9,634	
NPV		$491	$610	($1,984)	($3,195)	($1,210)	($960)	$285		$3,371	$5,365	$1,994	

Discount Rate =	8.97%
Benefit/Cost Ratio =	1.59

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Participants' Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Customer Equip Costs ($000s)	(3) Customer O&M Costs ($000s)	(4) Other Costs ($000s)	(5) Other Benefits ($000s)	(6) Change in Participants' Electric Bills ($000s)	(7) Tax Credits ($000s)	(8) Utility Paid Rebates & Incentives ($000s)	(9) Total Costs ($000s)	(10) Total Benefits ($000s)	(11) Total Net Benefits ($000s)	(12) Cumulative Discounted Net Benefits ($000s)
1999	$1,125	($108)	$34	$0	($22)	$0	$75	$1,159	$204	($955)	($955)
2000	$2,319	($333)	$69	$0	($63)	$0	$150	$2,388	$546	($1,842)	($2,646)
2001	$2,390	($572)	$70	$0	($102)	$0	$150	$2,460	$823	($1,637)	($4,024)
2002	$2,463	($825)	$71	$0	($146)	$0	$150	$2,534	$1,121	($1,413)	($5,116)
2003	$2,538	($1,093)	$71	$0	($183)	$0	$150	$2,610	$1,425	($1,184)	($5,955)
2004	$1,308	($1,251)	$36	$0	($209)	$0	$75	$1,344	$1,535	$191	($5,831)
2005	$0	($1,290)	$0	$0	($209)	$0	$0	$0	$1,498	$1,498	($4,938)
2006	$0	($1,329)	$0	$0	($210)	$0	$0	$0	$1,540	$1,540	($4,092)
2007	$0	($1,370)	$0	$0	($216)	$0	$0	$0	$1,586	$1,586	($3,295)
2008	$0	($1,412)	$0	$0	($215)	$0	$0	$0	$1,627	$1,627	($2,544)
2009	$0	($1,455)	$0	$0	($217)	$0	$0	$0	$1,673	$1,673	($1,835)
2010	$0	($1,500)	$0	$0	($220)	$0	$0	$0	$1,719	$1,719	($1,167)
2011	$0	($1,546)	$0	$0	($222)	$0	$0	$0	$1,768	$1,768	($537)
2012	$0	($1,593)	$0	$0	($224)	$0	$0	$0	$1,817	$1,817	$58
2013	$0	($1,642)	$0	$0	($227)	$0	$0	$0	$1,868	$1,868	$619
2014	$0	($1,692)	$0	$0	($229)	$0	$0	$0	$1,921	$1,921	$1,149
2015	$0	($1,744)	$0	$0	($232)	$0	$0	$0	$1,976	$1,976	$1,649
2016	$0	($1,797)	$0	$0	($235)	$0	$0	$0	$2,032	$2,032	$2,120
2017	$0	($1,852)	$0	$0	($237)	$0	$0	$0	$2,089	$2,089	$2,565
2018	$0	($1,909)	$0	$0	($240)	$0	$0	$0	$2,149	$2,149	$2,986
2019	$0	($1,967)	$0	$0	($243)	$0	$0	$0	$2,210	$2,210	$3,382
2020	$0	($2,028)	$0	$0	($246)	$0	$0	$0	$2,273	$2,273	$3,756
2021	$0	($2,090)	$0	$0	($249)	$0	$0	$0	$2,339	$2,339	$4,110
2022	$0	($2,154)	$0	$0	($252)	$0	$0	$0	$2,406	$2,406	$4,443
2023	$0	($2,220)	$0	$0	($256)	$0	$0	$0	$2,475	$2,475	$4,758
2024	$0	($2,288)	$0	$0	($259)	$0	$0	$0	$2,547	$2,547	$5,055
2025	$0	($2,358)	$0	$0	($263)	$0	$0	$0	$2,621	$2,621	$5,336
2026	$0	($2,430)	$0	$0	($267)	$0	$0	$0	$2,697	$2,697	$5,601
2027	$0	($2,504)	$0	$0	($271)	$0	$0	$0	$2,775	$2,775	$5,852
2028	$0	($2,581)	$0	$0	($275)	$0	$0	$0	$2,858	$2,858	$6,088
Nominal	$12,143	($48,929)	$351		($6,438)		$750	$12,495	$56,117	$43,622	
NPV	$9,821	($13,599)	$285		($1,984)		$610	$10,106	$16,194	$6,088	

Discount Rate = 8.97%
Benefit/Cost Ratio = 1.60

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Total Resource Cost-Effectiveness Measure
Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Change in Electric Supply Costs ($000s)	(3) Utility's Program Costs ($000s)	(4) Participants' Program Costs ($000s)	(5) Other Costs ($000s)	(6) Other Benefits ($000s)	(7) Incremental Generation Cap Costs ($000s)	(8) Incremental T&D Cap Costs ($000s)	(9) Incremental Prog Induced Fuel Costs ($000s)	(10) Total Costs ($000s)	(11) Total Benefits ($000s)	(12) Total Net Benefits ($000s)	(13) Cumulative Discounted Net Benefits ($000s)
1999	$0	$56	$1,017	$34	$0	($26)	$0	($8)	$1,108	$35	($1,073)	($1,073)
2000	$0	$116	$1,986	$69	$0	($80)	($59)	($27)	$2,171	$166	($2,006)	($2,914)
2001	$0	$119	$1,818	$70	$0	($139)	($95)	($45)	$2,008	$278	($1,729)	($4,370)
2002	$0	$123	$1,638	$71	$0	($197)	($127)	($65)	$1,832	$389	($1,443)	($5,486)
2003	$0	$127	$1,446	$71	$0	($261)	($156)	($84)	$1,644	$502	($1,142)	($6,298)
2004	$0	$65	$57	$36	$0	($300)	($167)	($94)	$158	$561	$403	($6,033)
2005	$0	$0	($1,290)	$0	$0	($310)	($160)	($97)	$0	$1,856	$1,856	($4,925)
2006	$0	$0	($1,329)	$0	$0	($317)	($154)	($98)	$0	$1,897	$1,897	($3,885)
2007	$0	$0	($1,370)	$0	$0	($324)	($148)	($101)	$0	$1,943	$1,943	($2,908)
2008	$0	$0	($1,412)	$0	$0	($331)	($142)	($104)	$0	$1,989	$1,989	($1,990)
2009	$0	$0	($1,455)	$0	$0	($341)	($136)	($106)	$0	$2,038	$2,038	($1,127)
2010	$0	$0	($1,500)	$0	$0	($350)	($130)	($108)	$0	$2,087	$2,087	($315)
2011	$0	$0	($1,546)	$0	$0	($360)	($123)	($112)	$0	$2,141	$2,141	$448
2012	$0	$0	($1,593)	$0	$0	($370)	($117)	($115)	$0	$2,196	$2,196	$1,167
2013	$0	$0	($1,642)	$0	$0	($380)	($111)	($117)	$0	$2,250	$2,250	$1,843
2014	$0	$0	($1,692)	$0	$0	($391)	($105)	($115)	$0	$2,303	$2,303	$2,477
2015	$0	$0	($1,744)	$0	$0	($401)	($100)	($115)	$0	$2,360	$2,360	$3,074
2016	$0	$0	($1,797)	$0	$0	($412)	($97)	($113)	$0	$2,419	$2,419	$3,636
2017	$0	$0	($1,852)	$0	$0	($423)	($94)	($112)	$0	$2,482	$2,482	$4,165
2018	$0	$0	($1,909)	$0	$0	($435)	($92)	($119)	$0	$2,555	$2,555	$4,664
2019	$0	$0	($1,967)	$0	$0	($452)	($89)	($123)	$0	$2,631	$2,631	$5,136
2020	$0	$0	($2,028)	$0	$0	($470)	($87)	($126)	$0	$2,711	$2,711	$5,582
2021	$0	$0	($2,090)	$0	$0	($489)	($84)	($130)	$0	$2,793	$2,793	$6,004
2022	$0	$0	($2,154)	$0	$0	($504)	($82)	($134)	$0	$2,873	$2,873	$6,402
2023	$0	$0	($2,220)	$0	$0	($519)	($79)	($138)	$0	$2,956	$2,956	$6,779
2024	$0	$0	($2,288)	$0	$0	($535)	($77)	($143)	$0	$3,042	$3,042	$7,134
2025	$0	$0	($2,358)	$0	$0	($551)	($74)	($147)	$0	$3,130	$3,130	$7,469
2026	$0	$0	($2,430)	$0	$0	($568)	($72)	($151)	$0	$3,221	$3,221	$7,786
2027	$0	$0	($2,504)	$0	$0	($585)	($70)	($156)	$0	$3,315	$3,315	$8,085
2028	$0	$0	($2,581)	$0	$0	($603)	($67)	($161)	$0	$3,411	$3,411	$8,367
Nominal		$607	($36,765)	$351		($11,421)	($3,093)	($3,266)	$8,921	$62,528	$53,607	
NPV		$491	($3,779)	$285		($3,195)	($1,210)	($960)	$7,476	$15,843	$8,367	

Discount Rate =	8.97%
Benefit/Cost Ratio =	2.12

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INPUT DATA -- PART 2

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

(1) Year	(2) Cumulative Total Participating Customers	(3) Cumulative Participating Customers Adj Free Rides	(4) Utility Average System Fuel Cost (C / kWh)	(5) Marginal Fuel Cost (Decreases) (C / kWh)	(6) Marginal Fuel Cost (Increases) (C / kWh)	(7) Replacement Fuel Cost (C / kWh)	(8) Program kW Effectiveness Factor	(9) Program kWh Effectiveness Factor	(10) Other Costs ($000)	(11) Other Benefits ($000)
1999	500	375	2.0531	2.0099	2.0099	2.0531	1.00	1.00	$34	$0
2000	1,500	1,125	1.8796	2.1798	2.1798	1.8796	1.00	1.00	$69	$0
2001	2,500	1,875	1.7318	2.1667	2.1667	1.7318	1.00	1.00	$70	$0
2002	3,500	2,625	1.7345	2.2272	2.2272	1.7345	1.00	1.00	$71	$0
2003	4,500	3,375	1.7895	2.2390	2.2390	1.7895	1.00	1.00	$71	$0
2004	5,000	3,750	1.8528	2.2692	2.2692	1.8528	1.00	1.00	$36	$0
2005	5,000	3,750	1.8989	2.3280	2.3280	1.8989	1.00	1.00	$0	$0
2006	5,000	3,750	1.9501	2.3468	2.3468	1.9501	1.00	1.00	$0	$0
2007	5,000	3,750	1.9987	2.4306	2.4306	1.9987	1.00	1.00	$0	$0
2008	5,000	3,750	2.0415	2.5090	2.5090	2.0415	1.00	1.00	$0	$0
2009	5,000	3,750	2.0973	2.5498	2.5498	2.0973	1.00	1.00	$0	$0
2010	5,000	3,750	2.1547	2.5981	2.5981	2.1547	1.00	1.00	$0	$0
2011	5,000	3,750	2.2136	2.6838	2.6838	2.2136	1.00	1.00	$0	$0
2012	5,000	3,750	2.2740	2.7707	2.7707	2.2740	1.00	1.00	$0	$0
2013	5,000	3,750	2.3362	2.8131	2.8131	2.3362	1.00	1.00	$0	$0
2014	5,000	3,750	2.4000	2.7636	2.7636	2.4000	1.00	1.00	$0	$0
2015	5,000	3,750	2.4656	2.7683	2.7683	2.4656	1.00	1.00	$0	$0
2016	5,000	3,750	2.5330	2.7274	2.7274	2.5330	1.00	1.00	$0	$0
2017	5,000	3,750	2.6023	2.7028	2.7028	2.6023	1.00	1.00	$0	$0
2018	5,000	3,750	2.6734	2.8597	2.8597	2.6734	1.00	1.00	$0	$0
2019	5,000	3,750	2.7464	2.9472	2.9472	2.7464	1.00	1.00	$0	$0
2020	5,000	3,750	2.8215	3.0375	3.0375	2.8215	1.00	1.00	$0	$0
2021	5,000	3,750	2.8986	3.1305	3.1305	2.8986	1.00	1.00	$0	$0
2022	5,000	3,750	2.9778	3.2264	3.2264	2.9778	1.00	1.00	$0	$0
2023	5,000	3,750	3.0690	3.3251	3.3251	3.0690	1.00	1.00	$0	$0
2024	5,000	3,750	3.1630	3.4270	3.4270	3.1630	1.00	1.00	$0	$0
2025	5,000	3,750	3.2598	3.5319	3.5319	3.2598	1.00	1.00	$0	$0
2026	5,000	3,750	3.3596	3.6400	3.6400	3.3596	1.00	1.00	$0	$0
2027	5,000	3,750	3.4625	3.7515	3.7515	3.4625	1.00	1.00	$0	$0
2028	5,000	3,750	3.5685	3.8664	3.8664	3.5685	1.00	1.00	$0	$0

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INPUT DATA -- PART 1

Cost-Effectiveness Analysis per Rule 25-17.008 Florida Administrative Code

I. Program Demand Impacts and Line Losses

(1) Change in Peak kW Customer at meter	-1.90	kW/Cus
(2) Change in Peak kW per Customer at generator	-2.46	kW Gen/Cu
(3) kW Line Loss Percentage	12.60%	
(4) Change in KWh per Customer at generator	(1,109)	kWh/Cus/Yr
(5) kWh Line Loss Percentage	7.70%	
(6) Group Line Loss Multiplier	1.0014	
(7) Annual Change in Customer kWh at Meter	(1,030)	kWh/Cus/Yr
* (8) Change in Winter kW per Cust at meter	4.40	kW/Cus

II. Economic Life and K-Factors

(1) DSM Program Study Period	30	Years
(2) Economic Life of Incremental Generation	40	Years
(3) Economic Life of Incremental T&D	30	Years
(4) K-Factor for Generation	1.4493	
(5) K-Factor for T&D	1.4394	
* (6) Switch: Rev Req (0) or Val-of-Def (1)	0	

III. Utility & Customer Costs

(1) Utility Nonrecurring Cost Per Customer	$150.00	$/Cus
(2) Utility Recurring Cost Per Customer	$0.00	$/Cus/Year
(3) Utility Cost Escalation Rate	3.06%	
(4) Customer Equipment Cost	$3,000.00	$/Cus
(5) Customer Equipment Cost Escalation Rate	3.06%	
(6) Customer O&M Cost	($287.00)	$/Cus/Year
(7) Customer O&M Cost Escalation Rate	3.06%	
* (8) Customer Tax Credit Per Installation	$0.00	$/Cus
* (9) Customer Tax Credit Escalation Rate	3.06%	
* (10) Change in Supply Costs	$0.00	$/Cus/Year
* (11) Supply Costs Escalation Rate	3.06%	
* (12) Utility Discount Rate	8.97%	
* (13) Utility AFUDC Rate	10.30%	
* (14) Utility Nonrecurring Rebate/Incentive	$200.00	$/Cus
* (15) Utility Recurring Rebate/Incentive	$0.00	$/Cus/Year
* (16) Utility Rebate/Incentive Escalation Rate	0.00%	

IV. Incremental Generation, Transmission, & Distribution Costs

(1) Base Year	1999	
(2) In-Service Year For Incremental Generation	2001	
(3) In-Service Year For Incremental T & D	2000	
(4) Base Year Incremental Generation Cost	$234.85	$/kW
(5) Base Year Incremental Transmission Cost	$58.75	$/kW
(6) Base Year Incremental Distribution Cost	$33.00	$/kW
(7) Gen, Tran, & Dist Cost Escalation Rate	2.56%	
(8) Generator Fixed O & M Cost	$2.77	$/kW/Yr
(9) Generator Fixed O&M Escalation Rate	2.99%	
(10) Transmission Fixed O & M Cost	$0.73	$/kW/Yr
(11) Distribution Fixed O & M Cost	$0.84	$/kW/Yr
(12) T&D Fixed O&M Escalation Rate	2.56%	
(13) Incremental Gen Variable O & M Costs	$0.433	$/kW/Yr
(14) Incre Gen Variable O&M Cost Esc Rate	3.84%	
(15) Incremental Gen Capacity Factor	3.40%	
(16) Incremental Generating Unit Fuel Cost	$0.0356	$/kWh
(17) Incremental Gen Unit Fuel Esc Rate	3.00%	
* (18) Incremental Purchased Capacity Cost	$20.70	$/KW/YR
* (19) Incremental Capacity Cost Esc Rate	2.56%	

Stop Revenue Loss at In-Service Year? (Y=1, N=0) 0

V. (1) Non-Fuel Cost in Customer Bill (Base Year)

(1) Non-Fuel Cost in Customer Bill (Base Year)	$0.0352	$/kWh
(2) Non-Fuel Escalation Rate	Per Table	
(3) Customer Demand Charge Per kW (Base Year)	$0.0000	$/kW/Mo
(4) Demand Charge Escalation Rate	Per Table	
* (5) Average Annual Change in Monthly Billing kW	0	kW/Mo.

Summary Results for This Analysis

	RIM	Participants'
NPV Benefits($000s)	$5,365	$16,194
NPV Costs ($000s)	$3,371	$10,106
NPV Net Benefits ($000s)	$1,994	$6,088
Benefit:Cost Ratio	1.592	1.602

* Supplemental Information Not Specifically Specified in Cost Effectiveness Manual

Cost Effectiveness Analysis
GoodCents Conversion Program

Filename	Existing System Heating	Existing System Cooling		New System Heating	New System Cooling	Cost Effectiveness RIM	Cost Effectiveness PART	Cost Effectiveness TRC
gthp_1 (as-filed)	**68% AFUE Gas Furnace**	**7 SEER A/C**		**7.4 HSPF Heat Pump**	**11 SEER Heat Pump**	**1.74**	**1.65**	**2.20**
Gas_HP	68% AFUE Gas Furnace	7 SEER A/C	25% Free Riders	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.59	1.60	2.12
gthp_1d	68% AFUE Gas Furnace	7 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.49	1.09	1.30
gthp_2	68% AFUE Gas Furnace	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	2.45	1.45	1.85
gthp_9	68% AFUE Gas Furnace	10 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	1.41	1.14	1.32
gthp_9a	68% AFUE Gas Furnace	10 SEER A/C	15 Yr. Program Life	7.4 HSPF Heat Pump	11 SEER Heat Pump	1.19	0.80	0.75
gthp_3	Gas or Resistance Heat	7 SEER A/C		Gas or Resistance Heat	11 SEER A/C	1.06	0.87	0.93
gthp_4	Gas or Resistance Heat	8 SEER A/C		Gas or Resistance Heat	11 SEER A/C	0.95	0.60	0.60
gthp_7	Resistance Heat	7 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.75	1.46	1.07
gthp_8	Resistance Heat	8 SEER A/C		7.4 HSPF Heat Pump	11 SEER Heat Pump	0.66	1.26	0.82

15. On page 8 of Gulf's filing, the cost-effectiveness sensitivities appear to be grouped into three general areas. The first group of six measures appear to add winter peak demand, while the third group of two measures clearly reduces winter peak demand. Please explain why all programs in the first group are cost-effective under the RIM test even though they add winter peak demand. Also explain why all programs in the third group are not cost-effective under the RIM test even though they reduce winter and summer peak demand.

Answer: The first group of six program scenarios consists of gas to heat pump conversions. Although these add winter peak, the scenarios also result in the reduction of summer peak demand and total annual kWh consumption. The third group of two scenarios involve the replacement of resistance heat and air conditioners to 11 SEER heat pumps. While the scenarios in the third group reduce winter and summer peak demand, the revenue erosion Gulf would experience in these scenarios is so great that it is not adequately off-set by capacity cost savings, hence, it is not cost effective for the general body of customers. Gulf does promote these types of equipment changes through its marketing programs, but the resulting RIM values make these activities ineligible for ECCR.

16. **On page 8 of Gulf's filing, the existing and new systems contained in the first and fourth item appear to be identical except that the first item's existing system has an AC unit with a SEER of 7.0 rather than 8.0. Given that an 8.0 SEER AC unit is more energy-efficient than a 7.0 SEER unit, it would appear that an upgrade from 7.0 SEER to 11.0 SEER would save more energy than an upgrade from 8.0 SEER to 11.0 SEER. Please explain why an upgrade from 8.0 SEER is more cost-effective under the RIM test than an upgrade from 7.0 SEER.**

Answer: It is correct that a 7 SEER air conditioner to 11 SEER heat pump unit saves more energy than an 8 SEER air conditioner to 11 SEER heat pump. However, the greater energy reduction results in a higher lost revenue figure and therefore a lower RIM test result.

17. **On page 8 of Gulf's filing, the existing and new systems contained in the first and third item appear to be identical except that the third item is an analysis of a 15-year program life. Please explain whether this analysis is of a sensitivity where participants are added for 15 years rather than seven, or whether this sensitivity analyzes the cost-effectiveness over 15 years rather than 30.**

Answer: The first and third items are the same with the exception that the third item analyzes the cost effectiveness of the program over a 15-year period instead of the standard 30-year program life.

18. Please explain why Gulf chose, as its baseline existing equipment, an AC Unit with a SEER rating of 7.0 If available, provide supporting documentation or data which justifies Gulf's choice of a 7.0 SEER AC unit as its baseline existing equipment.

Answer: The targeted program participants have existing equipment installations that are 10 to 15 years old. The minimum efficiency standards in effect for installations during that time frame were 7.5 SEER to 8.5 SEER. Gulf has assumed the average installed efficiency to be approximately 8 SEER with a15% efficiency degradation due to age. This results in an average current efficiency rating of approximately 7 SEER.

19. Please provide the annual total participation level expected by Gulf for the proposed Program. Explain how this level of program participation was derived.

Answer: Gulf Power is forecasting a participation rate of 1,000 units per year. This expectation is based upon Gulf's current level of air conditioner and furnace upgrades and conversion activity and is our best estimate of program potential.

AFFIDAVIT

STATE OF FLORIDA)
)
COUNTY OF ESCAMBIA)

Docket No. 981591-EG

Before me the undersigned authority, personally appeared Margaret D. Neyman, who being first duly sworn, deposes and says that she is the Marketing Services Manager of Gulf Power Company, a Maine Corporation, that the foregoing is true and correct to the best of his knowledge, information and belief. She is personally known to me.

Margaret D. Neyman
Margaret D. Neyman
Marketing Services Manager

Sworn to and subscribed before me this 14th day of January, 1999.

Linda C. Webb
Notary Public, State of Florida at Large

NOTARY PUBLIC STATE OF FLORIDA
LINDA C. WEBB
Notary Public-State of FL
Comm. Exp: May 31, 2002
Comm. No: CC 725969

Docket No. 981591-EG
Peoples Gas System
Witness: J.W. McCormick
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Here Are Answers to 42 Questions That Consumers Often Ask the Air-Conditioning & Refrigeration Institute

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Here are answers to 42 questions that consumers often ask the Air-Conditioning & Refrigeration Institute

How To Keep Your Cool and Save Cold Cash

1. Here are some basic rules to follow for keeping cool at minimum cost.

- Caulk, weatherstrip, and insulate (especially the attic) to close air gaps.
- Plan hot work (washing and drying clothes, baking, cooking) for cooler morning and evening hours.
- Pull drapes and shades over windows facing the sun.
- Keep windows and doors closed when the air conditioning is on.
- Use a thermostat control to automatically increase or decrease home temperatures for daytime/nighttime differences to save money.
- Set thermostat control at highest comfortable level—each degree raised reduces energy consumption by 3 to 4 percent.
- Clean or replace air filters regularly.
- With a new system, consider a service contract which includes periodic maintenance and repairs for a specified period of time.
- Keep the outside unit free of leaves or other airflow obstructions.
- Have the air conditioning unit cleaned each spring.

FLORIDA PUBLIC SERVICE COMMISSION
DOCKET
NO. 981591-EG EXHIBIT NO. 3
COMPANY/
WITNESS: McCormick
DATE: 10-12-98

AIR-CONDITIONING & REFRIGERATION INSTITUTE
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INDOOR AIR

2. How does an air conditioner work?

An air conditioner transfers heat—from the inside of a building, where it is not wanted, to the outside. Refrigerant in the system absorbs the excess heat and is pumped through a closed system of piping to an outside coil. A fan blows outside air over the hot coil, transferring heat from the refrigerant to the outdoor air. Because the heat is removed from the indoor air, the indoor area is cooled.

3. Is central air conditioning better than window units?

This depends largely on individual circumstances—for example, how large is the area to be air conditioned, how large is the family, what temperatures are required, how well the house is insulated, where the house is located, etc. Central systems require internal ducting; window units take up valuable window space. In many cases, if more than three large rooms need air conditioning, it is best to consider central air conditioning. Your contractor can advise you.

4. Should I augment my central air conditioning system with other air conditioners or ceiling fans?

If you need to use other air conditioners with a central air conditioning system, your central system probably is undersized or the air distribution system is imbalanced. Window air conditioners or split ductless systems may be used in rooms that lack air ducts.

Ceiling fans can be a good idea with some indoor comfort systems because they circulate air that tends to stagnate at the top of rooms with high ceilings.

5. What is the average life of a central air conditioning system?

It can vary, depending on how much the system is used and how regularly it is checked or serviced. Generally, the average life of cooling units built in the 1970s and 1980s is about 15 years, but individual units may vary and last much longer, depending on use and how well they are maintained. Heat pumps have about the same life-span—an ARI survey showed average heat pump life to be about 14 years when recommended maintenance procedures were followed. Newer units are expected to last even longer.

6. What should I do in advance to make sure that my air conditioning system will work efficiently this summer?

The main thing is to have the system checked each year before the peak cooling season—by a qualified contractor or service technician. Then, remember to keep the air filter clean and the outdoor unit free of leaves and debris.

7. If my air conditioner is no longer cooling properly, what is the most likely problem?

It could be as simple as replacing a fuse, resetting a circuit breaker or checking to see if the thermostat is set properly. If an electrical problem isn't the cause, the refrigerant may be low if the system still runs but does not cool properly. This can be corrected by having an EPA-certified technician add necessary refrigerant. Most likely, if the problem involves any major part, such as the compressor, you would hear strange noises similar to those of any mechanical equipment not running correctly, or the unit might not run at all.

8. Can homeowners repair their own air conditioners?

In most cases, definitely not. Cooling systems today are more complicated to service and usually require expert attention in order to comply with federal regulations, such as the Clean Air Act which prohibits releasing refrigerants into the atmosphere. An EPA-certified air conditioning contractor or service technician should be called at the first sign of trouble.

9. When do I know it's time to replace my system?

When the system starts giving you more problems than seem cost-effective to fix, particularly when major components such as the compressor start making unusual noises or otherwise indicating need for a service call. When faced with major repairs, consult several contractors for their recommendations. Replacing a compressor is somewhat less expensive than replacing the entire unit, but new units may give you greater efficiency and lower operating costs in the long run.

10. Which is better—letting a central cooling system wear out before replacing it, or replacing it at some point before it wears out?

Because newer equipment usually is more energy efficient than older central air conditioning or heat pump systems, you might actually save money by replacing your old system before it completely wears out. Contact local contractors and ask for their estimates. In some cases, the money you save in reduced utility costs might pay back your purchase price of a new system years earlier than you might think.

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INDOOR AIR

11. When is the best time to buy an air conditioner?

Like most items, in the off-season. That's when contractors have more time to spend with you determining exactly the best options you would want to consider for your individual needs.

12. How do I go about shopping for a new system?

Ask friends and neighbors about the types of systems they have, how much they cost, how long they've had them, and how satisfied they are with them. Then ask for recommendations as to brands and local contractors, or ask several different contractors to take a thorough look at your home, evaluate your overall comfort needs, and recommend the best system for you. Look at all indoor climate control options—the entire spectrum of heating, cooling, air filtration, and humidification equipment.

13. Should I replace both my outdoor condensing unit (which includes the compressor) and the indoor coil on my central air conditioning system at the same time?

In most instances, yes. Matching a new condensing unit with a new coil is the only reliable way to be certain you are going to get the rated efficiency of the new equipment. Matching a new, high SEER (seasonal energy efficiency ratio) condensing unit with an old indoor coil probably would not result in optimum efficiency.

14. What is the best type of system to meet all indoor comfort needs?

The best system depends on many variables, including family size, house location and design, and utility cost and availability. The optimum indoor comfort system might include high efficiency central air conditioning and heating, a high-efficiency air cleaner, and a central humidifier.

15. If I buy a new system, what is the best kind of control unit?

If you want flexibility to program your temperature changes, a computerized thermostat will probably be best. Manually-operated control systems allow you to select a temperature setting which your unit will maintain.

INDOOR AIR

16. How can I get a high efficiency system that will have minimum operational costs?

Manufacturers publish equipment efficiency ratings which are available to your contractor. ARI also publishes directories indicating various energy efficiency ratings of specific equipment. It is important that a contractor install a unit that has just the right capacity to cool your home. Units with excess capacity will cycle on and off and work less efficiently, thus increasing your operating costs.

17. How can a homeowner tell if a contractor's price is fair?

Mostly by comparing bids from several contractors, and possibly checking the local Better Business Bureau to be sure the contractor has a good reputation.

18. How easy is it to install central air conditioning in an older home?

Often it is fairly simple, particularly if the older home has existing duct work or plenty of room for adding duct work. Homes without air conditioning ducts can consider non-ducted systems which also provide the advantage of cooling only selected areas very effectively. An important consideration is how well the older home is sealed and insulated.

19. If I'm buying a house, how can I make sure that the air conditioning system is in good working order?

Just turn on the system and listen for unusual sounds while feeling how cool the air is and how strong the air flow is from the vents. Don't just listen inside the house—go outside and listen to the condensing unit, too. This personal inspection is a good indicator, but like buying a car, the best way is to then hire an expert—a contractor—to come out and inspect the system. It won't cost much, and it could save you lots of money in unanticipated repairs.

20. What is a heat pump?

A heat pump is like a conventional air conditioner except it also can provide heat in winter. In the summer, the heat pump collects heat from the house and expels it outside. In the winter, the heat pump extracts heat from outside air and circulates it inside the house. The heat pump works best when the outdoor temperature is above freezing. Below that, supplementary heat often is needed. A heat pump can save 30 to 60 percent less energy to supply the same heat when compared to an electric furnace with a resistance heating element.

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INDOOR AIR

21. Are air conditioners and heat pumps efficiency rated?

Yes. Central systems are rated by the seasonal energy efficiency ratio (SEER). Many older systems now in use have SEERs of 6 or below.

By 1994, the average SEER for all units shipped by manufacturers in the U.S. improved to 10.61 for central air conditioners and 10.94 for central heat pumps. The higher the rating, the more efficient the system.

22. What are the advantages of buying a system with a high SEER (seasonal energy efficiency ratio?

You will use less energy to cool your house, resulting in lower electric bills. Sometimes the savings are enough to partially or fully offset the cost of the new equipment within a few years. In all cases, it's an individual calculation which the homeowner should figure out with the contractor of choice.

23. Is there any law or rule covering air conditioning efficiency ratings?

Yes. The National Appliance Energy Conservation Act of 1987 (Public Law 100-12) sets national standards for residential air-cooled central air conditioners and air-source central heat pumps.

The NAECA provides for a federal minimum standard of 10.0 seasonal energy efficiency ratio (SEER) for split-system air conditioners and heat pumps, effective Jan. 1, 1992, and 9.7 SEER for single-package air conditioners and heat pumps, effective Jan. 1, 1993.

Heat pumps also are subject to federal standards of 6.8 heating seasonal performance factor (HSPF) for split systems, effective Jan. 1, 1992, and 6.6 HSPF for single packages, effective Jan. 1, 1993.

24. What is the difference between a split-system and a single-package central air conditioner or heat pump?

A split system has one of its heat exchangers (which includes the compressor) located outdoors and the other (the indoor coil) located indoors. A single package has both heat exchangers located in the same unit, usually indoors. Most residential central air conditioners and heat pumps are split systems.

INDOOR AIR

25. How can I determine the SEER of my present equipment?

There are three main ways to determine the SEER of equipment: (1) find the model numbers of your present equipment (the outdoor condenser/compressor unit and the indoor evaporator coil unit) and check them with local contractors who handle your brand; (2) estimate the SEER based on the average SEER units produced approximately when your system was installed; or (3) check the energy efficiency label on your outdoor condenser/compressor unit if you have equipment produced after late 1988.

In the first method, contractors can then consult manufacturer data or the ARI unitary equipment certification directory which lists all models of equipment by manufacturers that certify their equipment SEER ratings.

In the second method, for air conditioners and heat pumps produced in 1981, the first year SEER criteria was used, the average ratings were 7.78 and 7.51 respectively. By 1987, SEERs reached 8.97 and 8.93 respectively. By 1994, ratings increased to 10.61 for air conditioners and 10.94 for heat pumps.

In the third method, residential central air conditioners and heat pumps covered under Department of Energy (DOE) test procedures and manufactured on and after June 7, 1988, are required to have labels containing energy efficiency information. For each system, the label will be on the outdoor condenser/compressor unit, and will reflect the SEER achieved by matching the outdoor unit and the indoor evaporator coil unit.

26. How can I find the savings of higher SEER equipment compared to lower SEER equipment?

You'll need to talk with a local contractor to verify what size cooling equipment you now have and what you actually need, then determine the normal cooling load hours for your area, and find your electric rate cost.

When cooling, heat pump performance is measured in seasonal energy efficiency ratio (SEER). When heating, it is measured in coefficient of performance (COP) or heating seasonal performance factor (HSPF). In all measurements, the higher the rating the more efficient the system.

The formula is as follows:

$$\frac{\text{Capacity (Btuh)}}{\text{SEER}} \times \frac{\text{Cooling Load Hours}}{1000} \times \text{Electric Rate} = \text{Annual Operating Cost}$$

For example, if a home requires a unit with a capacity of 36,000 British thermal units per hour (Btuh), is located where the cooling load is 1500 hours and the electric rate is 8 cents per kilowatt hour, here is the calculation for a system with a SEER of 10:

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INDOOR AIR

$$\frac{36,000}{10} \times \frac{1500}{1000} \times .08 = \$432 \text{ per year}$$

The same calculation with a SEER of 12 reveals an annual operating cost of $360 or $72 less per season—a 17 percent savings.

27. What are typical savings to expect from higher SEERs in various parts of the country?

Here are *representative* operational costs of three SEER levels for a 2,000-square foot split level house in six regions of the United States (actual costs may vary greatly depending on individual circumstances):

Region	*SEER 7*	*SEER 9*	*SEER 11*
Southeast	$757	589	482
Southwest	469	365	298
South Central	964	749	613
Northeast	301	234	192
Northwest	100	77	63
North Central	364	282	231

28. What percentage of my utility bill is caused by air conditioning?

It can be surprisingly small on an annual basis, but it depends on how much you use your air conditioning, how efficient your equipment is, and how much you conserve energy by actions ranging from insulating your home to keeping doors and windows closed when the system is operating. Your local electric company is the best source for specifics in your area.

29. Is there any difference in the quality and quantity of cooling and heating from a heat pump and that from other cooling and heating systems?

No. In its cooling mode, a heat pump supplies exactly the same kind of cooling as all electric air conditioners. In its heating mode, the temperature of the air supplied by a heat pump is not as hot as the air supplied by a fossil fuel furnace, but the end result is the same: a warm, comfortable home. Air temperature from a heat pump at room outlets normally is about 100 degrees Fahrenheit compared to about 120 to 130 degrees from a fossil fuel furnace.

The heat pump warming effect thus is something like *warming your bath water more gradually and uniformly* by turning the hot water faucet to a moderately warm setting rather than turning the faucet all the way to maximum hot water.

INDOOR AIR

30. Do all heat pumps come with supplemental heat?

Virtually all heat pumps are available with supplemental electrical heat. Some heat pumps are used in conjunction with a fossil fuel heating system such as gas or oil. Whether supplemental heating is necessary depends on your climate and home location. Your local contractors can advise you as to whether supplemental heat is necessary, and what type of heat pump might be best for your needs.

31. Should I install a heat pump instead of a regular air conditioner if I have a gas or oil heating system?

A heat pump can be a worthwhile consideration no matter what heating system is used in a home. In many areas, a heat pump with gas or oil supplementary heat is the most economical system and offers excellent performance and comfort. However, check with local contractors who can determine the best systems for use in your area that meet your comfort needs.

32. How often should I change the air filter in my system?

Check it at least every month during peak use, and replace it when it looks dirty enough to significantly impair the air flow through it. Some filters, such as media filters or electronic air cleaners, are washable; others are disposable and must be replaced.

33. Will I get cleaner air by shutting up my house and running my central air conditioner or heating system, or by opening up my house as much as possible to let in fresh air?

As you might suspect, this depends primarily *on the* quality of air outside your home, the quality of air inside your home, and your home's indoor comfort equipment. Indoor air quality varies greatly from building to building. Factors may include everything from emissions by the materials used in your home's construction to the kind of cleaning products you use for personal and household needs, to possibly even radon from the ground or water in some areas.

Optimum air quality is a matter of personal preference, as is deciding when it is best to air out the home, and when it is best to rely primarily on the cooling/heating equipment. Research on indoor air quality is gaining momentum, but it may be years before comprehensive analysis of the spectrum of variables affecting indoor air quality is widely available to households nationwide.

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Using a high efficiency air cleaner on the central cooling/heating system remains one of the best ways to help maintain a clean indoor environment. High efficiency air cleaners can remove particles smaller than the eye can see.

34. How, and how often, should I clean my air conditioning registers and ducts?

Duct outlets and registers should be cleaned as part of your regular home cleaning routine. It's the filters in the system—and to a lesser degree the grilles and registers at the duct outlets—that collect most of the dust, and therefore need changing or cleaning.

Ducts usually don't require cleaning, especially if filters are kept clean. You can occasionally check ducts by removing a few registers and inspecting the ducts from the inside with a flashlight (be sure to look at return air ducts). If the insides of ducts need cleaning, some contractors provide this service.

35. Should my home be humidified?

That depends largely on your climate and personal needs. Humidification is definitely helpful in many homes and businesses. Particularly during cold weather, insufficient moisture in the air often is responsible for such assorted problems as stuffy noses, sore throats, even more dust than usual, cracks and dried-out joints in wood furniture, wilted plants, and static electricity which jolts hair, clothes, and computer disks. Indoor relative humidity may fall to around 7 percent, much drier than even the 25 percent relative humidity of the Sahara Desert! Ideal indoor relative humidity is between 30 to 50 percent.

36. Is there any advantage to letting the air conditioner or heat pump fan run all the time (the "on" setting on the thermostat) instead of periodically (the "auto" or "automatic" setting on the thermostat)?

If you live in a very humid climate you may not want to run the fan continuously because this reduces dehumidification. Otherwise, there are some potential advantages.

Continuously circulating the air keeps the temperature more even throughout the house by alleviating temperature stratification. It keeps air circulating through the comfort system's air filter, which—depending on filter type and efficiency—can keep the home cleaner and the air fresher to breathe. When the fan is operating continuously, the compressor continues to periodically cycle on and off automatically to cool and dehumidify your home just as it does on the "auto" setting.

Although running the fan alone takes much less energy than when the compressor is also operating, you may want to get a good idea of what it will cost. To estimate the cost, you can check with your comfort system contractor to determine approximately how much energy the fan uses, then multiply that times your local electric rate.

37. How do I know my equipment is ARI certified?

Equipment certified by manufacturers to ARI as being accurately rated is subject to ARI verification testing. This equipment normally is identified by an ARI certification seal on the outdoor unit of the equipment or on its operating instructions. If no seal is evident, ask your contractor or contact ARI. Ask your contractor to show you the appropriate ARI product certification directory that lists the units you are considering. Then have your contractor go over the various ratings with you.

38. Can my cooling or heating system reduce or eliminate radon or other "sick building" problems?

As a gas emanation primarily from soil or rocks, radon can be detected and measured by relatively inexpensive monitors that are becoming increasingly available to the general public. Considerable research is being done on measures to control radon and its health effects as typically found in indoor building environments—residential and commercial. At present, most conventional home central cooling and heating systems appear to have little, if any, effect on radon.

"Sick building" essentially refers to some buildings which have excessive concentrations of pollutants. Such pollutants may range from cigarette smoke to chemical emanations from materials used in furniture or building construction, to biological contaminants such as fungi (e.g., molds and mildew) and bacteria growing in areas where moisture may collect and stagnate. This may occur in such diverse locations as improperly maintained or damaged ceiling tiles, dishwashers, carpeting and air conditioning drain pans.

Most problems allegedly have occurred in commercial buildings. Cleanliness and adequate ventilation are major considerations. If you believe you may have a problem, you should seek the advice of a qualified contractor.

For more information about radon and sick building problems, contact your local American Lung Association, state radiation protection office, or Environmental Protection Agency regional office.

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INDOOR AIR

39. Is there any relationship between my home air-conditioning system and chlorofluorocarbon (CFC) refrigerants and the ozone layer?

An international protocol limits future worldwide production and consumption of the fully halogenated CFCs 11, 12, 113, 114, and 115.

Virtually all of the refrigerant used in residential central air-conditioning systems is called HCFC-22, which has some ozone-depletion potential, but only one-twentieth that of CFCs. This is because HCFC-22 breaks down fairly rapidly when released into the lower atmosphere, and most of it never reaches the ozone layer at high altitudes.

HCFC-22 will be phased out of production for use in new equipment by the year 2010 and for servicing existing equipment in 2020. After its phaseout, there will still be some of this refrigerant available for servicing existing equipment. Manufacturers are beginning to produce units that use alternative refrigerants. Consumers can thus enjoy their air conditioning and help protect the environment at the same time by following a few simple guidelines:

- A central air conditioner is a closed system and will not release refrigerant into the atmosphere as long as it is maintained properly. Have your system checked by a service person once a year before the cooling season. Make sure the technician checks for refrigerant leaks.
- After July 1, 1992, intentional venting of refrigerant is against the law. All refrigerant from units must be recovered. Only patronize service companies that practice refrigerant recovery and recycling and have the proper equipment to do so.

40. Is there anything dangerous about the refrigerant in my central air conditioning or heat pump system?

The refrigerant (HCFC-22) in residential central air conditioning and heat pump systems is nontoxic, nonflammable, odorless, and sealed within the system. Nonetheless, like any substance, it can be abused.

You should be aware that some people have died from deliberately inhaling or "sniffing" pure gas (e.g., after buying and "sniffing" cans of refrigerant like those used to recharge automobile air conditioners). Inhaling such concentrated refrigerant vapor can cause cardiac irregularities and cardiac arrest—a fatal heart attack.

Although a large release of refrigerant vapor could displace oxygen available for breathing and cause suffocation, this is virtually impossible with residential systems because of the relatively small amount of refrigerant used in the 24,000 to 36,000 Btuh (2-ton to 3-ton) units of most residential central air conditioning systems.

INDOOR AIR

41. In hot weather, should I turn my thermostat up when I leave for work in the morning?

If your house is going to be empty for more than about four hours, it's a good idea to turn your thermostat up to about 82 degrees or so instead of the 78 usually recommended. Keep the house closed to minimize heat build-up. When you come home, don't set the thermostat any lower than the temperature you actually want—your air conditioning system wouldn't cool any faster and might easily waste money by cooling your home more than needed.

42. Where can I get information about making the temperature in my home as comfortable and economical as possible?

This pamphlet and the following free ARI consumer information brochures, provide additional information about central air conditioning, heat pumps, air filters, humidifiers and air conditioning technician careers.

To order, write to the Air-Conditioning and Refrigeration Institute and enclose a self-addressed, stamped envelope for each single pamphlet ordered. Additional postage may be required if requesting several pamphlets.

- **Consumer Guide to Efficient Central Climate Control Systems.** Shows homeowners how to keep comfortable while holding down utility bills and how to compute cost savings (32 pages—please include two first class stamps).
- **Heat, Cool, Save Energy with a Heat Pump.** Highlights energy-saving and functional features of heat pumps (14 panels).
- **Breathing Clean—How Air Filters Provide Cleaner Living.** Discusses various types of air filters and explains how air filters provide cleaner living (8 panels).
- **How to Humidify Your House or Business.** Highlights advantages and relatively low costs of humidifying dry air (8 panels).
- **Life, Liberty and the Pursuit of Comfort.** Explains the operations and advantages of a ductless split air-conditioning system (8 panels).
- **Career Opportunities in Heating, Air Conditioning and Refrigeration.** Outlines opportunities available for people interested in becoming technicians in the heating, ventilation, air-conditioning and refrigeration industry (8 panels).

ARI ARI

1999 ASHRAE® HANDBOOK

Heating, Ventilating, and Air-Conditioning APPLICATIONS

Inch-Pound Edition

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
1791 Tullie Circle, N.E., Atlanta, GA 30329
(404) 636-8400 http://www.ashrae.org

Table 3 Estimates of Service Lives of Various System Components[a]

Equipment Item	Median Years	Equipment Item	Median Years	Equipment Item	Median Years
Air conditioners		Air terminals		Air-cooled condensers	20
Window unit	10	Diffusers, grilles, and registers	27	Evaporative condensers	20
Residential single or split package	15	Induction and fan-coil units	20	Insulation	
Commercial through-the-wall	15	VAV and double-duct boxes	20	Molded	20
Water-cooled package	15	Air washers	17	Blanket	24
Heat pumps		Ductwork	30	Pumps	
Residential air-to-air	15[b]	Dampers	20	Base-mounted	20
Commercial air-to-air	15	Fans		Pipe-mounted	10
Commercial water-to-air	19	Centrifugal	25	Sump and well	10
Roof-top air conditioners		Axial	20	Condensate	15
Single-zone	15	Propeller	15	Reciprocating engines	20
Multizone	15	Ventilating roof-mounted	20	Steam turbines	30
Boilers, hot water (steam)		Coils		Electric motors	18
Steel water-tube	24 (30)	DX, water, or steam	20	Motor starters	17
Steel fire-tube	25 (25)	Electric	15	Electric transformers	30
Cast iron	35 (30)	Heat exchangers		Controls	
Electric	15	Shell-and-tube	24	Pneumatic	20
Burners	21	Reciprocating compressors	20	Electric	16
Furnaces		Package chillers		Electronic	15
Gas- or oil-fired	18	Reciprocating	20	Valve actuators	
Unit heaters		Centrifugal	23	Hydraulic	15
Gas or electric	13	Absorption	23	Pneumatic	20
Hot water or steam	20	Cooling towers		Self-contained	10
Radiant heaters		Galvanized metal	20		
Electric	10	Wood	20		
Hot water or steam	25	Ceramic	34		

Source: Data obtained from a survey of the United States by ASHRAE Technical Committee TC 1.8 (Akalin 1978).
[a]See Lovvorn and Hiller (1985) and Easton Consultants (1986) for further information.
[b]Data updated by TC 1.8 in 1986.

Electrical Energy

Fundamental changes in the purchase of electrical energy are occurring in the United States, which is opening access to and eventually deregulating the electric energy industry. Individual electric utility rates and regulations may vary widely during this period of deregulation. Consequently, electrical energy providers and brokers or marketers need to be contacted to determine the most competitive supplier. Contract conditions need to be reviewed carefully to be sure that the service will suit the purchaser's requirements.

The total cost of electrical energy is usually a combination of several components: energy consumption charges, fuel adjustment charges, special allowances or other adjustments, and demand charges.

Energy Consumption Charges. Most utility rates have step rate schedules for consumption, and the cost of the last unit of energy consumed may be substantially different from that of the first. The last unit may be cheaper than the first because the fixed costs to the utility may already have been recovered from earlier consumption costs. Alternatively, the last unit of energy may be sold at a higher rate to encourage conservation.

To reflect time-varying operating costs, some utilities charge different rates for consumption according to the time of use and season; typically, costs rise toward the peak period of use. This may justify the cost of shifting the load to off-peak periods.

Fuel Adjustment Charge. Due to substantial variations in fuel prices, electric utilities may apply a fuel adjustment charge to recover costs. This adjustment may not be reflected in the rate schedule. The fuel adjustment is usually a charge per unit of energy and may be positive or negative depending on how much of the actual fuel cost is recovered in the energy consumption rate.

Power plants with multiple generating units that use different fuels typically have the greatest effect on this charge (especially during peak periods, when more expensive units must be brought on-line). Although this fuel adjustment charge can vary monthly, the utility should be able to estimate an average annual or seasonal fuel adjustment for calculations.

Allowances or Adjustments. Special allowances may be available for customers who can receive power at higher voltages or for those who own transformers or similar equipment. Special rates may be available for specific interruptible loads such as domestic water heaters.

Certain facility electrical systems may produce a low power factor, which means that the utility must supply more current on an intermittent basis, thus increasing their costs. These costs may be passed on as an adjustment to the utility bill if the power factor is below a level established by the utility. The power factor is the ratio of active (real) kilowatt power to apparent (reactive) kVA power.

When calculating power bills, utilities should be asked to provide detailed cost estimates for various consumption levels. The final calculation should include any applicable special rates, allowances, taxes, and fuel adjustment charges.

Demand Charges. Electric rates may also have demand charges based on the customer's peak kilowatt demand. While consumption charges typically cover the utility's operating costs, demand charges typically cover the owning costs.

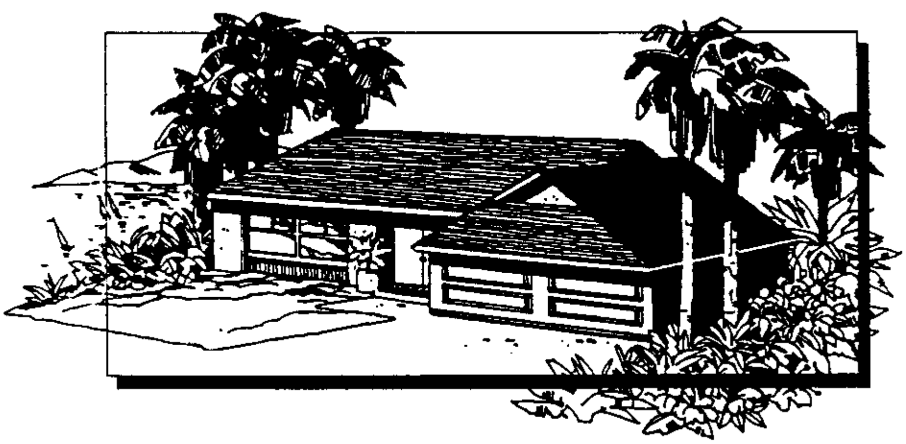
Demand charges may be formulated in a variety of ways:

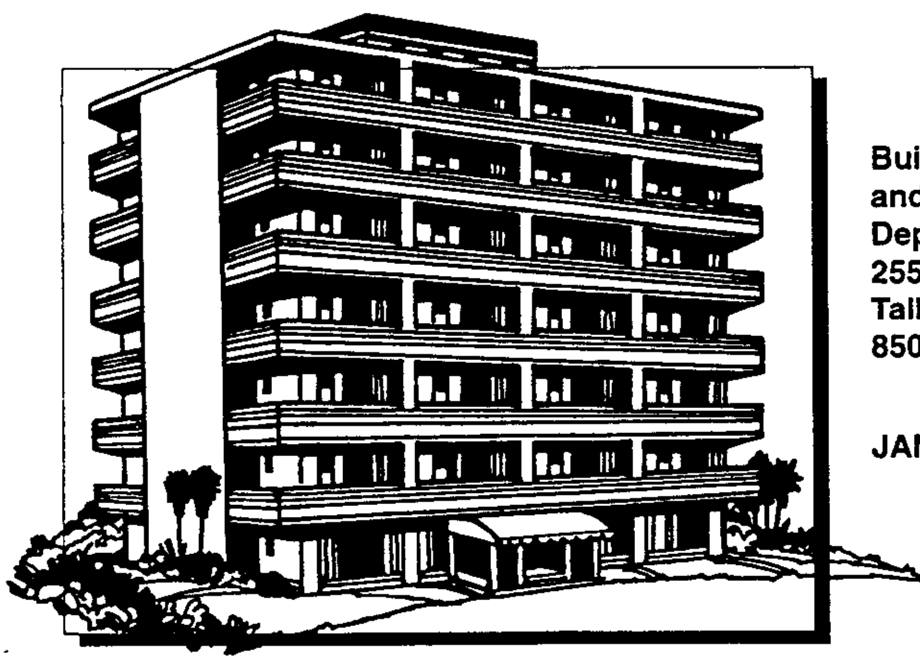
1. Straight charge—cost per kilowatt per month, charged for the peak demand of the month.
2. Excess charge—cost per kilowatt above a base demand (e.g., 50 kW), which may be established each month.

STATE OF FLORIDA

ENERGY EFFICIENCY CODE FOR BUILDING CONSTRUCTION

1997 EDITION





Building Codes
and Standards Office
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100
850/487-1824

JAMES F. MURLEY, Secretary

model number, meets the minimum Code requirements. The certification shall attest to the accuracy of the input data, the validity of the calculation procedure utilized and that the results of the simulation are in accordance with the DOE approved methodology. Simulated equipment efficiency rating certifications shall identify any enhancement features included to attain claimed ratings. a full set of input data utilized to arrive at the rating shall be available as documentation on request.

When challenged, computer simulated ratings shall not exceed 105 percent of the SEER, EER, HSPF or COP rating, as appropriate, of the actual tested performance for that condensing unit evaporator coil configuration. Unsubstantiated claims for such equipment shall be dropped from publication.

607.1.ABC.3.1.2 Field-Assembled Equipment and Components. Air conditioning and heat pump systems with capacities of 65,000 Btu/h or greater where components such as indoor or outdoor coils are used from more than one manufacturer, shall be rated by a calculated total system Energy Efficiency Ratio (EER). Component efficiencies shall be specified based on data provided by the component manufacturers. Calculations documenting how the efficiency rating was derived shall be submitted with the appropriate Code compliance form and shall be signed and sealed by a registered professional engineer.

Total on-site energy input to the equipment shall be determined by combining inputs to all components, elements and accessories, such as compressor(s) internal circulating pump(s), condenser-air fan(s), evaporative-internal circulating pump(s), purge devices, viscosity control heaters, and controls.

607.1.ABC.3.2 Minimum Efficiencies for Cooling Equipment

607.1.ABC.3.2.1 Electrically Operated, Cooling Mode. These requirements apply to unitary (central) cooling equipment (air-cooled, water-cooled and evaporatively cooled); the cooling mode of unitary (central) and packaged terminal heat pumps (air source and water source); packaged terminal air conditioners; roof air conditioners; and room air conditioners.

607.1.ABC.3.2.1.1 HVAC system equipment of less than 65,000 Btu/h, whose energy input in the cooling mode is entirely electric, shall have a Seasonal Energy Efficiency Ratio (SEER) or Energy Efficiency Ratio (EER), as specified for that piece of equipment in section 607.1.ABC.3.1, of not less than the values shown in Table 6-3.

607.1.ABC.3.2.1.2 HVAC system equipment with capacities between 65,000 Btu/h and 135,000 Btu/h whose energy input in the cooling mode is entirely electric, shall show an Energy Efficiency Ratio (EER) and/or Integrated Part-Load Value (IPLV), as specified for that piece of equipment in section 607.1.ABC.3.1, of not less than values shown in Table 6-4.

TABLE 6-3
ELECTRICALLY DRIVEN COOLING EQUIPMENT, CAPACITIES <65,000 BTU/H: MINIMUM PERFORMANCE EFFICIENCIES[1] - SEER, EER, IPLV[2]

TYPE OF EQUIPMENT, CAPACITIES, RATING CONDITIONS (°F)	EER	SEER	IPLV [2]
Central Units			
Air Cooled - Seasonal Rating [3]			
Split-system		10.0	
Single-package		9.7	
Evaporatively Cooled			
Standard Rating (80db/67wb indoor, 95db/75wb outdoors)	9.3		
Int. Part Load Value (80db/67wb out.)			8.5
Water Cooled			
Water-Source Heat Pump (80db/67wb indoor)			
Standard Rating (85 entering water)	9.3		
Low Temp. Rating (75 entering)	10.2		
Ground-Water Heat Pump			
Standard Rating (70 entering)	11.0		
Low Temp. Rating (50 entering)	11.5		
Ground Source Heat Pump			
77° Entering brine	10.0		
70° Entering brine	10.4		
Unitary Air Conditioners (80db/67wb indoor)			
Standard Rating (85 entering)	9.3		
Int. Part Load Value (75 entering)			8.3
Packaged Terminal Units (PTAC & PTHP)			
Standard Rating (95db outdoor)			
≤7,000	8.9		
7,001 - 8,000 Btu/h	8.8		
8,001 - 9,000 Btu/h	8.6		
9,001 - 10,000 Btu/h	8.5		
10,001 - 11,000 Btu/h	8.3		
11,001 - 12,000 Btu/h	8.2		
12,001 - 13,000 Btu/h	8.0		
13,001 - 14,000 Btu/h	7.8		
14,001 - 15,000 Btu/h	7.7		
>15,000 Btu/h	7.6		
Room Units [3]			
Without reverse cycle			
<6,000 Btu/h	8.0		
6,000-7,999 Btu/h	8.5		
8,000-13,999 Btu/h (with louvers)	9.0		
14,000-20,000 Btu/h (with louvers)	8.8		
>20,000 Btu/h (with louvers)	8.2		
8,000-20,000 BTU/H (without louvers)	8.5		
>20,000 Btu/h (without louvers)	8.2		
With reverse cycle (with louvers)	8.5		
With reverse cycle (without louvers)	8.0		

[1] Test procedures for equipment referenced shall be in accordance with the applicable standard listed in Chapter 3.
[2] Products covered by the 1992 Energy Policy Act have no efficiency requirements at other than standard rating conditions for products manufactured after 1/1/94.
[3] To be consistent with National Appliance Energy Conservation Act of 1987, P.L. 100-12.

GULF POWER
A SOUTHERN COMPANY

WATER HEATING CONVERSION
$140 REBATE
Individual Participant

Qualifying Unit

____
Address

____
City, State, Zip Code

____
Account Number

____
Water Heater Size (gallons)

____
Date of Installation

Rebate Payee

____
Name

____
Address

____
City, State, Zip Code

____
Social Security Number

Approvals

____
Residential Energy Consultant

____
Residential Marketing Manager

____
Date

FREE HOT WATER HEATER
Information

Customer Options for Water Heater Conversion Program
Must be Gas TO Electric

- Customer comes to Marketing Department and fills out voucher form (See Attachment) to get their Rheem 40-gallon water heater and timer.
- Customer takes voucher form to appliance warehouse in back to receive their water heater and timer. (Please make copy of voucher for Marketing rep)
- Customer has 30 days to install water heater and timer. A marketing rep will verify after installation is completed. (Marketing Rep's phone number is on voucher).
- Customer is responsible for their own installation. Some plumbers phone numbers are: Sasser's 243-8699 or Jim's 243-1651. (Others are available).

2nd Option

- Customer also may receive $140 Rebate check if they choose to purchase water heater and timer from somewhere else. (Example Lowe's, Home Depot Scotty's etc. (Customer may purchase any size or brand of water heater and timer).
- When installation is completed, customer calls Gulf Power Marketing Department at 244-4770 and Marketing rep will verify installation. (It takes approximately 7-10 days for customer to receive check).
- Customer must fill out $140 rebate form to receive check. (See attachment).

Gulf Power Company
Water Heating Voucher

This voucher is good for one (1) 40 gallon electric Rheem Water Heater. Model Number 81V40D, and one (1) Intermatic Timer. Model Number WH21.

____
Customer Name

____
Customer Account Number

____
Address

____
City, Zip Code

____
Telephone Number

____
Gulf Power Energy Consultant

____
Date

This free offer is contingent upon installation of this equipment in replacement of a gas water heater. Customer agrees to install this equipment within 30 days of the date of this voucher and to contact Gulf Power Energy Consultant for installation verification. **Failure to comply with these requirements will result in the customer being billed for the water heater and timer.**
Customer is responsible for equipment pickup and installation.

____
Customer Signature

Present this voucher to an Appliance Sales Clerk for product issuance.

Water Heater and Timer should be charged to Marketing account number 40233-908-01188

Staff's First Set of Interrogatories
Docket 981591-EG
GULF POWER COMPANY
January 11, 1999
Item No. 18
Page 1 of 1

18. **Please explain why Gulf chose, as its baseline existing equipment, an AC Unit with a SEER rating of 7.0 If available, provide supporting documentation or data which justifies Gulf's choice of a 7.0 SEER AC unit as its baseline existing equipment.**

Answer: The targeted program participants have existing equipment installations that are 10 to 15 years old. The minimum efficiency standards in effect for installations during that time frame were 7.5 SEER to 8.5 SEER. Gulf has assumed the average installed efficiency to be approximately 8 SEER with a15% efficiency degradation due to age. This results in an average current efficiency rating of approximately 7 SEER.

7. **Please explain the cause of the decrease in "customer O&M cost" contained on page 4, section III. (6) of Gulf's filing. If available, provide supporting documentation or data for the "customer O&M cost" value.**

Answer: The "Customer O & M Cost" decrease of $287 is the customer operating cost savings resulting from the removal of the gas furnace. This figure was arrived at by using Gulf's Residential Building Energy Program (RBEP) and the average price of natural gas across Gulf's service area. Estimated cost savings ranged from $227 in DeFuniak Springs where Gulf's customers experience the lowest cost for natural gas to $359 in the portion of Santa Rosa County surrounding the City of Milton, which has the highest cost for natural gas. The homeowner will pay less to heat with a heat pump than with natural gas in Florida. Natural gas in Northwest Florida costs about $.95 per therm while the national average is $.604 per therm. Electricity average cost is $.0695 per kWh at Gulf Power versus $.0841 per kWh national Average (GAMA Consumers' Directory of Certified Efficiency Ratings, April, 1998). The rate schedules of area gas distributors are included as Attachment "B".

Attachment "B"
Page 1 of 2

PEOPLES GAS - WFGAS (MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$7.42	$0.00742	$0.7423	74.2	$0.924	34.1%
		$7.00 CUSTOMER CHARGE EVERY MONTH					

Normal weather rate. Does not include Weather Normalization Charge in winter.

CHIPLEY - CHPGASOT (OUTSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
UNDER 2,500 CU FT	25	$10.59	$0.01059	$1.0587	105.9		
OVER 2,500 CU FT	25	$10.45	$0.01045	$1.0450	104.5	$1.052	52.6%
		$1.10 MINIMUM BILL					

CHIPLEY - CHPGASIN (INSIDE CITY)

Cu FT	THERMS	$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
UNDER 2,500 CU FT	25	$7.70	$0.00770	$0.7700	77.0		
OVER 2,500 CU FT	25	$7.60	$0.00760	$0.7600	76.0	$0.765	11.0%
		$1.00 MINIMUM BILL					

DE FUNIAK SPRINGS - DFUNKOUT.RAT (OUTSIDE CITY)
(MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$7.13	$0.00713	$0.7130	71.3	$0.827	20.1%
		$4.40 CUSTOMER CHARGE EVERY MONTH					

DE FUNIAK SPRINGS - DFUNKIN.RAT (INSIDE CITY)
(MAY CHANGE MONTHLY DUE TO FUEL COSTS)

Cu FT		$/1000CUFT	$/CUFT	$/THERM	¢/THERM		
ALL CU FT	ALL THERMS	$6.48	$0.00648	$0.6482	64.8	$0.752	9.2%
		$4.00 CUSTOMER CHARGE EVERY MONTH					

WEIGHTED AVERAGE PRICE CUSTOMERS PAY FOR NATURAL GAS IN NWF IN AN EFFICIENT HOME:	$0.950	37.9%
% CHANGE IN PRICE VS 6/1/94($.945/therm):	0.6%	
NATIONAL AVERAGE NATURAL GAS PRICE PER THERM (DOE/EIA est. 1997:	$0.689	
(1996 avg. = $0.634) *(Yellow Energy Guide = $.604)*		

LP GAS PRICES - GALLONS AND THERMS			PER/THERM
PENSACOLA	$0.99000	PER GALLON	$1.089
PANAMA CITY	$1.25000	PER GALLON	$1.375
FT WALTON BEACH	$0.99000	PER GALLON	$1.089
NATIONAL AVERAGE (DOE/FTC/Gan	$0.98300	PER GALLON	$1.081

NATIONAL AVERAGE ELECTRIC PRICE PER KWH (DOE/EIA) 1997:	price per KWH	$0.0846	
GULF POWER AVERAGE ANNUAL ELECTRIC PRICE 1997:	price per KWH	$0.0674	-25.5%
GULF POWER MARGINAL ELECTRIC PRICE April, 1998:	price per KWH	$0.0538	

NOTES: ELECTRICITY PRICE % LOWER THAN NATIONAL AVERAGE: 20.3%

THE EFFECTIVE OR ANNUALIZED COST PER THERM INCLUDES THE MONTHLY CUSTOMER CHARGE OR HIGH COST-LOW USAGE STEPS OF THE RATES WHERE APPLICABLE. THESE CHARGES CAUSE THE ACTUAL CUSTOMER CHARGE PER THERM TO BE HIGHER THAN THE PER THERM COST ON THE RATE SCHEDULE. ALL DOE COSTS INCLUDE CUSTOMER CHARGES.
THE RESIDENTIAL BUILDING ENERGY PROGRAM (RBEP2) WAS USED IN CALCULATING EFFECTIVE COST. THE CALCULATED USAGE IS 462 THERMS OF NATURAL GAS ANNUALLY AND BASED ON AN 1800 SQ. FT. ENERGY EFFICIENT HOUSE WITH AN 80% AFUE GAS FURNACE AND A 56% ENERGY FACTOR WATER HEATER.
THE HOUSE HAS R13 WALLS, R38 CEILING INSULATED DOORS AND WINDOWS. AND THE HOME MEETS ENERGY CODE.
RATES TAKEN FROM RATE SCHEDULES AND/OR VERIFIED BY PHONE FROM EACH GAS DISTRIBUTOR.
HOT WATER USAGE (19500 GALLONS, 194 THERMS) REFLECTS THE ENERGY CONSUMPTION FOR WATER HEATING OF THREE PEOPLE.
THE AVERAGE HOUSEHOLD SIZE IN NORTHWEST FLORIDA IS ABOUT 2.8 PEOPLE.
National avg. estimated natural gas price is from DOE/EIA Natural Gas Monthly, April 1998. 1996 price is final.
National avg. estimated Electricity prices is from DOE/EIA Electric Power Monthly, April 1998. 1996 price final.
The FTC Yellow Energy Guide cost is from Oct. 1997, GAMMA's Consumers' Directory of Certified Efficiency Ratings
Natural gas total usage in therms: 462

FTC = FEDERAL TRADE COMMISSION

NATURAL GAS QUANTITY NOMENCLATURE:
CF=CU.FT.=CUBIC FEET= APPROX. 1,000 BTU'S
100 CU FT = 1 CCF = 1 THERM = 100,000 BTU'S
ONE GALLON OF LP = 91,500 BTU'S AND 1.1 GALLONS OF LP = 1 THERM

Residential Marketing, Gulf Power [illegible]

FLORIDA PUBLIC SERVICE COMMISSION
DOCKET NO. 981591-WS EXHIBIT NO. 4
COMPANY/ WITNESS: Shell
DATE: 10-12-99

NY 87-09-3

SURVEY OF RESIDENTIAL AIR-TO-AIR HEAT PUMP SERVICE LIFE AND MAINTENANCE ISSUES

J.E. Lewis

ABSTRACT

A telephone survey was conducted among a national sample of 492 large HVAC dealer/contractors to elicit estimates of residential heat pump replacement age and other related issues. Similar data for unitary air conditioners and gas furnaces were collected to provide a relative perspective.

The sample selection and interviewing were designed to produce unbiased results and to provide appropriate data reliability for summaries at the national level and for three geographic regions (north, south, and west). The survey was conducted between December 4 and December 23, 1985. The key findings of the survey:

- The dealers' average estimate of age at replacement for unitary air-conditioning units is 12.1 years; air-conditioner compressors, 8.8 years; heat pump units, 10.9 years; heat pump compressors, 8.0 years; and gas furnaces, 16.3 years.
- Eighty-six percent of the dealers believe that heat pump reliability has been improved over the past few years, but slightly less than 50% expect the service life of heat pumps being installed today to be materially longer than that of the past.
- Only about 26% of the dealers use life-cycle cost analysis, and the average replacement age estimates for heat pumps used in customer discussions is 11.2 years.
- Estimates indicate that the installed cost of replacement compressors is 40-45% of the cost of a total new unit.

INTRODUCTION

The residential HVAC market is large, diverse, and complex. The introduction of new equipment with various levels of energy efficiency and other performance characteristics has added to the competitive intensity and complexity of the market environment. Within such a complex environment, issues of equipment replacement age are inherently complex and increasingly important as customers face a greater variety of choices and decisions.

It is difficult to collect accurate service life data, and few published studies are unbiased with respect to the sample from which the data were collected, the methods of data analysis, or the form in which the results are presented. There have been particular concerns about the average replacement age of heat pumps because of the market development pattern for this product. A number of technological changes are also occurring, designed to improve reliability of the heat pump. There are questions concerning the average replacement age for heat pumps based on actual experience and the effect that technological changes may have on heat pump service life going forward.

A survey of HVAC dealer/contractors was designed to elicit estimates and perceptions concerning issues of replacement age and maintenance for residential heat pumps. By incorporating similar information for unitary air conditioners and gas furnaces, the study would

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provide practical market perspectives and indicate dealer estimates of the relative replacement ages of these three products. (It should be noted, however, that the survey and questionnaire were specifically designed and structured to elicit information on heat pumps. The information on air conditioners and gas furnaces was included for perspective, and the survey results may not delineate as well the data on these products.)

The primary focus of the study was a telephone survey of large HVAC dealer/contractors, approximating the regional distribution of installed heat pumps. Sample selection was random within the basic dealer size and geographical location parameters (described below). Only residential equipment was covered.

The objectives of the dealer survey were to (1) obtain estimates of national and regional replacement age averages and ranges for the heat pump; (2) obtain estimates of similar information for unitary air conditioners and gas furnaces that could provide perspective and relative measures; and (3) describe dealer perceptions of service issues, maintenance costs, and other related information.

METHODOLOGY

A primary criterion of the methodology was to provide unbiased results that would accurately reflect the dealers' experiences and perceptions within a complex market environment. Interpretations, based on more than two dozen previous HVAC market studies and "qualitative" field research conducted as part of this study, are intended to provide a context for viewing the quantitative results of the dealer survey.

Sample

The basic sample selection approach was to start with the broadest possible base from which to draw the sample and to employ only limited screening parameters to avoid biasing the sample. The only parameters used were the size of the dealer/contractor firm and the degree of experience with heat pumps. The basic parameters and data sources included:

- A data base that includes more than 27,000 companies with 1711 as their primary industrial classification was used as the sample source (plumbing, heating, and air conditioning).

- A proportional distribution of installed heat pumps by state was based on data provided in the annual statistical issue of Air Conditioning and Refrigeration News (based on the 1980 census of population and housing).

- The primary sample drawn from the data base included firms with annual revenues between $700,000 and $8 million. A subsequent sample was drawn from firms with annual sales between $400,000 and $699,999.

It was estimated that a total U.S. sample of approximately 500 large dealer/contractors should provide adequate reliability. Given the regional distribution of installed heat pumps, about one-half of the sample would be needed for the South and one-quarter each for the northern and western regions. These levels should provide reasonable reliability for regional summaries, and the regional estimates could be more precisely weighted to derive proportionately weighted figures for the total U.S. (based on the estimated regional distribution of total in-place equipment installations).

A draft questionnaire was completed based on exploratory interviews with dealer/contractors and past experience in studies of this nature. The questionnaire was tested and a number of minor revisions were made. Interviews using the final questionnaire took between 15 and 20 minutes to complete. The actual telephone interviewing was conducted between December 4 and December 23, 1985.

A total of 492 interviews were completed with 80% being HVAC dealer/contractors and 20% being service contractors. Regional breakdowns were North, 122; South, 248; and West, 122. Respondents averaged:

- Annual revenue of $1.6 million.

- 249 annual unitary air-conditioning installations, which, extended by the number of respondents, represented approximately 5% of total U.S. sales.

- 147 annual heat pump installations, which, extended by the number of respondents, represented approximately 8% of total U.S. heat pump sales.

- 165 annual gas furnace installations, which, extended by the number of respondents, represented approximately 4% of total U.S. sales.

In addition to tabulations of raw data, regional weightings were applied to most of the questions to reflect distribution of equipment by region. For example, the South represented 50% of the responses but represents about 51% of unitary air-conditioning installations and 65% of heat pump installations. This procedure was designed to appropriately weight regional responses to derive national totals.

FINDINGS

Replacement Age

Four measures of replacement age experience were derived from the survey data. Respondent estimates of the average, minimum, and maximum replacement age for the total unit and for the replacement of compressors were gathered. This indicates a replacement age range, as well as two measures of the average: the stated estimated average and the midpoint of the estimated minimum/maximum range. These estimates are based upon dealer experiences and, therefore, relate to equipment installed in the past.

For unitary air conditioners, the estimated average is 12.1 years and the midpoint of the range is 12.6 years. For unitary air-conditioner compressors, the estimated average is 8.8 years and the midpoint of the range is 9.7 years. For heat pump units, the estimated average is 10.9 years and the midpoint of the range is 11.4 years. For heat pump compressors, the estimated average is 8.0 and the midpoint of the range is 8.4 years. For gas furnaces, the estimated average is 16.3 years and the midpoint of the range is 17.2 years (Figure 1).

The estimates for heat pump replacement age (both units and compressors) are about 90% of the estimated age for unitary air conditioners.

The estimates of replacement age for air conditioner and heat pump compressors bear a consistent relationship to estimates for unit replacement. Compressor replacement estimates are about 70% to 75% of the estimated unit replacement ages.

In addition, the service life expectancy used by dealer/contractors in customer discussions was also analyzed. This should relate to the perceptions of dealers with respect to changes in equipment technologies and the possible effects on service life.

The unit service life estimates used by dealers in customer discussions are similar to the estimated replacement age averages based on experiences and reflect the conservative nature of the HVAC trade.

- For unitary air-conditioning units, the estimated mean is 11.7 years

- For heat pump units, the estimated mean is 11.2 years

- For gas furnaces, the estimated mean is 15.2 years.

Estimates of replacement age for unitary air conditioners are similar in the North and West and lower in the South (Figure 2).

The estimates for the electric heat pump show a somewhat different regional pattern in which the lowest estimated average replacement age is in the North, followed by the South, and then the West. This possibly reflects the differences in heating requirements, combined heating and cooling requirements, and equipment-purchasing patterns among the regions. The dealer estimates in this survey seem to be consistent with regional market characteristics as defined by published market data and our previous studies. Since the heat pump provides both cooling and heating service, the number of hours and load "stress" for each mode of operation, as well as the total combination, will affect the estimated equipment service life (measured in years).

Where cooling requirements are greater than heating requirements, heat pump service life should be heavily influenced by the cooling load and thus similar to that of unitary air conditioners. This is the case in the South and West, where the heat pump service life is 95% and 93%, respectively, of the estimated service life for unitary air conditioners.

Where the heating load is significantly greater than the cooling load, as in the North, the heat pump service life can be expected to be less closely related to the estimated life for unitary air conditioners. This reflects not only the number of annual hours in the heating mode, but also the degree of stress experienced in the heating mode. The climate in the North imposes a greater stress on the heat pump heating mode than is generally the case in the other regions. The higher estimated ages in the West reflect a climate that is generally less extreme with respect to both the cooling and heating loads.

Estimates of replacement age for gas furnaces are highest in the North, followed by the West, and are lowest in the South. Heating requirements are relatively more important in the North, and, based upon previous proprietary surveys, customers generally have a greater tendency to purchase higher quality furnaces (which tend to have a longer service life). Gas furnaces have fewer "wear parts" and are less directly affected by annual hours of operation than air conditioners and heat pumps. The use of central (warm air) heating systems is a more recent (last 20-25 years) trend in the South and West, and over this period of time, the new construction portion of total furnace sales in the South and West has been considerably higher than in the North. Since lower-to-medium quality units (which tend to have shorter service lives) often are used in new construction, the estimated replacement age based upon dealer experience can be expected to be lower in these two regions than in the North.

The estimates of replacement age for compressors show similar patterns and relationships as those for unitary air conditioner and heat pump units (Figure 3). The estimates for compressor replacement age are consistently between 70% and 75% of the estimated total unit replacement ages for all regions.

On average, the estimated replacement age for heat pumps for the total U.S. is about 90% of the estimates for unitary air conditioners. As in the case for total units, the estimated ages are closer to those of unitary air conditioners in the South and West, with greater differences in the North.

The distribution of average replacement age estimates for unitary air conditioners indicates a two-humped distribution for total unit replacement (Figure 4). This reflects the complexities and practicalities of the marketplace. It indicates that there are several populations of equipment (within the total distribution) that vary in quality, number of annual operating hours, quality of service, and service life.

The estimated distribution for compressor replacement is fairly tight around the mean of 8.8 years.

- Almost 60% of compressor replacements are estimated to occur between 6 and 10 years.
- Approximately equal percentages for replacement are estimated to occur between 5 and 6 years and after 10 years.

The combination of distributions indicates some replacement tendencies that have to be considered in evaluating equipment replacement age. If a unit's compressor fails:

- Within the first six years, there appears to be a tendency to replace the compressor, as the other components of the unit may still have considerable service life.
- In the 8-to-12 year period, the compressor versus total unit replacement decision is more complex and could go either way.
- After 12 years, in most cases the total unit would be replaced, as the other components are viewed as having a somewhat limited additional service life.

The estimated replacement age distribution for heat pumps shows a less distinct two-humped pattern and greater concentration of replacement age estimates in the 6-to-12 year period than unitary air conditioners (Figure 5).

- Estimates suggest that about 64% of heat pump units are replaced between 6 and 12 years.

- Approximately 30% are estimated to be replaced in the 12-to-20 year range.

- As with the unitary air conditioners, it is believed that the humped pattern reflects somewhat different equipment populations, average operating hours per year, and quality of service. The upper end of the distribution would also include heat pumps that have had compressors replaced earlier in their service lives.

The estimated distribution for heat pump compressors is also similar to that for unitary air conditioners, with the distribution shifted slightly toward earlier replacement age.

Dealer estimates of the heat pump unit replacement distribution suggests that over 50% of replacements occur by the end of year 10. Likewise, dealers estimate that over 80% of heat pump compressor replacements occur by the end of year 10.

The distribution of average replacement age estimates for gas furnaces shows a distinct two-humped distribution pattern (Figure 6).

- Less than 9% of respondents estimated average replacement age at 10 years or less, versus about 42% for air conditioners and 54% for heat pumps.

- Almost 10% of estimates for gas furnaces were greater than 20 years, versus less than 1% for air conditioners and heat pumps.

- Almost 64% of replacement age estimates for gas furnaces fall in the 15-20 year period, with 31% at 15-16 years, 13% at 17-18 years, and 20% at 19-20 years.

As indicated earlier, the unit service life used in customer discussions should reflect dealers' perceptions of the expected life of equipment being installed today. It is, however, influenced by dealers' conservatism, and these values tend to be somewhat less than dealers' estimates of equipment life based on their experience. The respondents indicated that they considered manufacturers' estimates for expected service life but relied heavily on their own experience with respect to the expected service lives they were willing to discuss with customers.

Replacement Influences

Replacement decisions are influenced by a broad range of factors. Other proprietary studies conducted by the author suggest that from 50% to 60% of such decisions are due to actual failure of the total unit or a major (expensive) component. Other reasons include:

- Anticipation of probable failure within the next year or so, based upon increasing service costs, dealer suggestions, or simple concern about the age of the equipment.

- Dissatisfaction with system performance.

- Major home remodeling or alterations that increase heating or cooling requirements beyond the capacity of the current system.

- Replacement of both components of a dual-service system (furnace/air conditioner) when one of the components (air conditioner) fails, particularly when the other component (furnace) is believed to have five years or less service life remaining.

- Replacement of "live" equipment to achieve improved energy efficiency and energy cost savings.

Typically, lower-to-medium quality appliances ("builder" models) are installed in new construction. These units can generally be expected to have higher service costs and shorter service life expectancies than higher quality equipment. A unit that has had proper routine maintenance throughout its service life can be expected to have a longer service life. This is particularly true for air conditioners and heat pumps, where refrigerant leaks are a major service issue. If refrigerant leaks are not detected, the loss of refrigerant can lead to failures of major components (e.g., compressor).

Figure 7 shows a conceptual depiction of replacement tendencies derived from "qualitative" comments by trade contacts and supported by the analysis of the dealers' quantitative estimates of unit and compressor replacement ages. The figure reflects the pattern for both unitary air conditioners and heat pumps.

- The numerical values shown are a combination of the data derived from the survey results for both types of equipment. The figures are meant to provide perspective only.

- No attempt was made to estimate the vertical dimension, the relative proportions of compressor/unit replacement by time period, or the percentage of units that have a compressor replacement before the unit itself is replaced.

If the compressor fails within the first eight years or so, there is a strong tendency to replace the compressor as the other components of the unit are believed to have significant service life remaining: approximately 33% of compressor replacements but only about 6% of unit replacements occur during this period.

The period between about 8 and 13 years involves a more complex decision. The efficiency and quality of the original unit, satisfaction with the unit's performance, service costs related to components other than the compressor, and dealer marketing and promotional activities are likely to influence the decision. This is a heavy period of replacement of both compressors and units: about 62% of unit replacements and 60% of compressor replacements occur during this period.

After 13 years, there is a strong tendency to replace the total unit if the compressor fails because of the remaining service life of the other components: about 32% of unit replacements and 7% of compressor replacements occur after 13 years.

This pattern has important implications for estimating realistic service lives, as the effects of compressor replacement versus unit replacement must be considered. It raises the question of how a 15-year-old unit that has not had a compressor replacement can and should be viewed and compared to a 15-year-old unit that has had a compressor replacement.

- With respect to life cycle cost analysis, the incidence of compressor replacement must be considered in the analysis.

- The patterns in the marketplace are clearly complex, and the influencing factors must also be considered in setting average replacement age and procedures for conducting life-cycle cost analyses.

<u>Trends</u>

Given the changes that are occurring in the technology and in the market, dealer perceptions concerning trends in equipment reliability, service requirements, and service life are of interest. While the primary focus of technical development over the past few years has been improved efficiency, dealers believe that other improvements have been made.

The dealers expect that the improvements in reliability will have some influence on the service requirements for equipment being installed today. The largest portion, however, believe that the improved reliability will not materially affect service requirements for air conditioners and heat pumps.

- For unitary air conditioners, over 50% believe that service requirements will remain basically the same.

- About 40% believe that heat pump service requirements will remain basically the same. Almost a third believe that the improved reliability will reduce service requirements, while a slightly lower percentage believe they will be greater.

These results indicated that dealers perceive that certain of the technologies being employed to improve equipment reliability and efficiency (for all types) also make the equipment more complex, and that an equal or greater amount of service activity may be required to deal with these technologies.

Dealers do not perceive that improvements in reliability will necessarily lead to longer service life. Improvements may relate to the functional reliability within a defined service life, rather than specifically increase service life.

- With respect to unitary air conditioners, over 60% of the dealers expect replacement age to remain the same or in fact be shorter than in the past.

- Although more than 86% of the dealers perceived improvements in heat pump reliability, slightly more than 52% believed that the replacement age will remain the same or in fact be shorter.

The use of incentives to promote electric heat pumps has increased, and about 60% of the dealers in the survey indicated that electric utilities are offering incentives in their area: 20% cash incentives, 27% rebates (39% in the West), 23% co-op advertising (31% in the North), and 17% other incentives (i.e., low-rate financing or loans repaid through electric bill add-ons). In many areas, the size of the incentive is being tied to specific efficiency levels and/or the replacement of specific types of equipment (including gas equipment).

Maintenance Issues and Costs

Although maintenance costs were a secondary area of the survey, heat pump service costs (excluding air handler) were consistently estimated in the survey to be 20% to 30% higher than those for unitary air conditioners and 55% to 60% higher than those for gas furnaces. In addition, the average per-unit first year service reserve fund for heat pumps is:

- 33% higher ($101 versus $75) than air conditioners,
- 65% higher ($101 versus $61) than gas furnaces.

The survey did not attempt to determine rates of major component failure for heat pumps but did ask dealer/contractors to estimate the relative proportion of service calls for a selected list of service categories (other service activities were not investigated).

Refrigerant leaks	19%
Fans (blower, wheels, relays, motors, etc.)	19%
Compressor motor circuits	17%
Defrosting components	17%
Compressor failure	16%
Refrigerant components	12%
	100%

Dealer/contractor estimates of the average installed cost (equipment and labor) for a typical (3 ton) replacement compressor in their area were $793 for unitary air conditioners and $880 for heat pumps. Average estimates for the cost (installed) of a replacement compressor as a percentage of the cost of a totally new unit ranged from 40% to 45%.

CONCLUSIONS

Determining actual service life or replacement age in the marketplace is difficult due to the complexities of the market environment and the interactions of a wide range of influencing factors, including variations in equipment quality, installation quality, service/maintenance quality and use of annual/routine preventive maintenance, annual load requirements and load extremes (annual operating hours and load stresses), usage patterns, and other replacement influences.

For comparative equipment quality/operating situations, heat pumps must meet the same cooling requirements as air conditioners and, in addition, must meet the heating requirements that can double the number of operating hours. This, combined with market in-use practicalities and the technical aspects of the capability to perform both functions, raises questions of whether a heat pump can be expected to have an actual in-use service life equal to that of an air conditioner of similar quality (even with a specifically designed compressor).

There are strong indications that heat pump replacement age is, on average, lower than that of unitary air conditioners. Dealer/contractor estimates of heat pump replacement age are similar to, but consistently lower (by about 10%) than, their estimates for air conditioners.

Early replacement (of live equipment) is a significant factor in the marketplace and should be considered in evaluating service life benchmarks. A significant amount of heat pump replacement (possibly as much as 40-50%) is estimated to occur in the first 10 years.

The incidence and timing of compressor replacement should be considered in evaluating heat pump service life benchmarks.

- Dealer estimates indicate that a significant amount of compressor replacement occurs in the first 10 years.

- Compressor replacement represents a significant cost, 40-45% of the cost of a total new unit.

Market segmentation and the relative competitiveness of various HVAC products by market segment (e.g., customer type, climate) will be increasingly important in HVAC and energy marketing planning. In most new construction segments, end-users have little or no involvement in the choice of equipment. In the replacement market, the degree of end-user involvement is greater and more complex and would include such factors as constraints imposed by present in-place systems, replacement time frame (immediate failure need versus energy retrofit), and investment horizon (expected length of stay in the present housing). In general, end-users tend to upgrade equipment quality (and energy efficiency) when replacement decisions are made. Thus, the average in-place equipment quality will tend to increase as a market area matures (the ratio of replacement to new construction sales increases).

<u>RECOMMENDATIONS</u>

Estimates from a survey of this nature tend to be conservative and, given the high "efficiency replacement" factor (that can shift over time), a replacement age range may be more meaningful to use for many purposes than a point estimate.

Based upon the data from this dealer survey, the author recommends the following ranges in situations where range estimates would be more meaningful than point estimates:

	Survey Means	Range
Heat Pumps	10.9 yrs	10-13 yrs
Unitary air conditioners	12.1 yrs	12-15 yrs
Gas Furnaces	16.3 yrs	16-19 yrs

For situations where a point estimate of service life is needed, the use of the following benchmarks are recommended. These values retain the relative replacement age relationships indicated in the survey and were derived from cross-correlation analysis of all the data collected in the survey:

- 14 years for unitary air conditioners,

- 12 years for heat pumps,

- 18 years for gas furnaces.

Methods of life-cycle cost analysis used in equipment comparisons should explicitly recognize the incidence and timing of compressor replacement. This can be accomplished by including the cost of compressor replacement in the maintenance cost factor or by adjusting the estimated service life factor.

When service life "year" figures are used as benchmarks, assumptions concerning annual operating hours (and perhaps levels of equipment quality and routine maintenance) should also be clearly stated.

APPENDIX

HVAC DEALER/CONTRACTOR QUESTIONNAIRE

Company Name______________________ Date______________________

City/State______________________ Phone #______________________

State______________________ Size______________________

Region______________________

Hello, I'm ____________ from ____________, a national marketing research firm. We're doing a study of HVAC equipment service life and service costs and I'd like to ask you a few questions. Some of the questions may deal with data that you don't normally collect, but we would appreciate your opinions and best estimates based on your experience. All individual responses will remain confidential, and will only be reported in summary form to our client. The first couple of questions are for classification purposes only.

Try to speak with 1) Service Manager 2) Owner/Partner

1. Are your company's total annual sales over $400,000
   ________ Yes (continue)
   ________ No (terminate)

2. Do you do more than 10 residential electric heat pump installations in an average year?
   ________ Yes (continue)
   ________ No (terminate)

3a. What percentage of your sales are:
   ________% Residential
   ________% Commercial

3b. What percentage of your residential business is:
   ________% *New Construction*
   ________% Replacement
   ________% Service

FROM THIS POINT ON, HAVE YOUR RESPONDENTS ANSWER IN TERMS OF THEIR

RESIDENTIAL BUSINESS ONLY.

	Gas Furnaces	Unitary Air Conditioners	Electric Heat Pumps
4a. Approximately how many (READ COLUMN HEADINGS) do you install in a typical year?	______	______	______

FOR EACH EQUIPMENT TYPE ASK:
(*Work vertically*)

4b. What percentage of ________ were for replacement (rather than new construction)?	______%	______%	______%

4c. Of the replacement, what would you estimate as the percentage where "live" or still functioning equipment

	Gas Furnaces	Unitary Air Conditioners	Electric Heat Pumps
was replaced for energy efficiency (or other) reasons?	______%	______%	______%
4d.1. Based on your experience, what would you estimate has been the average age at replacement (when the total unit is replaced)? If unable to answer, skip to 4d.3	______Avg	______Avg	______Avg
4d.2. What might be a reasonable maximum/minimum replacement age? (Skip to 4e.)	______Min	______Min	______Min
4d.3. Prompt with ranges (for average only):	______Max	______Max	______Max
< 10 years	( )	( )	( )
10-14	( )	( )	( )
15-19	( )	( )	( )
20-24	( )	( )	( )
25+	( )	( )	( )
4e. Based on your experience, has the quality and reliability of ________ been improved in the last couple of years?			
Yes (continue)	( )	( )	( )
No (Go to 5a)	( )	( )	( )
4f. Do you expect this to lead to a ________ service life?			
Increased	( )	( )	( )
Decreased	( )	( )	( )
No change in	( )	( )	( )

FOR EACH EQUIPMENT TYPE ASK:
(Work vertically)

5a. Do you believe that the service life of equipment being installed today will be ________ than has been the case in the past?			
Longer	( )	( )	( )
Shorter	( )	( )	( )
The same as	( )	( )	( )
5b. Do you believe that the ________ being installed today will require ________ service than earlier models?			
Greater	( )	( )	( )
Less	( )	( )	( )
About the same	( )	( )	( )
5c. What average service life (years) does your company use for ________ in discussions with prospective customers or in cost comparisons? (Skip to 5d)	______	______	______

	Gas Furnaces	Unitary Air Conditioners	Electric Heat Pumps
If unable to answer, prompt with ranges:			
< 10 years	( )	( )	( )
10-14	( )	( )	( )
15-19	( )	( )	( )
20-24	( )	( )	( )
25+	( )	( )	( )
Don't know (skip to q. 6)	( )	( )	( )
5d. What is the source of these factors?			
Manufacturer	( )	( )	( )
Distributor	( )	( )	( )
ASHRAE Guidelines	( )	( )	( )
Own experience or opinion	( )	( )	( )

6. What methods do you use to determine the proper sizing of equipment? (Prompt only if necessary)

   a. Replace with comparable equipment ( )

   b. Rule of thumb or other ( )

   c. Manual calculation (standard ACCA J Form; heat loss survey) ( )

   d. Computer-based program ( )

   e. Use in-house computer ( ) }only ask if they
   f. Use utility/mfr's computer service ( ) }use a computer-based program

7. What information or methods do you use when comparing alternative systems in sales presentations to prospective customers? [Read List]

- Installed equipment cost only ( )
- Installed equipment and estimated annual energy costs ( )
- Installed equipment and estimated total annual operating costs (including energy, maintenance, other) ( )
- Simple payback analysis ( )
- Life cycle cost analysis ( )

	Unitary Air Conditioner	Electric Heat Pump
8a. In your experience, what would you estimate as the average service life (age at replacement) of a __________ compressor?	________Avg	________Avg
8b. What might be a reasonable minimum/maximum replacement age (skip to 8c)	________Min	________Min
	________Max	________Max
If unable to answer, prompt with ranges (for Avg. only):		
5-7 years	( )	( )
8-10 years	( )	( )
11-14 years	( )	( )
15-19 years	( )	( )
20+ years	( )	( )
8c. What would you estimate as an average installed cost (equipment and labor) for a __________ replacement compressor (typical or most common size in your area)?	$________	$________
8d. Approximately, what percentage of the installed cost of a totally new __________ unit would this be?	________%	________%
(Skip to 9)		
If unable to answer, prompt with ranges:		
20-30%	( )	( )
30-40%	( )	( )
40-50%	( )	( )
9. In terms of your average annual service calls for_____, what percentage are for:		
Fans (blades, blower wheels, capacitors, relays, motors)	________	________
Compressor Failure	________	________
Compressor Motor Circuits (contractors,capacitors, relays, etc.)	________	________
Defrosting Components	________	________
Refrigerant Components (reversing valve, motoring device, check valves)	________	________
Refrigerant leaks	________	________

ASK FOR EACH EQUIPMENT TYPE:

	Gas Furnaces	Unitary Air Conditioners	Electric Heat Pumps
10a. Approximately what percentage of your total service activity for ________ is on annual service contracts?	______%	______%	______%
10b. Is this annual service contract portion:			
Increasing	( )	( )	( )
Decreasing	( )	( )	( )
Remaining about the same	( )	( )	( )
10c. Approximately what percentage is on:			
Manufacturers Service Program	$______	$______	$______
Dealers Service Program	$______	$______	$______
10d. What do you estimate the annual maintenance costs would be for a typical ________ in your area?			
On an annual service contract	$______	$______	$______
On an "as needed" service basis	$______	$______	$______
10e. What would be a typical per unit first year service reserve (escrow) fund?	$______	$______	$______

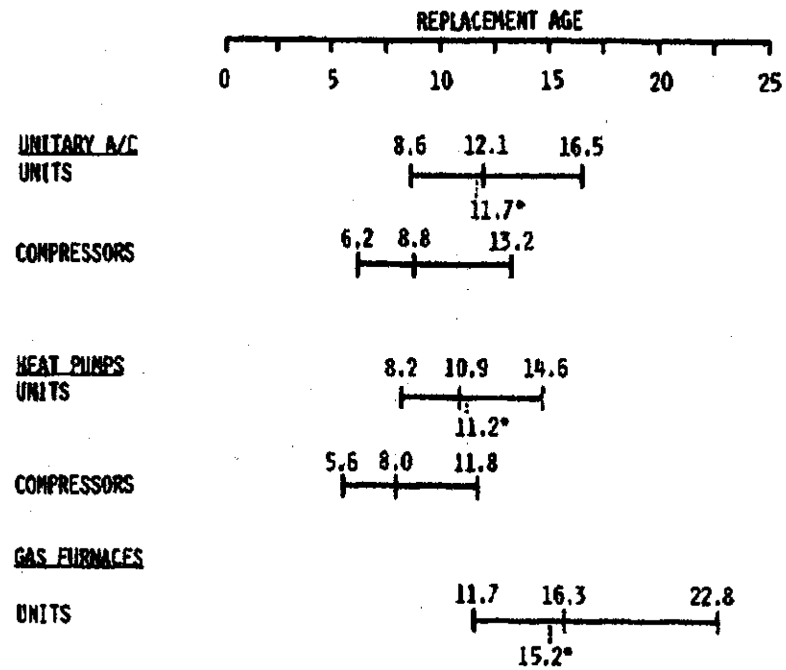
11. What would you estimate the breakdown by efficiency level of the ________ you expect to sell this year?

AFUE		Gas Furnace	SEER	Electric Heat Pump
< 80%	standard	______%	<7.5	______%
80-84%	hi-efficiency	______%	7.5-9.0	______%
85+%	condensing	______%	9.0+	______%

[Relates to Heat Pumps]

12. What incentives are being offered by: ________ in terms of the electric heat pump?

	Manufacturer	Utility
a. Cash	Y ( ) N ( )	Y ( ) N ( )
1. Average Amount	$______	$______
b. Rebates	Y ( ) N ( )	Y ( ) N ( )
1. Average Amount	$______	$______
d. Co-op Advertising	Y ( ) N ( )	Y ( ) N ( )
e. Other	Y ( ) N ( )	Y ( ) N ( )
f. None	Y ( ) N ( )	Y ( ) N ( )



* AVERAGE UNIT SERVICE LIFE USED BY DEALERS IN CUSTOMER DISCUSSIONS

Figure 1. Estimated minimum, average and maximum replacement age

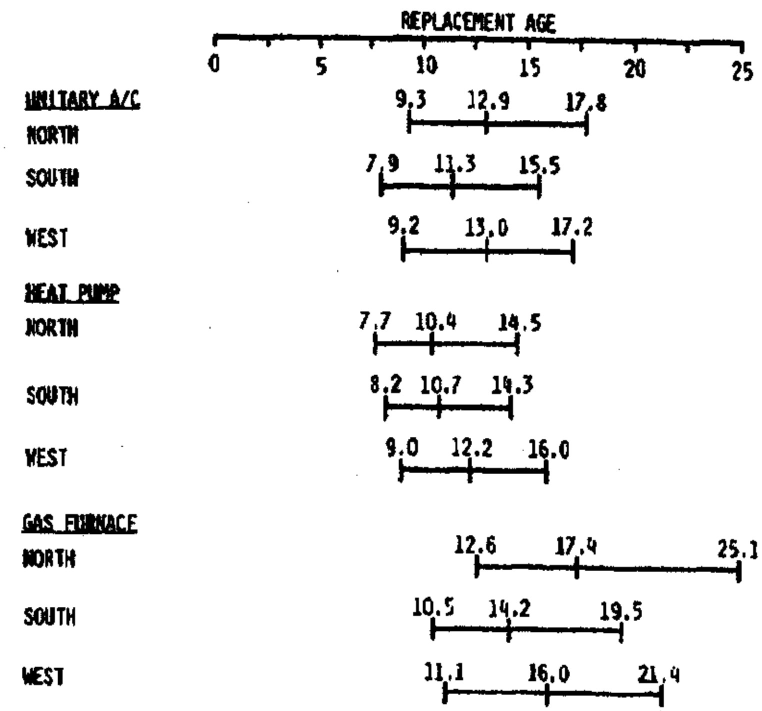


Figure 2. Estimated replacement age by region

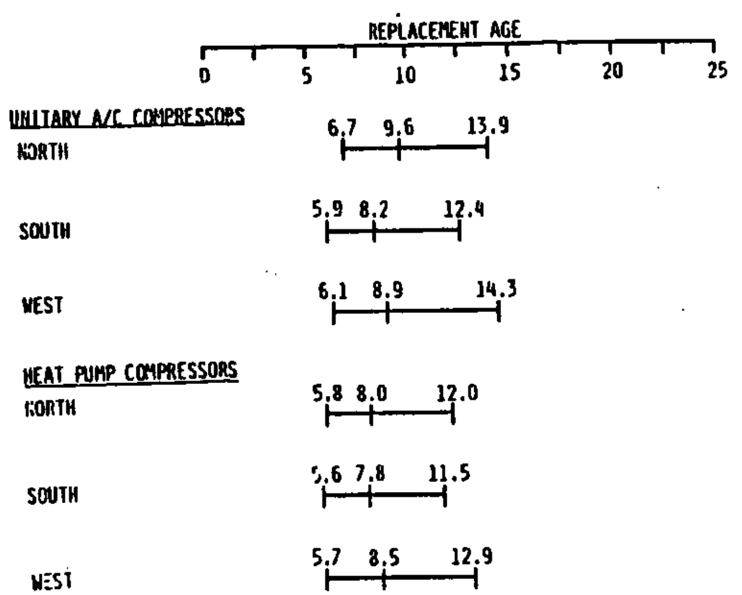


Figure 3. Estimated compressor replacement age by region

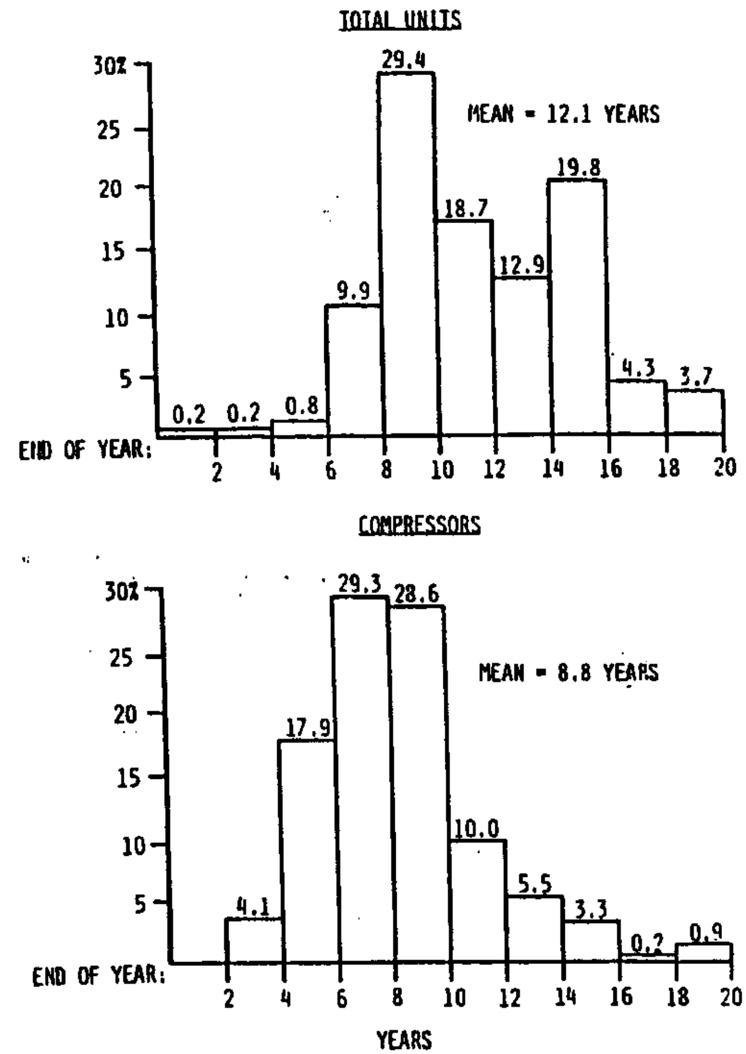


Figure 4. Distribution of unitary AC replacement ages

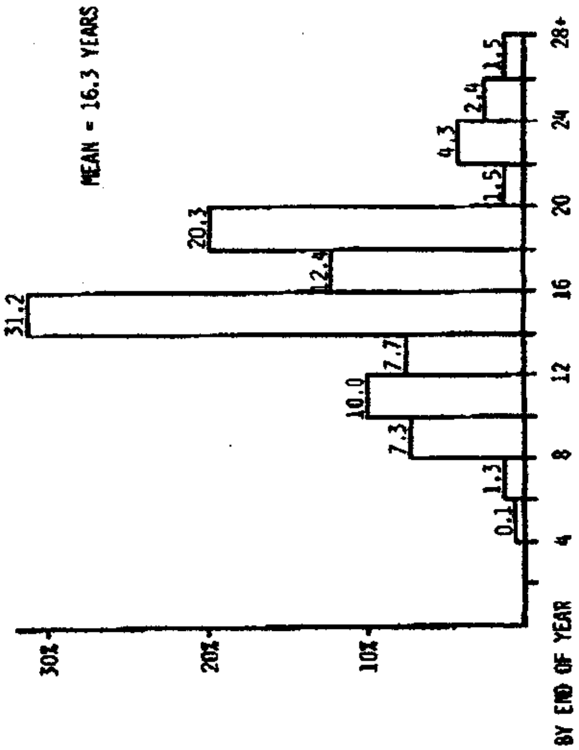


Figure 6. Distribution of gas furnace replacement ages

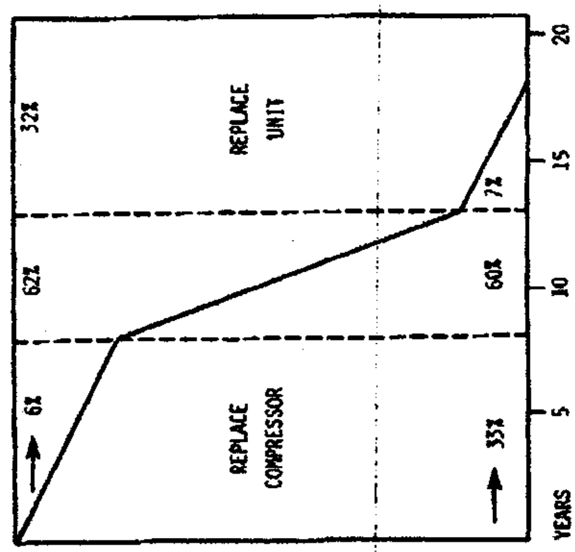


Figure 7. Conceptual depiction of replacement tendencies

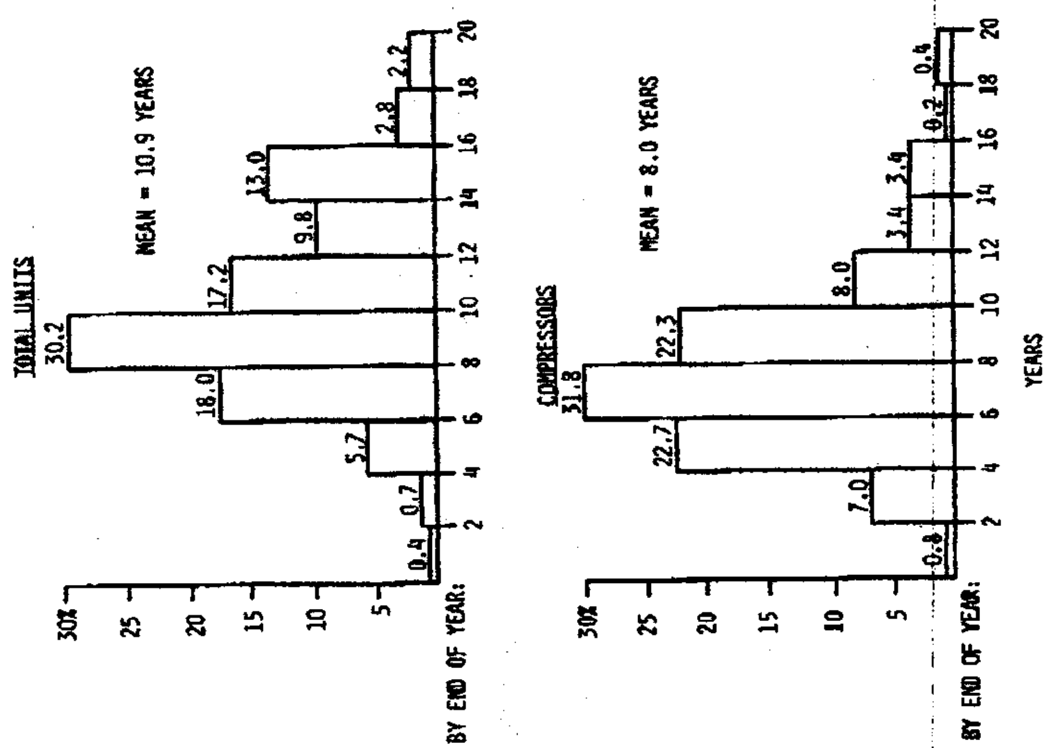


Figure 5. Distribution of heat pump replacement ages

HI-85-10 No. 5

A Study of Heat Pump Service Life

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ABSTRACT

This paper is based on a study of heat pump service life (age at replacement). The objective of the study was to survey known heat pump owners who had installed heat pumps between 1964 and 1974, gather empirical data that would provide responses to a series of questions concerning the service life of the known heat pump or, if appropriate, the successor, and determine the factors that influence the replacement decision. The major findings include the following:

1. Between 96% and 98% of the respondents surveyed still had heat pumps;

2. A large percentage of the original units are still in operation;

3. The median age of replacement is approximately 20 years in Alabama.

INTROUDUCTION

Much speculation has existed in recent years regarding the actual useful life of heat pumps, but no definitive work has been done to determine quantitatively the actual age at which heat pumps are typically replaced. A study(1) was initiated in 1984 to perform a survey of heat pump replacement life and related issues in Alabama. The Alabama region of the country was selected because of its lengthy experience with heat pumps and the existence of at least one assured service heat pump program(2) which provides a heat pump maintenance contract for up to ten years for a low monthly premium.

Under the particular heat pump service program addressed in this survey, qualifying heat pumps are installed by local dealers who have been certified by the program, and upon passing a check for conformance to the program installation standards, those heat pump installations then qualify for a ten year maintenance contract. The program maintains detailed service records during the ten year period, after which, no records are kept. Maintenance is done only as needed by one of the program's certified dealers. The program stresses the maintenance procedures and practices that must be followed in order for repair or installation work to meet program standards. These standards are primarily a means of ensuring that work is done to the stated requirements of the manufacturers.

The heat pump owners contacted during this survey had heat pumps that had been under the assured service maintenance contract for a full ten years, thus assuring that the results are representative of correctly installed heat pumps. The service program data base was used only for the purpose of generating a list of known heat pump installations and for verifying the

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validity of the survey responses with respect to the age and brand of the original heat pump. A future study is planned to correlate the maintenance history during the first ten years of the specific heat pumps' lives with their replacement age.

Much useful information on reasons for heat pump replacement, factors affecting the replacement selection and more was obtained in addition to information on actual replacement life. The specific objectives of the survey were as follows:

1. Determine actual service life (age at replacement) distribution of heat pumps in Alabama.

2. Determine the proportion of heat pumps in Alabama that are still in operation, as a function of installation date.

3. Determine, categorize, and quantify typical reasons for replacement of the heat pumps (not addressed in this paper).

4. Determine, categorize, and quantify typical factors affecting the choice of the replacement heating system (not addressed in this paper).

5. Determine the various types of heating systems used to replace those heat pumps that have been replaced (not addressed in this paper).

6. Determine seasonal replacement trends (not addressed in this paper).

7. Provide breakdowns of the above information categorized by manufacturer, year of installation, and other appropriate groupings.

METHODOLOGY

A 25-item questionnaire was developed to collect information on heat pumps that had been under a maintenance contract for ten years in Alabama. The participants were divided into three groups according to when they entered the maintenance contract program. The three groups were:

Group 1: Heat pumps installed between March 1964 and May 14, 1967.

Group 2: Heat pumps under maintenance contract installed between May 15, 1967 and Decembr 31, 1971.

Group 3: Heat pumps under maintenance contract installed between January 1, 1972 and April 18, 1974.

The dates of the three groups correspond to dates of changes in the heat pump service program. These groups were proportionally sampled and owners interviewed by telephone to provide the data for the study.

This section contains a discussion of the methods used in conducting the study. The discussion includes sample design, instrumentation, data collection procedures, and methods of data analysis.

Sample

The heat pump service program under discussion has been able to develop detailed tracking records that could be used to validate data generated through a field survey. These records, while not included herein, include histories of the heat pumps, heat pump unit identification information, warranty data, and service information.

The universe for this study was defined as heat pumps covered for a full ten years by the assured service program. The extremely long replacement lives of the heat pumps of this study showed that use of the above universe did not bias the results in any significant way. A total of 5,963 heat pump installations were identified and these were subsequently divided into the three groups previously mentioned. This stratification process allocated 597 names to Group 1; 3,443 names to Group 2; and 1,923 names to Group 3. Each of these three groups was further stratified into six geographic regions within Alabama.

To assure a high level of randomness and avoid the problem of periodicity, the homeowners names in all subgroups were reordered. More specifically, the listing of names was changed from the original format to one that alphabetized them.

The sampling procedure adopted for this study was the stratified sampling technique. This method selected from every stratum a random sample proportionate to the size of the stratum. Different sample sizes were selected for each of the three groups. For Group 1, it was decided that a census (a sampling of 100%) should be attempted because of the small number of units in the universe. For Group 2, it was decided that a sample of 1,000 would provide a safety factor of 20 to 1. In other words, if a survey result shows 20%, the odds are 20 to 1 that this result is accurate within 2.6 points...a census probably would come out between 17.4% and 22.6%. For Group 3, a sample size of 400 was selected.

Survey Questionnaire

In order to carry out the research goals as well as collect other relevant information, a questionnaire was developed. The survey was structured as a general heating and cooling study, and the participants and sponsors were not identified to the homeowner in order to avoid biasing of the responses.(1)

Data Collection Procedure

Data for this study were collected from the sample through telephone interviews. The survey instrument was subjected to a series of pre-survey tests until it was determined that no major flaws existed. The responses to these pre-survey tests provided valuable information on the final wording of several questions.

Survey

On June 13, 1984, the actual telephone interviewing commenced. Because the owners of some heat pumps had changed, attempts to locate the new owners were made using addresses. This resulted in telephone calls to 3,211 owners, of which there were 151 refusals and 1,010 who could not be reached. There were 2,050 completed surveys; and 1,689 which were identified as valid by passing verification and edit routines to check for survey self consistency and agreement with the heat pump service program data base information. The survey was performed by an independent firm normally engaged in market studies.

Data Analysis Procedure

Prior to data analysis, each interview form was edited to assure that the correct procedure had been followed. At this time, coded information was entered on the form, which would later be used to verify the validity and reliability of the information being collected. The next step of the process was to keypunch the information for further processing. Several computer routines were used to identify interviewer errors, internal inconsistencies, and make comparisons with acceptance standards. Once an interview passed all of these validation checks, it became a part of the data bank. All rejected interviews were checked to determine whether the problem could be resolved. Any interviews identified as unresolvable (353) were replaced with a new valid interview.

OVERALL SERVICE LIFE DISTRIBUTION

Figure 1 shows the service life distribution based on an analysis of the data. The actuarial distribution curve(3) is the appropriate curve to use in projecting the expected life of any generic heat pump. The curve in Figure 1 is of great significance, since it indicates that the median service life (age when 50% of the heat pumps are still in operation, and 50% have been replaced) of heat pumps in Alabama is approximately 20 years, as opposed to the more commonly held belief of 14-15 years for air-conditioning systems and even less for heat pump systems. Furthermore, at age 15, approximately 75% of all heat pumps surveyed are still in active use.

Analysis of the heat pump service program maintenance records has shown that on the average, a reasonable fraction of the heat pumps will have required servicing at least once during the first ten years of operation.(4) The curve in Figure 1 is hence even more significant because it conclusively shows that heat pumps in Alabama have very long service lives despite the probability that by age 20, a number of the heat pumps will have had servicing, some major. In other words, compressor failure or other major servicing clearly does not mandate early retirement of the unit. If such major servicing is correctly performed, the unit should continue to operate satisfactorily for an extended period of time.

SERVICE LIFE FOR VARIOUS MANUFACTURERS

Figures 2 through 7 show the service life distributions for manufacturers A, B, C, D, E, and (as a single group) F through V. Once again, the actuarial curves shown are the appropriate curves to examine for predicting the expected probability of survival of any given heat pump for the respective manufacturers.

The figures show that:

-- Manufacturer B's heat pumps have the longest service life with, on the average, approximately 62% of the units expected to be in operation at age 20, and a median service life notably in excess of 20 years.

-- Manufacturer A's and D's heat pumps have comparable service life, with approximately 52-53% of the units expected to be in operation at age 20, and a median service life slightly in excess of 20 years.

-- Manufacturer C's heat pumps have slightly shorter service life, with approximately 45% expected to be in operation at age 20, and a median service life of approximately 19.5 years.

-- Manufacturer E's heat pumps are few and the curve is not reliable, but the observed behavior is consistent with the other heat pumps discussed above.

-- Manufacturers F-V, as a group, have the shortest expected service life, with a median service life of approximately 16 years. Note, however, that there were less than 173 of the various brands F through V in total in the entire survey sample, which is why they were lumped into a single group.

These distributions are estimated from data pooled over different years of installation for each manufacturer. However, the pooling is acceptable because year of installation does not appear to affect service life. This is partly due to the fact that market and other sales promotion activities were found to have a major influence on the decision to replace units.

The actuarial curves for manufacturers B and E are flat at higher ages. This is a result of the small numbers of heat pumps of those manufacturers at higher ages, none of which failed, and of the weighting given to age at replacement in the actuarial method of analysis. For a larger sample of such heat pumps, the curves would decrease at higher ages.

EFFECT OF REPLACING ONLY WHEN A HEAT PUMP FAILS

Since it was found that slightly less than half of the heat pumps replaced were still operational when removed from service, it was thought useful to estimate the service life distribution that would result if all heat pumps had been replaced only at time of failure. Figure 8 shows both the observed actuarial distribution (from Figure 1) of service life, and the speculated actuarial projection of service life assuming units were only replaced at time of failure. As expected, the median heat pump service life, if replacement were done only at time of failure, is considerably longer than the 20 years observed in this study, which serves to point out the impact of homeowner perceptions on the replacement decision, and the influence that marketing and incentive programs can have on such decisions.

CONCLUSIONS

1. A total of 96.4% of the respondents surveyed were identified as still having heat pumps. another 1.6% reportedly have other forms of electric heating (possible reporting error - they could also have been heat pumps).

2. A large percentage of the original known heat pump sample are still in operation, with more than 50% of the units 20 years old still in active use, 75% of the units 15 years old, and nearly 100% for units 10 years old.

3. The median age to replacement (age at which 50% of the units have been removed from service and 50% still remain in service) in Alabama is approximately 20 years.

4. The observed range of median replacement life was from 16 years to notably in excess of 20 years, with the overwhelming majority of the surveys favoring the longer lives.

5. There were no convincing differences in service life between younger and older units, due in large measure to the types of factors that were found to impact the replacement decision.

6. Slightly less than 50% of the relatively small number of units that were replaced were still fully operational at the time of replacement. Such replacements appear to have been motivated both by the perception of expected life, and by marketing and promotional efforts of dealer/contractors and the local utility.

This survey has revealed that heat pump service life in Alabama is considerably better than all values previously published by others. Furthermore, the results of this survey provide conclusive evidence that, if properly performed, major servicing of heat pumps does not appreciably degrade heat pump service life. Moreover, age of the heat pump unit alone need not be a determining factor in making a replacement decision.

REFERENCES

(1) Lovvorn, N. C., "A Survey of Heat Pump Service Life," Final report for Research Project 2417-1 of the Electric Power Research Institute, to be published.

(2) "The Electric Heat Pump for Comfort, Efficiency, and Savings," Residential Marketing Dept., Alabama Power Co., P. O. Box 2641, Birmingham, AL 35291.

(3) Nelson, Wayne, Applied Data Analysis, Wiley, New York, 1st Ed, 1982, pp. 150-154.

(4) Lovvorn, N. C., "An Update on Heat Pump Reliability," EPRI Proceedings: Seminar on Heat Pump Research and Applications, New Orleans, LA 1984

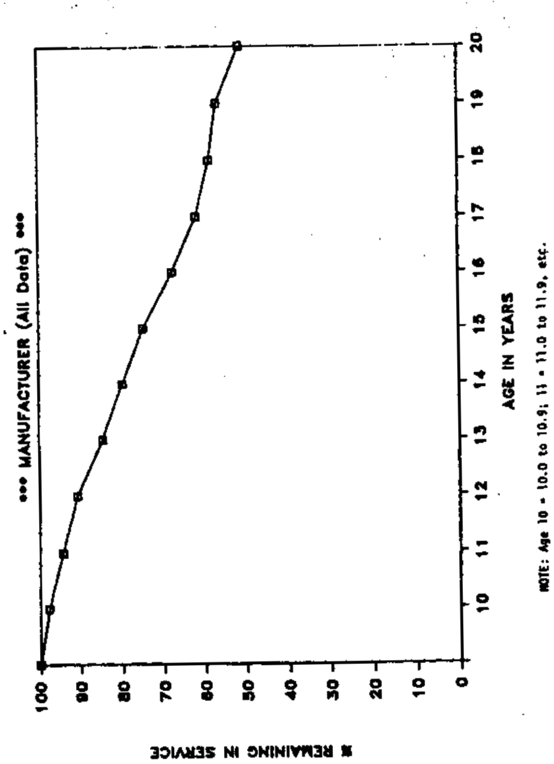


Figure 1. Percent remaining in service (all)

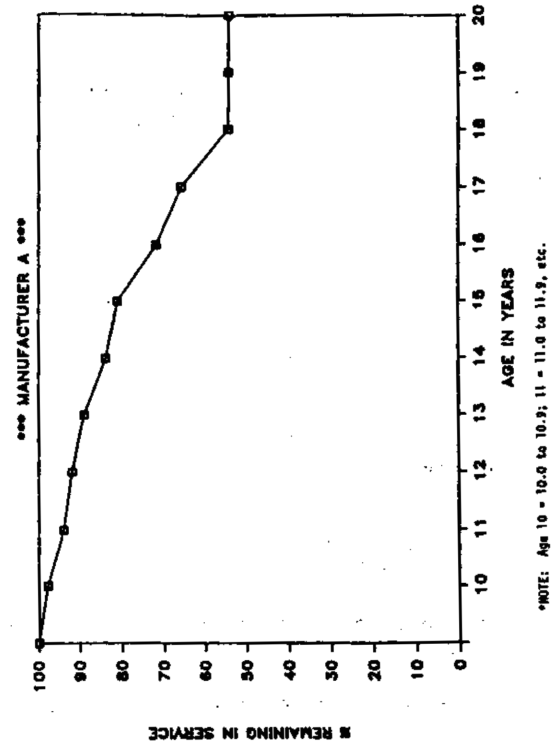


Figure 2. Percent remaining in service (mfg A)

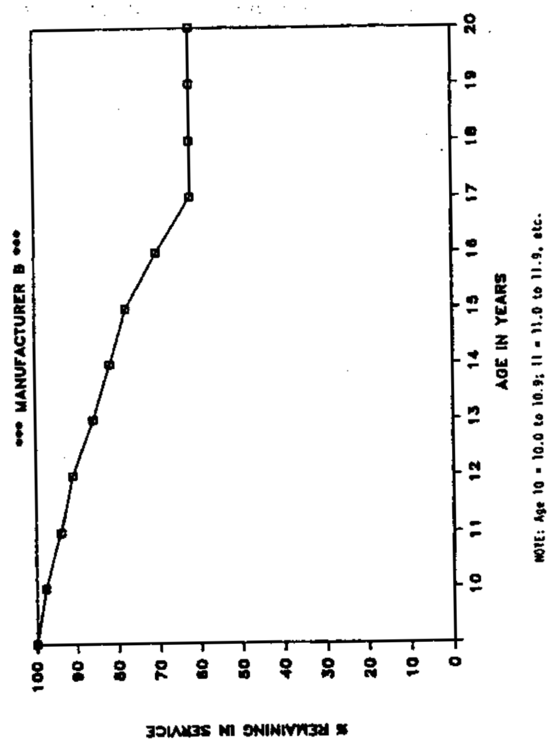


Figure 3. Percent remaining in service (mfg B)

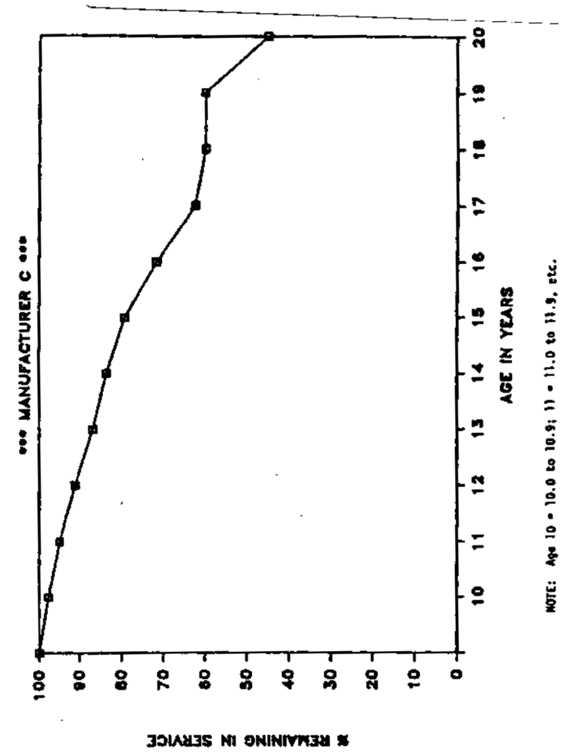


Figure 4. Percent remaining in service (mfg C)

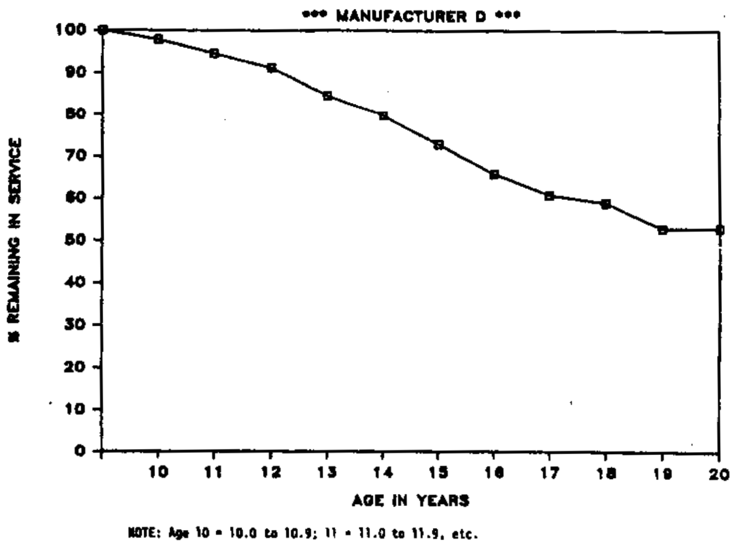


Figure 5. Percent remaining in service (mfg D)

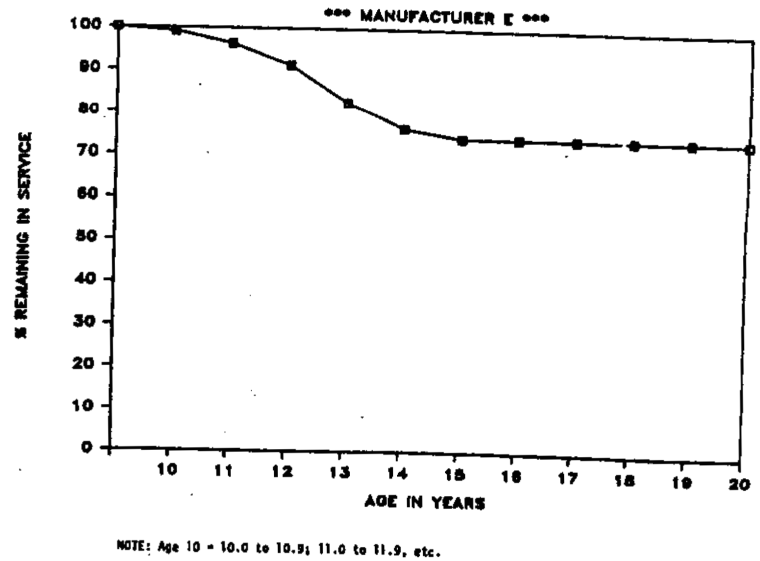


Figure 6. Percent remaining in service (mfg D)

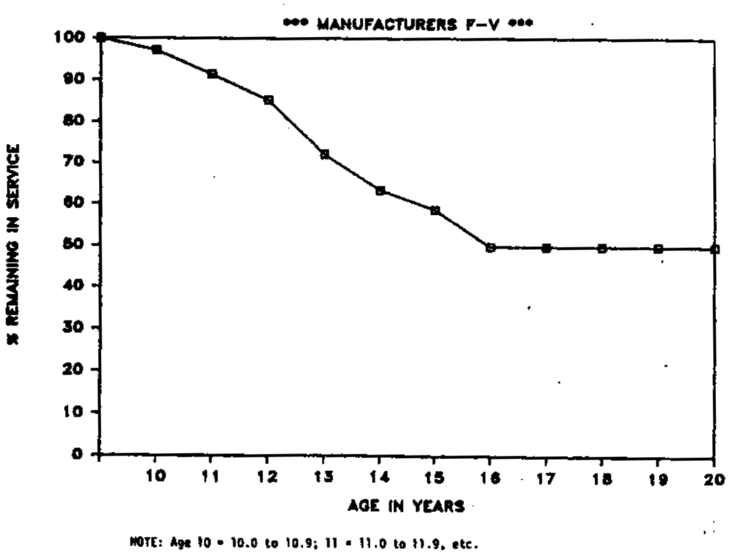


Figure 7. Percent remaining in service (mfg F-V)

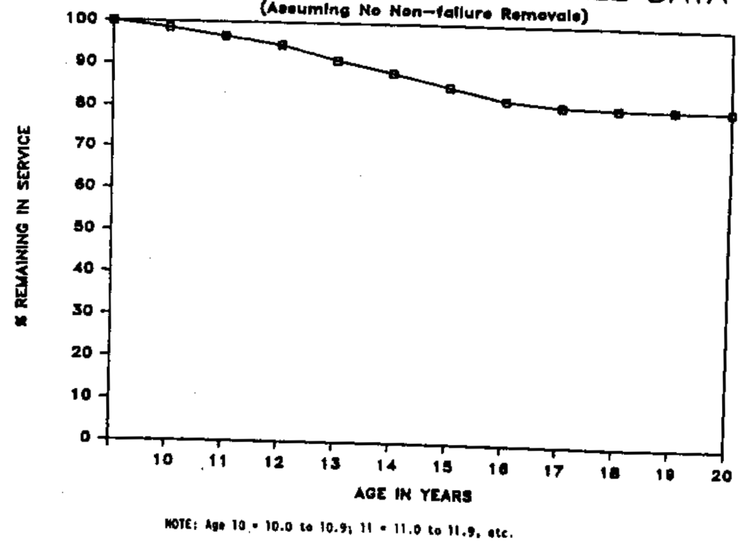
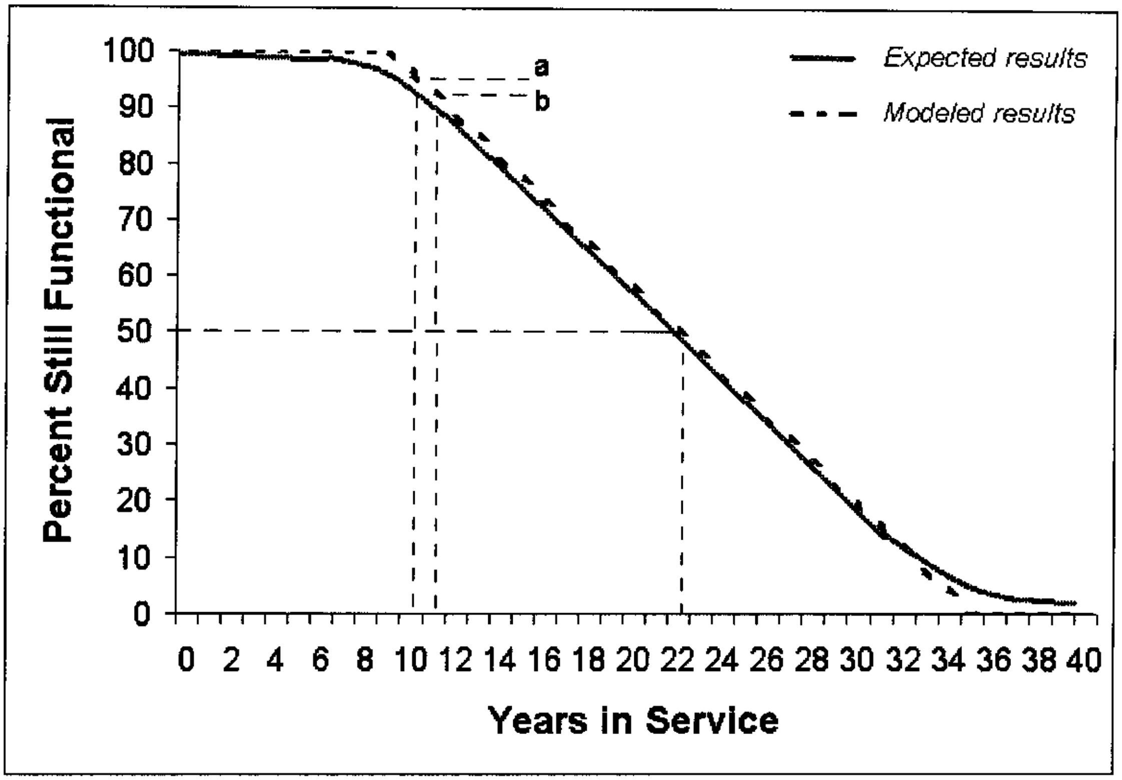


Figure 8. Percent remaining in service (no non-failure removals)

Derivation of HVAC Units in Service vs. Age and Probability of Failure vs. Age



Model of probability of failure within 12 months:

Example: In year 10, 96.15 percent of units are still in service (a).
In year 11, 92.31 percent of units are still in service (b).
In year 10, the probability of a unit failing within 12 months =

(96.15 – 92.31)/96.15 * 100% = 4.0%

In year 15, the probability of a unit failing within 12 months =

(76.92 – 73.07)/76.92 * 100% = 5.0%

In year 22, the probability of a unit failing within 12 months =

(50.0 – 46.15)/50.0 * 100% = 7.7%

Table of Selected FPSC-Approved Energy Efficiency and Conservation Programs

Docket No.	Utility	Program Name	Analysis Period
941171-EI	Florida Power Corp.	Home Energy Improvement	30 years
941171-EI	Florida Power Corp.	Better Business	30 years
941171-EI	Florida Power Corp.	Commercial Energy Management	30 years
941170-EG	Florida Power & Light	Residential Air Conditioning	23 years
941170-EG	Florida Power & Light	Residential Load Management ("On Call")	23 years
941170-EG	Florida Power & Light	Business Custom Incentive/Refrigeration	27 years
941173-EG	Tampa Electric Company	Residential Heating & Cooling	19 years
941173-EG	Tampa Electric Company	Prime Time Load Management	30 years
941173-EG	Tampa Electric Company	Commercial/Industrial Load Management	30 years

Table 2 Initial Cost Checklist

Energy and Fuel Service Costs
Fuel service, storage, handling, piping, and distribution costs
Electrical service entrance and distribution equipment costs
Total energy plant
Heat-Producing Equipment
Boilers and furnaces
Steam-water converters
Heat pumps or resistance heaters
Makeup air heaters
Heat-producing equipment auxiliaries
Refrigeration Equipment
Compressors, chillers, or absorption units
Cooling towers, condensers, well water supplies
Refrigeration equipment auxiliaries
Heat Distribution Equipment
Pumps, reducing valves, piping, piping insulation, etc.
Terminal units or devices
Cooling Distribution Equipment
Pumps, piping, piping insulation, condensate drains, etc.
Terminal units, mixing boxes, diffusers, grilles, etc.
Air Treatment and Distribution Equipment
Air heaters, humidifiers, dehumidifiers, filters, etc.
Fans, ducts, duct insulation, dampers, etc.
Exhaust and return systems
System and Controls Automation
Terminal or zone controls
System program control
Alarms and indicator system
Building Construction and Alteration
Mechanical and electric space
Chimneys and flues
Building insulation
Solar radiation controls
Acoustical and vibration treatment
Distribution shafts, machinery foundations, furring

Analysis Period

The time frame over which an economic analysis is performed greatly affects the results of the analysis. The analysis period is usually determined by specific analysis objectives, such as length of planned ownership or loan repayment period. The chosen analysis period is often unrelated to the equipment depreciation period or service life, although these factors may be important in the analysis.

Table 3 lists representative estimates of the service life of various system components. Service life as used here is the time during which a particular system or component remains in its original service application. Replacement may be for any reason, including, but not limited to, failure, general obsolescence, reduced reliability, excessive maintenance cost, and changed system requirements due to such influences as building characteristics, energy prices, or environmental considerations.

Depreciation periods are usually set by federal, state, or local tax laws, which change periodically. Applicable tax laws should be consulted for more information on depreciation.

Interest or Discount Rate

Most major economic analyses consider the opportunity cost of borrowing money, inflation, and the time value of money. **Opportunity cost** of money reflects the earnings that investing (or loaning) the money can produce. **Inflation** (price escalation) decreases the purchasing or investing power (value) of future money because it can buy less in the future. **Time value** of money reflects the fact that money received today is more useful than the same amount received a year from now, even with zero inflation, because the money is available earlier for reinvestment.

The cost or value of money must also be considered. When borrowing money, a percentage fee or interest rate must normally be paid. However, the interest rate may not necessarily be the correct cost of money to use in an economic analysis. Another factor, called the **discount rate**, is more commonly used to reflect the true cost of money. Discount rates used for analyses vary depending on individual investment, profit, and other opportunities. Interest rates, in contrast, tend to be more centrally fixed by lending institutions.

To minimize the confusion caused by the vague definition and variable nature of discount rates, the U.S. government has specified particular discount rates that can be used in economic analyses relating to federal expenditures. These discount rates are updated annually (Lippiatt 1994, OMB 1972, NIST) but may not be appropriate for private sector economic analyses.

Periodic Costs

Regularly or periodically recurring costs include insurance, property taxes, income taxes, rent, refurbishment expenses, disposal fees (e.g., refrigerant recycling costs), occasional major repair costs, and decommissioning expenses.

Insurance. Insurance reimburses a property owner for a financial loss so that equipment can be repaired or replaced. Insurance often indemnifies the owner from liability as well. Financial recovery may include replacing income, rents, or profits lost due to property damage.

Some of the principal factors that influence the total annual insurance premium are building size, construction materials, amount and size of mechanical equipment, geographic location, and policy deductibles. Some regulations set minimum required insurance coverages and premiums that may be charged for various forms of insurable property.

Property Taxes. Property taxes differ widely and may be collected by one or more agencies, such as state, county, or local governments or special assessment districts. Furthermore, property taxes may apply to both real (land, buildings) and personal (everything else) property. Property taxes are most often calculated as a percentage of assessed value but are also determined in other ways, such as fixed fees, license fees, registration fees, etc. Moreover, definitions of assessed value vary widely in different geographic areas. Tax experts should be consulted for applicable practices in a given area.

Income Taxes. Taxes are generally imposed in proportion to net income, after allowance for expenses, depreciation, and numerous other factors. Special tax treatment is often granted to encourage certain investments. Income tax experts can provide up-to-date information on income tax treatments.

Additional Periodic Costs. Examples of additional costs include changes in regulations that require unscheduled equipment refurbishment to eliminate use of hazardous substances, and disposal costs for such substances. Moreover, at the end of the equipment's useful life there may be negative salvage value (i.e., removal, disposal, or decommissioning costs).

OPERATING COSTS

Operating costs are those incurred by the actual operation of the system. They include costs of fuel and electricity, wages, supplies, water, material, and maintenance parts and services. Chapter 30 of the 1997 *ASHRAE Handbook—Fundamentals* outlines how fuel and electrical requirements are estimated. Note that total energy consumption cannot generally be multiplied by a per unit energy cost to arrive at annual utility cost.

Florida Public Service Commission
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GULF POWER COMPANY

Year	1999 Ten Year Site Plan without GC Conversion Program		1999 Ten Year Site Plan with GC Conversion Program as Filed	
	Net Firm Summer Peak Demand, MW	Net Firm Winter Peak Demand, MW	Net Firm Summer Peak Demand, MW	Net Firm Winter Peak Demand, MW
1999	2,175	2,071	2,174	2,074
2000	2,207	2,105	2,203	2,114
2001	2,234	2,121	2,228	2,135
2002	2,265	2,135	2,256	2,155
2003	2,280	2,139	2,269	2,165
2004	2,309	2,154	2,297	2,182
2005	2,347	2,178	2,335	2,206
2006	2,383	2,200	2,371	2,228
2007	2,425	2,229	2,413	2,257
2008	2,466	2,258	2,454	2,286

FLORIDA PUBLIC SERVICE COMMISSION
DOCKET NO. 981591-EI EXHIBIT NO. 6
COMPANY/ WITNESS: Spangenberg
DATE: 10-12-99